

State of Wyoming Retirement System – Public Employee Plan

Actuarial Valuation Report
for the Year Beginning January 1, 2021





April 7, 2021

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, 2021

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, 2021. 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.

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, 2021 is 74.76%. In the January 1, 2020 valuation, this funded ratio was 73.16%. On a market value of assets basis, the funded ratio increased from 76.41% as of January 1, 2020 to 79.22% as of January 1, 2021. 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, 2021, including recent 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 August 23, 2017 and were first utilized with the January 1, 2018 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. Our experience study report was dated January 10, 2018 and it covered the five-year investigation period ending December 31, 2016. 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 9.00% employee contribution and the 9.12% employer contribution are the current rates that comply with State law. Both employee and employer contribution rates will increase on July 1, 2021, when an ultimate rate of 9.25% for employees and 9.37% for employers is reached. 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, 2021 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, 2021 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 gain of approximately \$103 million, composed of a \$158 million investment gain, a \$53 million contribution loss, and a \$2 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, 2021.

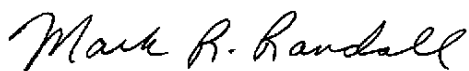
All of our work conforms with generally accepted actuarial principles and practices, and with the Actuarial Standards of Practice issued by the Actuarial Standards Board. In our opinion, our calculations also comply with the requirements of state law and, where applicable, the Internal Revenue Code and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

The undersigned are independent actuaries and consultants.

Mark Randall, Thomas Lyle, Dana Woolfrey are Enrolled Actuaries and Mark Randall, Paul Wood, Thomas Lyle, and Dana Woolfrey are Members of the American Academy of Actuaries, and all four 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.

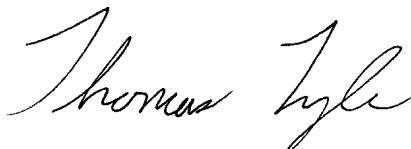
Respectfully submitted,
Gabriel, Roeder, Smith & Company



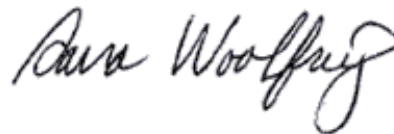
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SECTION I

EXECUTIVE SUMMARY

Executive Summary

Item	January 1, 2021	January 1, 2020
	No COLA	No COLA
1. Contributions:		
a. Total normal cost	10.850%	10.870%
b. Employee contributions*	(9.125%)	(8.875%)
c. Net employer normal cost	1.725%	1.995%
d. Amortization payment	9.280%	9.670%
e. Administrative expenses	0.380%	0.390%
f. Required contribution	11.385%	12.055%
g. Statutory contribution*	(9.245%)	(8.995%)
h. Shortfall/(surplus)	2.140%	3.060%
2. Funding Elements:		
a. Market value of assets (MVA)	\$8,294,241,897	\$7,790,558,842
b. Actuarial value of assets (AVA)	\$7,827,625,526	\$7,459,695,656
c. Actuarial accrued liability (AAL)	\$10,469,787,925	\$10,196,045,970
d. Unfunded/(overfunded) actuarial accrued liability	\$2,642,162,399	\$2,736,350,314
3. Contributions and Ratios:		
a. Annual required contribution	\$212,378,768	\$219,815,919
b. Actual contributions	N/A	165,984,825
i. Employer	N/A	163,847,654
ii. Other	N/A	2,137,171
c. Percentage contributed	N/A	75.51%
d. Funded ratio on an actuarial basis (AVA/AAL)	74.76%	73.16%
e. Funded ratio on a market basis (MVA/AAL)	79.22%	76.41%
f. Projected payroll	\$1,865,426,156	\$1,824,979,015

*The contribution rates are blended based on Enrolled Act No. 65. Both employee and employer contribution rates will increase on July 1, 2021 when an ultimate rate of 9.25% for employees and 9.37% for employers is reached.



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 74.76% and the market value funded ratio is 79.22%.
- 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.
- The amortization payment 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 contribution rates is shown in Table 5 under Section III of the report
- Pursuant to recently passed legislation, both employee and employer contribution rates will increase on July 1, 2021 when an ultimate rate of 9.25% for employees and 9.37% for employers is reached.
- The calculated funding period assuming the new contribution rates is 23 years. In the January 1, 2020 valuation, the funding period was 29 years. Projection results were produced under a separate cover.
- Absent negative plan experience, the plan is projected to be fully funded within the next 30 years.

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. As shown in Table 1 under Section III of the report, the employer contribution rate 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 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 calculated rate is used in determining the contributions necessary to meet the Actuarially Determined Contribution for the twelve-month period beginning January 1, 2021. As of January 1, 2021, the employer contribution is within 2.14% of meeting the Actuarially Determined Contribution. The current shortfall in contribution is expected to persist for years to come.



Financial Data and Experience

As of January 1, 2021, the Fund has a total market value of \$8,294 million. 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 2020.

During 2020, the total investment return on the market value of assets (MVA), as reported by Meketa Investment Group, Inc., was 11.03%, 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 \$7.8 billion. The AVA is 94.37% of the MVA as of December 31, 2020, compared to 95.75% last year. The difference between the AVA and the MVA is the deferred gains and losses. As of January 1, 2020, the total deferred gain was \$331 million. As of January 1, 2021, the total deferred gain was \$467 million. Having a deferred gain in the AVA is an indicator that the funded ratio will have an upward “tilt” in the near term, and contribution requirements will likewise have downward pressure.

In addition to the market return, Table 10 also shows the return on the actuarial value of assets for the Fund. For 2020, this return was 9.17%. Since this return is greater than the assumed 7.00% investment return, an actuarial gain occurred decreasing the unfunded actuarial accrued liabilities of the Fund by \$158.1 million.



Member Data

Member data as of January 1, 2021 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 2.22% last year, compared to an increased of 2.43% from the prior year.

The number of active members in Tier 1 decreased, from 17,845 to 16,444. There were 978 members who retired out of Tier 1, compared to 1,070 who retired out of Tier 1 last year.

Of the 35,110 active participants, 5,903 are eligible or will become eligible for unreduced retirement and 6,962 are eligible or will become eligible for reduced retirement in 2021.

The average of the final average salaries for participants who retired or became disabled this year is \$53,692.

Changes in payroll are significant because 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 less than expected so the effect is an increase in the calculated contribution rate of 0.03% of payroll.

One reason payroll increased less than expected is that the salary, for continuing active participants, increased less than expected. This represented a gain 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.
 - 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.

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
 - 9.00% 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.

Pursuant to Enrolled Act No. 65, the contributions will increase for the both the employee and employer 0.25% on July 1, 2021.



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 26 year closed period as a level percent of payroll. Future valuations will include additional amortization layers on a closed 20 year bases.
- The assumed annual investment return rate is 7.00%, 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 15.7 years.

The actuarial assumptions and methods were reviewed in detail as part of the 2017 Experience Study covering the five year period ending December 31, 2016. 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, 2021	January 1, 2020
1. Projected valuation payroll	\$1,865,426,156	\$1,824,979,015
2. Present value of future pay	\$15,189,690,721	\$14,781,544,687
3. Employer normal cost rate	1.73%	2.00%
4. Actuarial accrued liability for active members		
a. Present value of future benefits for active members	\$5,168,905,284	\$5,091,704,649
b. Less: present value of future employer normal costs	(227,390,833)	(186,411,157)
c. Less: present value of future employee contributions*	(1,359,014,321)	(1,359,014,321)
d. Actuarial accrued liability	\$3,582,500,130	\$3,546,279,171
5. Total actuarial accrued liability for:		
a. Retirees and beneficiaries	\$6,345,528,960	\$6,132,779,279
b. Disabled members	38,320,809	38,472,772
c. Inactive members	503,438,026	478,514,748
d. Active members (Item 4d)	3,582,500,130	3,546,279,171
e. Total	\$10,469,787,925	\$10,196,045,970
6. Actuarial value of assets (Table 9)	\$7,827,625,526	\$7,459,695,656
7. Unfunded actuarial accrued liability (UAAL) (Item 5e - Item 6)	\$2,642,162,399	\$2,736,350,314
8. Effective UAAL amortization period	26 years	28 years
9. Assumed payroll growth rate	2.50%	2.50%
10. Employer contribution requirement		
a. UAAL amortization payment as % of pay	9.28%	9.67%
b. Employer normal cost	1.73%	2.00%
c. Administrative expense	0.38%	0.39%
d. Contribution requirement (a + b + c)	11.39%	12.06%

*Includes the anticipated employee increases under Enrolled Act No. 65.

Table 1B

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

UAAL as of January 1, 2021		\$2,642,162,399		
Total Prior Remaining Amortization Bases as of January 1, 2021		2,745,356,497		
2021 Amortization Base as of January 1, 2021		(\$103,194,098)		
2021 Payment (20 years, level percent of pay amortization)		(\$7,786,427)		
As of January 1, 2021				
Base Year	Initial Base	Remaining Base	Years Remaining	Amortization Payment
2021	\$ (103,194,098)	\$ (103,194,098)	20	\$ (7,786,427)
2020	171,551,375	170,170,314	19	13,267,877
2019	259,338,420	254,510,671	18	20,558,809
2018	2,273,969,633	2,320,675,512	27	147,051,449
Total		\$ 2,642,162,399		\$ 173,091,708

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	\$1,174,872,302	\$3,564,641,338	\$4,739,513,640
Death-in-service benefits likely to be paid on behalf of present active members (employer financed portion)	35,426,245	86,419,472	121,845,717
Separation benefits (refunds of contributions and deferred allowances) likely to be paid to present active members	376,106,607	(68,560,680)	307,545,927
Benefits likely to be paid to vested inactive members	0	432,651,100	432,651,100
Benefits to be paid to members due refunds	0	70,786,926	70,786,926
Benefits to be paid to current retirees, disabled members, beneficiaries, and future beneficiaries of current retirees	0	6,383,849,769	6,383,849,769
Total	\$1,586,405,154	\$10,469,787,925	\$12,056,193,079
Actuarial value of assets	0	7,827,625,526	7,827,625,526
Liabilities to be covered by future contributions	\$1,586,405,154	\$2,642,162,399	\$4,228,567,553

Table 3

History of Total Normal Cost

(Assumes No Future Cost-Of-Living Increases)

Fiscal Year Ending December 31 (1)	Total Normal Cost as Percent of Payroll (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%

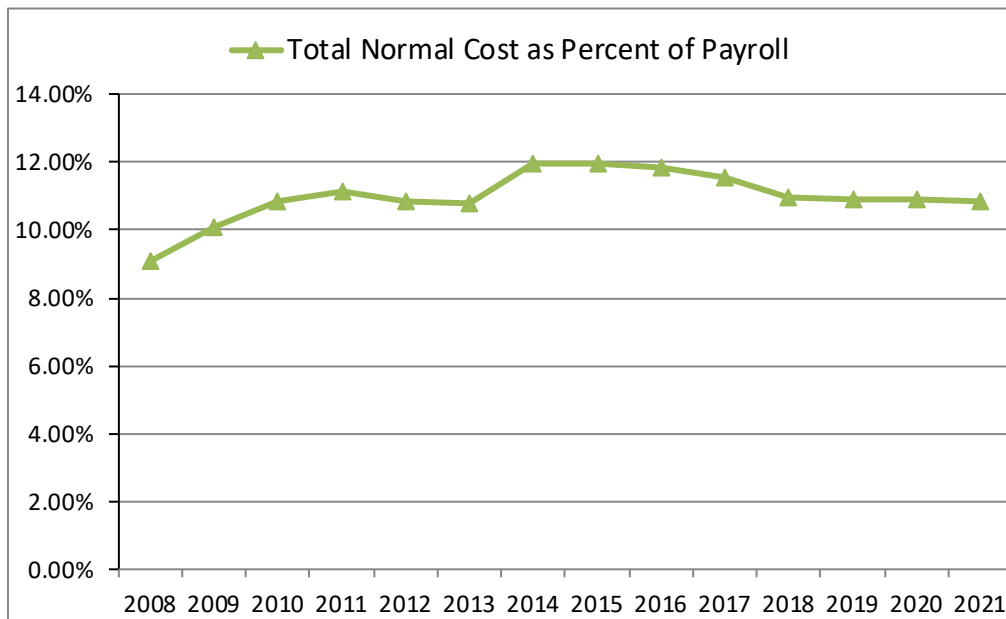


Table 4

Calculation of Total Actuarial Gain/(Loss) (Assumes No Future Cost-Of-Living Increases)

Item	January 1, 2021
1. Derivation of Experience Gain/(Loss)	
a. Unfunded actuarial accrued liability (UAAL) - previous valuation	\$2,736,350,314
b. Normal cost (NC) for fiscal year ending December 31, 2020	198,288,434
c. Expected administrative expenses for fiscal year ending December 31, 2020	7,027,900
d. Actuarially determined contribution for fiscal year ending December 31, 2020	381,782,807
e. Interest accrual:	
(i) For whole year on (a)	191,544,522
(ii) For half year on (b) + (c) - (d)	(6,071,866)
(iii) Total interest: (e)(i) + (e)(ii)	185,472,656
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)	2,745,356,497
i. Actual UAAL current year	2,642,162,399
j. Experience gain/(loss): (h) - (i)	103,194,098
k. Experience gain/(loss) as a % of actuarial accrued liability	0.99%
2. Approximate portion of gain/(loss) due to investments (at actuarial value)	\$158,054,899
3. Approximate portion of gain/(loss) due to contributions and administrative expenses higher or lower than expected*	(\$52,674,519)
4. Approximate amount of gain/(loss) due to liabilities: (1)(j) - (2) - (3)	(\$2,186,283)
a. Age & service retirements	(\$15,734,433)
b. Disability retirements	13,093
c. Death-in-service	(237,091)
d. Deferred members and withdrawal from employment	(15,521,445)
e. Rehires and new hires	323,044
f. Pay increases	21,808,510
g. Death after retirement	12,498,129
h. Service Purchases	(3,220,708)
i. Other	(2,115,382)
j. Other as a % of actuarial accrued liability	-0.02%

***Includes \$3.2 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, 2021
1. Calculated contribution rate as of January 1, 2020	12.06%
2. Change in contribution rate during year	
a. Change in normal cost	-0.02%
b. Change in employee contributions*	-0.25%
c. Actuarial (gain) loss from investments on actuarial value of assets	-0.64%
d. Actuarial (gain) loss from liability sources	0.00%
e. Difference between contributions made and required contribution	0.21%
f. Effect of payroll growing (faster)/slower than assumption	0.03%
g. Other changes	0.00%
h. Total change	-0.67%
3. Calculated contribution rate as of January 1, 2021	11.39%

**Includes the impact of using the blended employee contribution rates for calendar years 2020 & 2021.*

Table 6
Statement of Plan Net Assets

Assets at Market Value		
Item	FYE 2020	FYE 2019
1. Cash and Cash Equivalents (Operating Cash)	\$152,895,055	\$260,124,369
2. Receivables		
a. Insurance premium tax	\$0	\$0
b. Buy backs	0	0
c. Employer contributions	8,606,869	8,363,510
d. Employee contributions	8,486,060	8,243,908
e. Securities sold	16,556,002	28,339,394
f. Accrued interest and dividends	15,383,522	17,021,310
g. Currency contract receivable	857,807,119	176,103,231
h. Other	91,354	439,693
i. Rebate and fee income receivable	414,136	105,162
j. Total receivables	\$907,345,062	\$238,616,208
3. Investments, at Fair Value	\$8,483,535,523	\$7,882,964,892
4. Liabilities		
a. Benefits and refunds payable	(\$1,139,826)	(\$619,005)
b. Securities purchased	(43,783,951)	(37,925,431)
c. Administrative and consulting fees payable	(12,609,498)	(24,260,614)
d. Currency contract payable	(876,294,946)	(176,958,927)
e. Securities lending collateral	(315,705,522)	(351,382,650)
f. Total liabilities	(\$1,249,533,743)	(\$591,146,627)
5. Total Market Value of Assets Available for Benefits	\$8,294,241,897	\$7,790,558,842

Table 7
Reconciliation of Plan Net Assets

Assets at Market Value		
Item	FYE 2020	FYE 2019
A. Market Value of Assets at Beginning of Year	\$7,790,558,842	\$6,831,368,597
B. Contribution Income:		
1. Contributions		
a. Employee	\$161,723,547	\$153,582,203
b. Employer	163,847,654	155,456,957
c. Other	5,499,814	5,956,723
d. Total	<u>\$331,071,015</u>	<u>\$314,995,883</u>
2. Investment Income		
a. Interest, dividends, and other income	\$104,545,712	\$121,126,636
b. Net appreciation	744,783,383	1,177,617,048
c. Investment expenses	<u>(45,309,891)</u>	<u>(48,374,048)</u>
d. Net investment income	\$804,019,204	\$1,250,369,636
3. Securities Lending		
a. Gross income	\$4,219,988	\$11,952,293
b. Deductions	<u>(2,345,837)</u>	<u>(10,803,260)</u>
c. Net investment income	\$1,874,151	\$1,149,033
4. Benefits and Refunds		
a. Refunds	\$(19,412,613)	\$(21,308,205)
b. Regular monthly benefits	<u>(606,335,322)</u>	<u>(579,179,480)</u>
c. Total	\$(625,747,935)	\$(600,487,685)
5. Administrative and Miscellaneous Expenses	\$(7,533,380)	\$(6,836,622)
C. Market Value of Assets at End of Year	\$8,294,241,897	\$7,790,558,842

Table 8
Progress of Fund Through December 31, 2020

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	\$ 2,946,789,215	\$ 2,780,900,798	\$ (98,383,101)	\$ 9,997,078,492	\$(8,449,243,339)	\$(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

* 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 2020	FYE 2019
1. Actuarial value of assets, beginning of year (without corridor)	\$7,459,695,656	\$7,318,379,669
2. Market value, end of year	\$8,294,241,897	\$7,790,558,842
3. Market value, beginning of year	\$7,790,558,842	\$6,831,368,597
4. Non-investment/administrative net cash flow:		
a. Employee contributions	\$161,723,547	\$153,582,203
b. Employer contributions	163,847,654	155,456,957
c. Other contributions	5,499,814	5,956,723
d. Refund of employee accounts	(19,412,613)	(21,308,205)
e. Retirement benefits	(606,335,322)	(579,179,480)
f. Administrative expenses and Other Expenses	(7,533,380)	(6,836,622)
g. Total net cash flow: [sum of (4a) through (4f)]	(\$302,210,300)	(\$292,328,424)
5. Investments and securities lending:		
a. Interest and dividends on investments	\$104,545,712	\$121,126,636
b. Gross income from securities lending	4,219,988	11,952,293
c. Fees and expenses	(47,655,728)	(59,177,308)
d. Total net income: [sum of (5a) through (5c)]	\$61,109,972	\$73,901,621
6. Investment income:		
a. Actual market return: (2) - (3) - (4g) - (5d)	\$744,783,383	\$1,177,617,048
b. Assumed rate of return	7.00%	7.00%
c. Assumed amount of return	473,830,682	394,235,732
d. Amount subject to phase-in: (6a) - (6c)	\$270,952,701	\$783,381,316
7. Phase-in recognition of investment income:		
a. Current year: 0.20 * (6d)	\$54,190,540	\$156,676,263
b. First prior year	156,676,263	(151,644,000)
c. Second prior year	(151,644,000)	83,113,422
d. Third prior year	83,113,422	(7,136,709)
e. Fourth prior year	(7,136,709)	(115,501,918)
f. Total recognition	\$135,199,516	(\$34,492,942)
8. Actuarial value of assets, end of year		
a. Preliminary actuarial value of assets, end of year: (1) + (4g) + (5d) + (6c) + (7f)	\$7,827,625,526	\$7,459,695,656
b. Upper corridor limit: 120% * (2)	9,953,090,276	9,348,670,610
c. Lower corridor limit: 80% * (2)	6,635,393,518	6,232,447,074
d. Actuarial value of assets, end of year	\$7,827,625,526	\$7,459,695,656
9. Difference between market and actuarial value of assets	\$466,616,371	\$330,863,186
10. Actuarial rate of return	9.17%	6.05%
11. Market rate of return*	11.03%	18.72%
12. Ratio of actuarial value to market value of assets	94.37%	95.75%

* 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 (1)	Market Value (2)	Actuarial Value (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%

Average returns:

Last five years:	9.34%	6.58%
Last ten years:	7.67%	6.21%

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.

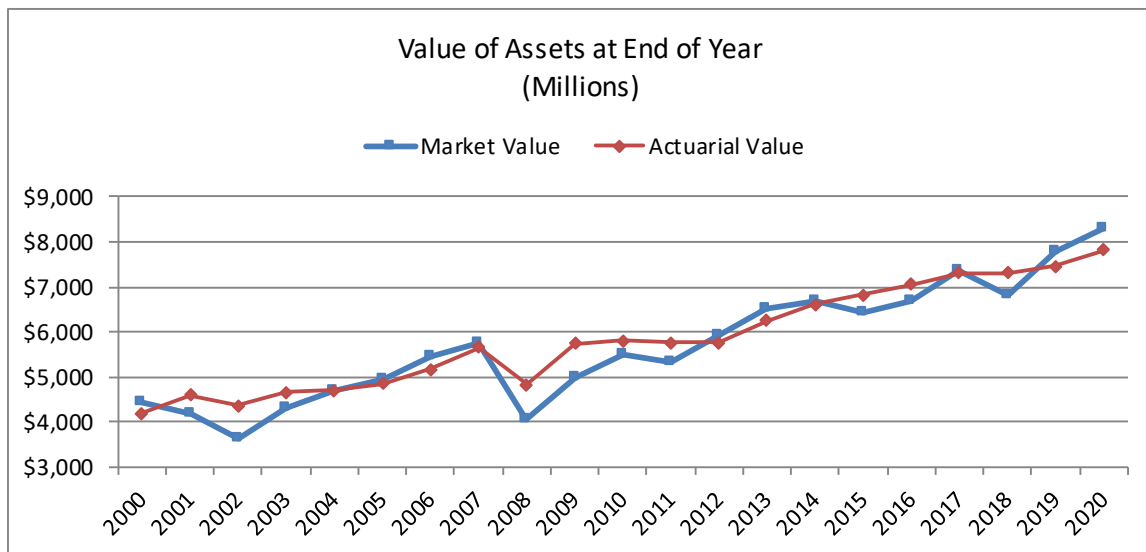


Table 11
Solvency Test

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%

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%

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 [(5)/(3)]
	% of Payroll	Amount	% of Payroll	Amount	
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	-	-	-

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		Vested Former Participants	Retired Participants	Disabled	Beneficiaries	Participants Due Refunds	Total
	Tier 1	Tier 2						
Number as of January 1, 2020	17,845	17,361	7,103	25,859	231	2,660	25,008	96,067
New participants	-	3,217	1	-	-	8	480	3,706
Vested terminations	(458)	(459)	924	-	-	-	(7)	-
Retirements	(978)	(61)	(282)	1,322	-	-	(1)	-
Disability	(6)	-	(3)	-	9	-	-	-
Deceased with beneficiary	(9)	-	(8)	(224)	(5)	246	-	-
Deceased without beneficiary	(18)	(16)	(17)	(526)	(6)	(133)	(19)	(735)
Due refunds	(3)	(1,541)	(1)	-	-	-	1,545	-
Lump sum payoffs	(66)	(396)	(175)	-	-	-	(730)	(1,367)
Rehires/return to active	140	563	(201)	(2)	-	-	(380)	120
Certain period expired	-	-	-	-	-	(32)	-	(32)
Reclassifications	(3)	3	-	-	-	-	-	-
Data corrections	-	(5)	-	-	-	-	-	(5)
Number as of January 1, 2021	16,444	18,666	7,341	26,429	229	2,749	25,896	97,754

Table 15
Demographic Statistics

	January 1		Change
	2021	2020	
<u>Active Participants</u>			
Number	35,110	35,206	-0.3%
<i>Vested</i>	23,557	23,762	
<i>Not vested</i>	11,553	11,444	
Average age (years)	45.99	46.07	-0.2%
Average service (years)	9.77	9.74	0.3%
Average entry age (years)	36.22	36.33	-0.3%
Total payroll*	\$1,865,426,156	\$1,824,979,015	2.2%
Average payroll*	\$53,131	\$51,837	2.5%
Total employee contributions with interest	\$1,601,637,607	\$1,549,303,903	3.4%
Average employee contributions with interest	\$45,618	\$44,007	3.7%
<u>Vested Former Participants</u>			
Number	7,341	7,103	3.4%
Average age (years)	50.87	50.65	0.4%
Total employee contributions with interest	\$262,444,947	\$246,472,591	6.5%
Average employee contributions with interest	\$35,751	\$34,700	3.0%
<u>Service Retirees</u>			
Number	26,429	25,859	2.2%
Average age (years)	72.53	72.25	0.4%
Total annual benefits	\$566,283,373	\$545,473,041	3.8%
Average annual benefit	\$21,427	\$21,094	1.6%
<u>Disability Retirees</u>			
Number	229	231	-0.9%
Average age (years)	66.05	65.79	0.4%
Total annual benefits	\$3,789,923	\$3,794,983	-0.1%
Average annual benefit	\$16,550	\$16,428	0.7%
<u>Beneficiaries</u>			
Number	2,749	2,660	3.3%
Average age (years)	76.52	76.14	0.5%
Total annual benefits	\$42,019,504	\$39,765,283	5.7%
Average annual benefit	\$15,285	\$14,949	2.2%
<u>Participants Due Refunds</u>			
Number	25,896	25,008	3.6%
Total Refunds Due	\$70,786,926	\$67,650,815	4.6%

* Projected payroll for the upcoming valuation year

Table 16

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

Average Age = 46.8 Average Service = 10.2

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	Count	22	-	-	-	-	-	-	22
	Avg. Salary	\$24,601	-	-	-	-	-	-	\$24,601
20-24	Count	366	4	-	-	-	-	-	370
	Avg. Salary	34,640	\$45,703	-	-	-	-	-	34,760
25-29	Count	702	147	1	-	-	-	-	850
	Avg. Salary	44,434	49,709	*	-	-	-	-	45,341
30-34	Count	685	489	77	-	-	-	-	1,251
	Avg. Salary	47,758	59,461	59,874	-	-	-	-	53,078
35-39	Count	616	481	363	77	4	-	-	1,541
	Avg. Salary	49,693	62,507	67,041	68,642	\$71,145	-	-	58,781
40-44	Count	447	399	366	265	49	1	-	1,527
	Avg. Salary	50,795	62,148	73,528	74,377	\$72,916	*	-	64,031
45-49	Count	386	320	310	230	225	45	2	1,518
	Avg. Salary	50,492	61,598	68,285	74,151	76,082	\$82,082	*	64,812
50-54	Count	396	320	266	216	237	209	69	1,713
	Avg. Salary	49,100	60,747	65,897	68,863	78,250	83,566	\$78,691	65,806
55-59	Count	376	286	254	237	193	161	182	1,689
	Avg. Salary	45,431	57,799	64,280	63,760	69,685	76,613	77,699	62,153
60-64	Count	287	248	208	169	133	95	190	1,330
	Avg. Salary	46,019	52,988	57,899	63,082	69,132	74,442	76,270	60,008
65-69	Count	143	113	77	54	32	18	40	477
	Avg. Salary	36,676	56,794	62,490	63,706	59,165	77,229	84,095	55,684
70 & Over	Count	66	45	18	17	11	6	12	175
	Avg. Salary	22,287	37,245	58,462	52,673	43,994	94,213	73,880	40,174
Totals	Count	4,492	2,852	1,940	1,265	884	535	495	12,463
	Avg. Salary	\$45,944	\$59,027	\$66,406	\$68,800	\$73,011	\$79,626	\$77,699	\$59,070

Average salary represents annualized salary earned in 2020 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 = 45.6 Average Service = 9.5

Age		Whole Years of Service at Valuation Date							Totals
Last Birthday		0-4	5-9	10-14	15-19	20-24	25-29	30 Plus	
Less than 20	Count	48	-	-	-	-	-	-	48
	Avg. Salary	\$18,223	-	-	-	-	-	-	\$18,223
20-24	Count	796	1	-	-	-	-	-	797
	Avg. Salary	31,479	*	-	-	-	-	-	31,466
25-29	Count	1,423	273	1	-	-	-	-	1,697
	Avg. Salary	39,600	\$48,143	*	-	-	-	-	40,976
30-34	Count	1,252	887	165	2	-	-	-	2,306
	Avg. Salary	39,483	53,401	\$57,258	*	-	-	-	46,111
35-39	Count	1,341	893	666	142	-	-	-	3,042
	Avg. Salary	36,791	51,885	61,173	\$61,790	-	-	-	47,727
40-44	Count	1,200	816	557	487	92	-	-	3,152
	Avg. Salary	37,391	49,526	58,600	66,038	\$66,977	-	-	49,570
45-49	Count	836	726	543	422	318	75	5	2,925
	Avg. Salary	37,100	48,117	54,508	63,624	70,281	\$72,202	\$55,476	51,432
50-54	Count	680	577	494	422	324	256	67	2,820
	Avg. Salary	38,861	46,197	52,949	58,243	66,674	74,949	\$74,347	53,045
55-59	Count	613	471	427	484	402	268	200	2,865
	Avg. Salary	36,510	42,717	49,236	49,413	56,628	63,528	71,138	49,374
60-64	Count	404	357	352	333	299	190	270	2,205
	Avg. Salary	35,144	42,753	45,035	49,892	51,928	57,172	65,412	48,062
65-69	Count	133	99	99	85	68	49	72	605
	Avg. Salary	25,733	39,561	46,943	48,104	48,869	54,159	61,179	43,730
70 & Over	Count	50	30	24	29	14	16	22	185
	Avg. Salary	22,085	27,300	42,945	40,234	38,584	38,433	58,788	35,509
Totals	Count	8,776	5,130	3,328	2,406	1,517	854	636	22,647
	Avg. Salary	\$36,972	\$48,535	\$54,441	\$57,453	\$60,823	\$65,291	\$67,367	\$47,853

Average salary represents annualized salary earned in 2020 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 = 46.0 Average Service = 9.8

Age		Whole Years of Service at Valuation Date							Totals
Last Birthday		0-4	5-9	10-14	15-19	20-24	25-29	30 Plus	
Less than 20	Count	70	-	-	-	-	-	-	70
	Avg. Salary	\$20,228	-	-	-	-	-	-	\$20,228
20-24	Count	1,162	5	-	-	-	-	-	1,167
	Avg. Salary	32,475	\$40,744	-	-	-	-	-	32,510
25-29	Count	2,125	420	2	-	-	-	-	2,547
	Avg. Salary	41,197	48,691	*	-	-	-	-	42,433
30-34	Count	1,937	1,376	242	2	-	-	-	3,557
	Avg. Salary	42,410	55,554	58,090	*	-	-	-	48,561
35-39	Count	1,957	1,374	1,029	219	4	-	-	4,583
	Avg. Salary	40,852	55,603	63,243	64,199	\$71,145	-	-	51,444
40-44	Count	1,647	1,215	923	752	141	1	-	4,679
	Avg. Salary	41,029	53,671	64,519	68,977	\$69,041	*	-	54,290
45-49	Count	1,222	1,046	853	652	543	120	7	4,443
	Avg. Salary	41,330	52,241	59,515	67,338	72,685	\$75,907	\$60,827	56,003
50-54	Count	1,076	897	760	638	561	465	136	4,533
	Avg. Salary	42,629	51,388	57,481	61,838	71,565	78,822	\$76,551	57,867
55-59	Count	989	757	681	721	595	429	382	4,554
	Avg. Salary	39,902	48,415	54,847	54,129	60,863	68,439	74,264	54,114
60-64	Count	691	605	560	502	432	285	460	3,535
	Avg. Salary	39,661	46,948	49,813	54,332	57,225	62,929	69,897	52,557
65-69	Count	276	212	176	139	100	67	112	1,082
	Avg. Salary	31,402	48,746	53,744	54,165	52,164	60,357	69,363	49,000
70 & Over	Count	116	75	42	46	25	22	34	360
	Avg. Salary	22,200	33,267	49,595	44,831	40,965	53,646	64,114	37,777
Totals	Count	13,268	7,982	5,268	3,671	2,401	1,389	1,131	35,110
	Avg. Salary	\$40,010	\$52,284	\$58,848	\$61,363	\$65,310	\$70,813	\$71,889	\$51,835

Average salary represents annualized salary earned in 2020 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 = 50.4 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	13	9	-	-	-	-	-	22
30-34	65	110	6	-	-	-	-	181
35-39	75	155	39	2	-	-	-	271
40-44	62	182	74	11	1	-	-	330
45-49	61	156	50	30	10	2	-	309
50-54	62	195	85	31	13	3	-	389
55-59	59	198	115	45	24	5	2	448
60-64	56	110	47	14	11	2	1	241
65-69	29	54	20	7	2	-	1	113
70 & Over	23	37	6	7	1	1	2	77
Totals	506	1,206	442	147	62	13	6	2,382

Table 20

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

Average Age = 51.1 Average Service = 8.5

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	42	37	-	-	-	-	-	79
30-34	139	204	8	-	-	-	-	351
35-39	150	308	57	2	-	-	-	517
40-44	146	325	112	21	1	-	-	605
45-49	98	315	133	58	17	1	-	622
50-54	114	391	184	68	26	9	-	792
55-59	139	427	225	113	39	9	2	954
60-64	109	279	131	44	23	3	-	589
65-69	56	134	37	19	10	3	3	262
70 & Over	54	104	21	5	1	1	1	187
Totals	1,048	2,524	908	330	117	26	6	4,959

Table 21

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

Average Age = 50.9 Average Service = 8.5

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	2	-	-	-	-	-	-	2
25-29	55	46	-	-	-	-	-	101
30-34	204	314	14	-	-	-	-	532
35-39	225	463	96	4	-	-	-	788
40-44	208	507	186	32	2	-	-	935
45-49	159	471	183	88	27	3	-	931
50-54	176	586	269	99	39	12	-	1,181
55-59	198	625	340	158	63	14	4	1,402
60-64	165	389	178	58	34	5	1	830
65-69	85	188	57	26	12	3	4	375
70 & Over	77	141	27	12	2	2	3	264
Totals	1,554	3,730	1,350	477	179	39	12	7,341

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

* 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	2,211	6,980	9,191	\$4,015,236	\$10,478,106	\$14,493,343	39	34	50
2	4,784	3,806	8,590	10,665,124	6,462,898	17,128,022	31	39	50
2P	1,509	2,130	3,639	2,886,049	3,933,142	6,819,192	15	20	28
3	480	604	1,084	1,175,803	1,079,284	2,255,087	5	4	6
3P	303	636	939	745,810	1,394,879	2,140,690	5	8	8
4a	317	597	914	514,915	832,742	1,347,657	7	2	8
4b	74	122	196	116,209	182,493	298,702	7	8	4
5	539	1,566	2,105	861,912	2,161,505	3,023,416	16	8	17
Total	10,217	16,441	26,658	\$20,981,059	\$26,525,049	\$47,506,108	125	123	171
Beneficiaries	642	2,107	2,749	\$726,832	\$2,774,794	\$3,501,626	-	-	-
Grand Total	10,859	18,548	29,407	\$21,707,891	\$29,299,843	\$51,007,734	125	123	171

*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	135	60	5	5	25	1	102	431
\$200-\$399	209	323	143	15	19	34	11	173	927
\$400-\$599	243	334	140	21	14	44	13	161	970
\$600-\$799	199	298	114	26	11	31	7	110	796
\$800-\$999	159	282	100	20	12	19	6	83	681
\$1,000-\$1,499	278	581	194	70	36	58	10	160	1,387
\$1,500-\$1,999	217	528	138	52	30	30	4	84	1,083
\$2,000-\$2,499	185	505	152	68	41	20	8	82	1,061
\$2,500 & over	623	1,798	468	203	135	74	14	208	3,523
Total	2,211	4,784	1,509	480	303	335	74	1,163	10,859
Females									
Benefit Amount	1	2	2P	3	3P	4a**	4b	5	Total
Under \$200	471	238	82	17	16	52	7	290	1,173
\$200-\$399	871	410	204	49	28	101	20	481	2,164
\$400-\$599	788	340	179	48	40	75	13	436	1,919
\$600-\$799	636	278	140	56	38	67	13	355	1,583
\$800-\$999	535	287	152	41	43	43	11	290	1,402
\$1,000-\$1,499	1,029	562	302	95	83	86	18	565	2,740
\$1,500-\$1,999	706	388	227	83	73	43	12	391	1,923
\$2,000-\$2,499	540	318	226	63	64	35	1	285	1,532
\$2,500 & over	1,404	985	618	152	251	115	27	560	4,112
Total	6,980	3,806	2,130	604	636	617	122	3,653	18,548
Males & Females									
Benefit Amount	1	2	2P	3	3P	4a**	4b	5	Total
Under \$200	569	373	142	22	21	77	8	392	1,604
\$200-\$399	1,080	733	347	64	47	135	31	654	3,091
\$400-\$599	1,031	674	319	69	54	119	26	597	2,889
\$600-\$799	835	576	254	82	49	98	20	465	2,379
\$800-\$999	694	569	252	61	55	62	17	373	2,083
\$1,000-\$1,499	1,307	1,143	496	165	119	144	28	725	4,127
\$1,500-\$1,999	923	916	365	135	103	73	16	475	3,006
\$2,000-\$2,499	725	823	378	131	105	55	9	367	2,593
\$2,500 & over	2,027	2,783	1,086	355	386	189	41	768	7,635
Total	9,191	8,590	3,639	1,084	939	952	196	4,816	29,407

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

**Option 4a includes 38 beneficiaries who are receiving a certain only benefit.

Table 25

Pensioners by Age and Option Code

Average Age Male = 72.9 Average Age Female = 72.8 Average Age Total = 72.9

Males	Option Code*								
Age Last Birthday	1	2	2P	3	3P	4a**	4b	5	Total
Under 50	3	2	-	-	-	12	-	8	25
50-54	12	8	2	1	1	4	1	8	37
55-59	57	149	57	13	5	4	4	31	320
60-64	276	629	191	34	29	30	27	115	1,331
65-69	508	1,114	432	81	68	70	26	237	2,536
70-74	498	1,158	422	100	91	74	12	236	2,591
75-79	379	828	261	84	65	65	3	219	1,904
80-84	282	533	104	78	28	39	1	174	1,239
85 & over	196	363	40	89	16	37	-	135	876
Total	2,211	4,784	1,509	480	303	335	74	1,163	10,859
Females									
Age Last Birthday	1	2	2P	3	3P	4a**	4b	5	Total
Under 50	2	3	-	-	-	12	-	18	35
50-54	19	11	3	1	3	2	1	23	63
55-59	161	134	64	14	18	13	11	65	480
60-64	898	622	407	85	124	56	42	299	2,533
65-69	1,649	1,102	702	170	182	119	42	629	4,595
70-74	1,596	948	598	143	168	157	22	727	4,359
75-79	1,105	503	271	85	96	119	2	617	2,798
80-84	796	273	66	54	37	66	1	610	1,903
85 & over	754	210	19	52	8	73	1	665	1,782
Total	6,980	3,806	2,130	604	636	617	122	3,653	18,548
Males & Females									
Age Last Birthday	1	2	2P	3	3P	4a**	4b	5	Total
Under 50	5	5	-	-	-	24	-	26	60
50-54	31	19	5	2	4	6	2	31	100
55-59	218	283	121	27	23	17	15	96	800
60-64	1,174	1,251	598	119	153	86	69	414	3,864
65-69	2,157	2,216	1,134	251	250	189	68	866	7,131
70-74	2,094	2,106	1,020	243	259	231	34	963	6,950
75-79	1,484	1,331	532	169	161	184	5	836	4,702
80-84	1,078	806	170	132	65	105	2	784	3,142
85 & over	950	573	59	141	24	110	1	800	2,658
Total	9,191	8,590	3,639	1,084	939	952	196	4,816	29,407

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

**Option 4a includes 38 beneficiaries who are receiving a certain only benefit.

Table 26
Pensions Awarded in 2020 by Option Code

Average Age = 63.1

Males & Females	Option Code*								
Benefit Amount	1	2	2P	3	3P	4a**	4b	5	Total
Under \$200	21	16	3	1	3	2	2	18	66
\$200-\$399	39	20	15	0	1	3	3	50	131
\$400-\$599	48	25	13	2	1	1	6	35	131
\$600-\$799	35	33	12	4	3	7	1	37	132
\$800-\$999	35	34	12	4	6	3	1	22	117
\$1,000-\$1,499	73	62	31	2	5	11	5	53	242
\$1,500-\$1,999	45	54	25	3	8	4	0	31	170
\$2,000-\$2,499	36	39	19	5	7	4	2	28	140
\$2,500 & over	120	153	56	19	22	10	7	69	456
Total	452	436	186	40	56	45	27	343	1,585
Males & Females									
Age Last Birthday	1	2	2P	3	3P	4a**	4b	5	Total
Under 50	2	2	0	0	0	6	0	3	13
50-54	4	13	1	0	2	1	0	7	28
55-59	49	64	21	7	12	3	4	19	179
60-64	203	170	93	16	29	19	13	77	620
65-69	162	153	65	11	12	13	8	70	494
70-74	23	29	4	4	1	3	1	66	131
75-79	5	4	1	2	0	0	1	33	46
80-84	3	1	0	0	0	0	0	47	51
85 & over	1	0	1	0	0	0	0	21	23
Total	452	436	186	40	56	45	27	343	1,585

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

**Option 4a includes 7 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 = 11.7

Service at Retirement		Years Elapsed Since Retirement							Totals
		0-4	5-9	10-14	15-19	20-24	25-29	30 Plus	
Less than 5	Count	174	252	222	162	80	62	95	1,047
	Avg. Benefit	\$368	\$300	\$267	\$293	\$2,064	\$149	\$141	\$238
5-9	Count	1,011	1,205	718	525	291	263	264	4,277
	Avg. Benefit	\$554	\$488	\$416	\$376	\$352	\$298	\$289	\$445
10-14	Count	1,163	1,022	606	482	384	285	265	4,207
	Avg. Benefit	\$986	\$881	\$772	\$636	\$654	\$571	\$523	\$802
15-19	Count	1,000	849	637	473	410	306	166	3,841
	Avg. Benefit	\$1,519	\$1,345	\$1,232	\$1,005	\$978	\$932	\$790	\$1,234
20-24	Count	953	921	638	521	334	230	126	3,723
	Avg. Benefit	\$2,061	\$2,037	\$1,766	\$1,427	\$1,410	\$1,241	\$1,117	\$1,775
25-29	Count	1,030	1,033	923	565	361	180	88	4,180
	Avg. Benefit	\$2,868	\$2,816	\$2,553	\$2,147	\$1,999	\$1,937	\$1,551	\$2,545
30-34	Count	851	1,059	698	487	261	220	45	3,621
	Avg. Benefit	\$3,761	\$3,678	\$3,298	\$2,791	\$2,677	\$2,664	\$2,304	\$3,354
35 & Over	Count	742	562	227	105	44	78	4	1,762
	Avg. Benefit	\$4,881	\$4,516	\$4,139	\$3,383	\$3,145	\$3,175	\$2,575	\$4,455
Totals	Count	6,924	6,903	4,669	3,320	2,165	1,624	1,053	26,658
	Avg. Benefit	\$2,169	\$2,017	\$1,783	\$1,410	\$1,294	\$1,234	\$713	\$1,782

Table 28

Retirees and Disabled Members by Year of Retirement

January 1, 2021 Total = 26,658

Year of Retirement	Count	Year of Retirement	Count
Under 1961	-	1991	189
1961	-	1992	295
1962	-	1993	269
1963	-	1994	321
1964	-	1995	535
1965	-	1996	385
1966	-	1997	392
1967	-	1998	412
1968	-	1999	454
1969	-	2000	518
1970	-	2001	582
1971	1	2002	572
1972	-	2003	661
1973	1	2004	785
1974	5	2005	715
1975	4	2006	745
1976	3	2007	866
1977	8	2008	996
1978	17	2009	894
1979	17	2010	1,102
1980	23	2011	1,303
1981	29	2012	1,349
1982	29	2013	1,414
1983	39	2014	1,471
1984	51	2015	1,434
1985	69	2016	1,493
1986	82	2017	1,463
1987	153	2018	1,403
1988	150	2019	1,432
1989	165	2020*	1,168
1990	194		

*May include retirements as of January 1, 2021

Table 29**Thirty Year Closed Group Projected Benefit Payments**

Year Ending December 31	Actives	Retirees*	Total
2021	\$ 33,087,293	\$ 629,209,770	\$ 662,297,063
2022	57,225,216	625,221,348	682,446,564
2023	80,940,091	620,510,117	701,450,208
2024	105,482,756	615,060,405	720,543,161
2025	133,491,488	608,452,256	741,943,744
2026	162,468,790	601,015,638	763,484,428
2027	192,107,736	592,962,320	785,070,056
2028	221,952,374	583,788,496	805,740,870
2029	252,186,818	574,484,541	826,671,359
2030	282,714,587	564,441,394	847,155,981
2031	313,581,296	543,777,271	857,358,567
2032	344,930,968	531,731,758	876,662,726
2033	376,931,068	518,305,839	895,236,907
2034	409,484,278	504,218,440	913,702,718
2035	442,682,956	489,269,261	931,952,217
2036	476,449,256	473,110,802	949,560,058
2037	510,375,865	456,195,307	966,571,172
2038	543,785,086	438,445,353	982,230,439
2039	576,749,984	419,911,058	996,661,042
2040	609,217,969	400,737,297	1,009,955,266
2041	640,719,659	380,871,207	1,021,590,866
2042	671,099,691	360,627,867	1,031,727,558
2043	699,964,475	339,947,846	1,039,912,321
2044	726,797,555	318,917,766	1,045,715,321
2045	751,269,747	297,828,787	1,049,098,534
2046	773,245,560	276,596,146	1,049,841,706
2047	792,045,161	255,631,512	1,047,676,673
2048	807,526,867	235,016,273	1,042,543,140
2049	819,580,131	214,795,367	1,034,375,498
2050	828,028,972	195,234,800	1,023,263,772

* 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, 2021 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 0.07), 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 a 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.



Summary of Actuarial Assumptions and Methods (continued)

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

7.00% per year, compounded annually, composed of an assumed 2.25% inflation rate and a 4.75% 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	3.50%
2	6.50%	15	3.25%
3	6.50%	16	3.25%
4	6.00%	17	3.25%
5	5.25%	18	3.25%
6	4.75%	19	3.00%
7	4.25%	20	3.00%
8	4.00%	21	2.75%
9	4.00%	22	2.75%
10	4.00%	23	2.75%
11	3.75%	24	2.75%
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.

Summary of Actuarial Assumptions and Methods (continued)

5. Demographic Assumptions

a. Mortality

Healthy Pre-Retirement Mortality:

RP-2014 Employee Mortality Table, fully generational, projected with Scale MP-2017

Males: No set back with a multiplier of 100%

Females: No set back with a multiplier of 100%

Healthy Post-Retirement Mortality:

RP-2014 Healthy Annuitant Mortality Table, fully generational, projected with Scale MP-2017

Males: No set back with a multiplier of 100%

Females: No set back with a multiplier of 88%

Disabled Mortality

RP-2014 Disabled Mortality Table, fully generational, projected with Scale MP-2017

Males: No set back with a multiplier of 100%

Females: No set back with a multiplier of 100%

Age	Pre-Retirement		Post-Retirement		Disabled	
	Projected to 2021 using Scale MP-2017					
	Male	Female	Male	Female	Male	Female
20	0.04%	0.02%	0.04%	0.01%	0.04%	0.02%
25	0.05%	0.02%	0.06%	0.03%	0.19%	0.09%
30	0.05%	0.02%	0.09%	0.06%	0.50%	0.24%
35	0.06%	0.03%	0.13%	0.10%	0.92%	0.45%
40	0.07%	0.04%	0.19%	0.14%	1.32%	0.68%
45	0.09%	0.06%	0.27%	0.18%	1.62%	0.90%
50	0.16%	0.11%	0.38%	0.23%	1.89%	1.13%
55	0.26%	0.17%	0.54%	0.32%	2.21%	1.43%
60	0.46%	0.25%	0.77%	0.46%	2.63%	1.72%
65	0.82%	0.36%	1.10%	0.69%	3.16%	2.04%
70	1.34%	0.59%	1.62%	1.06%	3.89%	2.65%
75			2.52%	1.72%	5.10%	3.83%
80			4.19%	2.90%	7.17%	5.77%
85			7.30%	5.10%	10.68%	8.66%
90			12.90%	9.08%	16.42%	12.78%
95			20.72%	15.14%	23.43%	18.82%
100			30.16%	23.14%	31.39%	27.00%

Summary of Actuarial Assumptions and Methods (continued)

b. Disability and Withdrawal

Age	Disability		Withdrawal		Withdrawal		
	Male	Female	Ultimate		Service	First five years	
			Male	Female		Male	Female
20	0.01%	0.01%	11.00%	10.00%	1	22%	25%
25	0.01%	0.01%	11.00%	10.00%	2	18%	21%
30	0.01%	0.01%	6.00%	6.00%	3	14%	15%
35	0.01%	0.01%	5.00%	5.00%	4	13%	15%
40	0.01%	0.01%	4.00%	5.00%	5	13%	14%
45	0.02%	0.02%	4.00%	5.00%			
50	0.12%	0.05%	3.00%	4.00%			
55	0.24%	0.12%	3.00%	4.00%			
60	0.24%	0.24%	3.00%	4.00%			

Retirement Rates

Age	Retirement	
	Unreduced	Reduced
<50	15.0%	1.0%
50	15.0%	0.5%
51	15.0%	0.5%
52	15.0%	0.5%
53	15.0%	0.5%
54	15.0%	0.5%
55	17.0%	1.0%
56	17.0%	1.0%
57	15.0%	1.0%
58	15.0%	1.0%
59	15.0%	2.5%
60	13.0%	2.5%
61	13.0%	2.5%
62	18.0%	2.5%
63	15.0%	2.5%
64	15.0%	2.5%
65	25.0%	
66	30.0%	
67	28.0%	
68	25.0%	
69	25.0%	
70	15.0%	
71	15.0%	
72	15.0%	
73	15.0%	
74	15.0%	
75	15.0%	
76	15.0%	
77	15.0%	
78	15.0%	
79	15.0%	
80+	100.0%	

Summary of Actuarial Assumptions and Methods (continued)

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 25% of active members who terminate with a deferred vested benefit will elect to have their contributions refunded.
- 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	9.00% of salary.
Employer	9.12% plus an additional 1.0% for park rangers.
	Per Enrolled Act No. 65, both employee and employer contribution rates will increase 0.25% on July 1, 2021.
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:

	<u>January 1, 2021</u>	<u>January 1, 2020</u>
Ratio of the market value of assets to total payroll	4.4	4.3
Ratio of actuarial accrued liability to payroll	5.6	5.6
Ratio of actives to retirees and beneficiaries	1.2	1.2
Ratio of net cash flows to market value of assets	-4%	-4%
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