State of Wyoming Retirement System – Public Employee Plan

Actuarial Valuation Report
for the Year Beginning January 1, 2023

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April 12, 2023

Board of Trustees
State of Wyoming Retirement System
6101 Yellowstone Road
Suite 500
Cheyenne, WY 82002

Dear Board of Trustees:

Subject: Actuarial Valuation as of January 1, 2023

We are pleased to present the report of the actuarial valuation of the Public Employee Plan of the State of Wyoming Retirement System ("the Fund") for the plan year commencing January 1, 2023. This report describes the current actuarial condition of the Fund, determines the calculated employer contribution rate (the actuarially determined contribution rate), and analyzes changes in this contribution rate from the prior year. Valuations are prepared annually, as of January 1, the first day of the Fund's plan year.

This report was prepared at the request of the Board and is intended for use by the Retirement System and those designated or approved by the Board. This report may be provided to parties other than the System only in its entirety and only with the permission of the Board. GRS is not responsible for unauthorized use of this report.

Financing objectives and Funding Policy

The employer and employee contribution rates are specified in the statute. The purposes of the valuation are to measure the System's funding progress and to determine whether or not the statutory contribution is sufficient to meet the obligations of the Fund. This report should not be relied on for any purpose other than the purposes described herein. Determinations of financial results, associated with the benefits described in this report, for purposes other than those identified above may be significantly different.

This valuation assumed the continuing ability of the plan sponsor to make the contributions necessary to fund this plan. A determination regarding whether or not the plan sponsor is actually able to do so is outside our scope of expertise and was not performed.

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Progress toward realization of financing objectives

The funded ratio (the ratio of the actuarial value of assets to the actuarial accrued liability) is a standard measure of a plan's funded status. The funded ratio, based upon the assumption of no further cost-of-living adjustment increases as of January 1, 2023 is 77.25%. In the January 1, 2022 valuation, this funded ratio was 77.04%. On a market value of assets basis, the funded ratio decreased from 86.23% as of January 1, 2022 to 75.06% as of January 1, 2023. The funded status alone is not appropriate for assessing the need for future contributions. The funded status is also not appropriate for assessing the sufficiency of plan assets to cover the estimated cost of settling the plan's benefit obligations.

Benefit Provisions

The benefit provisions reflected in this valuation are those, which were in effect on January 1, 2023, including legislation that affects benefits for members who join the State of Wyoming Retirement System later than August 31, 2012. W.S. 9-3-454 prohibits benefit changes, including cost-of-living increases, unless the funded ratio stays above 100% plus a margin for adverse experience throughout the life of the benefit change. Therefore, this valuation does not include any liability for future cost-of-living increases.

The benefit provisions are summarized in Appendix B of the report.

Assumptions and Methods

Actuarial assumptions and methods are set by the Board, based upon recommendations made by the plan's actuary. The current assumptions used in the actuarial valuation were adopted by the Board effective November 17, 2021 and February 17, 2022 and were first utilized with the January 1, 2022 valuation report. For a detailed description of the experience related to these assumptions, as well as the rationale for any changes, please see our latest Wyoming Retirement System Actuarial Experience Study Report that covered the five-year investigation period ending December 31, 2020. All actuarial assumptions used in this report are reasonable for the purposes of this valuation.

The results of the actuarial valuation are dependent upon the actuarial assumptions used. Actual results can and almost certainly will differ, as actual experience deviates from the assumptions. Even seemingly minor changes in the assumptions can materially change the liabilities, calculated contribution rates and funding periods. The actuarial calculations presented in the report are intended to provide information for rational decision making.

This report was prepared using our proprietary valuation model and related software which in our professional judgment has the capability to provide results that are consistent with the purposes of the valuation and has no material limitations or known weaknesses. We performed tests to ensure that the model reasonably represents that which is intended to be modeled.

Assumptions and Methods (continued)

The 9.25% employee contribution and the 9.37% employer contribution are the current rates that comply with State law. Due to the many factors affecting a retirement system, users of this report should be aware that contributions made at that rate do not necessarily guarantee long-term benefit security.

The employer contribution requirement in Table 1 of this report is determined using the actuarial assumptions and methods disclosed in Appendix A of this report. This report includes risk metrics in Appendix C but does not include a more robust assessment of the risks of future experience not meeting the actuarial assumptions. Additional assessment of risks was outside the scope of this assignment. We encourage a review and assessment of investment and other significant risks that may have a material effect on the plan's financial condition.

All assumptions and methods are described in Appendix A of our report.

Data

Member data for retired, active and inactive members was supplied as of January 1, 2023 by the System's staff. We did not audit this data, but we did apply a number of tests to the data, and we concluded that it was reasonable and consistent with the prior year's data.

Asset and financial information as of January 1, 2023 was prepared by the Wyoming Retirement System and is the responsibility of management. Eide Bailly, LLP provided us the asset and financial information and will opine on Wyoming Retirement System's statements.

We are not responsible for the accuracy or completeness of the information provided by the System's staff.

Plan Experience

As part of each valuation, we examine the Fund's experience relative to the assumptions. As experience in a given year deviates from the assumptions, a gain occurs if the liabilities grow slower than the assumption set anticipates and a loss occurs if the liabilities grow faster. This past fiscal year, the Fund had a total experience loss of approximately $46 million, composed of a $41 million investment gain, a $27 million contribution loss, and a $60 million liability loss. The aggregate results of these analyses are disclosed in Tables 4 and 5 under Section III of the report.

Actuarial Certification

All of the tables contained in this actuarial valuation report were prepared by Gabriel, Roeder, Smith & Company. Historical information for years prior to 2010 was prepared by the prior actuarial firm and was not subjected to our actuarial review.

We certify that the information presented herein is accurate and fairly portrays the actuarial position of the System as of January 1, 2023.

All of our work conforms with generally accepted actuarial principles and practices, and with the Actuarial Standards of Practice issued by the Actuarial Standards Board. In our opinion, our calculations also comply with the requirements of state law and, where applicable, the Internal Revenue Code and ERISA.

The undersigned are independent actuaries and consultants.

Thomas Lyle and Dana Woolfrey are Enrolled Actuaries and Paul Wood, Thomas Lyle, and Dana Woolfrey are Members of the American Academy of Actuaries, and all three meet all the Qualification Standards of the American Academy of Actuaries.

Finally, all of the undersigned are experienced in performing valuations for large public retirement systems.

Respectfully submitted,
Gabriel, Roeder, Smith & Company

Paul T. Wood, ASA, FCA, MAAA
Senior Consultant

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Consultant

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Table of Contents

Table of Contents

SECTION I

EXECUTIVE SUMMARY

Executive Summary

Item	January 1, 2023 No COLA	January 1, 2022 No COLA
1. Contributions:		
a. Total normal cost	11.33%	11.38%
b. Employee contributions	(9.25%)	(9.25%)
c. Net employer normal cost	2.08%	2.13%
d. Amortization payment	8.86%	8.81%
e. Administrative expenses	0.42%	0.42%
f. Actuarially determined contribution	11.36%	11.36%
g. Statutory contribution	(9.37%)	(9.37%)
h. Shortfall/(surplus)	1.99%	1.99%
2. Funding Elements:		
a. Market value of assets (MVA)	$8,406,590,596	$9,389,866,647
b. Actuarial value of assets (AVA)	$8,651,600,098	$8,389,355,255
c. Actuarial accrued liability (AAL)	$11,199,652,249	$10,889,858,029
d. Unfunded/(overfunded) actuarial accrued liability	$2,548,052,151	$2,500,502,774
3. Contributions and Ratios:		
a. Actuarially determined contribution	$218,711,295	$210,236,215
b. Actual contributions	N/A	178,277,910
i. Employer	*N/A*	*175,980,064*
ii. Other	*N/A*	*2,297,846*
c. Percentage contributed	N/A	84.80%
d. Funded ratio on an actuarial basis (AVA/AAL)	77.25%	77.04%
e. Funded ratio on a market basis (MVA/AAL)	75.06%	86.23%
f. Projected payroll	$1,925,275,481	$1,850,670,904

SECTION II

DISCUSSION

Contribution Requirements

- Exhibits throughout this report are based primarily, unless stated otherwise, on the assumption of no future cost-of-living adjustments (COLAs).
- W.S. 9-3-454 prohibits benefit changes, including cost-of-living increases, unless the funded ratio stays above 100% plus a margin for adverse experience throughout the life of the benefit change. The actuarial value funded ratio is 77.25% and the market value funded ratio is 75.06%.
- The actuarial assumptions have not changed since the prior valuation. For a detailed description of the experience related to these assumptions, as well as the rationale for any changes, please see our latest Wyoming Retirement System Actuarial Experience Study Report.
- An Actuarially Determined Contribution (ADC) is calculated as part of this valuation. Because contribution rates are set in statutes, the ADC could be thought of as a metric to which one could compare the statutory rate. The amortization payment for the purpose of calculating the ADC is based upon the following assumptions:
  - The funding period is based on a 30-year closed period for the initial base as of January 1, 2018 and 20-year closed period layers for future gains and losses
  - Amortization payment amounts are calculated in such a way that they will increase as a level percentage of payroll
  - Total payroll increases are assumed at 2.50% per year, and
  - Future growth in the number of active members is not reflected in the annual valuation
- The analysis of the changes in the ADC is shown in Table 5 under Section III of the report
- The employer is currently contributing at the rate of 9.37% of salary plus an additional 1.00% for park rangers. Employees are contributing at the rate of 9.25% of salary.
- The calculated funding period assuming the Statutory contribution rates and an open group projection based on a projection of the market value of assets is 41 years. In the January 1, 2022 valuation, the funding period based on a projection of the market value of assets was 17 years. Projection results were produced under a separate cover.
- The calculated funding period assuming the Statutory contribution rates and an open group projection based on the projection of the actuarial value of assets is 33 years. In the January 1, 2022 valuation, the funding period based on the projection of the actuarial value of assets was 35 years. Projection results were produced under a separate cover.
- Pursuant House Bill 0011, the full-time state park ranger participates will be moved to the law enforcement plan. This will be reflected in the January 1, 2024 valuation.

Calculation of Contribution Rates

The funds available to pay benefits come from two sources, contributions and investment income on those contributions (the majority of the funds available to pay benefits typically come from investment income). The Fund receives contributions from two sources, employer contributions and member contributions, both of which are determined as a percentage of pay. An Actuarially Determined Contribution (ADC) is calculated as part of this valuation. Because contribution rates are set in Statutes, the ADC could be thought of as a metric to which one could compare the Statutory rate. As shown in Table 1 under Section III of the report, the employer ADC has three components:

- The normal cost percentage (NC%)
- The amortization percentage (UAAL%)
- The administrative expenses

The NC% is the theoretical amount which would be required to pay the members' benefits if this amount had been contributed from each member's entry date and if the fund's experience exactly followed the actuarial assumptions. The NC% is shown in Table 3 under Section III of the report.

Members are required to make employee contributions and only the excess of the NC% over the member contribution rate is included in the employer contribution rate.

The actuarial accrued liability (AAL) is the difference between (i) the actuarial present value of all future benefits for all current participants of the fund, including active, inactive and retired members, and (ii) the actuarial present value of future normal costs. Thus, the AAL represents the liability associated with past years. The unfunded actuarial accrued liability (UAAL) is the difference between the AAL and the actuarial value of assets (AVA). It is the shortfall/excess between the liability associated with prior years (the AAL) and the assets actually accumulated (the AVA). This shortfall/excess can arise from several sources, including actuarial gains and losses, which are caused by differences between actual experience and the plan's assumptions, changes to the plan's actuarial assumptions, and amendments to the benefit provisions.

The UAAL% is the amount required to fund this difference. It is the amount, expressed as a level percentage of payroll, necessary to amortize the UAAL. Amortization bases are established each year and amortized based on the Board's policy. The Board's policy for purposes of calculating the ADC consists of amortizing the unfunded liability as of January 1, 2018, over a closed 30-year period with each subsequent amortization base created as a result of year to year experience changes over individual 20-year closed periods. The Executive Summary shows the UAAL%, called Amortization Payment, compared to that of last year.

Assumed administrative expenses are the average of the prior two years, with each year projected at 2.50% to the valuation date.

The ADC is calculated for the twelve-month period beginning January 1, 2023. As of January 1, 2023, the statutory employer contribution is within 1.99% of meeting the ADC. Assuming the market value of assets earns 6.8% and deferred losses are recognized, the current shortfall in contribution is expected to persist for many years.

Financial Data and Experience

As of January 1, 2023, the Fund has a total market value of $8.41 billion. Financial information was received from Eide Bailly, LLP.

Table 7 under Section III of the report shows a reconciliation of the market values between the beginning and end of 2022.

During 2022, the total investment return on the market value of assets (MVA), as reported by Meketa Investment Group, Inc., was (6.99%), as shown in Table 10 under Section III of the report.

In determining the contribution rates and funded status of the Fund, an actuarial value of assets (AVA) is used rather than the market value of assets. The actuarial value of assets is based on the market value of assets with a five-year phase-in of actual investment return in excess of (or less than) expected investment income. Expected investment income is determined using the assumed investment return rate and the market value of assets (adjusted for receipts and disbursements during the year). The returns are computed net of investment expenses. An adjustment is made if the actuarial value is not within 20% of the Market Value. For any year following a year in which the 20% of market value adjustment was applied, the actuarial value is determined as if the adjustment was not applied in the previous year.

The development of the AVA is shown in Table 9 under Section III of the report. The AVA is $8.7 billion. The AVA is 102.91% of the MVA as of December 31, 2022, compared to 89.34% last year. The difference between the AVA and the MVA is the deferred gains and losses. As of January 1, 2022, the total deferred gain was $1,001 million. As of January 1, 2023, the total deferred loss was $245 million. Having a deferred loss in the AVA is an indicator that the funded ratio will have a downward “tilt” in the near term, and the ADC will likewise have upward pressure.

In addition to the market return, Table 10 also shows the return on the actuarial value of assets for the Fund. For 2022, this return was 7.31%. Since this return is greater than the assumed 6.80% investment return, an actuarial gain occurred decreasing the unfunded actuarial accrued liabilities of the Fund by $41.4 million.

Member Data

Member data as of January 1, 2023 was supplied electronically by the Fund's staff. While we did not audit this data, we did perform various tests to ensure that it was internally consistent, consistent with the prior year's data, and was reasonable overall.

Table 15 under Section III of the report shows the number of members by category (active, inactive, retired, etc.) along with member statistics. Tables 16 through 28 show summaries of certain historical data and include membership statistics.

Total active member payroll increased 4.03% last year, compared to a decrease of 0.79% from the prior year.

The number of active members in Tier 1 decreased, from 14,800 to 13,535. There were 849 members who retired out of Tier 1, compared to 1,130 who retired out of Tier 1 last year.

Of the 34,712 active participants, 5,215 are eligible or will become eligible for unreduced retirement and 6,749 are eligible or will become eligible for reduced retirement in 2023.

The average of the final average salaries for participants who retired or became disabled this year is $53,828.

Changes in payroll are significant because the Fund receives its statutory contributions as a percent of pay. If payroll does not grow at the assumed rate, then fewer contributions will be made to the plan and the funding of the Fund will be delayed. Furthermore, the methodology used in the valuation to amortize the unfunded actuarial accrued liability assumes a growing payroll into the future. If the payroll does not grow at the assumed 2.50% per year average, then the current amortization payments may be understated and the funding position of the Fund will not strengthen as assumed over time. Higher than expected payroll growth, however, has the opposite effect of this and the funded position of the Fund should trend toward 100%. Table 5 under Section III of the report shows, for the past year, payroll for the plan increased more than expected so the effect is a decrease in the calculated contribution rate of 0.14% of payroll.

One reason payroll increased more than expected is that the salary, for continuing active participants, increased more than expected. This represented a loss to the Plan, as shown in Table 4 under Section III of the report.

Benefit Provisions

Appendix B of the report includes a more detailed summary of the benefit provisions for the Fund. A brief summary is as follows:

A new tier of benefits was signed into law on March 23, 2012 and is effective for new members joining the System on or after September 1, 2012.

- *Tier*
  - Members who join the State of Wyoming Retirement System by August 31, 2012 are in Tier 1, while members who join later are in Tier 2
- *Normal Retirement Eligibility*
  - For Tier 1 member - Age 60 with at least four years of service
  - For Tier 2 member - Age 65 with at least four years of service
- *Normal Retirement Benefit*
  - For Tier 1 member - 2.125% of employee's Highest Average Salary for each year of credited service for the first 15 years of service credit plus 2.25% of Highest Average Salary for any years of service credit exceeding 15 years. This amount is reduced by 5.0% per year that the employee is under age 60, given that they are at least age 50 with 4 years of service or have 25 total years of service.
  - For Tier 2 member - 2.00% of employee's Highest Average Salary for each year of credited service. This amount is reduced by 5.0% per year that the employee is under age 65, given that they are at least age 55 with 4 years of service or have 25 total years of service.

    However, members retiring with a combined age and service of at least 85 receive an unreduced benefit. Employees hired prior to July 1, 1981 may be entitled to benefits earned under a different formula.
- *Normal Form of Payment*
  - Monthly benefit for life with a lump-sum death benefit equal to the excess (if any) of the employee contributions with interest over the total benefits received.
- *Employee Contributions* are required
  - 9.25% of pay.
- *Post-retirement Cost-of-Living Adjustments (COLAs)*
  - W.S. 9-3-454 prohibits benefit changes, including cost-of-living increases, unless the funded ratio stays above 100% plus a margin for adverse experience throughout the life of the benefit change.

Actuarial Methods and Assumptions

Appendix A of the report includes a summary of the actuarial assumptions and methods used in this valuation. A few highlights are listed as follows:

- Costs are determined using the Entry Age Normal actuarial cost method, calculated as a level percentage of payroll.
- The unfunded actuarial accrued liability is amortized over an effective 24 year closed period as a level percent of payroll. Future valuations will include additional amortization layers on a closed 20-year basis.
- The assumed annual investment return rate is 6.80%, with assumed inflation of 2.25%.
- Payroll is assumed to increase at 2.50% per year.
- Inactive vested participants are assumed to retire at age 60 (65 for Tier 2) or on the valuation date if older.
- The benefit amount is not available for all members entitled to deferred benefits. The benefit amount and present value of benefits expected to be paid to vested inactive non-retired members without a benefit in the data is approximated using the data provided.

The average future lifetime for current pensioners is 15.9 years.

The actuarial assumptions and methods were reviewed in detail as part of the 2021 Experience Study covering the five-year period ending December 31, 2020. Please see Appendix A for a summary of these assumptions.

GASB and Funding Progress

Governmental Accounting Standards Board Statement Number 67 (GASB 67) contains certain accounting requirements for the Fund. Schedules, notes and required supplementary information are provided under separate cover.

SECTION III

SUPPORTING EXHIBITS

Table 1A

Calculation of Employer Contribution Rate
(Assumes No Future Cost-Of-Living Increases)

Item			January 1, 2023	January 1, 2022
1.	Projected valuation payroll		$1,925,275,481	$1,850,670,904
2.	Present value of future pay		$14,533,902,541	$13,982,399,333
3.	Employer normal cost rate		2.08%	2.13%
4.	Actuarial accrued liability for active members			
	a.	Present value of future benefits for active members	$5,330,443,702	$5,191,011,906
	b.	Less: present value of future employer normal costs	(250,360,341)	(248,080,532)
	c.	Less: present value of future employee contributions	(1,344,385,985)	(1,293,371,932)
	d.	Actuarial accrued liability	$3,735,697,376	$3,649,559,442
5.	Total actuarial accrued liability for:			
	a.	Retirees and beneficiaries	$6,817,999,915	$6,637,982,448
	b.	Disabled members	37,244,676	37,738,688
	c.	Inactive members	608,710,282	564,577,451
	d.	Active members (Item 4d)	3,735,697,376	3,649,559,442
	e.	Total	$11,199,652,249	$10,889,858,029
6.	Actuarial value of assets (Table 9)		$8,651,600,098	$8,389,355,255
7.	Unfunded actuarial accrued liability (UAAL) (Item 5e - Item 6)		$2,548,052,151	$2,500,502,774
8.	Effective UAAL amortization period		24 years	25 years
9.	Assumed payroll growth rate		2.50%	2.50%
10.	Employer actuarially determined contribution (ADC)			
	a.	UAAL amortization payment as % of pay	8.86%	8.81%
	b.	Employer normal cost	2.08%	2.13%
	c.	Administrative expense	0.42%	0.42%
	d.	Employer Contribution (a + b + c)	11.36%	11.36%

Table 1B

Calculation of UAAL Amortization Payment
(Assumes No Future Cost-Of-Living Increases)

UAAL as of January 1, 2023	$2,548,052,151
Total Prior Remaining Amortization Bases as of January 1, 2023	$2,501,972,251
2023 Amortization Base as of January 1, 2023	**$46,079,900**
2023 Payment (20 years, level percent of pay amortization)	**$3,421,306**

		As of January 1, 2023		
Base Year	**Initial Base**	**Remaining Base**	**Years Remaining**	**Amortization Payment**
2023 Experience Loss	$ 46,079,900	$ 46,079,900	20	$ 3,421,306
2022 Experience Gain	(316,011,592)	(313,252,762)	19	(24,049,570)
2022 Assumption Changes	168,448,054	166,977,477	19	12,819,477
2021 Experience Gain	(103,194,098)	(101,202,432)	18	(8,055,282)
2020 Experience Loss	171,551,375	165,957,479	17	13,735,580
2019 Experience Loss	259,338,420	246,658,278	16	21,298,643
2018 Experience Loss	2,273,969,633	2,336,834,211	25	151,439,076
Total		**$ 2,548,052,151**		**$ 170,609,230**

Table 2
Cost Breakdown
(Assumes No Future Cost-Of-Living Increases)

Item	Present Value of Future Normal Costs (1)	Actuarial Accrued Liabilities (2)	Total Present Value of Benefits (3) = (1) + (2)
Age and service allowances based on total service and disability benefits likely to be rendered by present active members	$1,037,130,089	$3,742,457,232	$4,779,587,321
Death-in-service benefits likely to be paid on behalf of present active members (employer financed portion)	17,373,151	49,201,603	66,574,754
Separation benefits (refunds of contributions and deferred allowances) likely to be paid to present active members	540,243,086	(55,961,459)	484,281,627
Benefits likely to be paid to vested inactive members	0	530,628,251	530,628,251
Benefits to be paid to members due refunds	0	78,082,031	78,082,031
Benefits to be paid to current retirees, disabled members, beneficiaries, and future beneficiaries of current retirees	0	6,855,244,591	6,855,244,591
Total	$1,594,746,326	$11,199,652,249	$12,794,398,575
Actuarial value of assets	0	8,651,600,098	8,651,600,098
Liabilities to be covered by future contributions	$1,594,746,326	$2,548,052,151	$4,142,798,477

Table 3

History of Total Normal Cost

(Assumes No Future Cost-Of-Living Increases)

Fiscal Year Ending December 31	Total Normal Cost as Percent of Payroll
(1)	(2)
2008	9.08%
2009	10.10%
2010	10.86%
2011	11.11%
2012	10.86%
2013	10.77%
2014	11.96%
2015	11.96%
2016	11.83%
2017	11.55%
2018	10.96%
2019	10.91%
2020	10.87%
2021	10.85%
2022	11.38%
2023	11.33%

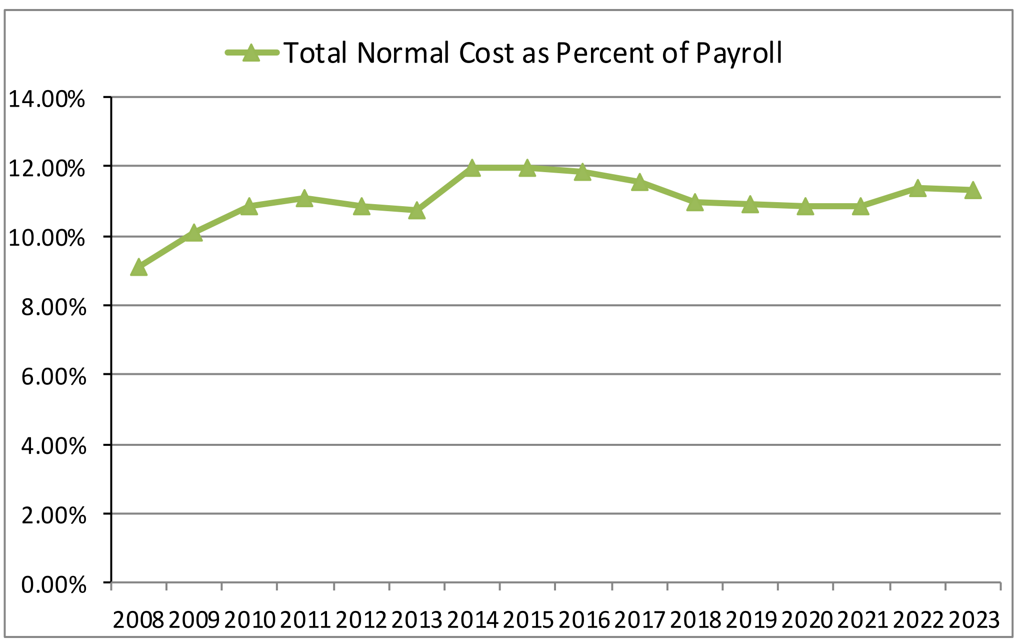

Table 4

Calculation of Total Actuarial Gain/(Loss)

(Assumes No Future Cost-Of-Living Increases)

Item	January 1, 2023
1. Derivation of Experience Gain/(Loss)	
a. Unfunded actuarial accrued liability (UAAL) - previous valuation	$2,500,502,774
b. Normal cost (NC) for fiscal year ending December 31, 2022	210,661,645
c. Expected administrative expenses for fiscal year ending December 31, 2022	7,747,900
d. Actuarially determined contribution for fiscal year ending December 31, 2022	381,519,714
e. Interest accrual:	
(i) For whole year on (a)	170,034,189
(ii) For half year on (b) + (c) - (d)	(5,454,543)
(iii) Total interest: (e)(i) + (e)(ii)	164,579,646
f. Change in UAAL due to plan changes	0
g. Change in UAAL due to assumption changes	0
h. Expected UAAL current year: (a) + (b) + (c) - (d) + (e)(iii) + (f) + (g)	2,501,972,251
i. Actual UAAL current year	2,548,052,151
j. Experience gain/(loss): (h) - (i)	(46,079,900)
k. Experience gain/(loss) as a % of actuarial accrued liability	-0.41%
2. Approximate portion of gain/(loss) due to investments (at actuarial value)	$41,379,580
3. Approximate portion of gain/(loss) due to contributions and administrative expenses higher or lower than expected*	($27,212,089)
4. Approximate amount of gain/(loss) due to liabilities: (1)(j) - (2) - (3)	($60,247,391)
a. Age & service retirements	($6,285,573)
b. Disability retirements	(6,822)
c. Death-in-service	(162,908)
d. Deferred members and withdrawal from employment	(2,050,107)
e. Rehires and new hires	(2,107,408)
f. Pay increases	(49,392,048)
g. Death after retirement	6,332,597
h. Service Purchases	(3,339,639)
i. Other	(3,235,483)
j. Other as a % of actuarial accrued liability	-0.03%

Includes $3.3 million in additional employee contributions for service purchases. *These additional contributions offset the liability loss due to service purchases.*

Table 5

Change in Calculated Contribution Rate Since the Prior Valuation

(Assumes No Future Cost-Of-Living Increases)

Item	January 1, 2023
1. Calculated contribution rate as of January 1, 2022	11.36%
2. Change in contribution rate during year	
a. Change in normal cost	-0.05%
b. Actuarial (gain) loss from investments on actuarial value of assets	-0.16%
c. Actuarial (gain) loss from liability sources	0.23%
d. Difference between contributions made and ADC	0.12%
e. Effect of payroll growing (faster)/slower than assumption	-0.14%
f. Other changes	0.00%
g. Total change	0.00%
3. Calculated contribution rate as of January 1, 2023	11.36%

Table 6

Statement of Plan Net Assets

Assets at Market Value		
Item	**FYE 2022**	**FYE 2021**
1. Cash and Cash Equivalents (Operating Cash)	$350,825,992	$459,356,639
2. Receivables		
a. Insurance premium tax	$0	$0
b. Buy backs	0	0
c. Employer contributions	9,866,366	9,226,070
d. Employee contributions	9,729,645	9,106,435
e. Securities sold	3,692,320	9,134,653
f. Accrued interest and dividends	15,465,035	21,901,115
g. Currency contract receivable	512,813,037	757,559,070
h. Other	238,094	116,185
i. Rebate and fee income receivable	0	0
j. Total receivables	$551,804,497	$807,043,528
3. Investments, at Fair Value	$8,456,966,964	$9,421,335,140
4. Liabilities		
a. Benefits and refunds payable	($1,721,235)	($702,344)
b. Securities purchased	(12,279,564)	(32,834,610)
c. Administrative and consulting fees payable	(11,697,269)	(11,548,297)
d. Currency contract payable	(526,344,201)	(752,664,720)
e. Securities lending collateral	(400,964,588)	(500,118,689)
f. Total liabilities	($953,006,857)	($1,297,868,660)
5. Total Market Value of Assets Available for Benefits	$8,406,590,596	$9,389,866,647

Table 7

Reconciliation of Plan Net Assets

Assets at Market Value		
Item	**FYE 2022**	**FYE 2021**
A. Market Value of Assets at Beginning of Year	$9,389,866,647	$8,294,241,897
B. Contribution Income:		
1. Contributions		
a. Employee	$173,778,027	$166,331,964
b. Employer	175,980,064	168,461,347
c. Other	5,651,540	5,750,948
d. Total	$355,409,631	$340,544,259
2. Investment Income		
a. Interest, dividends, and other income	$167,373,373	$155,117,113
b. Net appreciation	(764,156,970)	1,312,107,813
c. Investment expenses	(48,468,131)	(53,150,610)
d. Net investment income	$(645,251,728)	$1,414,074,316
3. Securities Lending		
a. Gross income	$7,339,891	$971,513
b. Deductions	(6,460,800)	(145,487)
c. Net investment income	$879,091	$826,026
4. Benefits and Refunds		
a. Refunds	$(24,875,791)	$(19,019,015)
b. Regular monthly benefits	(660,862,406)	(632,776,958)
c. Total	$(685,738,197)	$(651,795,973)
5. Administrative and Miscellaneous Expenses	$(8,574,848)	$(8,023,878)
C. Market Value of Assets at End of Year	$8,406,590,596	$9,389,866,647

Table 8

Progress of Fund Through December 31, 2022

Plan Year Ending December 31	Employer Contributions*	Employee Contributions*	Administrative Expenses and Other Expenses	Net Investment Income**	Benefit Payments	Transfers	Actuarial Value of Assets
Total	$ 3,294,268,913	$ 3,129,374,990	$ (114,981,827)	$ 11,479,232,070	$(9,786,777,509)	$ (115,633,895)	
1986	$ 41,364,465	$ 36,365,804	$ (782,000)	$ 98,998,090	$ (42,082,765)	$ -	$ 900,097,591
1987	39,901,834	36,039,418	(808,023)	91,374,783	(50,604,364)	-	1,016,001,239
1988	38,414,939	33,222,264	(444,343)	103,025,282	(48,627,479)	-	1,141,591,902
1989	36,139,394	36,231,108	(424,136)	128,370,680	(55,459,353)	-	1,286,449,595
1990	38,668,634	38,960,372	(850,148)	114,218,588	(61,154,261)	-	1,416,292,780
1991	38,903,350	39,288,267	(863,301)	148,164,188	(69,348,501)	-	1,572,336,783
1992	42,354,843	42,883,874	(909,653)	175,246,400	(75,211,430)	-	1,756,700,817
1993	41,596,571	42,266,219	(801,026)	189,281,426	(82,480,713)	-	1,946,563,294
1994	42,791,243	43,415,880	(888,518)	136,210,578	(89,707,717)	-	2,078,384,760
1995	43,714,263	44,435,762	(937,480)	230,731,781	(99,689,985)	-	2,296,639,101
1996	43,495,146	44,761,611	(1,028,163)	233,212,720	(108,536,621)	-	2,508,543,794
1997	44,958,544	46,152,691	(1,147,818)	314,340,179	(117,126,096)	-	2,795,721,294
1998	46,183,091	47,366,181	(1,074,562)	436,098,461	(123,858,991)	-	3,200,435,474
1999	48,681,209	50,106,535	(1,182,899)	475,758,627	(132,428,572)	-	3,641,370,374
2000	50,539,675	51,868,059	(1,096,747)	592,379,739	(144,620,949)	-	4,190,440,151
2001	56,517,377	53,792,429	(1,387,930)	439,286,379	(156,189,100)	-	4,582,462,306
2002	57,377,428	58,234,324	(1,281,554)	(66,209,697)	(171,160,286)	(106,978,719)	4,352,423,802
2003	55,363,788	60,848,296	(1,435,922)	376,524,142	(185,826,481)	-	4,657,897,625
2004	60,573,670	61,412,824	(1,644,382)	127,831,761	(201,772,174)	-	4,704,299,324
2005	65,191,670	63,381,309	(1,930,627)	238,882,774	(217,308,520)	(8,655,176)	4,843,861,114
2006	72,664,403	69,020,297	(1,949,051)	409,948,934	(232,944,164)	-	5,160,601,533
2007	83,149,236	78,495,298	(2,005,783)	583,547,681	(249,765,088)	-	5,654,022,877
2008	88,451,655	84,814,014	(2,778,990)	(720,402,274)	(268,232,301)	-	4,835,874,981
2009***	244,063,923	89,298,711	(3,081,105)	868,641,735	(292,256,569)	-	5,742,541,676
2010	104,757,666	99,291,423	(3,600,747)	170,797,772	(314,256,856)	-	5,799,530,934
2011	122,557,906	116,691,540	(5,541,488)	71,962,242	(343,979,208)	-	5,761,221,926
2012	124,648,088	119,052,404	(6,463,506)	126,138,774	(374,629,714)	-	5,749,967,972
2013	128,277,269	122,611,180	(6,513,680)	654,726,838	(404,568,029)	-	6,244,501,550
2014	129,627,747	141,061,289	(5,258,065)	535,776,435	(436,096,614)	-	6,609,612,342
2015	144,622,373	153,529,134	(5,410,522)	382,521,078	(469,954,814)	-	6,814,919,591
2016	151,488,715	152,422,538	(6,305,865)	452,136,957	(501,610,080)	-	7,063,051,856
2017	148,746,669	149,752,251	(6,863,445)	495,488,269	(535,492,257)	-	7,314,683,343
2018	147,632,510	151,130,515	(7,321,620)	278,282,588	(566,027,667)	-	7,318,379,669
2019	157,385,096	157,610,787	(6,836,622)	433,644,411	(600,487,685)	-	7,459,695,656
2020	165,984,825	165,086,190	(7,533,380)	670,140,170	(625,747,935)	-	7,827,625,526
2021	169,201,788	171,342,471	(8,023,878)	881,005,321	(651,795,973)	-	8,389,355,255
2022	178,277,910	177,131,721	(8,574,848)	601,148,257	(685,738,197)	-	8,651,600,098

* Employer contributions include other funding sources and employee contributions may include member redeposits and member service purchase contributions

** Net of investment expenses

*** December 31, 2009 market values exclude Air Guard Firefighters

Table 9

Development of Actuarial Value of Assets

Item	FYE 2022	FYE 2021
1. Actuarial value of assets, beginning of year (without corridor)	$8,389,355,255	$7,827,625,526
2. Market value, end of year	$8,406,590,596	$9,389,866,647
3. Market value, beginning of year	$9,389,866,647	$8,294,241,897
4. Non-investment/administrative net cash flow:		
a. Employee contributions	$173,778,027	$166,331,964
b. Employer contributions	175,980,064	168,461,347
c. Other contributions	5,651,540	5,750,948
d. Refund of employee accounts	(24,875,791)	(19,019,015)
e. Retirement benefits	(660,862,406)	(632,776,958)
f. Administrative expenses and Other Expenses	(8,574,848)	(8,023,878)
g. Total net cash flow: [sum of (4a) through (4f)]	($338,903,414)	($319,275,592)
5. Investments and securities lending:		
a. Interest and dividends on investments	$167,373,373	$155,117,113
b. Gross income from securities lending	7,339,891	971,513
c. Fees and expenses	(54,928,931)	(53,296,097)
d. Total net income: [sum of (5a) through (5c)]	$119,784,333	$102,792,529
6. Investment income:		
a. Actual market return: (2) - (3) - (4g) - (5d)	($764,156,970)	$1,312,107,813
b. Assumed rate of return	6.80%	7.00%
c. Assumed amount of return	507,393,379	466,818,755
d. Amount subject to phase-in: (6a) - (6c)	($1,271,550,349)	$845,289,058
7. Phase-in recognition of investment income:		
a. Current year: 0.20 * (6d)	($254,310,070)	$169,057,812
b. First prior year	169,057,812	54,190,540
c. Second prior year	54,190,540	156,676,263
d. Third prior year	156,676,263	(151,644,000)
e. Fourth prior year	(151,644,000)	83,113,422
f. Total recognition	($26,029,455)	$311,394,037
8. Actuarial value of assets, end of year		
a. Preliminary actuarial value of assets, end of year: (1) + (4g) + (5d) + (6c) + (7f)	$8,651,600,098	$8,389,355,255
b. Upper corridor limit: 120% * (2)	10,087,908,715	11,267,839,976
c. Lower corridor limit: 80% * (2)	6,725,272,477	7,511,893,318
d. Actuarial value of assets, end of year	$8,651,600,098	$8,389,355,255
9. Difference between market and actuarial value of assets	($245,009,502)	$1,000,511,392
10. Actuarial rate of return	7.31%	11.49%
11. Market rate of return*	-6.99%	17.19%
12. Ratio of actuarial value to market value of assets	102.91%	89.34%

* Current year market rate of return is based on unaudited data and is supplied by the plan's investment consultant.

Table 10

History of Investment Returns

Plan Year	Market Value	Actuarial Value
(1)	(2)	(3)
2000	-0.99%	16.37%
2001	-4.47%	10.54%
2002	-9.29%	-1.47%
2003	21.00%	8.72%
2004	11.54%	2.77%
2005	8.22%	5.13%
2006	12.63%	8.55%
2007	7.44%	11.41%
2008	-29.63%	-12.85%
2009	23.72%	17.89%
2010	13.80%	3.00%
2011	-0.90%	1.25%
2012	14.05%	2.22%
2013	13.53%	11.55%
2014	4.70%	8.70%
2015	-0.26%	5.87%
2016	7.60%	6.74%
2017	14.20%	7.14%
2018	-3.52%	3.88%
2019	18.72%	6.05%
2020	11.03%	9.17%
2021	17.19%	11.49%
2022	-6.99%	7.31%
Average returns:		
Last five years:	6.75%	7.55%
Last ten years:	7.28%	7.76%

The market returns above are gross of investment expenses and were provided by the plan's investment consultant. The actuarial returns above are based on the financial information provided by the plan's auditors.

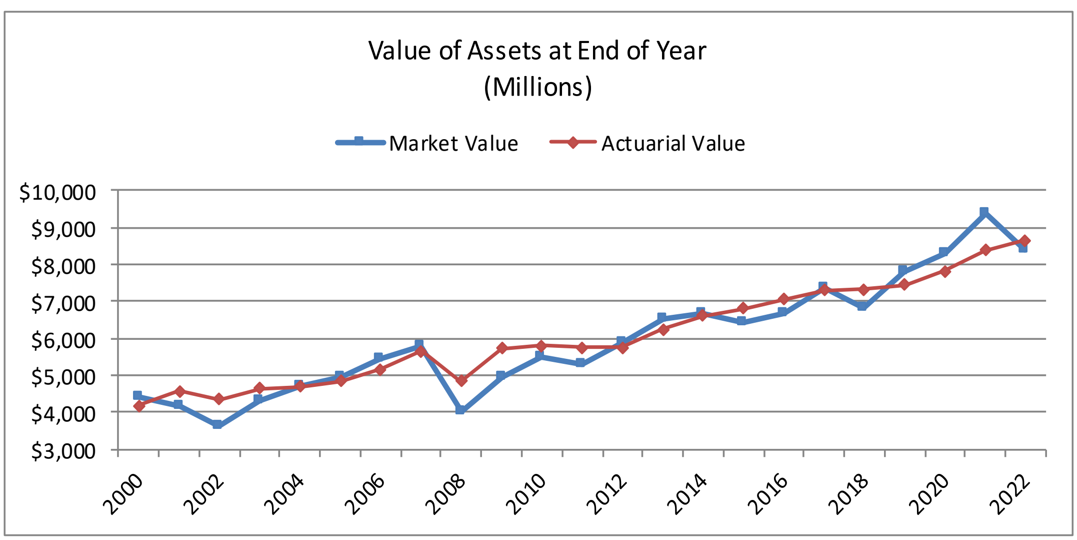

Table 11

Solvency Test

Valuation Date January 1	Total Active Member Contributions (1)	Inactive and Pensioner Liability (2)	Employer Financed Active Accrued Liability (3)	Actuarial Value of Assets	Percentage of Liabilities Covered by Assets (1)	(2)	(3)
2005	$840,104,000	$2,592,159,000	$2,103,929,000	$4,704,299,324	100%	100%	60.5%
2006	888,544,000	2,354,500,000	1,848,710,000	4,843,861,114	100%	100%	86.6%
2007	941,572,000	2,488,504,000	2,038,153,000	5,160,601,533	100%	100%	84.9%
2008	991,444,000	2,699,505,000	2,325,036,000	5,654,022,877	100%	100%	84.4%
2009	1,036,443,231	2,796,308,000	2,319,370,769	4,835,874,981	100%	100%	43.2%
2010	1,109,001,753	2,933,630,669	2,519,698,185	5,742,541,676	100%	100%	67.3%
2011	1,161,508,226	3,178,244,317	2,515,890,340	5,799,530,934	100%	100%	58.0%
2012	1,226,273,201	3,455,740,883	2,355,172,581	5,761,221,926	100%	100%	45.8%
2013	1,286,009,555	3,724,948,051	2,308,247,120	5,749,967,972	100%	100%	32.0%
2014	1,333,532,543	4,251,120,151	2,460,394,278	6,244,501,550	100%	100%	26.8%
2015	1,394,083,171	4,600,839,298	2,375,744,013	6,609,612,342	100%	100%	25.9%
2016	1,472,111,790	4,897,375,395	2,343,866,339	6,814,919,591	100%	100%	19.0%
2017	1,491,204,773	5,255,363,783	2,292,735,275	7,063,051,856	100%	100%	13.8%
2018	1,504,862,214	5,994,581,648	2,089,209,114	7,314,683,343	100%	97%	0.0%
2019	1,527,496,996	6,322,068,735	2,020,049,493	7,318,379,669	100%	92%	0.0%
2020	1,549,303,903	6,649,766,799	1,996,975,268	7,459,695,656	100%	89%	0.0%
2021	1,601,637,607	6,887,287,795	1,980,862,523	7,827,625,526	100%	90%	0.0%
2022	1,610,077,173	7,240,298,587	2,039,482,269	8,389,355,255	100%	94%	0.0%
2023	1,656,533,731	7,463,954,873	2,079,163,645	8,651,600,098	100%	94%	0.0%

Excludes Air Guard beginning in 2010

Effective January 1, 2010, liabilities are calculated assuming no future cost-of-living increases.

Table 12

Schedule of Funding Progress

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Valuation Date January 1	Actuarial Value of Assets	Actuarial Accrued Liability (AAL)	Unfunded AAL (UAAL) [(3) - (2)]	Funded Ratio [(2)/(3)]	Covered Payroll	UAAL as a Percentage of Covered Payroll [(4)/(6)]
2001	$4,190,440,151	$3,683,174,000	($507,266,151)	113.77%	$897,641,000	(56.51%)
2002	4,582,462,306	4,442,033,000	(140,429,306)	103.16%	964,121,000	(14.57%)
2003	4,352,423,802	4,718,618,000	366,194,198	92.24%	988,135,000	37.06%
2004	4,657,897,625	5,077,443,000	419,545,375	91.74%	1,032,259,000	40.64%
2005	4,704,299,324	4,902,322,000	198,022,676	95.96%	1,086,736,000	18.22%
2006	4,843,861,114	5,091,763,000	247,901,886	95.13%	1,156,400,000	21.44%
2007	5,160,601,533	5,468,229,000	307,627,467	94.37%	1,285,096,000	23.94%
2008	5,654,022,877	6,015,985,000	361,962,123	93.98%	1,462,474,000	24.75%
2009	4,835,874,981	6,152,122,000	1,316,247,019	78.60%	1,585,728,000	83.01%
2010	5,742,541,676	6,562,330,607	819,788,931	87.51%	1,697,341,384	48.30%
2011	5,799,530,934	6,855,642,883	1,056,111,949	84.59%	1,728,433,786	61.10%
2012	5,761,221,926	7,037,186,665	1,275,964,739	81.87%	1,756,856,648	72.63%
2013	5,749,967,972	7,319,204,726	1,569,236,754	78.56%	1,782,069,208	88.06%
2014	6,244,501,550	8,045,046,972	1,800,545,422	77.62%	1,782,062,471	101.04%
2015	6,609,612,342	8,370,666,482	1,761,054,140	78.96%	1,818,197,022	96.86%
2016	6,814,919,591	8,713,353,524	1,898,433,933	78.21%	1,858,678,687	102.14%
2017	7,063,051,856	9,039,303,831	1,976,251,975	78.14%	1,851,873,634	106.72%
2018	7,314,683,343	9,588,652,976	2,273,969,633	76.28%	1,784,888,475	127.40%
2019	7,318,379,669	9,869,615,224	2,551,235,555	74.15%	1,781,668,069	143.19%
2020	7,459,695,656	10,196,045,970	2,736,350,314	73.16%	1,824,979,015	149.94%
2021	7,827,625,526	10,469,787,925	2,642,162,399	74.76%	1,865,426,156	141.64%
2022	8,389,355,255	10,889,858,029	2,500,502,774	77.04%	1,850,670,904	135.11%
2023	8,651,600,098	11,199,652,249	2,548,052,151	77.25%	1,925,275,481	132.35%

Excludes Air Guard beginning in 2010

Effective January 1, 2010, liabilities are calculated assuming no future cost-of-living increases.

Table 13

Schedule of Contributions from the Employer(s) and Other Contributing Entities

(1)	(2)	(3)	(4)	(5)	(6)
Fiscal Year Ending December 31	Actuarially Determined Contribution		Employer Contributions*		Percentage of Actuarially Determined Contribution Contributed
	% of Payroll	Amount	% of Payroll	Amount	[(5)/(3)]
2004	8.76%	$90,477,000	5.87%	$60,573,670	66.95%
2005	10.00%	108,707,000	6.00%	65,191,670	59.97%
2006	5.68%	65,714,000	6.28%	72,664,403	110.58%
2007	5.68%	73,035,000	6.47%	83,149,236	113.85%
2008	5.68%	83,036,000	6.05%	88,451,655	106.52%
2009	9.15%	145,015,000	15.39%	244,063,923**	168.32%
2010	8.06%	136,689,664	6.17%	104,757,666	76.64%
2011	7.60%	131,260,466	7.09%	122,557,906	93.37%
2012	8.04%	141,299,725	7.09%	124,648,088	88.22%
2013	8.86%	158,013,754	7.20%	128,277,269	81.18%
2014	10.28%	183,086,430	7.27%	129,627,747	70.80%
2015	9.26%	168,411,742	7.95%	144,622,373	85.87%
2016	9.38%	174,211,753	8.15%	151,488,715	86.96%
2017	9.37%	173,551,431	8.03%	148,746,669	85.71%
2018	10.74%	191,677,662	8.27%	147,632,510	77.02%
2019	11.64%	207,518,684	8.83%	157,385,096	75.84%
2020	12.06%	219,815,919	9.10%	165,984,825	75.51%
2021	11.39%	212,378,768	9.07%	169,201,788	79.67%
2022	11.36%	210,236,215	9.63%	178,277,910	84.80%
2023	11.36%	218,711,295	-	-	-

Excludes Air Guard beginning December 31, 2009, including Employer Contributions of $149,244 as of December 31, 2009.

Effective January 1, 2010, liabilities are calculated assuming no future cost-of-living increases.

* Includes other funding sources but excludes member redeposits and member service purchase contributions.

** There was a $150.6 million legislative appropriation to address the increase in school district employee pay.

Table 14

Reconciliation of Participant Data

	Active Participants Tier 1	Active Participants Tier 2	Vested Former Participants	Retired Participants	Disableds	Beneficiaries	Participants Due Refunds	Total
Number as of January 1, 2022	**14,800**	**19,733**	**7,986**	**27,108**	**214**	**2,904**	**27,430**	**100,175**
New participants	-	4,148	4	-	-	18	727	4,897
Vested terminations	(492)	(790)	1,282	-	-	-	-	-
Retirements	(849)	(97)	(374)	1,320	-	-	-	-
Disability	(5)	-	-	(3)	8	-	-	-
Deceased with beneficiary	(6)	-	(4)	(240)	(2)	252	-	-
Deceased without beneficiary	(16)	(16)	(35)	(543)	(8)	(166)	(79)	(863)
Due refunds	(2)	(1,912)	-	-	-	-	1,914	-
Lump sum payoffs	(34)	(507)	(239)	(2)	-	-	(1,476)	(2,258)
Rehires/return to active	135	622	(239)	-	-	-	(474)	44
Certain period expired	-	-	-	-	-	(8)	-	(8)
Reclassifications*	3	(3)	-	-	-	-	(9,105)	(9,105)
Data corrections	1	(1)	2	3	-	-	(3)	2
Number as of January 1, 2023	**13,535**	**21,177**	**8,383**	**27,643**	**212**	**3,000**	**18,934**	**92,884**

**A large number of participants due refunds were removed from the data by the System due to their account balances being considered de minimis. These members are not valued in this report, but would be eligible for a small refund if so requested.*

Table 15

Demographic Statistics

	January 1 2023	January 1 2022	Change
<u>Active Participants</u>			
Number	34,712	34,533	0.5%
Vested	*22,660*	*22,847*	
Not vested	*12,052*	*11,686*	
Average age (years)	45.78	45.81	-0.1%
Average service (years)	9.51	9.64	-1.3%
Average entry age (years)	36.27	36.17	0.3%
Total payroll*	$1,925,275,481	$1,850,670,904	4.0%
Average payroll*	$55,464	$53,591	3.5%
Total employee contributions with interest	$1,656,533,731	$1,610,077,173	2.9%
Average employee contributions with interest	$47,722	$46,624	2.4%
<u>Vested Former Participants</u>			
Number	8,383	7,986	5.0%
Average age (years)	50.42	50.75	-0.7%
Total employee contributions with interest	$327,381,016	$294,927,522	11.0%
Average employee contributions with interest	$39,053	$36,931	5.7%
<u>Service Retirees</u>			
Number	27,643	27,108	2.0%
Average age (years)	72.99	72.70	0.4%
Total annual benefits	$612,543,501	$593,416,550	3.2%
Average annual benefit	$22,159	$21,891	1.2%
<u>Disability Retirees</u>			
Number	212	214	-0.9%
Average age (years)	66.42	66.15	0.4%
Total annual benefits	$3,560,101	$3,585,030	-0.7%
Average annual benefit	$16,793	$16,752	0.2%
<u>Beneficiaries</u>			
Number	3,000	2,904	3.3%
Average age (years)	76.91	76.67	0.3%
Total annual benefits	$47,949,438	$45,409,165	5.6%
Average annual benefit	$15,983	$15,637	2.2%
<u>Participants Due Refunds</u>			
Number	18,934	27,430	-31.0%
Total Refunds Due	$78,082,031	$77,333,053	1.0%

* Projected payroll for the upcoming valuation year

Table 16

Distribution of Male Active Members by Age and by Years of Service

Average Age = 46.6   Average Service = 9.9

Age Last Birthday		Whole Years of Service at Valuation Date 0-4	5-9	10-14	15-19	20-24	25-29	30 Plus	Totals
Less than 20	Count	42	-	-	-	-	-	-	42
	Avg. Salary	$27,140	-	-	-	-	-	-	$27,140
20-24	Count	373	4	-	-	-	-	-	377
	Avg. Salary	38,173	$35,419	-	-	-	-	-	38,143
25-29	Count	795	117	2	-	-	-	-	914
	Avg. Salary	46,719	53,536	*	-	-	-	-	47,603
30-34	Count	683	423	93	2	-	-	-	1,201
	Avg. Salary	49,455	59,722	59,491	*	-	-	-	53,847
35-39	Count	601	410	367	70	1	-	-	1,449
	Avg. Salary	53,097	64,596	70,600	70,444	*	-	-	61,622
40-44	Count	516	362	364	293	55	1	-	1,591
	Avg. Salary	51,180	64,295	74,267	77,612	$80,010	*	-	65,330
45-49	Count	432	272	287	329	203	41	2	1,566
	Avg. Salary	54,022	63,013	74,753	77,455	79,214	$85,288	*	68,416
50-54	Count	375	290	254	222	233	197	50	1,621
	Avg. Salary	52,502	62,438	68,480	73,855	79,934	86,476	$83,258	68,728
55-59	Count	377	243	236	218	195	150	150	1,569
	Avg. Salary	50,542	60,260	69,679	69,339	76,170	83,361	85,086	67,163
60-64	Count	301	235	172	184	143	83	158	1,276
	Avg. Salary	45,159	53,836	62,647	66,874	71,583	76,747	78,450	61,384
65-69	Count	158	95	76	53	32	19	41	474
	Avg. Salary	41,562	58,766	60,824	68,037	64,968	76,004	87,952	58,032
70 & Over	Count	93	45	29	17	11	7	13	215
	Avg. Salary	28,056	43,394	49,423	55,358	46,808	59,678	67,410	40,675
Totals	Count	**4,746**	**2,496**	**1,880**	**1,388**	**873**	**498**	**414**	**12,295**
	Avg. Salary	**$48,350**	**$60,699**	**$69,523**	**$73,210**	**$76,566**	**$83,034**	**$82,011**	**$61,442**

Average salary represents annualized salary earned in 2022 and is not shown for cells with counts less than or equal to three participants

Table 17

Distribution of Female Active Members by Age and by Years of Service

Average Age = 45.3 Average Service = 9.3

Age Last Birthday		Whole Years of Service at Valuation Date 0-4	5-9	10-14	15-19	20-24	25-29	30 Plus	Totals
Less than 20	Count	79	-	-	-	-	-	-	79
	Avg. Salary	$22,243	-	-	-	-	-	-	$22,243
20-24	Count	880	4	-	-	-	-	-	884
	Avg. Salary	33,388	43,635	-	-	-	-	-	33,435
25-29	Count	1,508	224	2	-	-	-	-	1,734
	Avg. Salary	41,791	$51,000	*	-	-	-	-	42,997
30-34	Count	1,277	768	142	4	-	-	-	2,191
	Avg. Salary	40,357	54,665	$58,743	$41,827	-	-	-	46,567
35-39	Count	1,324	790	646	165	-	-	-	2,925
	Avg. Salary	39,793	54,435	63,766	$65,070	-	-	-	50,468
40-44	Count	1,237	777	574	524	100	-	-	3,212
	Avg. Salary	40,165	51,941	61,831	68,677	$70,197	-	-	52,472
45-49	Count	936	689	538	449	354	60	2	3,028
	Avg. Salary	39,959	51,133	57,743	65,763	72,580	$70,630	*	53,961
50-54	Count	731	540	499	444	369	281	60	2,924
	Avg. Salary	40,594	50,615	54,121	62,472	70,902	76,181	$78,934	56,107
55-59	Count	597	413	348	414	368	209	187	2,536
	Avg. Salary	39,090	45,386	52,575	56,058	59,159	69,521	73,262	52,676
60-64	Count	461	295	295	340	285	169	190	2,035
	Avg. Salary	36,623	44,908	48,281	52,649	54,584	56,628	68,165	49,313
65-69	Count	147	127	81	90	65	57	64	631
	Avg. Salary	30,108	41,949	43,861	49,631	50,279	52,728	66,381	44,842
70 & Over	Count	78	36	33	29	20	14	28	238
	Avg. Salary	24,787	29,993	45,721	45,820	46,104	46,188	61,603	38,421
Totals	Count	**9,255**	**4,663**	**3,158**	**2,459**	**1,561**	**790**	**531**	**22,417**
	Avg. Salary	**$39,084**	**$51,020**	**$57,254**	**$61,431**	**$64,313**	**$67,591**	**$70,804**	**$50,091**

Average salary represents annualized salary earned in 2022 and is not shown for cells with counts less than or equal to three participants

Table 18

Distribution of Total Active Members by Age and by Years of Service

Average Age = 45.8 Average Service = 9.5

Age Last Birthday		Whole Years of Service at Valuation Date 0-4	5-9	10-14	15-19	20-24	25-29	30 Plus	Totals
Less than 20	Count	121	-	-	-	-	-	-	121
	Avg. Salary	$23,943	-	-	-	-	-	-	$23,943
20-24	Count	1,253	8	-	-	-	-	-	1,261
	Avg. Salary	34,813	$39,527	-	-	-	-	-	34,843
25-29	Count	2,303	341	4	-	-	-	-	2,648
	Avg. Salary	43,492	51,870	$53,615	-	-	-	-	44,587
30-34	Count	1,960	1,191	235	6	-	-	-	3,392
	Avg. Salary	43,528	56,461	59,039	$44,137	-	-	-	49,145
35-39	Count	1,925	1,200	1,013	235	1	-	-	4,374
	Avg. Salary	43,947	57,907	66,242	66,670	*	-	-	54,163
40-44	Count	1,753	1,139	938	817	155	1	-	4,803
	Avg. Salary	43,407	55,867	66,657	71,881	$73,679	*	-	56,731
45-49	Count	1,368	961	825	778	557	101	4	4,594
	Avg. Salary	44,400	54,496	63,660	70,707	74,998	$76,580	$96,350	58,888
50-54	Count	1,106	830	753	666	602	478	110	4,545
	Avg. Salary	44,632	54,746	58,965	66,266	74,398	80,424	$80,899	60,608
55-59	Count	974	656	584	632	563	359	337	4,105
	Avg. Salary	43,523	50,895	59,487	60,639	65,051	75,304	78,525	58,213
60-64	Count	762	530	467	524	428	252	348	3,311
	Avg. Salary	39,995	48,867	53,572	57,644	60,264	63,255	72,835	53,965
65-69	Count	305	222	157	143	97	76	105	1,105
	Avg. Salary	36,042	49,145	52,072	56,453	55,125	58,547	74,804	50,500
70 & Over	Count	171	81	62	46	31	21	41	453
	Avg. Salary	26,565	37,438	47,453	49,345	46,354	50,685	63,444	39,491
Totals	Count	**14,001**	**7,159**	**5,038**	**3,847**	**2,434**	**1,288**	**945**	**34,712**
	Avg. Salary	**$42,225**	**$54,394**	**$61,833**	**$65,681**	**$68,708**	**$73,562**	**$75,714**	**$54,111**

Average salary represents annualized salary earned in 2022 and is not shown for cells with counts less than or equal to three participants

Table 19

Distribution of Male Deferred Members by Age and by Years of Service

Average Age = 50.1 Average Service = 8.6

Age Last Birthday	Whole Years of Service at Valuation Date							Totals
	0-4	5-9	10-14	15-19	20-24	25-29	30 Plus	
Less than 20	-	-	-	-	-	-	-	-
20-24	1	-	-	-	-	-	-	1
25-29	19	23	-	-	-	-	-	42
30-34	57	110	4	-	-	-	-	171
35-39	99	196	40	5	-	-	-	340
40-44	77	215	90	11	-	-	-	393
45-49	64	185	80	35	17	3	-	384
50-54	75	201	88	43	21	4	-	432
55-59	58	221	118	40	19	7	-	463
60-64	78	127	42	23	11	1	1	283
65-69	30	52	23	10	4	-	-	119
70 & Over	25	39	9	5	2	1	-	81
Totals	**583**	**1,369**	**494**	**172**	**74**	**16**	**1**	**2,709**

Table 20

Distribution of Female Deferred Members by Age and by Years of Service

Average Age = 50.6 Average Service = 8.6

Age	Whole Years of Service at Valuation Date							
Last Birthday	0-4	5-9	10-14	15-19	20-24	25-29	30 Plus	Totals
Less than 20	-	-	-	-	-	-	-	-
20-24	2	-	-	-	-	-	-	2
25-29	38	29	-	-	-	-	-	67
30-34	153	220	22	-	-	-	-	395
35-39	205	400	85	2	-	-	-	692
40-44	172	406	122	33	1	-	-	734
45-49	128	381	148	66	17	2	1	743
50-54	126	426	207	103	46	6	-	914
55-59	134	458	230	114	40	12	1	989
60-64	142	318	138	52	20	6	1	677
65-69	69	131	61	19	6	3	-	289
70 & Over	52	85	24	5	2	1	3	172
Totals	**1,221**	**2,854**	**1,037**	**394**	**132**	**30**	**6**	**5,674**

Table 21

Distribution of Total Deferred Members by Age and by Years of Service

Average Age = 50.4   Average Service = 8.6

Age	Whole Years of Service at Valuation Date							
Last Birthday	0-4	5-9	10-14	15-19	20-24	25-29	30 Plus	Totals
Less than 20	-	-	-	-	-	-	-	-
20-24	3	-	-	-	-	-	-	3
25-29	57	52	-	-	-	-	-	109
30-34	210	330	26	-	-	-	-	566
35-39	304	596	125	7	-	-	-	1,032
40-44	249	621	212	44	1	-	-	1,127
45-49	192	566	228	101	34	5	1	1,127
50-54	201	627	295	146	67	10	-	1,346
55-59	192	679	348	154	59	19	1	1,452
60-64	220	445	180	75	31	7	2	960
65-69	99	183	84	29	10	3	-	408
70 & Over	77	124	33	10	4	2	3	253
Totals	**1,804**	**4,223**	**1,531**	**566**	**206**	**46**	**7**	**8,383**

Table 22

Schedule of Pension Recipients Added to and Removed from Rolls

Fiscal Year Ending December 31	Added to Rolls*		Removed from Rolls		Total		Percent Increase in Annual Pension Benefits	Average Annual Pension Benefit
	Count	Annual Pension Benefits	Count	Annual Pension Benefits	Count	Annual Pension Benefits		
2008	1,290	$26,985,322	552	$3,650,746	18,333	$268,901,376	9.50%	$14,668
2009	1,160	24,062,484	577	6,292,131	18,916	286,671,729	6.61%	15,155
2010	1,388	31,055,004	562	6,314,155	19,742	311,412,579	8.63%	15,774
2011	1,538	34,517,321	592	7,019,999	20,688	338,909,901	8.83%	16,382
2012	1,497	35,646,627	585	6,920,227	21,600	367,636,301	8.48%	17,020
2013	1,745	39,633,549	614	8,227,809	22,731	399,042,042	8.54%	17,555
2014	1,755	42,076,101	726	9,207,206	23,760	431,910,937	8.24%	18,178
2015	1,657	38,445,600	689	9,453,053	24,728	460,903,484	6.71%	18,639
2016	1,768	43,327,957	728	9,191,130	25,768	495,040,311	7.41%	19,211
2017	1,806	43,470,131	766	10,395,795	26,808	528,114,647	6.68%	19,700
2018	1,786	41,353,498	812	10,936,120	27,782	558,532,025	5.76%	20,104
2019	1,773	42,280,614	805	11,779,332	28,750	589,033,307	5.46%	20,488
2020	1,585	36,818,814	928	13,759,321	29,407	612,092,800	3.91%	20,815
2021	1,841	45,070,447	1,022	14,752,502	30,226	642,410,745	4.95%	21,254
2022	1,598	36,477,267	969	14,834,972	30,855	664,053,040	3.37%	21,522

* *Includes cost-of-living increases*

Table 23

Retired and Disabled Members by Option Code

Option Code*	Count			Monthly Benefit			Count elected self-funded COLA**		
	Male	Female	Total	Male	Female	Total	1%	2%	3%
1	2,284	7,362	9,646	$4,300,564	$11,559,499	$15,860,063	48	41	64
2	4,950	4,125	9,075	11,336,707	7,324,251	18,660,958	49	47	59
2P	1,540	2,192	3,732	3,034,099	4,141,993	7,176,092	21	23	34
3	474	650	1,124	1,220,362	1,227,750	2,448,112	9	5	7
3P	302	634	936	756,813	1,457,219	2,214,031	5	10	8
4a	295	598	893	490,618	873,131	1,363,749	10	5	10
4b	96	161	257	159,961	229,863	389,825	7	9	7
5	567	1,625	2,192	942,754	2,286,382	3,229,136	18	13	23
Total	**10,508**	**17,347**	**27,855**	**$22,241,878**	**$29,100,088**	**$51,341,967**	**167**	**153**	**212**
Beneficiaries	**690**	**2,310**	**3,000**	**$820,318**	**$3,175,469**	**$3,995,787**	**-**	**-**	**-**
Grand Total	**11,198**	**19,657**	**30,855**	**$23,062,196**	**$32,275,557**	**$55,337,754**	**167**	**153**	**212**

**See optional forms of payment in Appendix B*

***Option totals in left portion of the table include these counts of members who elected a self-funded COLA option.*

Table 24

Pensioners by Monthly Benefit and Option Code

Males	Option Code*								
Benefit Amount	**1**	**2**	**2P**	**3**	**3P**	**4a****	**4b**	**5**	**Total**
Under $200	98	129	51	4	5	22	1	93	403
$200-$399	213	323	137	13	20	28	12	178	924
$400-$599	245	338	139	18	14	44	18	164	980
$600-$799	199	299	112	27	10	24	7	122	800
$800-$999	166	286	104	21	12	16	8	97	710
$1,000-$1,499	273	599	200	65	34	57	14	167	1,409
$1,500-$1,999	228	521	138	49	30	28	6	96	1,096
$2,000-$2,499	186	519	158	66	39	18	9	84	1,079
$2,500 & over	676	1,936	501	211	138	73	21	241	3,797
Total	**2,284**	**4,950**	**1,540**	**474**	**302**	**310**	**96**	**1,242**	**11,198**
Females									
Benefit Amount	**1**	**2**	**2P**	**3**	**3P**	**4a****	**4b**	**5**	**Total**
Under $200	459	226	77	19	16	50	9	295	1,151
$200-$399	897	410	207	43	28	96	30	505	2,216
$400-$599	779	354	186	47	34	72	19	446	1,937
$600-$799	636	290	137	54	37	62	15	379	1,610
$800-$999	554	311	154	53	41	37	13	320	1,483
$1,000-$1,499	1,094	614	302	95	74	91	26	604	2,900
$1,500-$1,999	750	414	235	90	73	48	15	424	2,049
$2,000-$2,499	597	364	236	68	64	40	4	302	1,675
$2,500 & over	1,596	1,142	658	181	267	124	30	638	4,636
Total	**7,362**	**4,125**	**2,192**	**650**	**634**	**620**	**161**	**3,913**	**19,657**
Males & Females									
Benefit Amount	**1**	**2**	**2P**	**3**	**3P**	**4a****	**4b**	**5**	**Total**
Under $200	557	355	128	23	21	72	10	388	1,554
$200-$399	1,110	733	344	56	48	124	42	683	3,140
$400-$599	1,024	692	325	65	48	116	37	610	2,917
$600-$799	835	589	249	81	47	86	22	501	2,410
$800-$999	720	597	258	74	53	53	21	417	2,193
$1,000-$1,499	1,367	1,213	502	160	108	148	40	771	4,309
$1,500-$1,999	978	935	373	139	103	76	21	520	3,145
$2,000-$2,499	783	883	394	134	103	58	13	386	2,754
$2,500 & over	2,272	3,078	1,159	392	405	197	51	879	8,433
Total	**9,646**	**9,075**	**3,732**	**1,124**	**936**	**930**	**257**	**5,155**	**30,855**

**Options include those who elected a self-funded COLA option.*

***Option 4a includes 37 beneficiaries who are receiving a certain only benefit.*

Table 25

Pensioners by Age and Option Code

Average Age Male = 73.4 Average Age Female = 73.3 Average Age Total = 73.3

Males	Option Code*								
Age Last Birthday	**1**	**2**	**2P**	**3**	**3P**	**4a****	**4b**	**5**	**Total**
Under 50	1	1	-	-	-	8	-	7	17
50-54	16	6	3	2	2	3	1	8	41
55-59	68	130	48	9	7	1	5	28	296
60-64	237	592	165	46	24	27	29	116	1,236
65-69	502	1,140	361	82	62	60	37	221	2,465
70-74	523	1,174	457	91	83	75	18	258	2,679
75-79	405	911	315	90	70	52	5	253	2,101
80-84	306	580	141	66	38	51	1	186	1,369
85 & over	226	416	50	88	16	33	-	165	994
Total	**2,284**	**4,950**	**1,540**	**474**	**302**	**310**	**96**	**1,242**	**11,198**
Females									
Age Last Birthday	**1**	**2**	**2P**	**3**	**3P**	**4a****	**4b**	**5**	**Total**
Under 50	4	1	-	-	-	13	-	26	44
50-54	18	12	3	1	-	3	2	22	61
55-59	130	112	56	16	14	10	12	73	423
60-64	859	608	313	79	105	54	45	269	2,332
65-69	1,654	1,105	662	166	179	99	65	615	4,545
70-74	1,686	1,072	663	159	182	132	30	784	4,708
75-79	1,333	646	377	110	97	149	5	740	3,457
80-84	866	332	97	69	48	90	-	634	2,136
85 & over	812	237	21	50	9	70	2	750	1,951
Total	**7,362**	**4,125**	**2,192**	**650**	**634**	**620**	**161**	**3,913**	**19,657**
Males & Females									
Age Last Birthday	**1**	**2**	**2P**	**3**	**3P**	**4a****	**4b**	**5**	**Total**
Under 50	5	2	-	-	-	21	-	33	61
50-54	34	18	6	3	2	6	3	30	102
55-59	198	242	104	25	21	11	17	101	719
60-64	1,096	1,200	478	125	129	81	74	385	3,568
65-69	2,156	2,245	1,023	248	241	159	102	836	7,010
70-74	2,209	2,246	1,120	250	265	207	48	1,042	7,387
75-79	1,738	1,557	692	200	167	201	10	993	5,558
80-84	1,172	912	238	135	86	141	1	820	3,505
85 & over	1,038	653	71	138	25	103	2	915	2,945
Total	**9,646**	**9,075**	**3,732**	**1,124**	**936**	**930**	**257**	**5,155**	**30,855**

**Options include those who elected a self-funded COLA option.*

***Option 4a includes 37 beneficiaries who are receiving a certain only benefit.*

Table 26

Pensions Awarded in 2022 by Option Code

Average Age = 63.0

Males & Females	Option Code*								
Benefit Amount	**1**	**2**	**2P**	**3**	**3P**	**4a****	**4b**	**5**	**Total**
Under $200	21	12	6	3	1	1	1	25	70
$200-$399	59	24	11	1	1	1	5	45	147
$400-$599	48	36	10	3	3	8	6	43	157
$600-$799	27	43	9	1	2	1	2	29	114
$800-$999	29	37	14	6	2	1	0	24	113
$1,000-$1,499	61	68	22	4	2	8	6	70	241
$1,500-$1,999	47	39	16	5	5	4	4	43	163
$2,000-$2,499	42	44	19	3	5	3	1	30	147
$2,500 & over	101	169	52	18	22	7	4	73	446
Total	**435**	**472**	**159**	**44**	**43**	**34**	**29**	**382**	**1,598**
Males & Females									
Age Last Birthday	**1**	**2**	**2P**	**3**	**3P**	**4a****	**4b**	**5**	**Total**
Under 50	2	0	0	0	0	5	0	4	11
50-54	9	5	2	1	1	1	1	7	27
55-59	39	74	28	5	6	4	1	27	184
60-64	179	197	68	20	20	10	15	69	578
65-69	149	164	47	14	13	9	11	75	482
70-74	37	21	10	3	3	3	1	60	138
75-79	13	10	3	0	0	1	0	62	89
80-84	4	1	1	1	0	1	0	44	52
85 & over	3	0	0	0	0	0	0	34	37
Total	**435**	**472**	**159**	**44**	**43**	**34**	**29**	**382**	**1,598**

**Options include those who elected a self-funded COLA option*

***Option 4a includes 11 beneficiaries who are receiving a certain only benefit.*

Table 27

Retirees and Disabled Members by Service at Retirement and Years Since Retirement

(Average Monthly Benefit)

Average Service at Retirement = 20.2 Average Years Since Retirement = 12.0

Service at Retirement		Years Elapsed Since Retirement							
		0-4	**5-9**	**10-14**	**15-19**	**20-24**	**25-29**	**30 Plus**	**Totals**
Less than 5	Count	213	251	247	181	91	56	90	1,129
	Avg. Benefit	$1,977	$503	$258	$324	$2,058	$162	$146	$284
5-9	Count	960	1,206	878	556	333	244	262	4,439
	Avg. Benefit	$565	$521	$444	$388	$371	$322	$283	$462
10-14	Count	1,074	1,113	727	499	378	298	276	4,365
	Avg. Benefit	$1,021	$934	$818	$697	$642	$602	$524	$835
15-19	Count	1,046	893	663	493	414	310	178	3,997
	Avg. Benefit	$1,541	$1,435	$1,305	$1,081	$999	$927	$825	$1,286
20-24	Count	982	908	735	528	347	250	148	3,898
	Avg. Benefit	$2,082	$2,121	$1,924	$1,541	$1,398	$1,320	$1,183	$1,844
25-29	Count	966	1,027	1,025	663	398	198	91	4,368
	Avg. Benefit	$2,997	$2,865	$2,753	$2,265	$2,071	$1,962	$1,704	$2,639
30-34	Count	739	1,019	889	518	302	209	70	3,746
	Avg. Benefit	$3,820	$3,738	$3,509	$2,958	$2,653	$2,695	$2,557	$3,424
35 & Over	Count	659	679	313	137	50	52	23	1,913
	Avg. Benefit	$4,921	$4,684	$4,205	$3,667	$3,184	$3,402	$2,760	$4,517
Totals	Count	**6,639**	**7,096**	**5,477**	**3,575**	**2,313**	**1,617**	**1,138**	**27,855**
	Avg. Benefit	**$2,162**	**$2,098**	**$1,933**	**$1,534**	**$1,326**	**$1,245**	**$836**	**$1,843**

Table 28

Retirees and Disabled Members by Year of Retirement

January 1, 2023 Total = 27,855

Year of Retirement	Count	Year of Retirement	Count
Under 1961	-	1992	229
1961	-	1993	222
1962	-	1994	275
1963	-	1995	454
1964	-	1996	320
1965	-	1997	346
1966	-	1998	358
1967	-	1999	404
1968	-	2000	463
1969	-	2001	526
1970	-	2002	526
1971	-	2003	621
1972	-	2004	741
1973	1	2005	670
1974	1	2006	707
1975	2	2007	825
1976	2	2008	947
1977	4	2009	872
1978	12	2010	1,064
1979	11	2011	1,261
1980	14	2012	1,309
1981	20	2013	1,369
1982	20	2014	1,442
1983	20	2015	1,418
1984	34	2016	1,473
1985	43	2017	1,447
1986	61	2018	1,423
1987	107	2019	1,445
1988	116	2020	1,254
1989	124	2021	1,432
1990	150	2022*	1,112
1991	158		

**May include retirements as of January 1, 2023*

Table 29

Thirty Year Closed Group Projected Benefit Payments

Year Ending December 31	Actives	Retirees*	Total
2023	$ 22,378,080	$ 682,473,075	$ 704,851,155
2024	47,875,238	677,871,039	725,746,277
2025	72,101,232	671,959,225	744,060,457
2026	94,960,776	665,215,813	760,176,589
2027	123,935,640	657,793,229	781,728,869
2028	153,138,997	649,405,767	802,544,764
2029	182,967,613	640,735,245	823,702,858
2030	213,339,698	631,225,408	844,565,106
2031	244,317,682	620,589,883	864,907,565
2032	275,841,638	608,507,920	884,349,558
2033	308,236,994	584,425,437	892,662,431
2034	341,708,900	570,195,775	911,904,675
2035	376,278,794	554,688,585	930,967,379
2036	411,716,264	537,696,468	949,412,732
2037	447,428,781	519,650,244	967,079,025
2038	482,985,078	500,338,437	983,323,515
2039	518,259,640	479,933,877	998,193,517
2040	553,071,946	458,602,607	1,011,674,553
2041	586,836,165	436,218,344	1,023,054,509
2042	619,280,900	413,265,086	1,032,545,986
2043	650,060,499	389,712,457	1,039,772,956
2044	678,936,937	365,810,563	1,044,747,500
2045	705,698,462	341,740,612	1,047,439,074
2046	729,860,460	317,382,652	1,047,243,112
2047	751,361,892	293,129,264	1,044,491,156
2048	769,968,486	269,375,851	1,039,344,337
2049	785,750,655	246,188,529	1,031,939,184
2050	798,587,582	223,673,819	1,022,261,401
2051	807,989,327	202,137,423	1,010,126,750
2052	814,453,902	181,788,183	996,242,085

* Includes Disabled Members, Beneficiaries, and Deferred Vested Members. Retirement benefit payments for deferred vested members are assumed to commence at age 60 (age 65 for Tier 2).

Appendix A

Summary of Actuarial Assumptions and Methods

Summary of Actuarial Assumptions and Methods

The following methods and assumptions were used in preparing the January 1, 2023 actuarial valuation report.

1. Valuation Date

The valuation date for any given year is January 1st, the first day of each plan year. This is the date as of which the actuarial present value of future benefits and the actuarial value of assets are determined.

2. Actuarial Cost Method

The actuarial valuation uses the Entry Age Normal (EAN) actuarial cost method, amortized as a level percentage of payroll. Under this method, the employer contribution rate is the sum of (i) the employer normal cost rate, and (ii) the rate that will amortize the unfunded actuarial accrued liability (UAAL).

a. The valuation is prepared on the projected benefit basis, under which the present value, at the investment return rate assumed to be earned in the future (currently 6.80%), of each participant's expected benefit payable at retirement or death is determined, based on his/her age, service, sex and compensation. The calculations take into account the probability of a participant's death or termination of employment prior to becoming eligible for a benefit, as well as the possibility of his/her terminating with a service, disability, or survivor's benefit. Future salary increases are also anticipated. The present value of the expected benefits payable for the active participants is added to the present value of the expected future payments to retired participants and beneficiaries to obtain the present value of all expected benefits payable from the Fund on account of the present group of participants and beneficiaries.

b. The employer contributions required to support the benefits of the Fund are determined using a level funding approach, and consist of a normal cost contribution and an unfunded accrued liability contribution.

c. The normal cost contribution is determined using the "entry age normal" actuarial cost method. Under this method, a calculation is made to determine the average uniform and constant percentage rate of employer contribution which, if applied to the compensation of each new participant during the entire period of his/her anticipated covered service, would be required to meet the cost of all benefits payable on his/her behalf based on the benefits provisions applicable for the individual member.

d. The unfunded accrued liability contributions are determined by subtracting the actuarial value of assets from the actuarial accrued liability. Amortization bases are established each year and amortized based on the Board's policy. The Board's policy consists of amortizing the unfunded liability as of January 1, 2018, over a closed 30-year period with each subsequent amortization base created as a result of year to year experience changes over individual 20-year closed periods. The current year amortization base is determined by taking the current unfunded liability less the outstanding amounts of prior year bases.

3. Actuarial Value of Assets

The actuarial value of assets is based on the market value of assets with a five-year phase-in of actual investment return in excess of (less than) expected investment income. Expected investment income is determined using the assumed investment return rate and the market value of assets (adjusted for receipts and disbursements during the year). The returns are computed net of investment expenses. An adjustment is made if the actuarial value is not within 20% of the Market Value. For any year following a year in which the 20% of market value adjustment was applied, the actuarial value is determined as if the adjustment was not applied in the previous year.

4. Economic Assumptions

a. Investment return

6.80% per year, compounded annually, composed of an assumed 2.25% inflation rate and a 4.55% net real rate of return. This rate represents the assumed return, net of investment expenses.

b. Salary increase rate

Service	Rate	Service	Rate
1	6.50%	14	3.25%
2	6.50%	15	3.00%
3	6.50%	16	3.00%
4	6.00%	17	2.75%
5	5.25%	18	2.75%
6	4.75%	19	2.75%
7	4.25%	20	2.75%
8	4.00%	21	2.50%
9	4.00%	22	2.50%
10	3.50%	23	2.50%
11	3.50%	24	2.50%
12	3.50%	25	2.50%
13	3.50%	25+	2.50%

c. Payroll growth rate

In the amortization of the unfunded actuarial accrued liability, payroll is assumed to increase 2.50% per year. This increase rate is solely due to the effect of inflation on salaries, with no allowance for future membership growth.

d. Cost-of-Living adjustment

No cost-of-living adjustment is assumed since the policy for providing the benefit requires Board approval to make the recommendation to the Joint Appropriations Committee and the funded level of the plan shows a cost-of-living requirement would not be permitted.

5. Demographic Assumptions

a. Mortality

Healthy Pre-Retirement Mortality:
Pub-2010 General Active Mortality Table, amount weighted, fully generational, projected with the MP-2020 Ultimate Scale

Males: No set back with a multiplier of 100%
Females: No set back with a multiplier of 100%

Healthy Post-Retirement Mortality:
Pub-2010 General Healthy Annuitant Mortality Table, amount weighted, fully generational, projected with the MP-2020 Ultimate Scale

Males: No set back with a multiplier of 100%
Females: No set back with a multiplier of 103%

Disabled Mortality
Pub-2010 General Disabled Mortality Table, amount weighted, fully generational, projected with the MP-2020 Ultimate Scale

Males: No set back with a multiplier of 100%
Females: No set back with a multiplier of 100%

	Pre-Retirement		Post-Retirement		Disabled	
	Projected to 2023 using the MP-2020 Ultimate Scale					
Age	Male	Female	Male	Female	Male	Female
20	0.03%	0.01%	0.03%	0.01%	0.35%	0.20%
25	0.02%	0.01%	0.02%	0.01%	0.23%	0.14%
30	0.03%	0.01%	0.03%	0.01%	0.30%	0.22%
35	0.04%	0.02%	0.04%	0.02%	0.38%	0.34%
40	0.06%	0.03%	0.06%	0.03%	0.54%	0.53%
45	0.08%	0.05%	0.09%	0.06%	0.84%	0.83%
50	0.12%	0.07%	0.25%	0.19%	1.35%	1.24%
55	0.18%	0.10%	0.36%	0.25%	1.77%	1.46%
60	0.27%	0.16%	0.52%	0.33%	2.10%	1.64%
65	0.39%	0.25%	0.77%	0.53%	2.56%	1.90%
70	0.60%	0.42%	1.30%	0.93%	3.32%	2.43%
75			2.29%	1.66%	4.46%	3.44%
80			4.13%	3.00%	6.36%	5.20%
85			7.67%	5.70%	9.65%	8.33%
90			13.51%	10.90%	14.97%	12.59%
95			21.73%	18.41%	22.42%	18.32%
100			31.36%	27.89%	31.36%	27.08%

b. Disability, Withdrawal and Retirement

Age	Disability	
	Male	Female
20	0.01%	0.01%
25	0.01%	0.01%
30	0.01%	0.01%
35	0.01%	0.01%
40	0.01%	0.01%
45	0.02%	0.02%
50	0.12%	0.05%
55	0.24%	0.12%
60	0.24%	0.24%

Withdrawal		
Service	Male	Female
1	13.00%	14.00%
2	13.00%	14.00%
3	13.00%	14.00%
4	13.00%	14.00%
5	13.00%	13.00%
6	11.00%	11.00%
7	10.00%	10.00%
8	9.00%	9.00%
9	8.00%	8.00%
10	8.00%	8.00%
11	8.00%	8.00%
12	8.00%	7.00%
13	7.00%	7.00%
14	6.00%	7.00%
15	6.00%	6.00%
16	5.00%	6.00%
17	5.00%	6.00%
18	4.00%	6.00%
19	3.00%	6.00%
20+	3.00%	6.00%

Age	Retirement	
	Unreduced	Reduced
<50	15.00%	0.20%
50	15.00%	0.20%
51	15.00%	0.20%
52	15.00%	0.30%
53	15.00%	0.50%
54	15.00%	0.50%
55	17.00%	1.00%
56	17.00%	1.00%
57	17.00%	1.00%
58	17.00%	1.50%
59	17.00%	2.00%
60	13.00%	2.50%
61	13.00%	2.50%
62	18.00%	2.50%
63	15.00%	2.50%
64	15.00%	2.50%
65	30.00%	
66	35.00%	
67	28.00%	
68	25.00%	
69	25.00%	
70	25.00%	
71	20.00%	
72	20.00%	
73	20.00%	
74	15.00%	
75	15.00%	
76	15.00%	
77	15.00%	
78	15.00%	
79	15.00%	
80+	100.00%	

6. Other Assumptions

a. Percent married: 85% of employees are assumed to be married. (No beneficiaries other than the spouse assumed.)

b. Age difference: Male members are assumed to be three years older than their spouses, and female members are assumed to be three years younger than their spouses.

c. Percent electing annuity on death (when eligible): All of the spouses of vested, married participants are assumed to elect an annuity.

d. Percent electing deferred termination benefit: Vested terminating members are assumed to elect a refund or a deferred benefit. It is assumed that the active members will elect the maximum value of the refund or deferred benefit when they terminate.

e. Assumed age for commencement of deferred benefits: Members electing to receive a deferred benefit are assumed to commence receipt at the first age at which unreduced benefits are available, which for this plan is age 60 (65 for Tier 2).

f. No benefit amount data is available for members entitled to deferred benefits. The benefit is estimated using the final average compensation and service provided by WRS.

g. There will be no recoveries once disabled. We assume all disabled members are totally disabled.

h. No surviving spouse will remarry.

i. Administrative expenses: Assumed to be the average of the prior two years, with each year projected at 2.50% to the valuation date.

j. Pay increase timing: Beginning of (fiscal) year. This is equivalent to assuming that reported pay represents amount paid to members during the year ended on the valuation date.

k. Decrement timing: Decrements of all types are assumed to occur mid-year.

l. Eligibility testing: Eligibility for benefits is determined based upon the age nearest birthday and service nearest whole year on the date the decrement is assumed to occur.

m. Decrement relativity: Decrement rates are converted to probabilities in order to account for multiple decrements.

n. Incidence of Contributions: Contributions are assumed to be received continuously throughout the year based upon the computed percent of payroll shown in the report, and the actual payroll payable at the time contributions are made.

o. Benefit Service: All members are assumed to accrue one year of service each year. Exact fractional service is used to determine the amount of benefit payable.

APPENDIX B

SUMMARY OF PLAN PROVISIONS

Summary of Plan Provisions

Covered Members	Any full-time or regular part-time employee of an employer as defined under W.S. 9-3-402(a)(vii)
Tier	Members who join the State of Wyoming Retirement System by August 31, 2012 are in Tier 1, while members who join on or after September 1, 2012 are in Tier 2.
Final Average Salary	For Tier 1 member: employee's average annual salary for the highest paid three continuous years of service. For Tier 2 members: employee's average annual salary for the highest paid five continuous years of service.

Service Retirement

Eligibility	Tier 1 members may retire upon normal retirement on the date he/she attains age 60 with four or more years of service while Tier 2 members may retire upon normal retirement on the date he/she attains age 65 with four or more years of service. All employees may also retire upon normal retirement on the date that the sum of the member's age and service is at least 85. Tier 1 members are eligible for a reduced benefit at age 50 with four or more years of service and Tier 2 members are eligible for a reduced benefit at age 55 with four or more years of service. All members are eligible for a reduced benefit at any age with 25 or more years of service.
Benefit	For Tier 1 member: 2.125% of employee's Final Average Salary for each year of credited service for the first 15 years of service credit plus 2.25% of Final Average Salary for any years of service credit exceeding 15 years. For Tier 2 members: 2.000% of employee's Final (5-year) Average Salary for each year of credited service. This amount is reduced by 5.0% per year that the employee is under age 60 for Tier 1 and under age 65 for Tier 2. However, members retiring with a combined age and service of at least 85 receive an unreduced benefit. Employees hired prior to July 1, 1981 may be entitled to benefits earned under a different formula.
Vesting	Any employee who has left employment with four or more years of service, and who has not withdrawn accumulated contributions, is eligible to receive the above benefit or can elect to receive a lump-sum refund of employee contributions with interest. An employee who terminates with less than four years of service is only eligible for the lump-sum benefit.

Summary of Plan Provisions (continued)

Disability Benefit

Eligibility	Ten or more years of service.
Benefit	Service retirement benefit earned as of the date of disability, payable immediately.
Park Rangers	Effective March 5, 2015, for eligible peace officers as defined under W.S. 6-1-104(a)(vi)(P) whose disability is duty-related, the member shall be eligible immediately for a benefit of 62.5% of the member's final salary.

Pre-retirement Death Benefit

Eligibility	No age or service requirements.
Benefit	A lump sum equal to two times the employee contributions with interest. If the employee is vested, the beneficiary can elect, in lieu of this lump sum, to receive a monthly annuity equal to the actuarial equivalent of the retirement benefit that would be due the employee.
Park Rangers	Effective March 5, 2015, for eligible peace officers as defined under W.S. 6-1-104(a)(vi)(P) whose death is duty-related, the member shall be eligible immediately for a benefit of 62.5% of member's final actual salary, payable to the surviving spouse plus 6% of the member's final actual salary for each unmarried child under age 18. Payment shall not exceed the member's final actual salary.

Contributions

Employee	9.25% of salary.
Employer	9.37% plus an additional 1.0% for park rangers.
Interest	3.00% annually (0.0% for non-vested members).

Cost-of-Living Improvements	W.S. 9-3-454 prohibits benefit changes, including cost-of-living increases, unless the funded ratio stays above 100% plus a margin for adverse experience throughout the life of the benefit change.

Summary of Plan Provisions (continued)

Optional Forms of Payment

	All options include the choice to elect a reduced benefit with a self-funded annual COLA of 1%, 2%, or 3% per year. COLAs commence on July 1 following the two-year anniversary of retirement.
Option 1	Monthly benefit for life with a lump-sum death benefit equal to the excess (if any) of the employee contributions with interest over the total benefits
Option 2	Monthly benefit for life. Upon death, 100% of the benefit continues to be paid to the beneficiary.
Option 2P	Monthly benefit for life. Upon death, 100% of the benefit continues to be paid to the beneficiary. Benefit reverts to Option 1 amount but without the cash refund feature upon beneficiary death.
Option 3	Monthly benefit for life. Upon death, 50% of the benefit continues to be paid to the beneficiary.
Option 3P	Monthly benefit for life. Upon death, 50% of the benefit continues to be paid to the beneficiary. Benefit reverts to Option 1 amount but without the cash refund feature upon beneficiary death.
Option 4a	Monthly benefit for life with a guarantee of 120 monthly payments
Option 4b	Monthly benefit for life with a guarantee of 240 monthly payments
Option 5	The largest possible monthly benefit payable for life with no lump-sum death benefit.

APPENDIX C

RISKS ASSOCIATED WITH MEASURING THE ACCRUED LIABILITY

Risks Associated With Measuring the Accrued Liability and Actuarially Determined Contribution

The determination of the accrued liability and the actuarially determined contribution requires the use of assumptions regarding future economic and demographic experience. Risk measures, as illustrated in this report, are intended to aid in the understanding of the effects of future experience differing from the assumptions used in the course of the actuarial valuation. Risk measures may also help with illustrating the potential volatility in the accrued liability and the actuarially determined contribution that result from the differences between actual experience and the actuarial assumptions.

Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the following: plan experience differing from that anticipated by the economic or demographic assumptions; changes in economic or demographic assumptions due to changing conditions; increases or decreases expected as part of the natural operation of the methodology used for these measurements (such as the end of an amortization period, or additional cost or contribution requirements based on the plan's funded status); and changes in plan provisions or applicable law. The scope of an actuarial valuation does not include an analysis of the potential range of such future measurements.

Examples of risk that may reasonably be anticipated to significantly affect the plan's future financial condition include:

1. Investment risk – actual investment returns may differ from the expected returns;
2. Asset/Liability mismatch – changes in asset values may not match changes in liabilities, thereby altering the gap between the accrued liability and assets and consequently altering the funded status and contribution requirements;
3. Contribution risk – actual contributions may differ from expected future contributions. For example, actual contributions may not be made in accordance with the plan's funding policy or material changes may occur in the anticipated number of covered employees, covered payroll, or other relevant contribution base;
4. Salary and Payroll risk – actual salaries and total payroll may differ from expected, resulting in actual future accrued liability and contributions differing from expected;
5. Longevity risk – members may live longer or shorter than expected and receive pensions for a period of time other than assumed;
6. Other demographic risks – members may terminate, retire or become disabled at times or with benefits other than assumed resulting in actual future accrued liability and contributions differing from expected.

The effects of certain trends in experience can generally be anticipated. For example, if the investment return since the most recent actuarial valuation is less (or more) than the assumed rate, the cost of the plan can be expected to increase (or decrease). Likewise, if longevity is improving (or worsening), increases (or decreases) in cost can be anticipated.

The computed contribution rate shown on Table 1A may be considered as a minimum contribution rate that complies with the Board's funding policy. The timely receipt of the actuarially determined contributions is critical to support the financial health of the plan. Users of this report should be aware that contributions made at the actuarially determined rate do not necessarily guarantee benefit security.

Risks Associated With Measuring the Accrued Liability and Actuarially Determined Contribution

Plan Maturity Measures

Risks facing a pension plan evolve over time. A young plan with virtually no investments and paying few benefits may experience little investment risk. An older plan with a large number of members in pay status and a significant trust may be much more exposed to investment risk. Generally accepted plan maturity measures include the following:

	January 1, 2023	January 1, 2022
Ratio of the market value of assets to total payroll	4.4	5.1
Ratio of actuarial accrued liability to payroll	5.8	5.9
Ratio of actives to retirees and beneficiaries	1.1	1.1
Ratio of net cash flows to market value of assets	-4%	-3%
Duration of the actuarial accrued liability	11.8	11.8

Ratio of Market Value of Assets to Payroll

The relationship between assets and payroll is a useful indicator of the potential volatility of contributions. For example, if the market value of assets is 4.0 times the payroll, a return on assets 5% different than assumed would equal 20% of payroll. A higher (lower) or increasing (decreasing) level of this maturity measure generally indicates a higher (lower) or increasing (decreasing) volatility in plan sponsor contributions as a percentage of payroll.

Ratio of Actuarial Accrued Liability to Payroll

The relationship between actuarial accrued liability and payroll is a useful indicator of the potential volatility of contributions for a fully funded plan. A funding policy that targets a funded ratio of 100% is expected to result in the ratio of assets to payroll and the ratio of liability to payroll converging over time.

The ratio of liability to payroll may also be used as a measure of sensitivity of the liability itself. For example, if the actuarial accrued liability is 5.5 times the payroll, a change in liability 2% other than assumed would equal 11% of payroll. A higher (lower) or increasing (decreasing) level of this maturity measure generally indicates a higher (lower) or increasing (decreasing) volatility in liability (and also plan sponsor contributions) as a percentage of payroll.

Ratio of Actives to Retirees and Beneficiaries

A young plan with many active members and few retirees will have a high ratio of active to retirees. A mature open plan may have close to the same number of actives to retirees resulting in a ratio near 1.0. A super-mature or closed plan may have significantly more retirees than actives resulting in a ratio below 1.0.

Risks Associated With Measuring the Accrued Liability and Actuarially Determined Contribution

Ratio of Net Cash Flow to Market Value of Assets

A positive net cash flow means contributions exceed benefits and expenses. A negative cash flow means existing funds are being used to make payments. A certain amount of negative net cash flow is generally expected to occur when benefits are prefunded through a qualified trust. Large negative net cash flows as a percent of assets may indicate a super-mature plan or a need for additional contributions.

Duration of Actuarial Accrued Liability

The duration of the actuarial accrued liability may be used to approximate the sensitivity to a 1% change in the assumed rate of return. For example, duration of 10 indicates that the liability would increase approximately 10% if the assumed rate of return were lowered 1%.

Additional Risk Assessment

Additional risk assessment is outside the scope of the annual actuarial valuation. Additional assessment may include scenario tests, sensitivity tests, stochastic modeling, stress tests, and a comparison of the present value of accrued benefits at low-risk discount rates with the actuarial accrued liability