INDEPENDENT FISCAL OFFICE

TO: Governor Josh Shapiro
All Members of the General Assembly

FROM: Matthew Knittel, Director
Independent Fiscal Office

DATE: August 31, 2023

RE: Actuarial Note for House Bill 1416, Printer's Number 1584, Amendment A01821

The Independent Fiscal Office (IFO) submits an actuarial note for **Amendment A01821 to House Bill 1416, Printer's Number 1584** in accordance with section 615-B of the Administrative Code of 1929. Due to the material cost impact of the legislation, the IFO submitted a formal request to its contracted actuary (Milliman) for an actuarial note. A copy of the actuary's note is attached, along with responses prepared by the State Employees' Retirement System (SERS) and the Public School Employees' Retirement System (PSERS) in response to a data request made by the IFO on July 10, 2023.

Legislation Summary

The legislation would amend Title 24 (Education) and Title 71 (State Government) to provide supplemental annuities to individuals who retired prior to July 2, 2001 for SERS and PSERS.

- The legislation would provide for a supplemental annuity (COLA) to begin the first January 1 (SERS) or July 1 (PSERS) 60 days after certification by the respective system that it has a funded ratio of at least 100%.
- To be eligible, annuitants must (1) receive an annuity by the January 1 (SERS) or July 1 (PSERS) after the effective date of the COLA, (2) be retired prior to July 2, 2001, and (3) have no credited service that qualifies as Class T-D, Class D-4, or Class AA.
- Beneficiaries and survivor annuitants of members who die prior to commencement of the COLA would not be eligible.
- The unfunded actuarial liability due to the benefit increase would be amortized through level dollar payments over a period of 10 years beginning the second July 1 (both systems) following the effective date.
- The supplemental annuity is based on the most recent date of retirement for the individual. The full schedule is below.

Retirement Effective Date	Annuity Increase (%)	Retirement Effective Date	Annuity Increase (%)
7/2/2000 - 7/1/2001	15.0	7/2/1990 - 7/1/1991	20.0
7/2/1999 - 7/1/2000	15.5	7/2/1989 - 7/1/1990	20.5
7/2/1998 - 7/1/1999	16.0	7/2/1988 - 7/1/1989	21.0
7/2/1997 - 7/1/1998	16.5	7/2/1987 - 7/1/1988	21.5
7/2/1996 - 7/1/1997	17.0	7/2/1986 - 7/1/1987	22.0
7/2/1995 - 7/1/1996	17.5	7/2/1985 - 7/1/1986	22.5
7/2/1994 - 7/1/1995	18.0	7/2/1984 - 7/1/1985	23.0
7/2/1993 - 7/1/1994	18.5	7/2/1983 - 7/1/1984	23.5
7/2/1992 - 7/1/1993	19.0	7/2/1982 - 7/1/1983	24.0
7/2/1991 - 7/1/1992	19.5	Prior to 7/2/1982	24.5

Review of Findings

The legislation would enact supplemental annuities for individuals who retired prior to July 2, 2001 for SERS and PSERS. Valuations for SERS occur on a calendar year (CY) basis, while PSERS' occur on a fiscal year (FY) basis. The table below compares the projected impact from House Bill 1416, Printer's Number 1584 (base) to the legislation should it be amended by A01821:

Impacts of Amendment A01821 to House Bill 1416, P.N. 1584

	SERS		PSERS	
	Base	A01821	Base	A01821
Required Funded Ratio	n.a.	100%	n.a.	100%
Commencement Date	1/1/2024	1/1/2049	7/1/2023	7/1/2043
Individuals	25,334	2,109	43,475	4,286
Benefit Increases				
Avg. First Year (actual $)[1]	$2,240	$925	$3,040	$1,790
Lifetime[2]	$566.4	$10.3	$1,220.2	$33.7
Initial Change				
Unfunded Actuarial Liability	+$371.0	+$7.8	+$821.1	+$26.6
Funded Ratio	-0.46%	-0.01%	-0.44%	-0.02%
Employer Contr. Rate	+0.74%	+0.01%	+0.81%	+0.02%
Annual Amortized Cost[3]	$52.5	$1.1	$125.1	$4.1

Note: Dollars in millions, unless otherwise noted.

1 The number of indentified individuals and the projected first year payments as provided by the systems. Does not take into account projected changes in annuitant demographics, including mortality.

2 Additional retirement benefits paid over the lifetime of the annuitants and qualified beneficiaries.

3 Proposed legislation stipulates a 10-year level dollar amortization period.

In its analysis, Milliman notes the following issues:

- It is unlikely that the systems will obtain a 100% funded status in the same year. For this amendment, PSERS will provide COLAs to qualified annuitants 5.5 years prior to SERS. In the past, supplemental annuities commenced on the same date.
- For both systems, the employer contribution rate for unfunded accrued liabilities is projected to turn negative for certain years after the COLAs become effective; however, the total effective employer contribution rate cannot be less than the normal contribution rate. In the years this occurs, the systems would not make unfunded accrued liability contributions. System projections for this analysis result in unfunded liabilities being paid in one (SERS) and two (PSERS) of the 10 amortization periods.[1] This reduces the nominal cost to fund the COLAs ($8.1 million total for SERS; $1.1 million total for PSERS). Those costs would be absorbed by plan assets and could impact contributions in subsequent years.
- The legislation provides that the cost of supplemental annuities would be funded in equal dollar installments over a period of 10 years per §8348.8(f). However, §8328(d)(2) in the PSERS code indicates that increases in benefits due to supplemental annuities shall be funded as a level percentage of compensation over a period of 10 years from the July 1 second succeeding the date such legislation is enacted.

[1] For SERS, the 30-year projection period ends after four of the 10 amortization periods. Additional annual payments of $1.1 million could be required for the remaining six years which could bring total nominal costs to $7.7 million.

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August 29, 2023

Mr. Matthew Knittel
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Pennsylvania Independent Fiscal Office
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400 Market Street
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Re: House Bill 1416, Printer's Number 1584, as amended by Amendment A01821

Dear Mr. Knittel:

As you requested, we have prepared an actuarial note on House Bill 1416, Printer's Number 1584, as amended by Amendment A01821. The Bill would amend both the Public School Employees' Retirement Code and the State Employees' Retirement Code to provide for an ad hoc cost-of-living-adjustment (COLA) (e.g. supplemental annuities) to retirees of both Systems with an effective date of retirement prior to July 2, 2001 commencing on the July 1 or January 1, respectively, after the System is certified to be at least 100% funded.

Executive Summary

This Bill would provide a benefit increase to retirees in PSERS and SERS ranging from 15% to 24.5% of the member's benefit at the effective date based on the member's date of retirement. The effective date would depend on when the Systems are certified to be at least 100% funded. Based on the Systems' actuaries' projections, approximately 4,300 PSERS retirees would receive the increased benefits commencing July 1, 2043 and approximately 2,100 SERS retirees would receive the increased benefits commencing January 1, 2049. Based on the Systems' actuaries' projections, such increase would result in a slight decrease in the funded ratio of both Systems and increase the employer contribution rate in FY 2044-2045 by 0.02% for PSERS and in FY 2049-2050 by 0.01% for SERS based on the 10-year amortization period set forth in the Bill.

Because the unfunded accrued liability contribution rate is projected to become negative after the COLA benefits become effective, the number of the projected explicit additional payments is less than the 10-year amortization period. The PSERS actuary projects 2 years of the explicit additional payments. The SERS actuary projects 1 year of the explicit additional payments in the last year of the projection period (FY 2052-2053), which is the 4th year of the 10-year amortization period. Additional explicit payments may occur after the end of the projection period. Plan assets will absorb the remaining cost of the COLA benefits. Based on the Systems' actuaries' projections, the following chart compares the projected COLA benefit

payments, the increase in the accrued liability of the COLA benefits, and the additional payments expected to be received.

	PSERS	SERS
Total COLA benefits projected to be paid	$33.7 million	$10.3 million
Liability increase (present value of projected COLA benefit payments)	$26.6 million	$7.8 million
10-year amortization payment	$4.1 million	$1.1 million
Number of years projected to be paid	2 years	1 year [1]
Total payments projected to be received	$8.1 million	$1.1 million

[1] Only one year of payments is expected to be received during the SERS projection period, which ends in year 4 of the projected 10-year amortization period (fiscal year 2052-2053). If the amortization payments are made for the remaining 6 years after the projection period ends, the total payments projected to be received increases to $7.7 million.

If enacted as drafted, the funding for the increased benefits payable to SERS retirees would begin either six or eighteen months after the increased benefits commence. Prior to enactment, consideration should be given to revising the funding such that it begins six months after the increased benefits commence. See the discussion on page 4 for more information.

If enacted as drafted, this Bill would have a negative cash flow impact on both Systems for approximately 10 years for PSERS and 9 years for SERS once the COLAs are payable and assuming the 10-year additional amortization payments are paid for all 10 years. Prior to enactment, consideration should be given to revising the funding of the increased benefits to mitigate the negative cash flow impact. See the discussion starting on page 4 for more information.

We note that it is unlikely that PSERS and SERS will both reach 100% funded in the same year whereas past supplemental annuities have commenced at the same dates for PSERS and SERS retirees.

The cost of this Bill was determined independently of any other bill or amendment that may impact benefits paid to current retirees. To the extent that the increases proposed in this Bill apply to benefits provided in other bills, additional costs for these changes may apply.

Summary of the amended Bill

The amended Bill would provide for an ad hoc COLA commencing on the July 1 after the System is certified to be 100% funded for retirees in the Public School Employees' Retirement System (PSERS) and on the January 1 after the System is certified to be 100% funded for

retirees in the State Employees' Retirement System (SERS) with an effective date of retirement prior to July 2, 2001. Throughout this analysis, we refer to the July 1 date for PSERS and the January 1 date for SERS as the "applicable commencement date".

Each Systems' Board would need to notify the Legislative Reference Bureau once it has certified that the System has an actuarial funded ratio of at least 100%. For SERS, the funded ratio determination would include the balance, if any, of the advance payments made under §5507(h) as part of the System's assets.

To be eligible for the COLA, superannuation, withdrawal, and disability annuitants must be receiving an annuity on the applicable commencement date, have an effective date of retirement prior to July 2, 2001, and whose credited service does not include any service credited as either Class T-D, Class D-4, or Class AA service. Withdrawal annuitants would not be eligible to receive the COLA until the July 1 coincident with or following attainment of superannuation age.

Beneficiaries and survivor annuitants of members who die prior to the applicable commencement date would not be eligible for the COLA.

The amount of the COLA is based on the annuitant's most recent effective date of retirement and would be paid in accordance with the schedule below as applied to the monthly annuity payment on the applicable commencement date. The COLA would be payable under the option in effect as of the applicable commencement date as selected by the member at retirement.

Most Recent Effective Date of Retirement	Percentage Increase
July 2, 2000, through July 1, 2001	15.0%
July 2, 1999, through July 1, 2000	15.5
July 2, 1998, through July 1, 1999	16.0
July 2, 1997, through July 1, 1998	16.5
July 2, 1996, through July 1, 1997	17.0
July 2, 1995, through July 1, 1996	17.5
July 2, 1994, through July 1, 1995	18.0
July 2, 1993, through July 1, 1994	18.5
July 2, 1992, through July 1, 1993	19.0
July 2, 1991, through July 1, 1992	19.5
July 2, 1990, through July 1, 1991	20.0
July 2, 1989, through July 1, 1990	20.5
July 2, 1988, through July 1, 1989	21.0
July 2, 1987, through July 1, 1988	21.5
July 2, 1986 through July 1, 1987	22.0
July 2, 1985 through July 1, 1986	22.5
July 2, 1984 through July 1, 1985	23.0
July 2, 1983 through July 1, 1984	23.5
July 2, 1982 through July 1, 1983	24.0

Most Recent Effective Date of Retirement	Percentage Increase
Prior to July 2, 1982	24.5

The unfunded actuarial accrued liability resulting from the benefit increase would be amortized through level dollar payments over a period of 10 years beginning the July 1 after the applicable commencement date for PSERS and beginning the July 1 after the first July 1 after the effective date for SERS.

Discussion of the amended Bill

This amended Bill would grant COLAs to retirees who retired prior to the 25% benefit increase under Act 9 of 2001. Such retirees last received a supplemental annuity effective July 1, 2002 if retired prior to July 2, 1990 and July 1, 2003 if retired after July 1, 1990.

Applicable Commencement Date

Assuming no changes in plan provisions or actuarial assumptions since the latest valuation (June 30, 2022 for PSERS and December 31, 2022 for SERS) and that experience matches the actuarial assumptions, including the assumed investment return on the market value of assets each and every year (7.00% for PSERS and 6.875% for SERS), the Systems are projected to be at least 100% as of June 30, 2042 for PSERS and as of December 31, 2047 for SERS. As a result, the estimated applicable commencement date for PSERS would be July 1, 2043 with the funding beginning July 1, 2044 and the estimated applicable commencement date for SERS would be January 1, 2049 with the funding beginning July 1, 2049 (assuming the SERS' effective date was prior to July 1, 2048).

Funding beginning date for SERS

As drafted, the funding for SERS would begin the July 1 after the first July 1 that occurs after the effective date of this section. The effective date of the section would occur 60 days after the publication of the notice in the Pennsylvania Bulletin that SERS is certified to be at least 100% funded. This could result in the funding of the COLA beginning either six or eighteen months after the applicable commencement date (which is the first January 1 after the effective date). The SERS' actuary's projection assumes the funding begins six months after the COLA payments begin.

If the legislators wish to ensure that the funding begins six months after the COLA payments begin, the amendment should be revised to indicate that funding should begin "the July 1 after the first January 1 that occurs after the effective date of this section."

Amortization period

In October 2014, the Conference of Consulting Actuaries Public Plans Community released a white paper titled *Actuarial Funding Policies and Practices for Public Pension Plans* ("CCA White Paper"), which 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. This white paper provides "guidance to policymakers and other interested parties on the development of actuarially based funding policies for public pension plans", which could be helpful to the legislature.

This Bill would fund the increases due to these supplemental annuities in equal dollar installments over a 10-year period. The CCA White Paper recommends that plan amendments impacting inactive member benefits (such as increases due to supplemental annuities) be amortized over the lesser of the average payment period of the expected increased benefits and 10 years. The CCA White Paper also recommends that the amortization period should also control for negative cash flow where additional amortization payments are less than additional benefit payments, thus reducing plan assets in the short-term.

While the estimated life expectancy of the eligible retirees is approximately 5 years as of June 30, 2043 for PSERS and 6 years as of December 31, 2048 for SERS as reported by the Systems' actuaries, this calculation does not take into account that older retirees would receive higher benefit increases, lost interest on the supplemental annuities, nor that the funding for this potential COLA would result in a projected negative cash flow. The SERS estimated life expectancy includes potential survivors and reflects the life expectancy of a spouse for retirees who have elected a joint and survivor form of payment. Using the estimated applicable commencement dates of July 1, 2043 for PSERS and January 1, 2049 for SERS with SERS funding beginning July 1, 2049 and assuming the additional amortization payments are paid for 10 years, this Bill is projected to result in lower asset values until June 30, 2054 for PSERS and December 31, 2058 for SERS. Under the Bill, the increased benefits would begin immediately on the applicable commencement date but funding for the increased benefits would not begin until one year later for PSERS and either six or eighteen months later for SERS. This funding delay is the primary reason for the negative cash flow impact.

To review the reasonableness of the 10-year amortization period, we estimated the duration of the supplemental annuities. Duration takes into account the weighting of additional projected benefits by the interest rate used in the actuarial values. While the estimated life expectancy is approximately 5 to 6 years, the duration of the increased benefits is approximately 3 to 4 years. We believe that it would be preferable to shorten the amortization period to 3 years for this Bill. This would also reduce the time until the projected asset values are higher than prior to adoption of the Bill by approximately 8 years for both PSERS and SERS.

Impact of Unfunded Accrued Liability Contribution Rate becoming Negative

Based on the Systems' actuaries' projections, the unfunded accrued liability contribution rate is projected to become negative after the COLA benefits become effective. Because the employer contribution rate cannot be less than the normal contribution rate, there will be no unfunded accrued liability contribution in those years. This provision could eliminate the explicit additional payment for the COLA benefits resulting in the number of additional payments to pay for these COLA benefits being less than 10 years. The PSERS actuary projects 2 years of the explicit additional payments for funding these COLA benefits. The SERS actuary projects 1 year of the

explicit additional payments in the last year of the projection period (FY 2052-2054), which is the 4th year of the 10-year amortization period. The remaining cost is absorbed by plan assets and could impact contributions in subsequent years.

Potential Conflict in type of amortization in PSERS

As the PSERS' actuary indicates in their cost estimate, the Bill provides that the cost of these supplemental annuities would be funded in equal dollar installments over a period of 10 years in §8348.8(f). However, §8328(d)(2) in the PSERS code indicates that increases in benefits due to supplemental annuities shall be funded as a level percentage of compensation over a period of ten years from the July 1 second succeeding the date such legislation is enacted.

The cost estimate prepared by the System actuary reflects a 10-year level dollar amortization. We believe that the level dollar approach is more appropriate in this situation.

Different commencement date

The Bill would provide for COLAs starting on July 1 for eligible PSERS retirees and January 1 for eligible SERS retirees once a funded ratio of 100% is achieved. It is unlikely that PSERS and SERS will both reach this funding threshold in the same year resulting in one System's retirees receiving COLAs and the other System not for a period of time. Based on the Systems' actuaries' projections, this difference is projected to be 5 ½ years. Past COLAs have generally commenced at the same date for both PSERS and SERS retirees. This may result in increased pressure to provide COLAs in a System that is nearly 100% funded but has not yet reached that level yet if the other System has.

Review of Estimated Actuarial Cost Prepared by System Actuaries

The IFO provided us with a copy of the July 24, 2023 estimate by Buck Global, LLC (Buck) for PSERS and the July 21, 2023 estimate by Korn Ferry for SERS. In addition, Buck and Korn Ferry have provided us with additional details regarding their cost estimates. We appreciate their cooperation in providing this information on a timely basis.

The estimates contain the estimated increase in the actuarial accrued liability as of the estimated applicable commencement dates (July 1, 2043 for PSERS and January 1, 2049 for SERS) and the corresponding 10-year amortization beginning the following July 1. We have reviewed the estimates for both PSERS and SERS and found that they appear to be reasonable.

Buck and Korn Ferry indicated that the estimated number of eligible retirees as of the estimated applicable commencement dates is 4,286 in PSERS based on data as of June 30, 2022 and 2,109 in SERS based on data as of December 31, 2022. We have not been provided the underlying data files to review the accuracy of these calculations and have relied upon them in our analysis.

Based on these estimates for PSERS and SERS, the table below contains the estimated increase by year in the unfunded actuarial accrued liability and the first year of increased amortization payments due to this Bill reflecting the estimated applicable commencement dates (July 1, 2043 for PSERS and January 1, 2049 for SERS) with funding beginning the following July 1. Since the Bill would only affect retired members, there would be no change in normal cost. For illustrative purposes only, we have also shown the impact of using a 3-year amortization period instead of the Bill's 10-year period that could be used to help mitigate the negative cash flow impact of this Bill.

Estimated Actuarial Cost of House Bill 1416, Printer's Number 1584
As amended by Amendment A01821
($ amounts in millions)

	10-year Amortization Period as specified in HB 1416	**Illustrative** 3-year Amortization Period
PSERS – reflects estimated applicable commencement date of July 1, 2043		
Increase in Unfunded Actuarial Accrued Liability as of June 30, 2043	$26.6	$26.6
Increase in First Year Amortization Payment		
2044/2045 Contribution Amount	4.1	10.8
2044/2045 Contribution Rate	0.02%	0.05%
SERS – reflects estimated applicable commencement date of January 1, 2049		
Increase in Unfunded Actuarial Accrued Liability as of December 31, 2048	$7.8	$7.8
Increase in First Year Amortization Payment		
2049/2050 Contribution Amount	1.1	3.0
2049/2050 Contribution Rate	0.01%	0.03%

Based on the information provided for PSERS and SERS, the Bill would result in a slight decrease in the funded ratio as of the projected valuation date the COLA becomes effective. The projected PSERS' funded ratio as of June 30, 2043 would decline by 0.02% from 100.07% to 100.05%. The projected SERS' funded ratio as of December 31, 2048 would decline by 0.01% from 100.61% to 100.60%.

The applicable commencement date, and thus the actual cost of this amended Bill, will depend on when the Systems are certified to be 100% funded. If the applicable commencement dates are earlier than estimated, the costs would be higher; and if the applicable commencement dates are later, the costs would be lower. If the applicable commencement dates were 5 years earlier, the increase in the unfunded actuarial accrued liability would be roughly 200% higher. If the applicable commencement date were 5 years later, the increase in the unfunded actuarial accrued liability would be roughly 70% lower.

The Bill does not provide COLAs to beneficiaries and survivor annuitants of members who die prior to the applicable commencement date. Based on the estimation techniques used by both System actuaries, we believe they may have included future beneficiaries of retirees who are assumed to die between the valuation date and the date the COLAs are projected to begin. We believe this approximation used by the actuaries is reasonable for purposes of this measurement.

Both Systems' actuaries included information on the potential risks in their cost estimates. We encourage the legislature to consider these risks prior to enactment. In particular, the PSERS actuary Buck notes that granting benefit improvements may increase the impact of longevity risk due to larger benefits being paid for longer than expected. The SERS actuary Korn Ferry indicated that if the assumed mortality rates were lowered by 10% for a ten-year period, thereby increasing life expectancy, then the increase in the liability for the increased benefits provided in the original Bill would be 3.7% higher.

Basis for Analysis

In performing this analysis, we have relied on the information provided by the IFO, PSERS, SERS, Buck, and Korn Ferry. We have not audited or verified this data and other information. If the data or information is inaccurate or incomplete, the results of this analysis may likewise be inaccurate or incomplete.

We performed a limited review of the cost estimates prepared by Buck and Korn Ferry as provided by the IFO, PSERS, and SERS for reasonableness and consistency and have not found material defects. If there are material defects, it is possible that they would be uncovered by a detailed, systematic review and comparison to search for values that are questionable or for relationships that are materially inconsistent. Such a review was beyond the scope of our assignment.

Future actuarial measurements may differ significantly from the current measurements presented in this analysis due to actual plan experience deviating from the actuarial assumptions, the natural operation of the plan's actuarial cost method, and changes in plan provisions, actuarial assumptions, actuarial methods, and applicable law. An assessment of the potential range and cost effect of such differences is beyond the scope of this analysis.

As the reviewing actuary, Milliman is not required to provide a risk disclosure under Actuarial Standard of Practice No. 51 *Assessment and Disclosure of Risk Associated with Measuring*

Pension Obligations and Determining Pension Plan Contributions nor the additional disclosures required for funding valuations under Actuarial Standard of Practice No. 4 *Measuring Pension Obligations and Determining Pension Plan Costs or Contributions*.

Milliman's work is prepared solely for the internal business use of the Pennsylvania Independent Fiscal Office. To the extent that Milliman's work is not subject to disclosure under applicable public records laws, Milliman's work may not be provided to third parties without Milliman's prior written consent. Milliman does not intend to benefit or create a legal duty to any third party recipient of its work product. Milliman's consent to release its work product to any third party may be conditioned on the third party signing a Release, subject to the following exceptions:

- The IFO may provide a copy of Milliman's work, in its entirety, to its professional service providers who are subject to a duty of confidentiality and who agree to not use Milliman's work for any purpose other than to provide services to the IFO.
- The IFO may provide a copy of Milliman's work, in its entirety, any applicable regulatory or governmental agency, as required by law.

No third party recipient of Milliman's work product should rely upon Milliman's work product. Such recipients should engage qualified professionals for advice appropriate to their own specific needs.

The consultants who worked on this assignment are retirement actuaries. We have not explored any legal issues with respect to the proposed changes. We are not attorneys and cannot give legal advice on such issues. We suggest that you review this proposal with counsel.

We are members of the American Academy of Actuaries and meet its Qualification Standards to render this actuarial opinion.

Please let us know if we can provide any additional information regarding this Bill.

Sincerely,

Timothy J. Nugent

Scott F. Porter

Katherine A. Warren

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Actuarial Cost Note Regarding H.B. 1416, P.N. 1584
Including Amendments A01806, A01821, A01771 and A01791
To Estimate the Cost Impact of a Proposed Cost of Living Adjustment
to the Pennsylvania State Employees Retirement System

July 21, 2023

The following is an actuarial cost note which describes, and presents the estimated cost impact of proposed legislation (under House Bill 1416, Printer's Number 1584 that would provide a Cost of Living Adjustment (COLA) to certain retired members of the Pennsylvania State Employees' Retirement System (SERS), commencing with the first monthly annuity payment after January 1, 2024.

Design of the COLA

If this bill became law, retired members meeting all three (3) of these conditions would be eligible for the COLA:

- The retired member must be either a retiree who has reached superannuation age or a disabled retiree or an early retiree (who would become eligible for the COLA upon reaching superannuation age) receiving an annuity on January 1, 2024;
- The retired member's most recent effective date of retirement would have to be prior to July 2, 2001, and
- The retired member's credited service may not include any service credited as Class AA or Class D-4 (or Class T-D).

If enacted, the amount of the COLA increase, which would commence with the first monthly annuity payment after January 1, 2024, will be determined as a percentage of the amount of the monthly annuity payment on January 1, 2024, such percentage being specifically prescribed on the basis of the eligible member's most recent effective date of retirement. Table 1 on the following page provides the specific COLA increase percentages and effective dates of retirement proposed under this bill.

Other noteworthy provisions relating to the design of this proposed COLA include:

- Beneficiaries or survivors of members who die before January 1, 2024 are not eligible and
- The COLA will be payable under the same terms and conditions as provided under the option plan in effect as of January 1, 2024.

Funding of the COLA

The bill states that "… the additional liability for the increase in benefits provided under this section shall be funded in equal dollar installments over a period of 10 years beginning July 1, 2024."

Proposed COLA Increases

The proposed COLA increase percentages are presented in Table 1 below.

Table 1
Proposed COLA Increases
Effective After January 1, 2024 &
Payable to Eligible Retired Members
Who Retired Prior to July 2, 2001

Most Recent Effective Date of Retirement	Proposed COLA Increase
Prior to July 2, 1982	24.5%
July 2, 1982 - July 1, 1983	24.0%
July 2, 1983 - July 1, 1984	23.5%
July 2, 1984 - July 1, 1985	23.0%
July 2, 1985 - July 1, 1986	22.5%
July 2, 1986 - July 1, 1987	22.0%
July 2, 1987 - July 1, 1988	21.5%
July 2, 1988 - July 1, 1989	21.0%
July 2, 1989 - July 1, 1990	20.5%
July 2, 1990 - July 1, 1991	20.0%
July 2, 1991 - July 1, 1992	19.5%
July 2, 1992 - July 1, 1993	19.0%
July 2, 1993 - July 1, 1994	18.5%
July 2, 1994 - July 1, 1995	18.0%
July 2, 1995 - July 1, 1996	17.5%
July 2, 1996 - July 1, 1997	17.0%
July 2, 1997 - July 1, 1998	16.5%
July 2, 1998 - July 1, 1999	16.0%
July 2, 1999 - July 1, 2000	15.5%
July 2, 2000 - July 1, 2001	15.0%
July 2, 2001 and After	0.0%

Estimated COLA Impact and Costs

Table 2 on the following page presents some approximate statistics related to the impact if this proposed COLA were to become law, as well as the estimated additional liability and annual cost to SERS, based upon funding in equal dollar annual installments over a 10-year period beginning July 1, 2024.

The estimated number of retirees to receive the proposed COLA is based on the number eligible to receive the COLA as of December 31, 2022. The average increase is the overall average increase the eligible members (as of December 31, 2022) would receive.

Table 2 Impact & Estimated Cost of Proposed COLA Increase (dollars in millions)	
Effective date of first COLA payment	After January 1, 2024
Funding date	July 1, 2024
Estimated number of retirees to receive COLA	25,334
Average COLA increase	17.79%
Expected payroll in fiscal year 2024/2025	$7,103.6
Increase in liability	$371.0
Level annual 10-year funding payment	$52.5
As a percent of projected payroll	0.74%

Under Amendment A01806, the COLA payments and funding will be deferred until after the plan reaches a funded ratio of at least 95%. When a December 31 valuation achieves the funding threshold, then a notice is transmitted to the Legislative Reference Bureau for publication. The COLAs will be effective for retirees in the plan on January 1 after the publication occurs. The funding of the COLA will begin on the July 1 following the effective date of the COLA. Current projections have SERS reaching 95% funding on December 31, 2041, so the COLA is expected to be paid beginning January 2043 to all retirees in pay status. The funding of this COLA is expected to begin July 1, 2043.

Table 3 Impact & Estimated Cost of Proposed COLA Increase As Amended By A01806 (dollars in millions)	
Expected date of first COLA payment	After January 1, 2043
Expected Funding date	July 1, 2043
Estimated number of retirees to receive COLA	4,759
Estimated Average COLA increase	17.26%
Expected payroll in fiscal year 2043/2044	$11,101.1
Expected Increase in liability	$26.2
Level annual 10-year funding payment	$3.7
As a percent of projected payroll	0.03%

Under Amendment A01821, the COLA payments and funding will be deferred until after the plan reaches a funded ratio of at least 100%. When a December 31 valuation achieves the funding threshold, then a notice is transmitted to the Legislative Reference Bureau for publication. The COLAs will be effective for retirees in the plan on January 1 after the publication occurs. The funding of the COLA will begin on the July 1 following the effective date of the COLA. Current projections have SERS reaching 100% funding on December 31, 2047, so the COLA is

expected to be paid beginning January 2049 to all retirees in pay status. The funding of this COLA is expected to begin July 1, 2049.

Table 4 Impact & Estimated Cost of Proposed COLA Increase As Amended By A01821 (dollars in millions)	
Expected date of first COLA payment	After January 1, 2049
Expected Funding date	July 1, 2049
Estimated number of retirees to receive COLA	2,109
Estimated Average COLA increase	17.20%
Expected payroll in fiscal year 2043/2044	$12,667.6
Expected Increase in liability	$7.8
Level annual 10-year funding payment As a percent of projected payroll	$1.1 0.01%

Amendment A01771 would restrict state employees who first become members of the House of Representatives on or after December 1, 2024 from entering the defined benefit plan. These Representatives can elect to be covered by the DC only plan. All legislators represent about 0.2% of the total SERS payroll, so the transition to excluding House members would be gradual and ultimately have very little impact on the plan. We assume most of these new members would elect the DC only plan. DC only members would have contributions made to SERS on their behalf by their employer to fund the unfunded liability. A new member entering the defined benefit plan begins with no liability which accumulates over time through normal costs that are contributed annually to the Plan. Excluding this near equal accumulation of assets and liabilities for this small group has a de minimis impact on the SERS funded position.

Amendment A01791 limits the investment options for contributions made to fund the COLA. SERS cannot invest these funds into alternative investments. Since the COLA will be paid immediately, it is likely that any contributions will be invested in liquid assets and not tied up in long-term investments that carry penalties if the funds are needed too soon. The addition of the contributions may free up other assets to be invested in alternative investments, but the amendment is not restricting all funds from alternative investments. Since the contributions will not be invested in a manner restricted by this amendment, and the fund is still expected to earn its annual 6.875% return on average, there is no cost impact from this amendment.

Methods and Assumptions Underlying Table 2 Results

The data used for this cost estimate is based on a special run provided by SERS that included all retirements through December 31, 2022. The data included age, gender, date of retirement, and both the initial and current monthly benefit for the retired population as of December 31, 2022. The estimated number of retirees to receive the COLA is based on the number of retirees in payment status as of December 31, 2022.

The liability was determined by using the actuarial assumptions and methods underlying the December 31, 2022 actuarial valuation. The expected payroll figure shown above is as of the first fiscal year in which the COLA will be funded. It is the December 31, 2022 valuation funding payroll projected forward one year.

The valuation results were produced using a proprietary actuarial valuation system, Pension Valuation Language (PVL). PVL has been actively used for over 40 years to perform annual funding/accounting valuations, gain and loss analyses, and cost studies for a wide variety of retirement systems. PVL was created specifically to value pension plan liabilities and uses the applicable assumptions and methods along with the pension plan census data to produce appropriate results. Test lives are generated to review the accuracy of both the input and output, allowing the users to confirm with a high degree of accuracy how the programmed benefit is applied to an individual along with the proposed decrements and other assumptions. The actuarial team loads the participant data, programs the benefit provisions, enters the applicable assumptions into the model, and reviews sample life output and results under the supervision of a credentialed actuary or actuaries who are proficient users of the software. We are not aware of any material limitations in the model nor any material inconsistencies in the assumptions used within the model.

Potential Risks Related to the COLA

The liabilities and costs in this cost note are based upon actuarial assumptions utilized in the December 31, 2022 actuarial valuation of SERS. These measurements represent a single estimate of the future liabilities and costs of SERS. Since the actual liabilities and costs will be determined based upon (i) the future actuarial assumptions underlying such future measurements and (ii) the actual future experience of SERS, there is a risk that future measurements will differ from those presented in this cost note.

To provide readers of this cost note with a greater appreciation for the sensitivity of these results to potential future changes in both the underlying actuarial assumptions and future SERS experience, we have performed three additional liability calculations:

- One liability calculation, based upon a 5.875% underlying interest rate assumption (a full 1% lower than the 6.875% assumption currently applicable to SERS). This is for the purpose of showing the extent of increase that would occur in our liability result if a 1% lower interest rate assumption applied in the future. Our resulting liability (based on the 5.875% interest rate) was $390.9 million, or 5.4% greater than the Table 2 liability increase of $371.0 million.
- A second liability calculation, based upon the assumption that the actual future mortality rates experienced by the retirees eligible for the proposed COLA increases are 10% lower than those currently assumed for SERS annuitants for a 10-year period and then revert back to current mortality assumptions after. This is in order to show the extent of increase that would occur in our liability result if the COLA-eligible SERS retirees had favorable future longevity. Our resulting liability (based on the more favorable mortality rates) was $384.6 million, or 3.7% greater than the Table 2 liability increase of $371.0 million.
- A third liability calculation, based upon both of the two adjustments described above.

Our resulting liability (based on the 5.875% interest rate and the 10% lower assumed mortality rates for 10 years) was $405.6 million, or 9.3% greater than the Table 2 liability increase of $371.0 million.

- The amendments that introduce funding thresholds reduce the impact by delaying the implementation of the COLA. If the plan does not achieve the funding target by our projection, then the impact of the COLA will be delayed and reduced further. Alternatively, if the funding target is reached early, then the impact of the COLA will be higher than presented. Since the impact of the delayed COLA is expected to be small, the timing of granting the COLA only poses a small risk.

Again, we are presenting the above supplemental results to be responsive to ASOP 51, hoping to enhance understanding and appreciation of SERS' risk exposure for readers of this cost note.

Actuarial Certification

To the best of our knowledge, the information we are presenting herein is complete and accurate and all costs and liabilities have been determined in conformance with generally accepted actuarial principles and on the basis of actuarial assumptions and methods which are reasonable (taking into account the past experience of SERS and reasonable expectations) and which represent our best estimate of anticipated experience under the plan.

The actuaries certifying to this valuation are members of the Society of Actuaries or other professional actuarial organizations and meet the General Qualification Standards of the American Academy of Actuaries for purposes of issuing Statements of Actuarial Opinion.

Please let us know if you have any questions on any of this.

Respectfully submitted,

Korn Ferry

By: _____
Kristopher E. Seets, F.S.A.
Member American Academy of Actuaries
Enrolled Actuary No. 23-8055

By: _____
Craig R. Graby
Member American Academy of Actuaries
Enrolled Actuary No. 23-7319

July 21, 2023

BUCK
A Gallagher Company

200 Plaza Drive
1st Floor
Secaucus, New Jersey 07094

July 24, 2023

Ms. Terrill J. Sanchez
Executive Director
Pennsylvania Public School Employees' Retirement System
5 North 5th Street
Harrisburg, PA 17101

Re: Amendment A01821 to House Bill 1416, Printer's No. 1584

Dear Ms. Sanchez:

As requested, we have examined Amendment A01821 to House Bill 1416, Printer's No. 1584 (A01821). A copy of the Independent Fiscal Office's (IFO) request for analysis, the text of A01821 and the original text of House Bill 1416, Printer's No. 1584 are included in the Appendix to this letter. Our understanding of A01821 is as follows:

- Upon the Public School Employees' Retirement Board's (Board) first certification that the Public School Employees' Retirement System (PSERS or System) has achieved an actuarial value of assets based funded ratio of, at least, 100%, A01821 would provide monthly supplemental annuities (COLA) for System retirees who meet the following conditions:

  (a) Retirees in receipt of a superannuation, withdrawal, or disability annuity from the System on the July 1st next following the Board's certification (COLA effective date),
  (b) Retirees whose most recent effective date of retirement is prior to July 2, 2001, and
  (c) Retirees whose credited service does not include any service credited as either Class T-D, Class D-4, or Class AA.

- The amount of each eligible retiree's monthly supplemental annuity would be a percentage of the retiree's monthly annuity payment as of the COLA effective date. The applicable percentage is based on the retiree's most recent effective date of retirement, as follows:

Most recent effective date of retirement:	Percentage Factor:
July 2, 2000 through July 1, 2001	15.0%
July 2, 1999 through July 1, 2000	15.5%
July 2, 1998 through July 1, 1999	16.0%
July 2, 1997 through July 1, 1998	16.5%
July 2, 1996 through July 1, 1997	17.0%
July 2, 1995 through July 1, 1996	17.5%
July 2, 1994 through July 1, 1995	18.0%
July 2, 1993 through July 1, 1994	18.5%
July 2, 1992 through July 1, 1993	19.0%
July 2, 1991 through July 1, 1992	19.5%
July 2, 1990 through July 1, 1991	20.0%
July 2, 1989 through July 1, 1990	20.5%
July 2, 1988 through July 1, 1989	21.0%
July 2, 1987 through July 1, 1988	21.5%
July 2, 1986 through July 1, 1987	22.0%
July 2, 1985 through July 1, 1986	22.5%
July 2, 1984 through July 1, 1985	23.0%
July 2, 1983 through July 1, 1984	23.5%

July 2, 1982 through July 1, 1983	24.0%
Prior to July 2, 1982	24.5%

- No monthly supplemental annuity would be payable to any beneficiary or survivor of a retiree who dies prior to the COLA effective date.

- The monthly supplemental annuity for eligible retirees would commence with the first monthly annuity payment after the COLA effective date. However, no monthly supplemental annuity would be payable to an annuitant receiving a withdrawal annuity prior to the first day of July coincident with or next following the annuitant's attainment of superannuation age.

- The monthly supplemental annuity would be paid automatically unless the annuitant files a written notice with the Board requesting that the additional monthly supplemental annuity not be paid.

- The monthly supplemental annuity would be payable under the same optional form of payment as the annuity payment as of the COLA effective date. It would also be subject to any subsequent modification of the annuity form of payment as of the COLA effective date.

- The additional liability attributable to the increase in benefits provided under A01821 would be funded in equal installments over a 10-year period beginning the July 1st next following the COLA effective date.

Estimates of the potential financial impact of A01821 are presented in the attached Exhibit 1; A01821's additional cost to the System through 2056 is estimated to be $8,107,000 on a cash flow basis. It is important to note that the estimated additional accrued liability due to the increased benefits is $26,610,000 as of the June 30, 2043 valuation date. In accordance with A01821, this is to be funded in equal installments over a 10-year period beginning fiscal year ending 2045. However, in accordance with Section 8328 of the Retirement Code, due to the projected funded status of the System as of the COLA effective date and subsequent years, the System is projected to have no unfunded accrued liability contribution due beginning fiscal year ending 2047. The estimated cost presented in Exhibit 1 may increase due to unfavorable System experience after the COLA effective date.

Exhibit 2 provides a distribution of the eligible benefit recipients based on A01821's "most recent effective date of retirement" supplemental annuity subgroups.

Exhibit 3 provides the projected annual annuity cash flows for the eligible recipients with and without A01821's supplemental annuity.

In addition, the IFO has requested the following supplemental information:

i) The projected total number of eligible recipients as of June 30, 2043, the projected valuation date that the COLA would be implemented, is 4,286.
ii) The projected average age of the eligible retirees as of June 30, 2043 is 93.97 years.
iii) The projected total annual annuities to be paid to eligible recipients during the fiscal year beginning July 1, 2043 is $45,650,176.
iv) The projected total of annual annuities for eligible recipients with the supplemental annuity increases during the fiscal year beginning July 1, 2043 is $53,330,460.
v) The expected annual increases in benefit payments due to the proposed supplemental annuity are reported in Exhibit 3.

vi) The average life expectancy for eligible retirees as of June 30, 2043 was 5.23 years.

The calculations presented here are based on the data, methods, and assumptions used in the June 30, 2022 actuarial valuation of PSERS, including an assumed annual rate of return on System assets of 7.00%, as well as the following assumptions for the projected future actuarial valuation results:

(a) The workforce size is assumed to remain constant over the projection period.
(b) Among new school employees hired on or after July 1, 2022, 98% will become Class T-G members, 1% will elect Class T-H membership, and 1% will elect Class DC participation.
(c) Future new employees are assumed to have similar demographic characteristics (age/gender/salary) to those of new members who entered PSERS in the period July 1, 2019 through June 30, 2022.

In addition:

- The information presented in this analysis are based on the June 30, 2022 valuation data and assume mortality in accordance with the valuation mortality assumption to the first effective payment of the supplemental annuity. The estimates of A01821's potential statistical and financial impact will be reduced by the statistics and cost of the supplemental annuity for contingent annuitants of any eligible member who dies prior to the COLA effective date, as they are not eligible; the expected impact of these deaths will reduce the overall cost impact of A01821.
- A01821 is silent on the asset value to be used to determine "funded ratio". This cost analysis measures "funded ratio" using the actuarial value of assets calculated under the funding requirements of Section 8328 of the Retirement Code.
- All eligible recipients were assumed to accept A01821's supplemental annuity.
- The System's annual actuarial valuation does not anticipate subsequent modifications to current retirees' annuity form of payment. Therefore, this analysis does not consider future modifications to A01821's supplemental annuity form of payment.
- A01821 requires funding of the additional liability in equal payments over a 10-year period. However, this contradicts § 8328(d) of current statutes, which stipulates that the additional liability for increases in supplemental benefits due to legislation enacted after June 30, 2010, is to be funded as a level percentage of compensation over a 10-year period. We are not qualified to comment on possible conflicts in Pennsylvania law. This analysis is based on A01821's provisions. The estimates of A01821's potential financial impact, as presented in the attached Exhibit 1, will change if it is determined that § 8328(d) of current statutes takes precedence over the funding provisions of A01821.

The information contained herein was developed at your request by Buck Global, LLC, using generally accepted actuarial principles and techniques in accordance with all applicable Actuarial Standards of Practice (ASOPs). The purpose of this analysis is to provide an estimate of A01821's projected additional cost to the System. Use of this presentation for any other purpose, or by anyone other than the Board of Trustees or the staff of PSERS, may not be appropriate and may result in mistaken conclusions because of failure to understand applicable assumptions, methods, or inapplicability of the presentation for that purpose. Buck should be asked to review any statement to be made on the basis of the results contained herein. Buck will accept no liability for any such statement made without prior review by Buck. No third-party recipient of Buck's work product should rely upon Buck's work product absent involvement of Buck or without our approval.

Unless stated otherwise, references to "funded ratio" and "unfunded accrued liability" are measured using the actuarial value of assets. It should be noted that if the same measurements were made

using the market value of assets, different funded ratios and unfunded accrued liabilities would result. Moreover, the funded ratio presented is appropriate for evaluating the need and level of future contributions but makes no assessment regarding the funded status of the System if the System were to settle (i.e., purchase annuities to cover) a portion or all of its liabilities.

These results may be used as estimates of the likely pattern of emerging costs and liabilities resulting from A01821's proposed changes but should not be viewed as a guarantee of actual costs. Actual future funding obligations will be determined by actuarial valuations made on future valuation dates and will likely differ from the estimates provided in this analysis.

ASOP Nos. 27 and 35 ask the actuary to disclose the information and analysis used to support the actuary's determination that the assumptions selected by the Board do not significantly conflict with what, in the actuary's professional judgment, are reasonable for the purpose of the measurement. The Board adopted a new set of economic and demographic assumptions for the June 30, 2021 actuarial valuation based on the recommendations outlined by Buck in their 5-year experience study for the period July 1, 2015 to June 30, 2020. In the case of the Board's selection of an expected return on assets ("EROA"), we reviewed the analysis provided by the System's investment advisor as well as Buck's Financial Risk Management practice and determined the EROA assumption together with the System's other economic and demographic assumptions do not significantly conflict with what is reasonable for the purpose of the measurement.

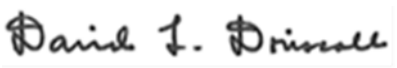
The Appendix presents a discussion of risks of actual future measurements deviating from expected future measurements and models used in calculating the results shown in this analysis.

This cost analysis only provides information regarding future funding contributions of the System. It does not provide any information regarding the impact any changes may have on financial disclosures under applicable GASB standards.

This cost analysis was prepared under my supervision. I am a Fellow of the Society of Actuaries and a Member of the American Academy of Actuaries. I meet the Academy's qualification Standards to issue this Statement of Actuarial Opinion. This report has been prepared in accordance with all applicable Actuarial Standards of Practice and I am available to answer questions about it.

Please contact me if you have any questions concerning this report.

Sincerely,



David L. Driscoll, FSA, MAAA, EA, FCA
Principal, Consulting Actuary

Enc.
Pc: Brian Carl

Exhibit 1

Pennsylvania Public School Employees' Retirement System
Projection of Contribution Rates and Funded Ratios As of June 30, 2022
PSERS (Current) vs. Amendment A01821 to House Bill 1416, Printer's No. 1584 (A01821)

Fiscal Year Ending June 30	Total Payroll ($Thousands)		Projected DC Payroll ($Thousands)		Fiscal Year Market Rate of Return		Pension Rate Floor		Member Contribution Rate		Employer Normal Cost Rate		Employer Unfunded Liability Rate		Preliminary Employer Pension Rate		Health Care Contribution		Employer DC Contribution Rate		Total Employer Contribution Rate		Projected Total Employer Contribution ($Thousands)				Funded Ratio		Unfunded Accrued Liability (Based on Actuarial Value of Assets & $Millions)		Actuarial Value of Assets ($Millions)		Market Value of Assets ($Millions)	
																							Cost/(Savings)										
	Current	A01821	Current	A01821	Current	A01821	Current	A01821	Current	A01821	Current	A01821	Current	A01821	Current	A01821	Current	A01821	Current	A01821	Current	A01821	Current	A01821	Cash Flow Basis	Present Value as of June 30, 2022 (7.00%)	Current	A01821	Current	A01821	Current	A01821	Current	A01821
2021	$ 14,078,000	$ 14,078,000			24.58 %	24.58 %	7.37 %	7.37 %	7.61 %	7.61 %	7.37 %	7.37 %	26.14 %	26.14 %	33.51 %	33.51 %	0.82 %	0.82 %			34.51 %	34.51 %							59.6 %	59.6 %	$ 45,534.7	$ 45,534.7	$ 67,248.7	$ 67,248.7	$ 72,099.9	$ 72,099.9
2022	14,289,000	14,289,000	$ 953,207	$ 953,207	2.28	2.28	7.20	7.20	7.56	7.56	7.20	7.20	26.79	26.79	33.99	33.99	0.80	0.80			34.94	34.94					61.6	61.6	**43,965.5**	**43,965.5**	**70,646.8**	**70,646.8**	**70,663.7**	**70,663.7**
2023	14,497,000	14,497,000	1,294,059	1,294,059	7.00	7.00	6.07	6.07	7.52	7.52	6.07	6.07	28.24	28.24	34.31	34.31	0.75	0.75	0.20 %	0.20 %	35.26	35.26	$ 5,111,642	$ 5,111,642	$ 0	$ 0	63.2	63.2	43,061.4	43,061.4	73,900.3	73,900.3	74,054.2	74,054.2
2024	**15,260,000**	**15,260,000**	1,847,170	1,847,170	7.00	7.00	5.86	5.86	7.44	7.44	5.86	5.86	**27.23**	**27.23**	**33.09**	**33.09**	**0.64**	**0.64**	0.27	0.27	34.00	34.00	**5,188,400**	**5,188,400**	**0**	**0**	64.6	64.6	42,313.9	42,313.9	77,097.0	77,097.0	77,682.9	77,682.9
2025	15,372,913	15,372,913	2,349,025	2,349,025	7.00	7.00	5.66	5.66	7.37	7.37	5.66	5.66	27.96	27.96	33.62	33.62	0.77	0.77	0.34	0.34	34.73	34.73	5,338,384	5,338,384	0	0	66.3	66.3	41,103.5	41,103.5	80,731.5	80,731.5	81,483.6	81,483.6
2026	15,489,907	15,489,907	2,839,630	2,839,630	7.00	7.00	5.49	5.49	7.30	7.30	5.49	5.49	28.82	28.82	34.31	34.31	0.78	0.78	0.40	0.40	35.49	35.49	5,497,903	5,497,903	0	0	68.4	68.4	39,256.6	39,256.6	84,951.4	84,951.4	85,496.7	85,496.7
2027	15,610,679	15,610,679	3,322,675	3,322,675	7.00	7.00	5.32	5.32	7.23	7.23	5.32	5.32	29.59	29.59	34.91	34.91	0.77	0.77	0.47	0.47	36.15	36.15	5,642,624	5,642,624	0	0	70.6	70.6	37,207.5	37,207.5	89,310.9	89,310.9	89,715.9	89,715.9
2028	15,731,799	15,731,799	3,799,338	3,799,338	7.00	7.00	5.15	5.15	7.16	7.16	5.15	5.15	30.20	30.20	35.35	35.35	0.78	0.78	0.54	0.54	36.67	36.67	5,768,420	5,768,420	0	0	72.9	72.9	34,935.1	34,935.1	93,832.9	93,832.9	94,139.9	94,139.9
2029	15,854,223	15,854,223	4,268,320	4,268,320	7.00	7.00	4.97	4.97	7.10	7.10	4.97	4.97	30.86	30.86	35.83	35.83	0.77	0.77	0.61	0.61	37.21	37.21	5,899,255	5,899,255	0	0	75.3	75.3	32,299.6	32,299.6	98,621.0	98,621.0	98,761.0	98,761.0
2030	15,975,648	15,975,648	4,731,426	4,731,426	7.00	7.00	4.77	4.77	7.05	7.05	4.77	4.77	31.56	31.56	36.33	36.33	0.77	0.77	0.67	0.67	37.77	37.77	6,034,795	6,034,795	0	0	78.2	78.2	28,984.5	28,984.5	103,985.0	103,985.0	103,601.4	103,601.4
2031	16,094,737	16,094,737	5,208,681	5,208,681	7.00	7.00	4.58	4.58	6.99	6.99	4.58	4.58	32.27	32.27	36.85	36.85	0.77	0.77	0.73	0.73	38.35	38.35	6,172,011	6,172,011	0	0	80.5	80.5	26,300.8	26,300.8	108,609.5	108,609.5	108,680.0	108,680.0
2032	16,210,721	16,210,721	5,702,222	5,702,222	7.00	7.00	4.39	4.39	6.93	6.93	4.39	4.39	32.85	32.85	37.24	37.24	0.76	0.76	0.80	0.80	38.80	38.80	6,289,569	6,289,569	0	0	83.3	83.3	22,798.7	22,798.7	113,922.0	113,922.0	113,979.2	113,979.2
2033	16,323,673	16,323,673	6,212,890	6,212,890	7.00	7.00	4.18	4.18	6.87	6.87	4.18	4.18	33.89	33.89	38.07	38.07	0.76	0.76	0.86	0.86	39.69	39.69	6,478,411	6,478,411	0	0	86.4	86.4	18,844.5	18,844.5	119,521.9	119,521.9	119,564.7	119,564.7
2034	16,434,098	16,434,098	6,729,680	6,729,680	7.00	7.00	3.97	3.97	6.81	6.81	3.97	3.97	34.75	34.75	38.72	38.72	0.75	0.75	0.92	0.92	40.39	40.39	6,637,034	6,637,034	0	0	89.7	89.7	14,435.8	14,435.8	125,423.4	125,423.4	125,451.5	125,451.5
2035	16,531,409	16,531,409	7,252,431	7,252,431	7.00	7.00	3.76	3.76	6.75	6.75	3.76	3.76	35.66	35.66	39.42	39.42	0.75	0.75	0.99	0.99	41.16	41.16	6,803,672	6,803,672	0	0	93.2	93.2	9,538.1	9,538.1	131,639.9	131,639.9	131,656.2	131,656.2
2036	16,617,513	16,617,513	7,788,175	7,788,175	7.00	7.00	3.55	3.55	6.68	6.68	3.55	3.55	17.91	17.91	21.46	21.46	0.75	0.75	1.05	1.05	23.26	23.26	3,865,562	3,865,562	0	0	94.9	94.9	7,220.7	7,220.7	135,023.3	135,023.3	135,032.2	135,032.2
2037	16,696,491	16,696,491	8,338,062	8,338,062	7.00	7.00	3.33	3.33	6.62	6.62	3.33	3.33	13.60	13.60	16.93	16.93	0.75	0.75	1.12	1.12	18.80	18.80	3,139,593	3,139,593	0	0	96.2	96.2	5,449.9	5,449.9	137,638.4	137,638.4	137,643.1	137,643.1
2038	16,774,523	16,774,523	8,904,833	8,904,833	7.00	7.00	3.11	3.11	6.55	6.55	3.11	3.11	11.79	11.79	14.90	14.90	0.75	0.75	1.19	1.19	16.84	16.84	2,824,438	2,824,438	0	0	97.3	97.3	3,852.0	3,852.0	139,865.3	139,865.3	139,868.2	139,868.2
2039	16,850,631	16,850,631	9,487,405	9,487,405	7.00	7.00	2.88	2.88	6.48	6.48	2.88	2.88	9.63	9.63	12.51	12.51	0.75	0.75	1.26	1.26	14.52	14.52	2,447,489	2,447,489	0	0	98.3	98.3	2,498.3	2,498.3	141,608.5	141,608.5	141,611.7	141,611.7
2040	16,927,479	16,927,479	10,085,663	10,085,663	7.00	7.00	2.66	2.66	6.40	6.40	2.66	2.66	7.93	7.93	10.59	10.59	0.75	0.75	1.33	1.33	12.67	12.67	2,144,674	2,144,674	0	0	99.1	99.1	1,331.9	1,331.9	142,904.3	142,904.3	142,908.8	142,908.8
2041	17,006,109	17,006,109	10,698,945	10,698,945	7.00	7.00	2.43	2.43	6.33	6.33	2.43	2.43	6.40	6.40	8.83	8.83	0.75	0.75	1.41	1.41	10.99	10.99	1,868,927	1,868,927	0	0	99.8	99.8	335.1	335.1	143,827.3	143,827.3	143,830.5	143,830.5
2042	17,089,893	17,089,893	11,325,273	11,325,273	7.00	7.00	2.21	2.21	6.25	6.25	2.21	2.21	1.95	1.95	4.16	4.16	0.75	0.75	1.48	1.48	6.39	6.39	1,091,735	1,091,735	0	0	100.0	100.0	24.4	24.4	143,852.1	143,852.1	143,854.2	143,854.2
2043	17,185,219	17,185,219	11,963,321	11,963,321	7.00	7.00	1.98	1.98	6.18	6.18	1.98	1.98	0.74	0.74	2.72	2.72	0.75	0.75	1.56	1.56	5.03	5.03	863,858	863,858	0	0	100.1	100.1	(101.3)	(74.7)	143,524.4	143,524.4	143,525.9	143,525.9
2044	17,298,187	17,298,187	12,610,212	12,610,212	7.00	7.00	1.78	1.78	6.10	6.10	1.78	1.78	0.45	0.45	2.23	2.23	0.75	0.75	1.63	1.63	4.61	4.61	797,314	797,314	0	0	100.1	100.1	(186.7)	(158.2)	143,028.5	143,020.6	143,029.6	143,021.7
2045	17,434,238	17,434,238	13,264,654	13,264,654	7.00	7.00	1.59	1.59	6.02	6.02	1.59	1.59	0.92	0.94	2.51	2.53	0.75	0.75	1.71	1.71	4.97	4.99	866,112	870,166	4,053	855	100.3	100.2	(360.1)	(333.7)	142,574.6	142,564.1	142,575.5	142,564.9
2046	17,598,440	17,598,440	13,918,503	13,918,503	7.00	7.00	1.42	1.42	5.95	5.95	1.42	1.42	0.69	0.71	2.11	2.13	0.75	0.75	1.78	1.78	4.64	4.66	816,354	820,407	4,053	799	100.4	100.3	(506.7)	(482.5)	142,075.9	142,064.0	142,076.6	142,064.6
2047	17,796,447	17,796,447	14,570,226	14,570,226	7.00	7.00	1.27	1.27	5.88	5.88	1.27	1.27	(0.98)	(0.95)	0.29	0.32	0.75	0.75	1.85	1.85	3.87	3.87	688,722	688,722	0	0	100.4	100.4	(548.5)	(522.4)	141,586.0	141,569.5	141,586.5	141,570.0
2048	18,030,565	18,030,565	15,217,413	15,217,413	7.00	7.00	1.15	1.15	5.82	5.82	1.15	1.15	(0.13)	(0.11)	1.02	1.04	0.75	0.75	1.90	1.90	3.80	3.80	685,161	685,161	0	0	100.4	100.4	(587.8)	(559.8)	141,206.6	141,186.1	141,207.0	141,186.6
2049	18,310,281	18,310,281	15,863,300	15,863,300	7.00	7.00	1.05	1.05	5.76	5.76	1.05	1.05	(0.29)	(0.27)	0.76	0.78	0.75	0.75	1.95	1.95	3.75	3.75	686,636	686,636	0	0	100.4	100.4	(631.0)	(600.9)	140,940.0	140,916.0	140,940.3	140,916.3
2050	18,636,715	18,636,715	16,508,677	16,508,677	7.00	7.00	0.97	0.97	5.71	5.71	0.97	0.97	(0.62)	(0.60)	0.35	0.37	0.75	0.75	1.99	1.99	3.71	3.71	691,422	691,422	0	0	100.5	100.5	(679.3)	(646.9)	140,808.9	140,781.5	140,809.1	140,781.8
2051	19,006,112	19,006,112	17,155,285	17,155,285	7.00	7.00	0.92	0.92	5.66	5.66	0.92	0.92	(0.75)	(0.72)	0.17	0.20	0.75	0.75	2.03	2.03	3.70	3.70	703,226	703,226	0	0	100.5	100.5	(731.9)	(697.1)	140,818.9	140,788.4	140,819.0	140,788.6
2052	19,415,170	19,415,170	17,799,444	17,799,444	7.00	7.00	0.87	0.87	5.62	5.62	0.87	0.87	(0.60)	(0.57)	0.27	0.30	0.75	0.75	2.06	2.06	3.68	3.68	714,478	714,478	0	0	100.6	100.5	(787.3)	(749.8)	140,990.7	140,957.2	140,990.8	140,957.3
2053	19,856,094	19,856,094	18,444,660	18,444,660	7.00	7.00	0.83	0.83	5.59	5.59	0.83	0.83	(0.52)	(0.49)	0.31	0.34	0.75	0.75	2.09	2.09	3.67	3.67	728,719	728,719	0	0	100.6	100.6	(846.1)	(805.8)	141,371.1	141,334.6	141,371.2	141,334.7
2054	20,330,830	20,330,830	19,088,442	19,088,442	7.00	7.00	0.80	0.80	5.56	5.56	0.80	0.80	(0.47)	(0.44)	0.33	0.36	0.75	0.75	2.11	2.11	3.66	3.66	744,108	744,108	0	0	100.6	100.6	(908.7)	(865.4)	141,917.8	141,878.2	141,917.9	141,878.3
2055	20,835,805	20,835,805	19,723,385	19,723,385	7.00	7.00	0.77	0.77	5.54	5.54	0.77	0.77	(0.38)	(0.37)	0.39	0.40	0.75	0.75	2.13	2.13	3.65	3.65	760,507	760,507	0	0	100.7	100.7	(975.1)	(928.7)	142,657.4	142,614.6	142,657.4	142,614.7
2056	21,359,598	21,359,598	20,350,727	20,350,727	7.00	7.00	0.76	0.76	5.52	5.52	0.76	0.76	(0.04)	(0.02)	0.72	0.74	0.75	0.75	2.14	2.14	3.65	3.65	779,625	779,625	0	0	100.7	100.7	(1,043.7)	(993.9)	143,624.9	143,578.9	143,625.0	143,578.9
																					Total		$ 104,770,784	$ 104,778,890	$ 8,107	$ 1,654							

This is an attachment to Buck's July 24, 2023 cost anaylsis on Amendment A01821 to House Bill 1416, Printer's No. 1584. Please refer to that cost analysis for more information.

Exhibit 2
Eligible Benefit Recipients based on the June 30, 2022 Valuation Data
Distributed on Most Recent Effective Date of Retirement

Most recent effective date of retirement	Percentage Factor	Number of Eligible Benefit Recipients
July 2, 2000 through July 1, 2001	15.00%	1,338
July 2, 1999 through July 1, 2000	15.50%	3,249
July 2, 1998 through July 1, 1999	16.00%	6,652
July 2, 1997 through July 1, 1998	16.50%	3,739
July 2, 1996 through July 1, 1997	17.00%	5,139
July 2, 1995 through July 1, 1996	17.50%	3,143
July 2, 1994 through July 1, 1995	18.00%	1,851
July 2, 1993 through July 1, 1994	18.50%	1,698
July 2, 1992 through July 1, 1993	19.00%	4,259
July 2, 1991 through July 1, 1992	19.50%	1,511
July 2, 1990 through July 1, 1991	20.00%	1,466
July 2, 1989 through July 1, 1990	20.50%	1,275
July 2, 1988 through July 1, 1989	21.00%	1,168
July 2, 1987 through July 1, 1988	21.50%	864
July 2, 1986 through July 1, 1987	22.00%	889
July 2, 1985 through July 1, 1986	22.50%	1,027
July 2, 1984 through July 1, 1985	23.00%	827
July 2, 1983 through July 1, 1984	23.50%	715
July 2, 1982 through July 1, 1983	24.00%	554
Prior to July 2, 1982	24.50%	2,111
Total		**43,475**

This is an attachment to Buck's July 24, 2023 cost analysis on Amendment on A01821 to House Bill 1416, Printer's No. 1584. Please refer to that cost analysis for more information.

Exhibit 3
Projected Annual Benefit Cash Flows for the Eligible Benefit Recipients

Fiscal Year Ending June 30	Current	Reflecting A01821 Supplemental Annuity	Increase in Benefit Payments due to A01821 Supplemental Annuity
2043	57,598,659	57,598,659	-
2044	45,650,176	53,330,460	7,680,284
2045	35,781,196	41,804,301	6,023,105
2046	27,749,043	32,423,938	4,674,895
2047	21,308,327	24,902,118	3,593,791
2048	16,219,479	18,958,726	2,739,247
2049	12,256,394	14,329,571	2,073,177
2050	9,212,333	10,773,262	1,560,929
2051	6,903,962	8,075,808	1,171,846
2052	5,173,162	6,052,688	879,526
2053	3,887,417	4,549,287	661,870
2054	2,938,749	3,439,620	500,871
2055	2,241,421	2,623,639	382,218
2056	1,728,992	2,023,799	294,807
2057	1,351,169	1,581,381	230,212
2058	1,070,706	1,252,886	182,180
2059	860,521	1,006,667	146,146
2060	701,152	819,968	118,816
2061	578,728	676,568	97,840
2062	483,439	564,972	81,533
2063	408,352	477,055	68,703
2064	348,535	407,033	58,498
2065	300,416	350,717	50,301
2066	261,344	304,998	43,654
2067	229,317	267,527	38,210
2068	202,814	236,522	33,708
2069	180,663	210,610	29,947
2070	161,926	188,694	26,768
2071	145,853	169,894	24,041
2072	131,862	153,533	21,671
2073	119,506	139,086	19,580
2074	108,442	126,155	17,713
2075	98,410	114,435	16,025
2076	89,215	103,697	14,482
2077	80,717	93,779	13,062
2078	72,823	84,571	11,748
2079	65,472	76,002	10,530
2080	58,623	68,023	9,400
2081	52,245	60,598	8,353

Exhibit 3
Projected Annual Benefit Cash Flows for the Eligible Benefit Recipients

Fiscal Year Ending June 30	Current	Reflecting A01821 Supplemental Annuity	Increase in Benefit Payments due to A01821 Supplemental Annuity
2082	46,323	53,707	7,384
2083	40,845	47,338	6,493
2084	35,803	41,478	5,675
2085	31,192	36,123	4,931
2086	27,008	31,267	4,259
2087	23,238	26,893	3,655
2088	19,864	22,981	3,117
2089	16,868	19,510	2,642
2090	14,229	16,453	2,224
2091	11,923	13,783	1,860
2092	9,920	11,465	1,545
2093	8,189	9,463	1,274
2094	6,701	7,742	1,041
2095	5,431	6,274	843
2096	4,355	5,030	675
2097	3,450	3,985	535
2098	2,696	3,113	417
2099	2,073	2,394	321
2100	1,567	1,809	242
2101	1,161	1,341	180
2102	842	972	130
2103	596	688	92
2104	411	475	64
2105	275	318	43
2106	178	206	28
2107	112	129	17
2108	68	78	10
2109	39	45	6
2110	22	25	3
2111	12	14	2
2112	6	7	1
2113	3	3	-
2114	1	1	-
2115	1	1	-
2116	-	-	-
2117	-	-	-

This is an attachment to Buck's July 24, 2023 cost analysis on Amendment A01821 to House Bill 1416, Printer's No. 1584. Please refer to that cost analysis for more information.

Appendix

Actuarial Standard of Practice No. 56

ASOP No. 56 provides guidance to actuaries when performing actuarial services with respect to designing, developing, selecting, modifying, using, reviewing, or evaluating models. Buck uses the following:

- third-party software in the performance of annual actuarial valuations and projections to calculate the liabilities associated with the provisions of the plan using data and assumptions as of the measurement date under the funding methods specified in this report.
- an internally developed model that applies applicable funding methods and policies to the liabilities derived from the output of the third-party software and other inputs, such as plan assets and contributions, to generate many of the exhibits found in this report.

Buck has an extensive review process whereby the results of the liability calculations are checked using detailed sample output, changes from year to year are summarized by source, and significant deviations from expectations are investigated. Other outputs and the internal model are similarly reviewed in detail and at a high level for accuracy, reasonability, and consistency with prior results. Buck also reviews the third-party model when significant changes are made to the software or model. The review is performed by experts within the company who are familiar with applicable funding methods as well as the manner in which the model generates its output. If significant changes are made to the internal model, extra checking and review are completed. Significant changes to the internal model that are applicable to multiple clients are generally developed, checked, and reviewed by multiple experts within the company who are familiar with the details of the required changes.

Actuarial Standard of Practice No. 51

Funding future retirement benefits prior to when those benefits become due involves assumptions regarding future economic and demographic experience. These assumptions are applied to calculate actuarial liabilities, current contribution requirements and the funded status of the plan. However, to the extent future experience deviates from the assumptions used, variations will occur in these calculated values. These variations create risk to the plan. Understanding the risks to the funding of the plan is important. ASOP 51 requires certain disclosures of potential risks to the plan and provides useful information for intended users of actuarial reports that determine plan contributions or evaluate the adequacy of specified contribution levels to support benefit provisions.

Under ASOP 51, risk is defined as the potential of actual future measurements deviating from expected future measurements resulting from actual future experience deviating from actuarially assumed experience.

It is important to note that not all risk is negative, but all risk should be understood and accepted based on knowledge, judgement and educated decisions. Future measurements may deviate in ways that produce positive or negative financial impacts to the Retirement System.

In the actuary's professional judgment, the following risks may reasonably be anticipated to significantly affect the Retirement System's future financial condition:

- Investment risk – potential that the investment return will differ from the 7.00% expected in the actuarial valuation
- Salary increases – potential that salary increases will be different from that assumed for the actuarial valuation

- Longevity risk – potential that participants live longer than expected from the valuation mortality assumptions
- Declining workforce – potential that future employer contribution rates will be different from expected
- Contribution risk – potential that the contribution will be different than the recommended contribution in the actuarial valuation

The following information is provided to comply with ASOP 51 and furnish beneficial information on potential risks to the plan. This list is not all-inclusive; it is an attempt to identify the most significant risks and how those risks might affect the results shown in this report.

Note that ASOP 51 does not require the actuary to evaluate the ability or willingness of the Retirement System employers to make contributions to the Retirement System when due, or to assess the likelihood or consequences of potential future changes in law. In addition, this valuation report is not intended to provide investment advice or to provide guidance on the management or reduction of risk. Buck welcomes the opportunity to assist in such matters as part of a separate project or projects utilizing the appropriate staff and resources for those objectives.

Investment Risk: Retirement System costs are very sensitive to the market return. Returns on assets below those assumed will increase costs.

- Investment returns at less than expected levels will cause the assets to be lower than expected. This decrease in assets will increase the Retirement System cost.
- The Retirement System uses an actuarial value of assets that smooths gains and losses on market returns over a ten-year period to help control some of the volatility in costs due to investment risk.

Salary increases: Retirement System costs are sensitive to salary increases since benefits at retirement are pay related.

- Salary increases above those expected would lead to higher liabilities, larger unfunded liabilities, and larger employer contributions.
- Salaries below those expected would lead to lower liabilities but may increase employer contribution rates due to lower employer payroll.

Longevity Risk: Retirement System costs will increase as participants are expected to live longer. This is because:

- Benefits are paid over a longer lifetime when life expectancy is expected to increase. The longer duration of payments leads to higher liabilities.
- Health care has been improving, which increases the life expectancy of participants. As health care improves, Retirement System costs will increase.
- The mortality assumption used in the actuarial valuation of the Retirement System incorporates assumed future improvement in longevity. Future longevity improvements exceeding those reflected in the current mortality assumption would lead to increased Retirement System costs.
- Granting benefit improvements may increase the impact of this risk due to larger benefits being paid over a longer period than is presently expected. Because the benefit increases are an ad hoc, one-time improvement, the increase in longevity risk may be mitigated.

Declining workforce: Employer contributions are based on a percentage of participants' salaries. If the required dollar amount of contributions remains level or increases, a declining active workforce will result in higher contribution rates in order to meet required contribution levels.

Contribution Risk: The Retirement System contribution is a budgeted amount. There is a risk associated with the employer's contribution when the budgeted amount and recommended amount differ. This is because:

- When the budgeted contribution is lower than the recommended contribution the Retirement System may not be sustainable in the long term.
- Any underpayment of the contribution will increase future contribution amounts to help pay off the additional Unfunded Actuarial Accrued Liability associated with any lower than recommended contribution amounts.