North Carolina Firefighters' and Rescue Squad Workers' Pension Fund

Principal Results of Actuarial Valuation as of December 31, 2021

October 27, 2022, Board of Trustees Meeting

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Valuation input

Member data

Inputs

Membership Data

Asset Data

Benefit Provisions

Assumptions

Funding Methodology

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Results

Actuarial Value of Assets

Actuarial Accrued Liability

Net Actuarial Gain or Loss

Funded Ratio

Employer Contributions

Benefit Enhancement

Additional Disclosures

Projections

The table below provides a summary of the membership data used in this valuation compared to the prior valuation.

Number as of	12/31/2021	12/31/2020
Active members	25,713	24,655
Lapsed members	16,661	16,465
Terminated members and survivors of deceased members entitled to benefits but not yet receiving benefits	108	122
Retired members and survivors of deceased members killed in the Line of Duty currently receiving benefits	14,741	14,922
Total	57,223	56,164

A detailed summary of the membership data used in this valuation is provided in Section 3 and Appendix B.

The number of fully active members increased by 4.3% from the previous valuation date.

The number of retired members decreased by 1.2% from the previous valuation date.

The decrease in retiree population results from the actual number of retiree deaths being greater than expected.

Valuation input

Asset data

Inputs

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Projections

The table below provides details of the Market Value of Assets for the current and prior year's valuations.

Asset Data as of	12/31/2021	12/31/2020
Beginning of Year Market Value of Assets	$ 499,936,606	$ 458,687,909
Employer Contributions	19,002,208	18,827,208
Employee Contributions	2,525,870	2,539,802
Benefit Payments Other than Refunds	(29,999,134)	(29,844,643)
Refunds	(206,237)	(241,587)
Administrative Expenses	(989,669)	(936,587)
Investment Income	48,109,540	50,904,504
Net Increase/(Decrease)	38,442,578	41,248,697
End of Year Market Value of Assets	$ 538,379,184	$ 499,936,606
Estimated Net Investment Return on Market Value (Annualized)	9.72%	11.22%

A detailed summary of the market value of assets is provided in Section 4.

FRSWPF assets are held in trust and are invested for the exclusive benefit of plan members.

Incoming contributions currently cover almost 70% of the outgoing benefit payments and administrative expenses.

Over the long term, benefit payments and administrative expenses not covered by contributions are expected to be covered with investment income, illustrating the benefits of following actuarial pre-funding since inception.

Valuation results

Net actuarial gain or loss

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Asset Data
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Assumptions
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The table below provides a reconciliation of the prior year's unfunded actuarial accrued liability to the current year's unfunded actuarial accrued liability.

(in millions)	
Unfunded Actuarial Accrued Liability (UAAL) as of 12/31/2020	$ 21.0
Normal Cost and Administrative Expenses during 2021	8.4
Reduction due to Actual Contributions during 2021	(21.5)
Interest on UAAL, Normal Cost, and Contributions	1.2
Asset (Gain)/Loss	(12.6)
Actuarial Accrued Liability (Gain)/Loss	(8.5)
Impact of Assumption Changes	0.0
Impact of Legislative Changes	0.0
Unfunded Actuarial Accrued Liability (UAAL) as of 12/31/2021	$ (12.0)

A detailed summary of the net actuarial gain or loss is provided in Section 5.

During 2021, the UAAL decreased more than expected due an asset gain during the year that decreased the UAAL by $12.6 million and SCRSP contributions exceeding the actuarially determined contribution.

Additionally, AAL decreased by $8.5 million more than expected, including a $5.6 million decrease due to demographic experience and a $2.9 million decrease due to valuation programming modifications and differences in methodology as a result of transition from the prior actuarial firm to Buck.

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Employer contributions

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The table below provides a reconciliation of the actuarially determined employer contribution.

Fiscal year ending June 30, 2023 Preliminary ADEC (estimated based on December 31, 2020 Valuation)	13,086,519
Impact of Legislative Changes	0
Fiscal year ending June 30, 2023 Final ADEC	13,086,519
Change Due to Demographic (Gain)/Loss	(1,159,542)
Change Due to Payoff of Unfunded Liability Base established in June 30, 2010, valuation	(6,784,330)
Change Due to Investment (Gain)/Loss	(1,509,009)
Change Due to Contributions Greater than ADEC	(561,092)
Impact of Assumption Changes	0
Impact of Direct Rate Smoothing	180,832
Fiscal year ending June 30, 2024 Preliminary ADEC (estimated based on December 31, 2021 Valuation)	3,253,378

A detailed summary of the actuarially determined employer contribution is provided in Section 6.

The change in the ADEC due to investment gain is based on the actuarial value of assets return of 9.18%, which was greater than the 6.50% assumed return.

12-year amortization of the fresh start unfunded actuarial accrued liability effective July 1, 2011, with current annual payments of $6.8 million will be paid off as of June 30, 2023, which significantly reduces the actuarially determined employer contribution.

Valuation results

State Contribution Rate Stabilization Policy

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- Session Law 2016-108 requires that the Board develop a State Contribution Rate Stabilization Policy (SCRSP) for the FRSWPF
- Below is a summary of the SCRSP that the Board adopted on April 29, 2021
- State Contributions
  - Board will recommend to the General Assembly the higher of the underlying ADEC or $350,000 greater than the current year's recommendation
  - SCRSP Minimum Contribution Rate for FYE 2023 is $20,052,208 (Greater of ADEC of $3,253,378 and FYE 2023 recommendation of $19,702,208 plus $350,000)
- Board considerations for Benefit and Member Contribution Increases:
  - Recommended benefit increase is no greater than the most recent June-over-June CPI-U increase
  - Sufficient funding is available to meet the Benefit Improvement Funding Requirement (BIFR)
  - With a goal of a 50/50 split between member and state contributions toward the normal cost portion of the annual contribution, the Board will recommend that monthly member contributions be set at the $5 increment closest to a 50/50 share of the Fund's normal cost, along with any recommendation to provide a benefit increase.
  - Board has considered legislative changes, if any, in the tax on gross property insurance and recommended additional funding if necessary.
  - See next slides for metrics the Board must use to recommend benefit and/or member contribution increases

Valuation results

State Contribution Rate Stabilization Policy

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Metrics the Board must consider to recommend a benefit increase to the General Assembly based on the results of the December 31, 2021 valuation:

- The most recent June-over-June increase in the CPI-U is 9.06%. Consequently, the maximum benefit improvement[1] is $15.
- The increase in the AAL and Normal Cost for certain proposed benefit improvements:

	$ Improvement				
	$1	$5	$9	$10	$15
Increase in AAL	$ 2,886,093	$ 14,430,466	$ 25,974,839	$ 28,860,932	$ 43,291,398
% increase in AAL	0.58%	2.91%	5.23%	5.81%	8.72%
Increase in Normal Cost	$ 39,259	$ 196,297	$ 353,334	$ 392,593	$ 588,890

- The BIFR for certain proposed benefit improvements:

	$ Improvement				
	$1	$5	$9	$10	$15
(1) Full Actuarial Cost of Proposed Benefit Improvement	$ 2,925,353	$ 14,626,763	$ 26,328,173	$ 29,253,526	$ 43,880,288
(2) FRSWPF Actuarial Accrued Liability as of 12/31/2021	496,483,247	496,483,247	496,483,247	496,483,247	496,483,247
(3) FRSWPF Actuarial Value of Assets as of 12/31/2021	508,510,376	508,510,376	508,510,376	508,510,376	508,510,376
(4) Underlying ADEC for FYE 6/30/2024	3,253,378	3,253,378	3,253,378	3,253,378	3,253,378
(5) Policy Contribution without Benefit Increase FYE 6/30/2024	20,052,208	20,052,208	20,052,208	20,052,208	20,052,208
(6) Total Adjustment (2)-(3)+(4)-(5), only if less than $0	(28,825,959)	(28,825,959)	(28,825,959)	(28,825,959)	(28,825,959)
BIFR: (1) + (6), not less than $0	$ -	$ -	$ -	$ 427,567	$ 15,054,329

- Any of these benefit improvements trigger a member contribution increase from $10 per month to $15 per month
  - The $5 increase is sufficient to pay for the increase in normal cost for any permissible improvement
  - This increases the member percent share of total normal cost from 32.17% to 48.02% for a $1 improvement or from 32.17% to 44.97% for the maximum $15 improvement, inclusive of benefit and member contribution increases

[1]An increase in the monthly benefit, from the current $170 monthly benefit, for participants who are already retired as well as those who retire in the future.

Valuation results

State Contribution Rate Stabilization Policy Metrics

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Asset Data
Benefit Provisions
Assumptions
Funding Methodology

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Metrics the Board must use in recommending benefit improvements and member contribution increases based on the December 31, 2021 valuation are as follows:

		$ Improvement				
	Valuation	$1	$5	$9	$10	$15
Total normal cost	7,128,985	7,168,244	7,325,282	7,482,319	7,521,578	7,717,875
Normal cost rate	329.34	331.16	338.41	345.67	347.48	356.55
Expense rate	43.68	43.68	43.68	43.68	43.68	43.68
Total normal cost rate	373.02	374.84	382.09	389.35	391.16	400.23
State's rate	253.02	254.84	262.09	269.35	271.16	280.23
Employee rate ($10 per month)	120.00	120.00	120.00	120.00	120.00	120.00
Employee rate as a % of the total rate	32.17%	32.01%	31.41%	30.82%	30.68%	29.98%
Increase in EE rate to get close to a 50/50						
State/EE split in the rate ($15 per month)		180.00	180.00	180.00	180.00	180.00
EE cont as a % of the total rate		48.02%	47.11%	46.23%	46.02%	44.97%

Key takeaways

- Key results of the December 31, 2021 valuation were:
  - Market value returns of 9.72% during calendar year 2021 compared to 6.5% assumed
  - Continuation of direct-rate smoothing of the change in the employer contribution rate due to the changes in assumptions and methods over a 5-year period
  - 12-year amortization of the fresh start unfunded actuarial accrued liability effective July 1, 2011, with current annual payments of $6.8 million will be paid off as of June 30, 2023, which significantly reduces the actuarially determined employer contribution
  - Transition from prior actuarial firm to Buck resulted in a net decrease in actuarial accrued liability due to valuation programming modifications and differences in methodology
  - Employer contributions under the State Contribution Rate Stabilization Policy (SCRSP) exceeded the actuarially determined employer contribution (ADEC) which lowered unfunded actuarial liability

Key takeaways (continued)

- When compared to the December 31, 2020 actuarial valuation, the previous resulted in:
  - A higher funded ratio (102.4% in the December 31, 2021 valuation compared to 95.8% in the December 31, 2020 valuation)
  - A lower actuarially determined employer contribution ($3,253,378 for fiscal year ending June 30, 2024 compared to $13,086,519 for fiscal year ending June 30, 2023)
- Recommended contribution under the State Contribution Rate Stabilization Policy (SCRSP) of $20,052,208, which is the greater of:
  - The ADEC of $3,253,378 and
  - The FYE 2023 recommendation of $19,702,208 plus $350,000

Key takeaways (continued)

FRSWPF is well funded compared to its peers. This is due to:

- Stakeholders working together to keep FRSWPF well-funded since inception
- A history of appropriating and contributing the recommended contribution requirements
- Implementation of SCRSP, which provides additional funding
- Assumptions that in aggregate are more conservative than peers
- A funding policy that aggressively pays down unfunded liability over a 12-year period
- Modest changes in benefits when compared to peers

Continued focus on these measures will be needed to maintain the solid status of FRSWPF well into the future.

ASOP 27/35 disclosures

ASOPs 27 and 35 ask the actuary to disclose the information and analysis used to support the actuary's determination that the assumptions selected by the plan sponsor do not significantly conflict with what, in the actuary's professional judgment, are reasonable for the purpose of the measurement. In the case of the plan sponsor's selection of expected return on assets ("EROA"), the signing actuaries have used economic information and tools provided by Buck's Financial Risk Management ("FRM") practice. A spreadsheet tool created by the FRM team converts averages, standard deviations, and correlations from Buck's Capital Markets Assumptions ("CMA") that are used for stochastic forecasting into approximate percentile ranges for the arithmetic and geometric average returns. It is intended to suggest possible reasonable ranges for EROA without attempting to predict or select a specific best estimate rate of return. It takes into account the duration (horizon) of investment and the target allocation of assets in the portfolio to various asset classes. Based on the actuary's analysis, including consistency with other assumptions used in the valuation and the percentiles generated by the spreadsheet described above, the actuary believes the EROA, in the actuary's professional judgment, is reasonable for the purpose of the measurement.

ASOP 56 disclosure

Actuarial Standard of Practice No. 56 (“ASOP 56”) provides guidance to actuaries when performing actuarial services with respect to designing, developing, selecting, modifying, using, reviewing, or evaluating models. Buck uses third-party software in the performance of annual actuarial valuations and projections. The model is intended to calculate the liabilities associated with the provisions of the Plan using data and assumptions as of the measurement date under the accounting rules specified in this report. The output from the third-party vendor software is used as input to an internally developed model that applies applicable accounting rules to the liabilities derived and other inputs, such as Plan assets and contributions, to generate many of the exhibits found in this report. Buck has an extensive review process whereby the results of the liability calculations are checked using detailed sample output, changes from year to year are summarized by source, and significant deviations from expectations are investigated. Other accounting outputs and the internal model are similarly reviewed in detail and at a high level for accuracy, reasonability, and consistency with prior results. Buck also reviews the third-party model when significant changes are made to the software. The review is performed by experts within the company who are familiar with applicable accounting rules as well as the manner in which the model generates its output. If significant changes are made to the internal model, extra checking and review are completed. Significant changes to the internal model that are applicable to multiple clients are generally developed, checked and reviewed by multiple experts within the company who are familiar with the details of the required changes.

Certification

Future actuarial results may differ significantly from the current results presented in this report due to such factors as the following: fund experience differing from that anticipated by the economic or demographic assumptions; changes in economic or demographic assumptions; and changes in plan provisions or applicable law. Such changes in law may include additional costs resulting from future legislated benefit improvements or cost-of-living pension increases or supplements, which are not anticipated in the actuarial valuation. Because of limited scope, Buck performed no analysis of the potential range of such future differences, except for some limited analysis in financial projections or required disclosure information.

This report was prepared under our supervision and in accordance with all applicable Actuarial Standards of Practice. We are Fellows of the Society of Actuaries, Enrolled Actuaries, Members of the American Academy of Actuaries, and Fellows of the Conference of Consulting Actuaries. We meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein. We are available to discuss this report with you at your convenience.

Michael A. Ribble, FSA, EA, MAAA, FCA

Elizabeth A. Wiley, FSA, EA, MAAA, FCA

North Carolina Firefighters' and Rescue Squad Workers' Pension Fund

Report on the Actuarial Valuation
Prepared as of December 31, 2021

October 2022

110 West Berry Street
Suite 1300
Fort Wayne, IN 46802

October 14, 2022

Board of Trustees
Local Governmental Employees'
Retirement System of North Carolina
3200 Atlantic Avenue
Raleigh, NC 27604

Members of the Board:

We submit herewith our report on the annual valuation of the North Carolina Firefighters' and Rescue Squad Workers' Pension Fund (referred to as "FRSWPF") prepared as of December 31, 2021. The report has been prepared in accordance with North Carolina General Statute 58-86-1 through 58-86-101. Information contained in our report for plan years from December 31, 2017, to December 31, 2020, is based on valuations performed by the prior actuarial firm.

The primary purpose of the valuation report is to determine the required member and employer contribution rates, to describe the current financial condition of FRSWPF, and to analyze changes in such condition. In addition, the report provides information that the Office of the State Controller (OSC) requires for its Annual Comprehensive Financial Report, and it summarizes census data. Use of this report for any other purposes or by anyone other than OSC and its auditors, or North Carolina Retirement Systems Division and Department of State Treasurer staff may not be appropriate and may result in mistaken conclusions because of failure to understand applicable assumptions, methods, or inapplicability of the report for that purpose. The attached pages should not be provided without a copy of this cover letter. Because of the risk of misinterpretation of actuarial results, you should ask Buck to review any statement you wish to make on the results contained in this report. Buck will not accept any liability for any such statement made without prior review.

The valuation is based upon membership data and financial information as furnished by the Retirement Systems Division and the Financial Operations Division and as summarized in this report. Although we reviewed for reasonableness and consistency with the prior valuation, these elements have not been audited by Buck and we cannot certify as to the accuracy and completeness of the data supplied. Sometimes assumptions are made by Buck to interpret membership data that is imperfect. The valuation is also based on benefit and contribution provisions as presented in this report. If you have reason to believe that the plan provisions are incorrectly described that important plan provisions relevant to this valuation are not described, or that conditions have changed since the calculations were made, you should contact the authors of this actuarial report prior to relying on this information.

The valuation is further based on the actuarial valuation assumptions, approved by the Board of Trustees, as presented in this report. We believe that these assumptions are reasonable and comply with the Actuarial Standards of Practice ("ASOPs") 27 and 35 and the requirements of Governmental Accounting Standards Board (GASB) Statement No. 67. We prepared this

valuation in accordance with the requirements of this standard and in accordance with all applicable ASOPs.

The assumptions used for the December 31, 2021, actuarial valuation are based on the experience study prepared as of December 31, 2019 and adopted by the Board of Trustees on January 28, 2021. All assumptions other than the investment return assumption (i.e., the valuation interest rate) are discussed annually with the appropriate parties, and actuarial gain/loss experience is reviewed during each valuation, to see if any changes are needed. The economic assumptions with respect to investment yield and inflation have been based upon a review of the existing portfolio structure as well as recent and anticipated experience. All assumptions represent an estimate of future experience.

ASOPs 27 and 35 ask the actuary to disclose the information and analysis used to support the actuary's determination that the assumptions selected by the plan sponsor do not significantly conflict with what, in the actuary's professional judgment, are reasonable for the purpose of the measurement. In the case of the Board's selection of the investment return assumption, the signing actuaries have used economic information and tools provided by Buck's Financial Risk Management ("FRM") practice. A spreadsheet tool created by the FRM team converts averages, standard deviations, and correlations from Buck's Capital Markets Assumptions ("CMA") that are used for stochastic forecasting into approximate percentile ranges for the arithmetic and geometric average returns. It is intended to suggest possible reasonable ranges for the investment return assumption without attempting to predict or select a specific best estimate rate of return. It takes into account the duration (horizon) of investment and the target allocation of assets in the portfolio to various asset classes. Based on the actuaries' analysis, including consistency with other assumptions used in the valuation, the percentiles generated by the spreadsheet described above, and review of actuarial gain/loss analysis, the actuaries believe the assumptions, in the actuaries' professional judgment, are reasonable for the purpose of the measurement.

Where presented, references to "funded ratio" and "unfunded accrued liability" typically are measured on an actuarial value of assets basis. It should be noted that the same measurements using market value of assets would result in different funded ratios and unfunded accrued liabilities. Moreover, the funded ratio presented may be appropriate for evaluating the need and level of future contributions but makes no assessment regarding the funded status of the plan if the plan were to settle (i.e. purchase annuities) for a portion or all of its liabilities. In various places in the report the results also show funded ratios and unfunded liabilities based upon varying sets of assumptions as well as market values of assets as that is required for certain disclosure information required per accounting rules or statutes. Where this has been done it has been clearly indicated.

Actuarial Standard of Practice No. 56 ("ASOP 56") provides guidance to actuaries when performing actuarial services with respect to designing, developing, selecting, modifying, using, reviewing, or evaluating models. In addition to the spreadsheet model discussed above, Buck uses third-party software in the performance of annual actuarial valuations and projections. The model is intended to calculate the liabilities associated with the provisions of the Plan using data and assumptions as of the measurement date under the accounting rules specified in this report. The output from the third-party vendor software is used as input to an internally developed model that applies applicable accounting rules to the liabilities derived and other inputs, such as Plan assets and contributions, to generate many of the exhibits found in this report. Buck has an extensive review process whereby the results of the liability calculations are checked using detailed sample output, changes from year to year are summarized by source, and significant

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

Future actuarial results may differ significantly from the current results presented in this report due to such factors as the following: fund experience differing from that anticipated by the economic or demographic assumptions; changes in economic or demographic assumptions; and changes in plan provisions or applicable law. Such changes in law may include additional costs resulting from future legislated benefit improvements or cost-of-living pension increases or supplements, which are not anticipated in the actuarial valuation. Because of limited scope, Buck performed no analysis of the potential range of such future differences, except for some limited analysis in financial projections or required disclosure information.

This report was prepared under our supervision and in accordance with all applicable Actuarial Standards of Practice. We are Fellows of the Society of Actuaries, Enrolled Actuaries, Members of the American Academy of Actuaries, and Fellows of the Conference of Consulting Actuaries. We meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein. We are available to discuss this report with you at your convenience.

Respectfully submitted,

Buck Global, LLC (Buck)

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Elizabeth A. Wiley, FSA, EA, MAAA, FCA
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Executive Summary

Overview

The North Carolina Retirement Systems Division (RSD) was established in 1941 to provide retirement benefits for public servants in the State of North Carolina. Today, under the management of the Department of State Treasurer, RSD administers seven public pension plans (defined benefit plans), three supplemental retirement plans (voluntary defined contributions plans), a health trust fund, a disability income plan, death benefit funds and a number of other benefit programs. As of December 31, 2021, the RSD defined benefit plans cover over one million current and prior public servants of the state of North Carolina. During the fiscal year ending June 30, 2022, RSD paid over $7.1 billion in pensions to more than 330,000 retirees. And as of June 30, 2022, RSD's defined benefit plan assets were valued at over $110 billion.

Under the supplemental retirement plans, the amount of contributions in any given year is defined by law. The amount of benefits derived is dependent on the investment returns the individual achieves. Conversely, under the pension plans, the amount of the benefit paid to a member upon retirement, termination, death or disability is defined by law. The amount of contributions needed to fund these benefits cannot be known with certainty. In North Carolina, like other states, these contributions are paid during a public servant's career so that upon retirement, termination, death, or disability, there are funds available to pay these benefits. These amounts are determined through an actuarial valuation. Actuarial valuations are performed for each of the pension plans administered by RSD and the results are contained in actuarial valuation reports like this.

The Firefighters' and Rescue Squad Workers' Pension Fund ("FRSWPF") provides benefits to all paid and volunteer certified firefighters and rescue squad workers. FRSWPF has approximately $538 million in assets and over 57,000 members as of December 31, 2021. This actuarial valuation report is our annual analysis of the financial health of FRSWPF. This report, prepared as of December 31, 2021, presents the results of the actuarial valuation of the Retirement System.

Purpose

An actuarial valuation will be performed on FRSWPF annually as of the end of the calendar year. The actuary determines the amount of contributions to be made to FRSWPF during each member's career that, when combined with investment return, will be sufficient to pay for retirement benefits.

In addition, the annual actuarial valuation is performed to:

- Determine the progress on funding FRSWPF,
- Explore why the results of the current valuation differ from the results of the valuation of the previous year, and
- Satisfy regulatory and accounting requirements.

A detailed summary of the valuation process and a glossary of actuarial terms are provided in Appendix A.

Executive Summary (continued)

Risk

Actuarial Standard of Practice No. 51 (“ASOP 51”) requires certain disclosures of potential risks to the plan and provides useful information for intended users of actuarial reports that determine plan contributions or evaluate the adequacy of specified contribution levels to support benefit provisions.

Measuring pension obligations and actuarially determined contributions requires the use of assumptions regarding future economic and demographic experience. Whenever assumptions are made about future events, there is risk that actual experience will differ from expected. Actuarial valuations include the risk that actual future measurements will deviate from expected future measurements due to actual experience that is different than the actuarial assumptions.

The primary areas of risk in this actuarial valuation are:

- Investment Risk – the potential that investment returns will be different than expected.
- Longevity and Other Demographic Risks – the potential that mortality or other demographic experience will be different than expected.
- Interest Rate Risk – To the extent market rates of interest affect the expected return on assets, there is a risk of change to the discount rate which determines the present value of liabilities and actuarial valuation results.
- Contribution Risk – The potential that actual contributions are different than the actuarially determined contributions.

Annual actuarial valuations are performed for RSD which re-measure the assets and liabilities and compute a new actuarially determined contribution. RSD also has experience studies performed every five years to analyze the discrepancies between actuarial assumptions and actual experience and determine if the actuarial assumptions need to be changed. Annual actuarial valuations and periodic experience studies are practical ways to monitor and reassess risk.

Executive Summary (continued)

Key Takeaways

The actuarial valuation is performed each year to replace the estimates the actuary assumed for the prior valuation with the actual events that happened. This past year, as expected, some of the assumptions used in the prior valuation were not realized. Key results of the December 31, 2021 valuation were:

- Market value returns of 9.72% during calendar year 2021 compared to 6.50% assumed
- Continuation of direct-rate smoothing of the change in the employer contribution rate due to the changes in assumptions and methods over a 5-year period
- 12-year amortization of the fresh start unfunded actuarial accrued liability effective July 1, 2011, with current annual payments of $6.8 million will be paid off as of June 30, 2023, which significantly reduces the actuarially determined employer contribution
- Transition from prior actuarial firm to Buck resulted in a net increase in actuarial accrued liability due to valuation programming modifications and differences in methodology
- Employer contributions under the State Contribution Rate Stabilization Policy (SCRSP) significantly exceeded the actuarially determined employer contribution (ADEC)

When compared to the December 31, 2020 actuarial valuation, the above resulted in:

- A higher funded ratio (102.4% in the December 31, 2021 valuation compared to 95.8% in the December 31, 2020 valuation)
- A lower actuarially determined employer contribution ($3,253,378 for fiscal year ending June 30, 2024 compared to $13,086,519 for fiscal year ending June 30, 2023)

FRSWPF is well funded compared to its peers. This is due to:

- Stakeholders working together to keep FRSWPF well-funded since inception
- A history of appropriating and contributing a minimum of the recommended contribution requirements
- Implementation of SCRSP which provides additional funding
- Assumptions that in aggregate are more conservative than peers
- A funding policy that aggressively pays down unfunded liability over a 12-year period
- Modest changes in benefits when compared to peers

Continued focus on these measures will be needed to maintain the solid status of FRSWPF well into the future.

More details can be found later in this report. We encourage readers to start with Sections 1 and 2 and refer to other sections for additional details as needed.

This report, prepared as of December 31, 2021, presents the results of the annual valuation of the system. The principal results of the valuation and a comparison with the preceding year's results are summarized in the following table.

Section 1: Principal Results

This report, prepared as of December 31, 2021, presents the results of the actuarial valuation of the system. The principal results of the valuation and a comparison with the preceding year's results are summarized below.

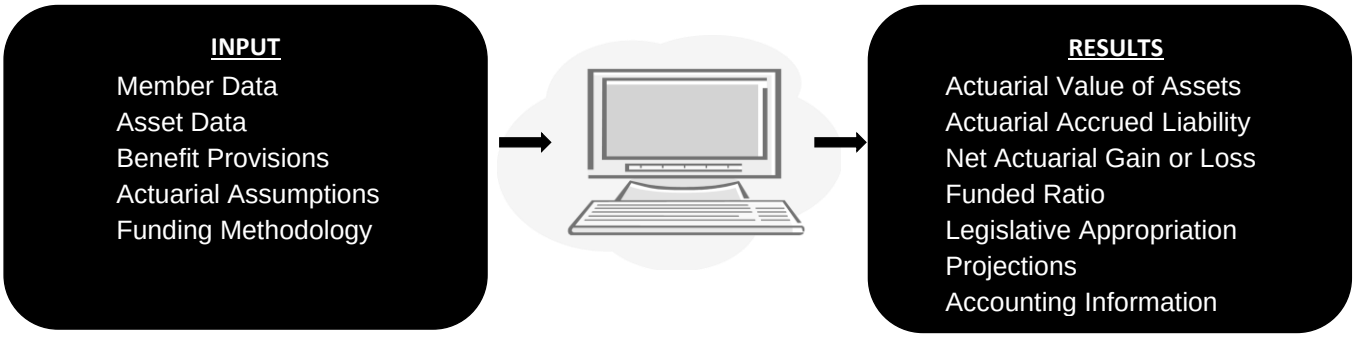
Table 1: Summary of Principal Results

Valuation results as of	12/31/2021	12/31/2020
Active Members		
Non-lapsed Members	25,713	24,655
Lapsed Members	16,661	16,465
Retired Members and Survivors of Deceased Members Killed in the Line of Duty Currently Receiving Benefits		
Number	14,741	14,922
Annual Allowances	$ 30,071,640	$ 30,440,880
Number of Deferred Members	108	122
Assets		
Actuarial Value (AVA)	$ 508,510,376	$ 475,032,285
Market Value	$ 538,379,184	$ 499,936,606
Actuarial Accrued Liability (AAL)	$ 496,483,247	$ 496,012,307
Unfunded Accrued Liability (AAL-AVA)	$ (12,027,129)	$ 20,980,022
Funded Ratio* (AVA/AAL)	102.4%	95.8%
Results for Fiscal Year Ending	**6/30/2024**	**6/30/2023**
Actuarially Determined Employer Contribution (ADEC)		
Normal Cost	$ 5,732,168	$ 5,729,089
Accrued Liability	(1,936,295)	8,080,757
Total	$ 3,795,873	$ 13,809,846
Total Based on Direct Rate Smoothing	$ 3,253,378	$ 13,086,519
Impact of Legislative Changes	N/A	0
Final ADEC	N/A	$ 13,086,519
SCRSP Minimum Contribution Rate	$ 20,052,208	$ 19,702,208
Appropriations Act for Fiscal Year Ending	**6/30/2024**	**6/30/2023**
Legislative Appropriation	N/A	$ 19,702,208

* The Funded Ratio on a Market Value of Assets basis is 108.4% as of December 31, 2021.

Section 2: Valuation Process

The following diagram summarizes the inputs and results of the actuarial valuation process.



A more detailed description of the valuation process is provided in Appendix A.

Valuation Input: Membership Data

As with any estimate, the actuary collects information that we know now. Under the actuarial valuation process, current information about FRSWPF members is collected annually by the Retirement Systems Division staff at the direction of the actuary. Membership data will assist the actuary in estimating benefits that could be paid in the future. Information about benefit provisions and assets held in the trust as of the valuation date is also collected.

The member information the actuary collects includes data elements such as current service, salary and benefit group identifier for members that have not separated service, and actual benefit amounts and form of payment for members that have separated service. Data elements such as gender and date of birth are used to determine when a benefit might be paid and for how long.

The table below provides a summary of the membership data used in this valuation compared to the prior valuation.

Number as of	12/31/2021	12/31/2020
Active members	25,713	24,655
Lapsed members	16,661	16,465
Terminated members and survivors of deceased members entitled to benefits but not yet receiving benefits	108	122
Retired members and survivors of deceased members killed in the Line of Duty currently receiving benefits	14,741	14,922
Total	57,223	56,164

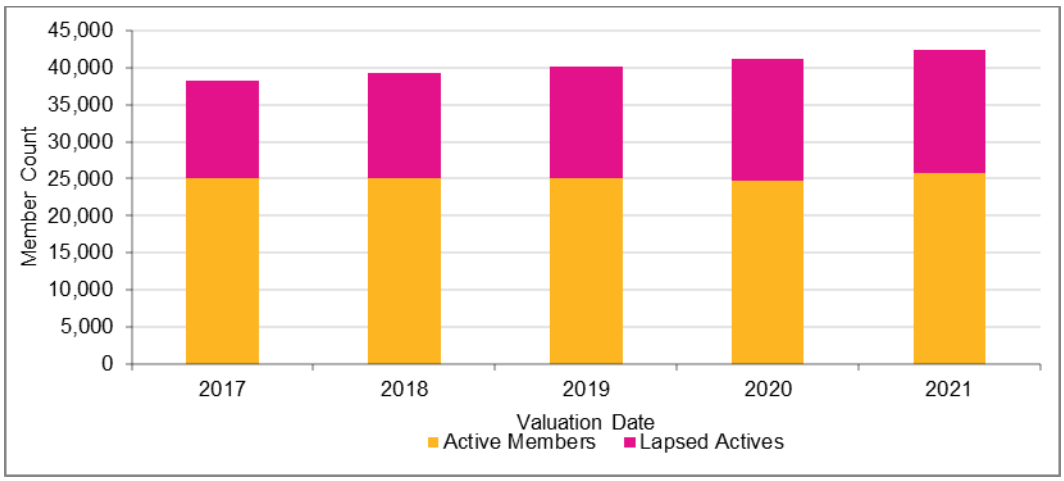
Commentary: The number of fully active and lapsed members increased approximately 3.0% overall. The number of retired members decreased 1.2% from the previous valuation date. The decrease in retiree population results from the actual number of retiree deaths being greater than expected.

Section 2: Valuation Process (continued)

Valuation Input: Membership Data (continued)

The graph below provides a history of the number of active members over the past five years.

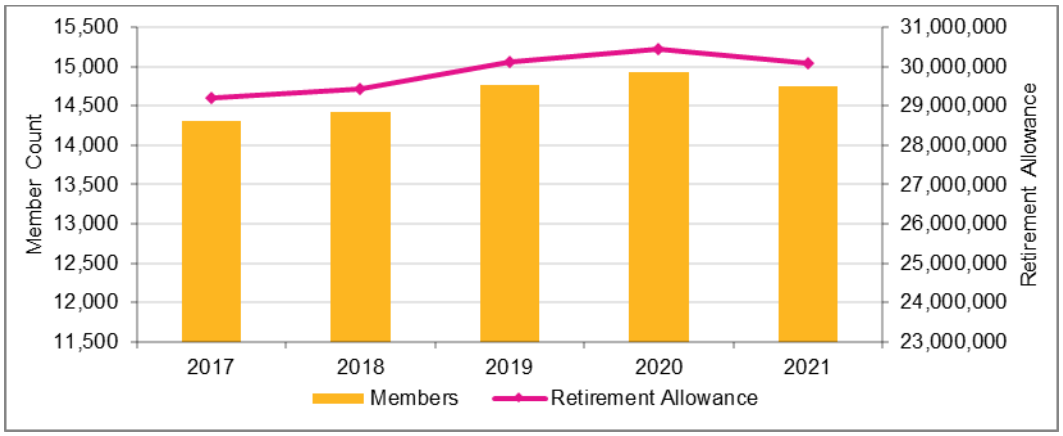
Graph 1: Active Members



Commentary: Since the December 31, 2013 valuation, members who are not in receipt of benefits and who have not received a refund of employee contributions are split into active members and lapsed members. Lapsed members include members who did not accrue a year of service in the past year. The return to service assumption, which was implemented on a preliminary basis for the December 31, 2013 valuation and was finalized for the December 31, 2015 valuation, assumes that a lapsed member returns to active service at a rate based on the number of years that the member has been lapsed. Based on the experience study prepared as of December 31, 2019 and adopted by the Board on January 28, 2021, there was no change to this assumption.

Graph 2: Retired Members

The graph below provides a history of the number of retired members and benefit amounts payable over the past five years.



Commentary: The number of retired members and the benefits paid to these members had been increasing steadily, as expected based on plan assumptions, until 2021 where there was a decrease because the actual number of retired member deaths was greater than expected.

A detailed summary of the membership data used in this valuation is provided in Section 3 and Appendix B of this report.

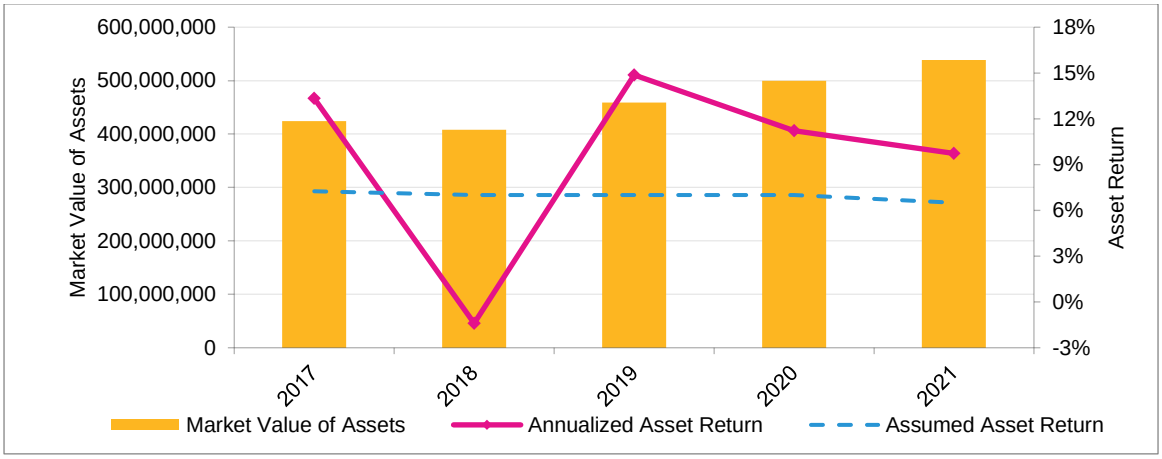
Section 2: Valuation Process (continued)

Valuation Input: Asset Data

FRSWPF assets are held in trust and are invested for the exclusive benefit of plan members. The Market Value of Assets is $538 million as of December 31, 2021 and $500 million as of December 31, 2020. The investment return for the market value of assets for calendar year 2021 was 9.72%.

Graph 3: Market Value of Assets and Annualized Asset Returns

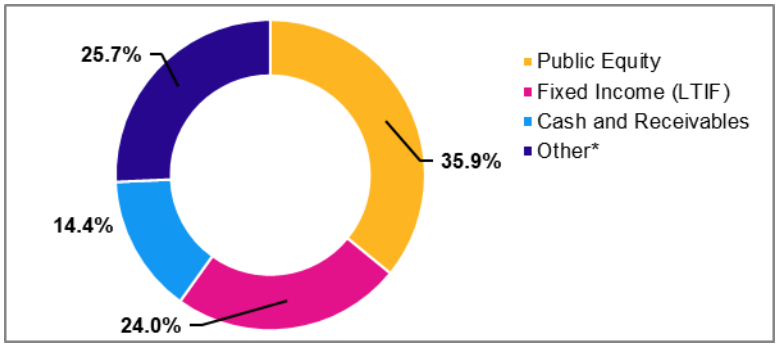
The graph below provides a history of the market value of assets and asset returns over the past five years.



Commentary: Market value returns during 2021 were higher than the 6.50% assumed rate of return, resulting in a lower required contribution and higher funded ratio than anticipated.

Graph 4: Allocation of Investments by Category

The graph below provides the breakdown of the market value of assets as of December 31, 2021 by asset category.



* Real Estate, Alternatives, Inflation and Credit

Commentary: Based on historical market returns, the current asset allocation, the current investment policy, and the expectation of future asset returns, as reviewed in the last experience study, the 6.50% discount rate used in this valuation is reasonable and appropriate.

A detailed summary of the market value of assets is provided in Section 4 of this report.

Section 2: Valuation Process (continued)

Valuation Input: Benefit Provisions

Benefit provisions are described in North Carolina General Statutes, Chapter 58. There were no changes in benefit provisions since the prior year's valuation.

Highlights of the benefit provisions are described below.

- An unreduced retirement allowance is payable to members who retire from service after attaining age 55 and 20 years of service as an eligible firefighter or eligible rescue squad worker.
- The unreduced retirement allowance is equal to $170 per month.

Commentary: Many Public Sector Retirement Systems in the United States have undergone pension reform where the benefits of members (active or future members) have been reduced. Because of the well-funded status of the Retirement System due to the legislature contributing the actuarially required contribution, benefit cuts have not been needed in North Carolina as they have been in most other states. Instead, we have seen a modest expansion of benefits in recent years based on sound plan design. However, if North Carolina's investment policy shifts substantively, the system should review likely impacts of the shift and consider corresponding changes to actuarial assumptions, funding policy and/or benefit levels.

A detailed summary of the benefit provisions is provided in Appendix C of this report.

Valuation Input: Actuarial Assumptions

Actuarial assumptions bridge the gap between the information that we know with certainty as of the valuation date (age, gender, service, and benefits of the members) and what may happen in the future. The actuarial assumptions of the Retirement System are reviewed at least every five years. Based on this review, the actuary will make recommendations on the demographic and economic assumptions.

Demographic assumptions describe future events that relate to people such as retirement rates, termination rates, disability rates, and mortality rates. Economic assumptions describe future events that relate to the Retirement System's assets such as the interest rate and the real return.

Valuations since December 31, 2015 reflect the return to service assumption (based on the findings of the data audit of the FRSWPF and presented in our letter dated June 10, 2016), which was adopted by the Board of Trustees on July 21, 2016. The return to service assumption assumes that a lapsed member returns to active service at a rate based on the number of years that the member has been lapsed. A preliminary assumption was reflected in the December 31, 2013 and December 31, 2014 actuarial valuations and for actuarially determined employer contributions for fiscal year ending June 30, 2015 through fiscal year ending June 30, 2016.

The assumptions used for the December 31, 2021 actuarial valuation are based on the experience study prepared as of December 31, 2019 and adopted by the Board of Trustees on January 28, 2021.

The assumptions and methods were not changed since the prior valuation.

Section 2: Valuation Process (continued)

Valuation Input: Funding Methodology

The Funding Methodology is the payment plan for FRSWPF and is composed of the following three components:

- Actuarial Cost Methods allocate costs to the actuarial accrued liability (i.e. the amount of money that should be in the fund) for past service and normal cost (i.e. the cost of benefits accruing during the year) for current service.
  - The Board of Trustees has adopted Entry Age Normal as its actuarial cost method
  - Develops normal costs that are expected to stay level over time
- Asset Valuation Methods smooth or average the market value returns over time to alleviate contribution volatility that results from market returns. The Board of Trustees has adopted the following:
  - Asset returns in excess of or less than the expected return on market value of assets reflected over a five-year period.
  - Assets corridor: not greater than 120% of market value and not less than 80% of market value
- Amortization Methods determine the payment schedule for unfunded actuarial accrued liability (i.e. the difference between the actuarial accrued liability and actuarial value of assets). The Board of Trustees has adopted the following:
  - Payment level: the payment is determined as a level dollar amount, similar to a mortgage payment
  - Payment period: a 12-year closed amortization period was adopted for fiscal year ending 2012. A new amortization base is created each year based on the prior years' experience.

Commentary: When compared to other Public Sector Retirement Systems in the United States, the funding policy for FRSWPF is quite aggressive in that the policy pays down the unfunded actuarial accrued liability over a much shorter period of time (12 years) compared to most other Public Sector Retirement Systems. As such it is a best practice in the industry.

A detailed summary of the actuarial assumptions and methods is provided in Appendix D of this report.

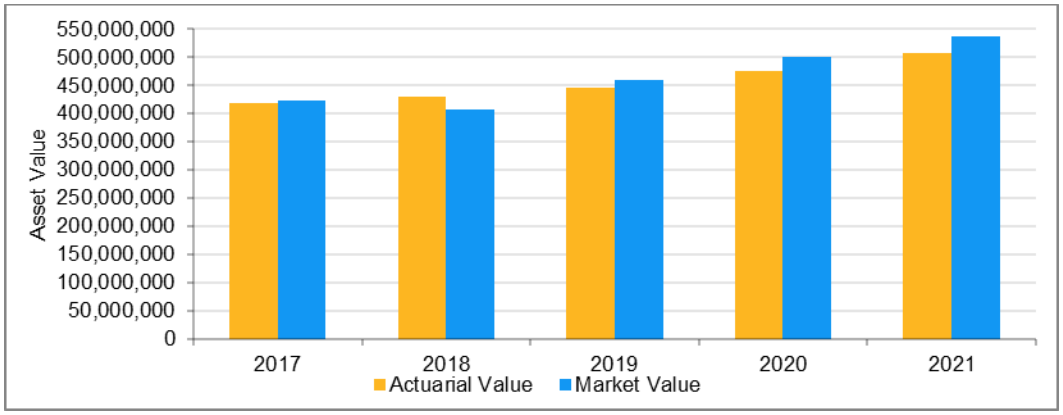
Section 2: Valuation Process (continued)

Valuation Results: Actuarial Value of Assets

In order to reduce the volatility that investment gains and losses can have on required contributions and funded status of FRSWPF, the Board adopted an asset valuation method to determine the Actuarial Value of Assets used for funding purposes. The Actuarial Value of Assets is $508.5 million as of December 31, 2021 and $475.0 million as of December 31, 2020.

Graph 5: Actuarial Value and Market Value of Assets

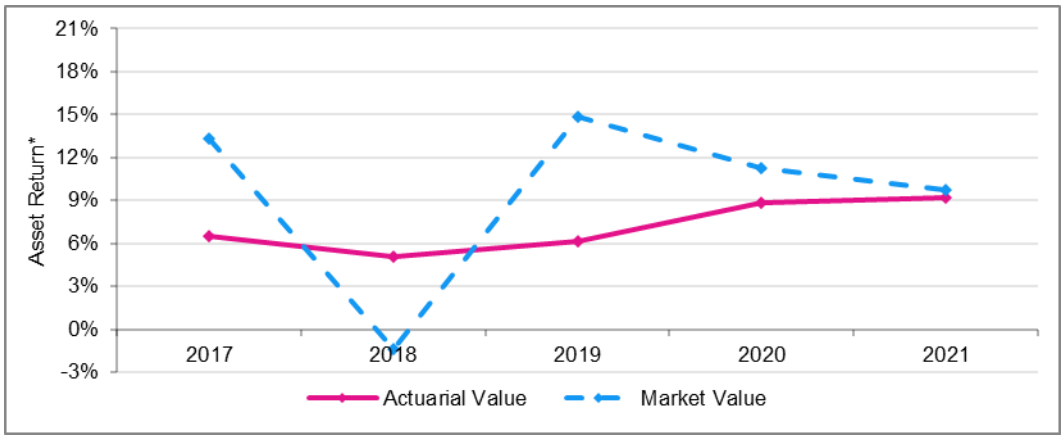
The graph below provides a history of the market value and actuarial value of assets over the past five years.



Commentary: The market value of assets is greater than the actuarial value of assets, which is used to determine employer contributions. This indicates that overall, there are unrecognized asset gains to be recognized in future valuations.

The graph below provides a history of the market value and actuarial value of asset returns over the past five year.

Graph 6: Asset Returns



Commentary: The investment return for the market value of assets for calendar year 2021 was 9.72%. The actuarial value of assets smooths investment gains and losses. Higher than expected market returns in 2019, 2020 and 2021, resulted in an actuarial value of asset return for calendar year 2021 of 9.18% and a recognized actuarial asset gain of $12.6 million during 2021. After recognizing this gain, the assets at actuarial value were $12.0 million more than the actuarial accrued liability as of December 31, 2021.

A detailed summary of the Actuarial Value of Assets is provided in Section 4 of this report.

Section 2: Valuation Process (continued)

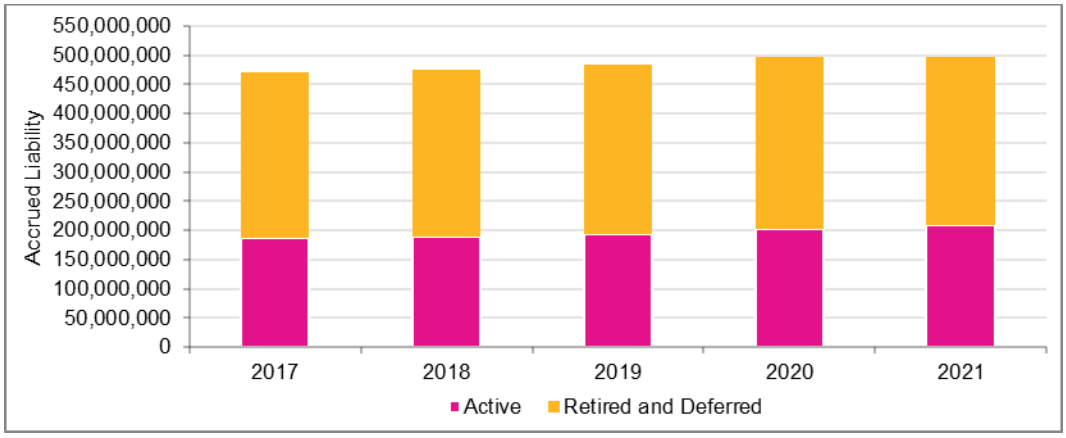
Valuation Results: Actuarial Accrued Liability

Using the provided membership data, benefit provisions, and actuarial assumptions, the future benefit payments of FRSWPF are estimated. These projected future benefit payments are discounted into today's dollars using the assumed rate of investment return assumption to determine the Present Value of Future Benefits (PVFB) of FRSWPF. The PVFB is an estimate of the current value of the benefits promised to all members as of a valuation date.

Once the PVFB is developed, an actuarial cost method is used to allocate the PVFB. Under the actuarial cost method, the PVFB is allocated to past, current and future service, respectively known as the actuarial accrued liability (AAL), normal cost (NC) and present value of future normal costs (PVFNC). The AAL is also referred to as the amount of money the Retirement System should ideally have in the trust. The NC is also referred to as the cost of benefits accruing during the year.

Graph 7: Actuarial Accrued Liability

The graph below provides a history of the actuarial accrued liability over the past five years.



Commentary: The AAL increased from $496.0 million to $496.5 million in 2021. FRSWPF is an open plan, which means that new members enter the plan each year. In an open plan, liabilities are expected to grow from one year to next as more benefits accrue and the membership approaches retirement. The AAL was $5.6 million lower than expected, resulting primarily from higher than expected retiree mortality and fewer than expected lapsed members returning to active service. Since the prior valuation, a transition from the prior actuarial firm to Buck resulted in a decrease in AAL of $2.9 million due to valuation programming modifications and differences in methodology. A detailed summary of the AAL is provided in Section 5 of this report.

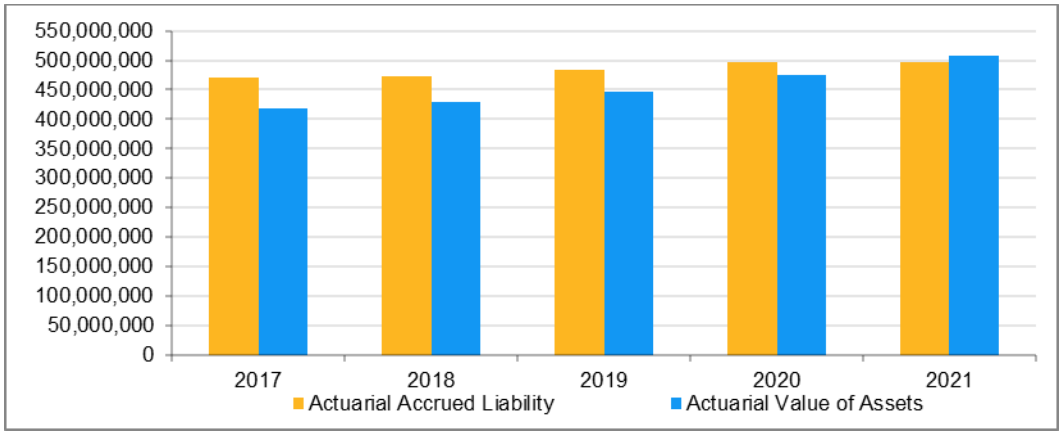
Section 2: Valuation Process (continued)

Valuation Results: Funded Ratio

The funded ratio is a measure of the progress that has been made in funding the plan as of the valuation date. It is the ratio of how much money the Retirement System actually has in the fund to the amount the FRSWPF should have in the fund.

Graph 8: Actuarial Accrued Liability and Actuarial Value of Assets

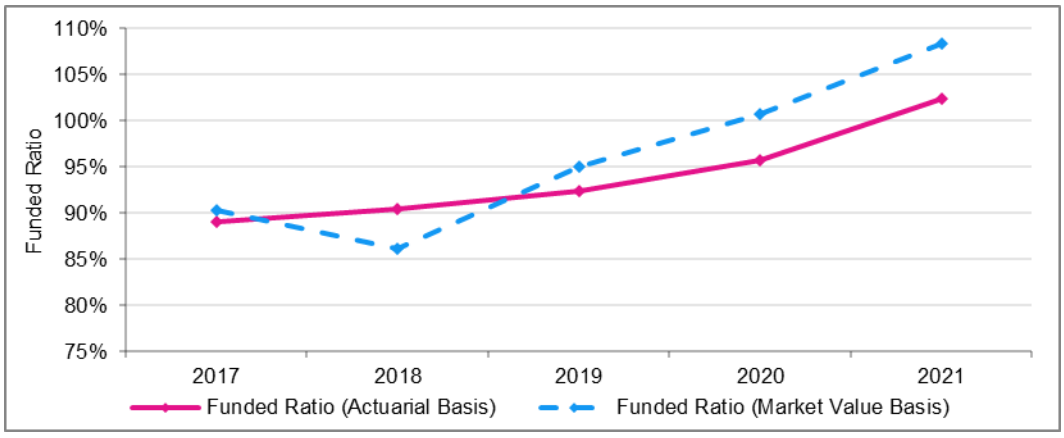
The graph below provides a history of the actuarial accrued liability and actuarial value of assets over the past 5 years.



Commentary: The actuarial value of assets basis is used for computing contributions to alleviate contribution volatility. The difference in the actuarial accrued liability and the actuarial value of assets is the amount of unfunded actuarial accrued liability to be paid off in 12 years.

Graph 9: Funded Ratios

The graph below provides a history of the funded ratio on a market and actuarial basis over the past five years.



Commentary: The ratio of assets to liabilities shows the health of the plan on an accrued basis. The funded ratio on an actuarial basis increased from 95.8% as of December 31, 2020 to 102.4% at December 31, 2021.

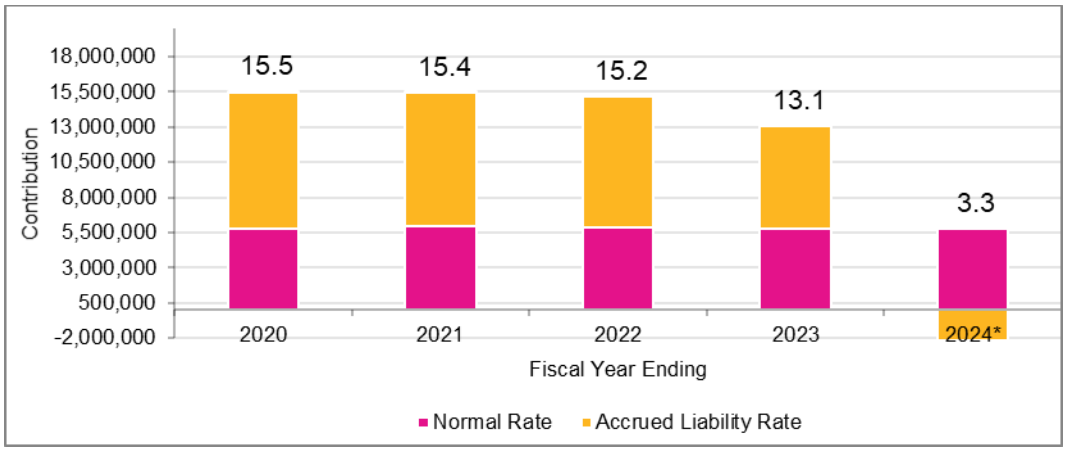
Section 2: Valuation Process (continued)

Valuation Results: State Contributions

The December 31, 2020 valuation suggested that the preliminary total employer contribution be set at $13,086,519 for the fiscal year ending June 30, 2023 subject to the SCRSP (which would suggest a contribution of at least $19,702,208) and the impact of any future legislative changes effective during that fiscal year. As a result of the December 31, 2021 valuation, the preliminary actuarially determined employer contribution is $3,253,378 for the fiscal year ending June 30, 2024, subject to the SCRSP (which would suggest a contribution of at least $20,052,208) and the impact of any future legislative changes effective during that fiscal year.

Graph 10: Actuarially Determined Employer Contributions

The graph below provides a history of actuarially determined employer required contributions over the past five years.



***** Subject to the impact of future legislative changes effective during that fiscal year.

Commentary: The actuarially determined employer contribution is the amount needed to pay for the cost of the benefits accruing and to pay off the unfunded actuarial accrued liability over a 12-year period, offset for the $10 monthly contribution the members make until they attain 20 years of service. The 12-year period is a relatively short period for Public Sector Retirement Systems in the United States, with the funding period for most of these systems much longer. The shorter period results in higher contributions and more benefit security.

A detailed summary of the actuarially determined employer contributions rates is provided in Section 6 of this report.

Valuation Results: Accounting Information

The Governmental Account Standards Board (GASB) issues statements which establish financial reporting standards for defined benefit pension plans and accounting for pension expenditures and expenses for governmental employers.

The valuation has been prepared in accordance with the parameters of Statement No. 67 of the GASB and all applicable Actuarial Standards of Practice. The Net Pension Liability (Asset) under GASB 67 for the fiscal year ending June 30, 2022, is $19,662,000 (compared to $(27,931,000) for fiscal year ending June 30, 2021). The required financial reporting information for FRSWPF under GASB No. 67 can be found in Section 8 of this report.

Section 3: Membership Data

The Retirement Systems Division provided membership data as of the valuation date for each member of the Retirement System. The membership data assists the actuary in estimating benefits that could be paid in the future. The tables below provide a summary of the membership data used in this valuation. Detailed tabulations of data are provided in Appendix B.

Table 2: Active Member Data

	Member Count	Average Age	Average Service
Lapsed Members	16,661	41.74	5.88
Active Members	25,713	39.51	11.11
Total	42,374	40.38	9.05

The table above includes members who are not in receipt of benefits and who have not received a refund of employee contributions. Lapsed members include members who did not accrue a year of service in the past year.

Table 3: Data for Members Currently Receiving Benefits

Member Count	Average Age	Annual Retirement Allowances
14,741	69.03	$ 30,071,640

Table 4: Data for Disabled Members Eligible for Deferred Pensions

Member Count	Average Age	Annual Retirement Allowances
108	51.25	$ 220,320

Section 4: Asset Data

Assets are held in trust and are invested for the exclusive benefit of FRSWPF members. The tables below provide the details of the Market Value of Assets for the current and prior years' valuations.

Table 5: Market Value of Assets

Asset Data as of	12/31/2021	12/31/2020
Beginning of Year Market Value of Assets	$ 499,936,606	$ 458,687,909
Employer Contributions	19,002,208	18,827,208
Employee Contributions	2,525,870	2,539,802
Benefit Payments Other than Refunds	(29,999,134)	(29,844,643)
Refunds	(206,237)	(241,587)
Administrative Expenses	(989,669)	(936,587)
Investment Income	48,109,540	50,904,504
Net Increase/(Decrease)	38,442,578	41,248,697
End of Year Market Value of Assets	$ 538,379,184	$ 499,936,606
Estimated Net Investment Return on Market Value (Annualized)	9.72%	11.22%

Table 6: Allocation of Investments by Category of the Market Value of Assets

Category	12/31/2021	12/31/2020
Allocation by Dollar Amount		
Public Equity	$ 193,440,605	$ 184,565,985
Fixed Income (LTIF)	129,206,999	134,012,941
Cash and Receivables	77,372,302	54,654,002
Other*	138,359,278	126,703,678
Total Market Value of Assets	$ 538,379,184	$ 499,936,606
Allocation by Percentage of Asset Value		
Public Equity	35.9%	36.9%
Fixed Income (LTIF)	24.0%	26.8%
Cash and Receivables	14.4%	10.9%
Other*	25.7%	25.4%
Total Market Value of Assets	100.0%	100.0%

***** Real Estate, Alternatives, Inflation and Credit

Section 4: Asset Data (continued)

In order to reduce the volatility that investment gains and losses can have on the required contributions and funded status of FRSWPF, the Board adopted an asset valuation method to determine the Actuarial Value of Assets used for funding purposes. The table below provides the calculation of the Actuarial Value of Assets at the valuation date.

Table 7: Actuarial Value of Assets

Asset Data as of	12/31/2021
Beginning of Year Actuarial Value of Assets	$ 475,032,285
Beginning of Year Market Value of Assets	$ 499,936,606
Contributions	21,528,078
Benefit Payments, Refunds and Administrative Expenses	(31,195,040)
Net Cash Flow	(9,666,962)
Expected Investment Return	32,186,649
Expected End of Year Market Value of Assets	522,456,293
End of Year Market Value of Assets	538,379,184
Excess of Market Value over Expected Market Value of Assets	15,922,891
80% of 2021 Asset Gain/(Loss)	12,738,313
60% of 2020 Asset Gain/(Loss)	11,477,153
40% of 2019 Asset Gain/(Loss)	12,695,444
20% of 2018 Asset Gain/(Loss)	(7,042,102)
Total Deferred Asset Gain/(Loss)	29,868,808
Preliminary End of Year Actuarial Value of Assets	508,510,376
Final End of Year Actuarial Value of Assets (not less than 80% and not greater than 120% of Market Value)	508,510,376
Estimated Net Investment Return on Actuarial Value	9.18%

Commentary: The actuarial value of assets smooths investment gains/losses on the market value of assets over a five-year period resulting in less volatility in the actuarially determined employer contribution. The asset valuation recognizes asset returns in excess of or less than the expected return on the market value of assets over a five-year period. Actuarial value of assets was reset to the market value of assets as of December 31, 2014.

Section 4: Asset Data (continued)

The valuation assumes that the funds will earn a 6.50% asset return in all future years. The table below provides a history of the Actuarial Value and Market Value of Asset returns.

Table 8: Historical Asset Returns

Year*	Actuarial Value of Asset Return	Market Value of Asset Return
2012	5.96%	2.25%
2013	7.43%	12.42%
2014	7.42%	6.24%
2015	5.87%	0.35%
2016	5.33%	6.24%
2017	6.54%	13.33%
2018	5.08%	(1.40%)
2019	6.19%	14.87%
2020	8.80%	11.22%
2021	9.18%	9.72%
10-Year Average	6.77%	7.39%
10-Year Range	4.10%	16.27%

* Asset returns for years prior to 2013 are the returns for the year ending on June 30 of the applicable year. The 2013 asset return is the annualized return for the 18-month period from June 30, 2012 to December 31, 2013. Asset returns for years after 2013 are for the calendar year.

Commentary: The average investment return recognized for purposes of determining the annual change in contribution each year is the actuarial value of assets return. Currently, the average actuarial return over the last 10 years of 6.77% compares with an average market return of 7.39%. But the range of returns on market value is markedly more volatile, 16.27% versus 4.10%. This results in much lower actuarially determined employer contribution volatility using the actuarial value of assets versus market, while ensuring that the actuarial needs of FRSWPF are met.

Section 5: Liability Results

Using the provided membership data, benefit provisions, and actuarial assumptions, future benefit payments of FRSWPF are estimated. These projected future benefit payments are discounted into today's dollars using the assumed rate of investment return assumption to determine the Present Value of Future Benefits. The Present Value of Future Benefits is allocated to past, current, and future service, respectively known as the actuarial accrued liability, normal cost and present value of future normal costs. The table below provides these liability numbers for the current and prior years' valuations.

Table 9: Liability Summary

Valuation Results as of	12/31/2021	12/31/2020
(a) Present Value of Future Benefits		
(1) Active Members*	$ 261,360,121	$ 254,656,393
(2) Members Currently Receiving Benefits and Members with Deferred Benefits	287,180,992	292,577,066
(3) Total	$ 548,541,113	$ 547,233,459
(b) Present Value of Future Normal Costs		
(1) Employee Future Normal Costs	$ 18,433,484	$ 18,267,240
(2) Employer Future Normal Costs	33,624,382	32,953,912
(3) Total	$ 52,057,866	$ 51,221,152
(c) Actuarial Accrued Liability: (a3) - (b3)	$ 496,483,247	$ 496,012,307
(d) Actuarial Value of Assets	$ 508,510,376	$ 475,032,285
(e) Unfunded Accrued Liability: (c) - (d)	$ (12,027,129)	$ 20,980,022

*Includes present value of future members for lapsed members whose service did not increase during 2021.

The table below provides an allocation of the total present value of future benefits by funding source.

Table 10: Funding Allocation

	12/31/2021	12/31/2020
Allocation by Dollar Amount		
Assets (Actuarial Value)	$ 508,510,376	$ 475,032,285
Future Employee Contributions	18,433,484	18,267,240
Future Normal Contributions	33,624,382	32,953,912
Present Value of Funded Benefits	$ 560,568,242	$ 526,253,437
Present Value of Unfunded Benefits	(12,027,129)	20,980,022
Total Present Value of Benefits	$ 548,541,113	$ 547,233,459
Allocation by Percentage of PVB		
Assets (Actuarial Value)	92.7%	86.8%
Future Employee Contributions	3.4%	3.3%
Future Normal Contributions	6.1%	6.0%
Present Value of Funded Benefits	102.2%	96.1%
Present Value of Unfunded Benefits	(2.2%)	3.9%
Total Present Value of Benefits	100.0%	100.0%

Section 5: Liability Results (continued)

The table below provides a reconciliation of the prior year's unfunded actuarial accrued liability to the current year's unfunded actuarial accrued liability.

Table 11: Reconciliation of Unfunded Actuarial Accrued Liability (in millions)

(in millions)	
Unfunded Actuarial Accrued Liability (UAAL) as of 12/31/2020	$ 21.0
Normal Cost and Administrative Expenses during 2021	8.4
Reduction due to Actual Contributions during 2021	(21.5)
Interest on UAAL, Normal Cost, and Contributions	1.2
Asset (Gain)/Loss	(12.6)
Actuarial Accrued Liability (Gain)/Loss	(8.5)
Impact of Assumption Changes	0.0
Impact of Legislative Changes	0.0
Unfunded Actuarial Accrued Liability (UAAL) as of 12/31/2021	$ (12.0)

Commentary: During 2021, the UAAL decreased more than expected due an asset gain during the year that decreased the UAAL by $12.6 million and SCRSP contributions exceeding the actuarially determined contribution. Additionally, demographic experience decreased the UAAL by $5.6 million, and the transition from the prior actuarial firm to Buck resulted in a decrease in UAAL of $2.9 million due to valuation programming modifications and differences in methodology. These two figures sum to the $8.5 million decrease in UAAL noted in the Actuarial Accrued Liability (Gain)/Loss line item in the table above.

Section 6: Actuarially Determined Employer Contribution

The actuarially determined employer contribution consists of a normal cost contribution and an accrued liability contribution. The normal cost contribution is the employer's portion of the cost of benefits accruing during the year after reducing for the member contribution. The accrued liability contribution is the payment toward the unfunded accrued liability in order to pay off the unfunded accrued liability over 12 years.

The table below provides the calculation of the actuarially determined employer contribution for the current and prior years' valuations.

Table 12: Calculation of Actuarially Determined Employer Contribution (ADEC) Payable per Active Member

Valuation Date	12/31/2021	12/31/2020
ADEC for Fiscal Year Ending	6/30/2024	6/30/2023
Normal Cost Rate Calculation		
(a) Total Normal Rate	$ 329.34	$ 335.66
(b) Employee Normal Cost	$ 120.00	$ 120.00
(c) Employer Normal Cost: (a) - (b)	$ 209.34	$ 215.66
(d) Expenses Rate*	$ 43.68	$ 42.14
(e) Total Normal Cost Rate: (c) + (d)	$ 253.02	$ 257.80
Accrued Liability Rate Calculation		
(f) Total Annual Amortization Payments**	$ (1,936,295)	$ 8,080,757
(g) Active Member Count***	22,655	22,223
(h) Accrued Liability Rate: (f) / (g)	$ (85.47)	$ 363.62
Total ADEC (e) + (h)	$ 167.55	$ 621.42

* Based on actual expenses during the previous year.

** See Table 16 for more detail.

*** The active member count reflects the number of currently active or lapsed members who are expected to accrue additional benefits in the next year.

Table 13: Actuarially Determined Employer Contribution (ADEC)

The tables below provide the calculation of the actuarially determined employer contribution (ADEC) for the current and prior years' valuations.

Valuation Date	12/31/2021	12/31/2020
ADEC for Fiscal Year Ending	6/30/2024	6/30/2023
(a) Current Active Member Count*	22,655	22,223
(b) Normal Cost Rate	$ 253.02	$ 257.80
(c) Normal Cost Contribution: (a) x (b)	$ 5,732,168	$ 5,729,089
(d) Accrued Liability Contribution	(1,936,295)	8,080,757
(e) Total ADEC: (c) + (d)	$ 3,795,873	$ 13,809,846
(f) ADEC: Direct Rate Smoothing	$ 3,253,378	$ 13,086,519
Impact of Legislative Changes	N/A	0
Final ADEC	N/A	$ 13,086,519
SCRSP Minimum Contribution	$ 20,052,208	$ 19,702,208

* The active member count reflects the number of currently active or lapsed members who are expected to accrue additional benefits in the next year.

Section 6: Actuarially Determined Employer Contribution (continued)

The table below provides a reconciliation of the actuarially determined employer contribution (ADEC).

Table 14: Reconciliation of the Change in the ADEC

Fiscal year ending June 30, 2023 Preliminary ADEC (estimated based on December 31, 2020 Valuation)	13,086,519
Impact of Legislative Changes	0
Fiscal year ending June 30, 2023 Final ADEC	13,086,519
Change Due to Demographic (Gain)/Loss	(1,159,542)
Change Due to Payoff of Unfunded Liability Base established in June 30, 2010, valuation	(6,784,330)
Change Due to Investment (Gain)/Loss	(1,509,009)
Change Due to Contributions Greater than ADEC	(561,092)
Impact of Assumption Changes	0
Impact of Direct Rate Smoothing	180,832
Fiscal year ending June 30, 2024 Preliminary ADEC (estimated based on December 31, 2021 Valuation)	3,253,378

Section 6: Actuarially Determined Employer Contribution (continued)

Amortization methods determine the payment schedule for the unfunded actuarial accrued liability. FRSWPF adopted a 12-year closed amortization period for fiscal year ending 2012. A new amortization base is created each year based on the prior years' experience. The tables below provide the calculation of the new amortization base and the amortization schedule for the current year's valuation.

Table 15: Calculation of the New Amortization Base

Calculation as of		12/31/2021	12/31/2020
(a)	Unfunded Actuarial Accrued Liability	$ (12,027,129)	$ 20,980,022
(b)	Prior Years' Outstanding Balances	$ 12,738,297	$ 29,602,588
(c)	New Amortization Base: (a) - (b)	$ (24,765,426)	$ (8,622,566)
(d)	New Amortization Payment	$ (3,232,723)	$ (1,125,535)

Table 16: Amortization Schedule for Unfunded Accrued Liability

Date Established	Original Balance	12/31/2021 Outstanding Balance	Annual Payment Effective July 1, 2023
June 30, 2010	$ 51,963,371	$ 9,709,415	$ -
June 30, 2011	8,122,313	2,444,797	1,057,068
June 30, 2012	3,813,072	1,553,694	494,704
December 31, 2013	(11,374,070)	(7,060,346)	(1,519,055)
December 31, 2014	(4,939,476)	(3,508,099)	(657,787)
December 31, 2015	14,577,214	11,567,890	1,935,502
December 31, 2016	5,571,626	4,850,764	737,095
December 31, 2017	5,881,084	5,541,025	775,156
December 31, 2018	(1,528,072)	(1,544,242)	(201,047)
December 31, 2019	(1,522,520)	(1,633,568)	(199,673)
December 31, 2020	(8,622,566)	(9,183,033)	(1,125,535)
December 31, 2021	(24,765,426)	(24,765,426)	(3,232,723)
Total		$ (12,027,129)	$ (1,936,295)

Commentary: This is the payment schedule for the unfunded actuarial accrued liability of FRSWPF.

Section 6: Actuarially Determined Employer Contribution (continued)

The table below provides a history of the actuarially determined employer contribution and the corresponding appropriated rate.

Table 17: History of Actuarially Determined Employer Contributions and Appropriated Rates

Valuation Date	Fiscal Year Ending	Preliminary ADEC	Subsequent Changes to ADEC	Final ADEC	Appropriated Rate
12/31/2021	6/30/2024	$ 3,253,378	N/A	N/A	N/A
12/31/2020	6/30/2023	13,086,519	-	$13,086,519	$19,702,208
12/31/2019	6/30/2022	15,182,523	-	15,182,523	19,352,208
12/31/2018	6/30/2021	14,845,609	-	14,845,609	19,002,208
12/31/2017	6/30/2020	14,323,684	-	14,323,684	18,652,208

Section 7: Valuation Balance Sheet

The valuation balance sheet shows the assets and liabilities of FRSWPF. The items shown in the balance sheet are present values actuarially determined as of the relevant valuation date. The table below provides the valuation balance sheet for the current year and prior year.

Table 18: Valuation Balance Sheet

Balance Sheet as of	12/31/2021	12/31/2020
Assets		
Current Actuarial Value of Assets		
Annuity Savings Fund	$ 41,100,290	$ 40,502,997
Pension Accumulation Fund	467,410,086	434,529,288
Total	$ 508,510,376	$ 475,032,285
Future Member Contributions to the Annuity Savings Fund	$ 18,433,484	$ 18,267,240
Prospective Appropriations to the Pension Accumulation Fund		
Normal Appropriations	$ 33,624,382	$ 32,953,912
Unfunded Accrued Liability Appropriations	(12,027,129)	20,980,022
Total	$ 21,597,253	$ 53,933,934
Total Assets	$ 548,541,113	$ 547,233,459
Liabilities		
Annuity Savings Fund		
Past Member Contributions	$ 41,100,290	$ 40,502,997
Future Member Contributions	18,433,484	18,267,240
Total Contributions	$ 59,533,774	$ 58,770,237
Pension Accumulation Fund		
Benefits Currently in Payment	$ 287,180,992	$ 292,577,066
Benefits to be Paid to Current Active Members	201,826,347	195,886,156
Total Benefits Payable	$ 489,007,339	$ 488,463,222
Total Liabilities	$ 548,541,113	$ 547,233,459

Section 8: Accounting Results

The section contains the accounting information for Governmental Accounting Standards Board (GASB) Statement No. 67 for fiscal year ending June 30, 2022 based on a valuation date of December 31, 2021.

The June 30, 2022 total pension liability presented in this section was determined by an actuarial valuation as of December 31, 2021, based on the assumptions, methods and plan provisions described in this report. The actuarial cost method used to develop the total pension liability is the Entry Age Normal Cost method, as required by GASB Statement No. 67.

GASB Statement No. 67 set forth certain items of information to be disclosed in the financial statements of the Plan. The tables below provide a distribution of the number of employees by type of membership.

Table 19: Number of Active and Retired Members as of December 31, 2021

Group	Number
Retired members and survivors of deceased members currently receiving benefits	14,741
Terminated members and survivors of deceased members entitled to benefits but not yet receiving benefits	108
Active members*	42,374
Total	57,223

* Includes all members who have not received a refund of contributions. This group includes 25,713 active members and 16,661 lapsed members whose service did not decrease during 2021.

Section 8: Accounting Results (continued)

GASB Statement No. 67 set forth certain items of information to be disclosed in the financial statements of the Plan. The tables below provide the schedule of changes in Net Pension Liability (Asset).

Table 20: Schedule of Changes in Net Pension Liability (Asset)

Calculation as of	June 30, 2022
Total Pension Liability	
Service Cost	$ 7,262,000
Interest	32,013,000
Changes of Benefit Terms	0
Difference between Expected and Actual Experience	(8,484,000)
Change of Assumptions	0
Benefit Payments, including Refund of Member Contributions	(30,369,000)
Net Change in Total Pension Liability	$ 422,000
Total Pension Liability - Beginning of Year	$ 500,196,000
Total Pension Liability - End of Year	$ 500,618,000
Plan Fiduciary Net Position	
Legislative Appropriations	$ 19,352,000
Member Contributions	2,318,000
Net Investment Income	(37,515,000)
Benefit Payments, including Refund of Member Contributions	(30,369,000)
Administrative Expenses	(975,000)
Other	18,000
Net Change in Fiduciary Net Position	$ (47,171,000)
Plan Fiduciary Net Position - Beginning of Year	$ 528,127,000
Plan Fiduciary Net Position - End of Year	$ 480,956,000

Table 21: Net Pension Liability (Asset)

Calculation as of	June 30, 2022	June 30, 2021
Total Pension Liability	$ 500,618,000	$ 500,196,000
Plan Fiduciary Net Position	480,956,000	528,127,000
Net Pension Liability (Asset)	$ 19,662,000	$ (27,931,000)
Plan Fiduciary Net Position as a Percentage of the Total Pension Liability	96.07%	105.58%

Section 8: Accounting Results (continued)

The table below is the sensitivity of the net pension liability to changes in the discount rate.

Table 22: Sensitivity of the Net Pension Liability (Asset) as of June 30, 2021 to Changes in the Discount Rate

	1% Decrease	Current	1% Increase
Discount Rate	5.50%	6.50%	7.50%
Net Pension Liability (Asset)	83,428,000	19,662,000	(32,480,000)

The discount rate used to measure the total pension liability was 6.50%. The projection of cash flows used to determine the discount rate assumed that System contributions will continue to follow the current funding policy, including “direct-rate smoothing” as adopted by the Board on January 28, 2021. It is also assumed that for fiscal years ending 2023 through 2027, System contributions will follow the State Contribution Rate Stabilization Policy as adopted by the Board of Trustees on April 29, 2021. It is further assumed that for fiscal years 2028 and beyond, System contributions will be based on the actuarially determined contribution amounts. Investment earnings are based on actual returns through June 30, 2022, and on the assumed investment rate of return thereafter. In addition, future administrative expenses are assumed equal to actual expenses paid in the prior year, but no less than a flat rate per active and in-pay member equal to $27 in 2022 and increased by 2.5% per year thereafter. Based on those assumptions, the System’s fiduciary net position was projected to be available to make all projected future benefit payments of current plan members. Please see Appendix E for additional detail. Additional SCRSP contributions are not included in Appendix E.

The table below provides the methods and assumptions used to calculate the actuarially determined contribution rate.

Table 23: Additional Information for GASB Statement No. 67

Valuation Date	12/31/2021
Actuarial Cost Method	Entry Age
Amortization Method	Level dollar closed
Amortization Period	12 year closed period
Asset Valuation Method	Asset returns in excess of or less than the expected return on market value of assets reflected over a five-year period (not greater than 120% of market value and not less than 80% of market value)
Actuarial Assumptions	
Investment Rate of Return*	6.50%
Projected Salary Increases	N/A
*Includes Inflation of	2.50%
Cost-of-living Adjustments	N/A

Appendix A: Valuation Process and Glossary of Actuarial Terms

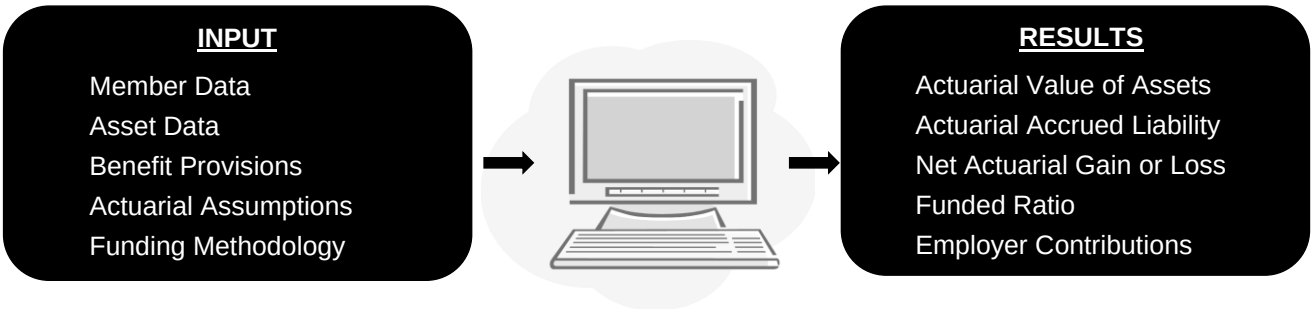
Purpose of an Actuarial Valuation

The majority of Public Sector Retirement Systems in the State of North Carolina are defined benefit (DB) retirement systems. Under a DB retirement system, the amount of benefits payable to a member upon retirement, termination, death or disability is defined in various contracts and legal instruments and is based, in part, on the member's years of credited service and final compensation. The amount of contribution needed to fund these benefits cannot be known with certainty. A primary responsibility of the Board of Trustees of a Retirement System is to establish and monitor a funding policy for the contributions made to the Retirement System.

While somewhat uncommon, in some jurisdictions, contributions are made by the plan sponsor as benefits come due. This is known as pay-as-you-go financing. More commonly, contributions for benefits are made in advance during the course of active employment of the members. This is known as actuarial pre-funding. For example, the State of North Carolina mandates for the Teachers' and State Employees' Retirement System ("TSERS") under G.S.135-8(d) that "on account of each member there shall be paid into the pension accumulation fund by employers an amount equal to a certain percentage of the actual compensation of each member to be known as the 'normal contribution' and an additional amount equal to a percentage of the member's actual compensation to be known as the 'accrued liability contribution'…The rate per centum of such contributions shall be fixed on the basis of the liabilities of the Retirement System as shown by actuarial valuation, duly approved by the Board of Trustees, and shall be called the 'actuarially determined employer contribution rate'. The actuarially determined employer contribution rate shall be calculated annually by the actuary using assumptions and a cost method approved by the Actuarial Standards Board of the American Academy of Actuaries and selected by the Board of Trustees."

The Actuarial Valuation Process

The following diagram summarizes the inputs and results of the actuarial valuation process. A narrative of the process follows the diagram. The reader may find it worthwhile to refer to the diagram from time to time.



Under the actuarial valuation process, current information about Retirement System members is collected annually by staff at the direction of the actuary, namely member data, asset data and information on benefit provisions. Member data is collected for each member of the Retirement System. The member data will assist the actuary in estimating benefits that could be paid in the future. The member information the actuary collects to estimate the amount of benefit includes elements such as current service, salary and benefit group identifier for members that have not separated service; for those that have, the actual benefit amounts are collected. The actuary collects information such as gender and date of birth to determine when a benefit might be paid and for how long.

Appendix A: Valuation Process and Glossary of Actuarial Terms (continued)

The Actuarial Valuation Process (continued)

The actuary collects summary information about assets as of the valuation date and information on cash flows for the year ending on the valuation date. Information about benefit provisions as of the valuation date is also collected. To bridge the gap between the information collected and potential benefits to be paid in the future, the actuary must make assumptions about future activities. These assumptions are recommended by the actuary to the Boards based on the results of an experience review. An experience review is a review of the Retirement System over a period of time, typically five years, where the actuary analyzes the demographic and economic assumptions of the Retirement System. Based on this review, the actuary will make recommendations on the demographic assumptions, such as when members will be projected to retire, terminate, become disabled and/or die in the future, as well as the economic assumptions, such as what rate of return is projected to be earned by the fund based on the Retirement System investment policy and what level of future salary increases is expected for members. To maintain the assumptions, the Board should adopt a prudent policy of having an experience review being performed every five years. The next experience review for the North Carolina Retirement Systems will be based on the five-year period ending on December 31, 2024 and will be presented during 2025. Using these assumptions, the actuary is able to use the member data, asset data and benefit provision information collected to project the benefits that will be paid from the Retirement System to current members. These projected future benefit payments are based not only on service and pay through the valuation date but includes future pay and service, which has not yet been earned by the members but is expected to be earned.

These projected future benefit payments are discounted into today's dollars using the assumed rate of investment return assumption to determine the Present Value of Future Benefits (PVFB) of the Retirement System. The PVFB is an estimate of the value of the benefits promised to all members as of a valuation date. If the Retirement System held assets equal to the PVFB and all the assumptions were realized, there would be sufficient funds to pay off all the benefits to be paid in the future for members in the Retirement System as of the valuation date.

The PVFB is a large sum of money, typically much larger than the amount of Retirement System assets held in the trust. The next step is for the actuary to apply the Funding Policy as adopted by the Board to determine the employer contributions to be made to the Retirement System so that the gap between the PVFB and assets is systematically paid off over time. The Funding Policy is adopted by the Board based on discussions with the actuary. When the Board develops a funding policy, a balance between contributions which are responsive to the needs of the Retirement System yet stable should be struck. There are many different funding policies for the Board to consider, and the actuary is responsible for discussing the various features of the funding policies under consideration. Funding Policies are generally reviewed during an experience review, but it is not uncommon to review a funding policy in between, particularly during period where large increases or decreases in contributions are expected. The Funding Policy is composed of three components: the actuarial cost method, the asset valuation method, and the amortization method.

Once the PVFB is developed, an actuarial cost method is used to allocate the PVFB. Under the actuarial cost method, the PVFB is allocated to past, current, and future service, respectively known as the actuarial accrued liability (AAL), normal cost (NC) and present value of future normal costs (PVFNC). The actuary computes the liability components (PVFB, NC, AAL, and PVFNC) for each participant in the Retirement System at the valuation date. These liability components are then totaled for the Retirement System. There are many actuarial cost methods. Different actuarial methods will produce different contribution patterns, but do not change the ultimate cost of the benefits. The entry age normal cost method is the most prevalent method used for public sector plans in the United States because the expected normal cost is calculated in such a way that it will tend to stay level as a percent of pay over a member's career.

Appendix A: Valuation Process and Glossary of Actuarial Terms (continued)

The Actuarial Valuation Process (continued)

The actuarial accrued liability (AAL) is also referred to as the amount of money the Retirement System should ideally have in the trust. The unfunded actuarial accrued liability (UAAL) is the portion of actuarial accrued liability that is not covered by the assets of the Retirement System. The UAAL can be a negative number, which means that the Retirement System has more assets than actuarial accrued liability. We refer to this condition as overfunded liability in this summary. Having UAAL does not indicate that the Retirement System is in failing actuarial health. Most retirement systems have UAAL. Another related statistic of the Retirement System is the funded ratio. The funded ratio is the percent of the actuarial accrued liabilities covered by the actuarial value of assets. The assets used for these purposes are an actuarial value of assets (AVA), not market. The actuarial value of assets is based on the asset valuation method as recommended by the actuary and adopted by the Board. An actuarial value of assets is a smoothed, or averaged, value of assets, which is used to limit employer contribution volatility. Typically, assets are smoothed, or averaged, over a period of 3 to 5 years. By averaging returns, the UAAL is not as volatile, which we will see later results in contributions that are not as volatile as well. The North Carolina Retirement Systems use an actuarial value of assets with a smoothing period of 5 years.

While having UAAL is common, it is acceptable only if it is systematically being paid off. The method by which the UAAL is paid off is known as the amortization method. The concept is similar to that of a mortgage payment. The Board adopts the amortization method used to pay off the UAAL over a period of time. The amortization method is composed of the amortization period, the amount of payment increase, whether the period is open or closed and by the amount of amortization schedules. The amortization period is the amount of time over which the UAAL will be paid off. This is generally a period of thirty years or less, but actuaries are beginning to recommend shorter periods. The payments can be developed to stay constant from year to year like a mortgage, but often they are developed to increase each year at the same level payroll increases. Amortization type can be closed or open. Under a closed period, the UAAL is expected to be paid off over the amortization period. This is similar to a typical mortgage. Under an open period, the amortization period remains unchanged year after year. The concept is similar to re-mortgaging annually. In many instances, an amortization schedule is developed, whereby the UAAL is amortized over a closed period from the point the UAAL is incurred. Finally, some amortization methods are defined by a schedule of payments, where a new schedule of payments is added with each valuation. Regardless of the amortization type or period, the funding policy should generate a contribution that pays off the UAAL, which results in the funded ratio trending to 100% over time. Caution should be used when an open method is used, because typically an open amortization policy does not result in the UAAL being paid off. North Carolina pays off a much larger amount of UAAL compared to other states. While many states struggle to pay a 30-year level percent of pay UAAL contribution, which doesn't even reduce the amount of UAAL, North Carolina pays down the UAAL with level dollar payments over 12 years. This aggressive payment schedule of the UAAL results in North Carolina being home to many of the best funded Public Retirement Systems in the United States.

To satisfy the requirements of the State of North Carolina, the actuary calculates the total annual contribution to the Retirement System as the normal cost plus a contribution towards UAAL. Said another way, this contribution is sufficient to pay for the cost of benefits accruing during the year (normal cost) plus the mortgage payment (UAAL payment). The total contribution is reduced by the amount of member contributions, if any, to arrive at the employer contribution. Continuing to follow the aggressive North Carolina contribution policy will keep the North Carolina Retirement Systems among the best funded in the United States.

Appendix A: Valuation Process and Glossary of Actuarial Terms (continued)

The Actuarial Valuation Process (continued)

An actuarial valuation report is produced annually, which contains the contribution for the fiscal year as well as the funded ratio of the Retirement System. The primary purpose of performing an actuarial valuation annually is to replace the estimated activities from the previous valuation, which were based on assumptions, with the actual experience of the Retirement System for the prior year. The experience gain (loss) is the difference between the expected and the actual UAAL of the Retirement System. An experience loss can be thought of as the amount of additional UAAL over and above the amount that was expected from the prior year due to deviation of actual experience from the assumption. Similarly, an experience gain can be thought of as having less UAAL than that which was expected from the prior year assumptions. As an example, if the Retirement System achieves an asset return of 15% when the assumption was a 6.50% return, an actuarial gain is said to have happened, which typically results in lower contributions and higher funded ratio, all else being equal. Alternatively, a return of 2% under the same circumstances would result in an actuarial loss, requiring an increase in contributions and a funded ratio that is lower than anticipated. Experience gains and losses are common within the valuation process. Typically gains and losses offset each other over time. To the extent that does not occur, the reasons for the gains and losses should be understood, and appropriate recommendations should be made by the actuary after an experience review to adjust the assumptions.

The actuarial valuation report will contain histories of key statistics from prior actuarial valuation reports. In particular, a history of the funded ratio of the Retirement System is an important exhibit. Trustees should understand the reason for the trend of the funded ratio of the Retirement System over time. The actuary will discuss the reasons for changes in the funded ratio of the Retirement System with each valuation report. To the extent that there are unexplained changes in funded ratio corrective action should be explored and the actuary will make recommendations as to whether there should be changes in the assumptions, funding policy, or some other portion of the actuarial valuation process.

In addition to historical information, projections of contributions and funded ratio based on current assumptions can sometimes be found in an actuarial valuation report. Projections of contributions can allow the employer to plan their budget accordingly. Surprises in Retirement System contributions to be paid by the employer serve no one. A one-year projection based on “bad” asset returns can provide ample time for the employer to plan or allow for a discussion of changing the funding policy to occur. Contribution surprises are a primary contributor to employers considering pension reform. It is important to keep the employer apprised of future contribution requirements. A projection of funded ratio can serve the Trustees by illustrating the trend of the funded ratio over time. The funded ratio, under a prudent funding policy, should trend to 100% over a period of less than 30 years. (It is worthwhile to note that while 30 years has served as an industry standard for the longest period over which 100% funding should be achieved, that period is coming under scrutiny by the actuarial community and will likely be shortened.) If a projection funded ratio does not trend to 100% over time, consideration should be given to fixing the funding policy to achieve this goal. For the largest North Carolina Retirement Systems, projections are generally performed for the January board meetings.

The actuarial report will contain schedules of information about the census, plan and asset information submitted by Retirement System staff upon which the actuarial valuation is based. It is important that the Board of Trustees review that information and determine if the information is consistent with their understanding of the Retirement System. If after questioning staff, the Board of Trustees is not comfortable that the information provided is correct, the actuary should be notified to determine if the actuarial valuation report should be corrected.

Finally, the valuation report and/or presentation should contain sufficient information in an understandable fashion to allow the Board to take action and adopt the contribution rate for the upcoming year. It should also allow stakeholders to understand key observations over the past year that resulted in contributions increasing (or decreasing) and where contributions are headed. The actuary is always open to making the results understandable. The actuary works with the North Carolina Retirement Systems Division to make your reports and presentations understandable and actionable. If something doesn’t make sense – speak up!!

Appendix A: Valuation Process and Glossary of Actuarial Terms (continued)

Glossary

Note that the first definitions given are the "official" definitions of the term. For some terms there is a second definition, in italics, which is the unofficial definition.

Actuarial Accrued Liability (AAL)

The portion of the Present Value of Projected Benefits (PVFB) allocated to past service. Also difference between (i) the actuarial present value of future benefits, and (ii) the present value of future normal cost. Sometimes referred to as "accrued liability" or "past service liability." *The amount of money that should be in the Fund. The funding target.*

Actuarial Assumptions

Estimates of future plan experience with respect to rates of mortality, disability, retirement, investment income and salary increases. Demographic ("people") assumptions (rates of mortality, separation, and retirement) are generally based on past experience, often modified for projected changes in conditions. Economic ("money") assumptions (salary increases and investment income) consist of an underlying rate appropriate in an inflation-free environment plus a provision for a long-term average rate of inflation. *Estimates of future events used to project what we know now- current member data, assets, and benefit provisions – into an estimate of future benefits.*

Actuarial Cost Method

A mathematical budgeting procedure for allocating the dollar amount of the Present Value of Projected Benefits (PVFB) between the normal costs to be paid in the future and the actuarial accrued liability. Sometimes referred to as the "actuarial funding method."

Actuarial Methods

The collective term for the Actuarial Cost Method, the Amortization Payment for UAAL Method, and the Asset Valuation Method used to develop the contribution requirements for the Retirement System. *The Funding Policy*.

Actuarial Equivalent

Benefits whose actuarial present values are equal.

Actuarial Present Value

The amount of funds presently required to provide a payment or series of payments in the future. It is determined by discounting the future payments at a predetermined rate of interest, taking into account the probability of payment.

Actuarial Value of Assets (AVA)

A smoothed value of assets which is used to limit contribution volatility. Also known as the funding value of assets*. Smoothed value of assets.*

Appendix A: Valuation Process and Glossary of Actuarial Terms (continued)

Glossary (continued)

Amortization Payment for UAAL

Payment of the unfunded actuarial accrued liability by means of periodic contributions of interest and principal, as opposed to a lump sum payment. The components of the amortization payment for UAAL includes:

- Amortization Period Length

  Generally, amortization periods of up to 15 to 20 years (and certainly not longer than 30) are allowed. Similar to a mortgage, the shorter the amortization period, the higher the payment and the faster the UAAL is paid off.

- Amortization payment increases

  Future payments can be level dollar, like a mortgage, or as a level percent of pay. Most Retirement Systems amortize UAAL as a level percent of pay which when combined with the employer normal cost that is developed as a level percent of pay can result in contributions that are easier to budget.

- Amortization type

  Amortization schedule can be closed or open. A closed amortization schedule is similar to a mortgage – at the end of the amortization period the UAAL is designed to be paid off. An open amortization period is similar to refinancing the UAAL year after year.

- Amortization schedule

  UAAL can be amortized over a single amortization period, or it can be amortized over a schedule.

The amortization payment for UAAL can be thought of as the UAAL mortgage payment.

Asset Valuation Method

The components of how the actuarial value of assets is to be developed FRSWPF uses a five-year smoothing of asset gains and losses, which is the most commonly used method.

Experience Gain (Loss)

A measure of the difference between actual experience and experience anticipated by a set of actuarial assumptions during the period between two actuarial valuation dates, in accordance with the actuarial cost method being used. *The experience Gain (Loss) represents how much the actuary missed the mark in a given year.*

Funded Ratio

The percent of the actuarial accrued liabilities covered by the actuarial value of assets. Also known as the funded status. *The ratio of how much money you actually have in the fund to the amount you should have in the fund.*

Normal Cost

The annual cost assigned, under the actuarial funding method, to current and subsequent plan years. Sometimes referred to as “current service cost.” An amortization payment toward the unfunded actuarial accrued liability is paid in addition to the normal cost to arrive at the total contribution in a given year. *The cost of benefits accruing during the year*.

Present Value of Future Normal Cost (PVFNC)

The portion of the Present Value of Projected Benefits (PVFB) allocated to future service. *The value in today’s dollars of the amount of contribution to be made in the future for benefits accruing for members in the Retirement System as of the valuation date. Note that in practice, this number is rarely discussed.*

Appendix A: Valuation Process and Glossary of Actuarial Terms (continued)

Glossary (continued)

Present Value of Future Benefits (PVFB)

The projected future benefit payments of the plan are discounted into today's dollars using an assumed rate of investment return assumption to determine the Present Value of Future Benefits (PVFB) of the Retirement System. The PVFB is the discounted value of the projected benefits promised to all members as of a valuation date, including future pay and service for members which has not yet been earned. *If the Retirement System held assets equal to the PVFB and all the assumptions were realized, there would be sufficient funds to pay off all the benefits to be paid in the future for members in the Retirement System as of the valuation date.*

Reserve Account

An account used to indicate that funds have been set aside for a specific purpose and are not generally available for other uses.

Unfunded Actuarial Accrued Liability (UAAL)

The difference between the actuarial accrued liability (AAL) and actuarial value of assets (AVA). The UAAL is sometimes referred to as "unfunded accrued liability." *Funding shortfall, or prefunded amount if negative.*

Valuation Date

The date that the actuarial valuation calculations are performed as of. *Also known as the "snapshot date".*

Appendix B: Detailed Tabulations of Member Data

Table B-1: The Number of Active and Lapsed Members Distributed by Age and Service as of December 31, 2021

	Years of Service										
Age	**Under 1**	**1 to 4**	**5 to 9**	**10 to 14**	**15 to 19**	**20 to 24**	**25 to 29**	**30 to 34**	**35 to 39**	**40 & Up**	**Total**
Under 25	498	2,099	263	2	0	0	0	0	0	0	2,862
25 to 29	661	2,625	1,883	228	2	0	0	0	0	0	5,399
30 to 34	682	2,371	1,844	1,371	216	0	0	0	0	0	6,484
35 to 39	516	1,966	1,458	1,167	1,045	167	1	0	0	0	6,320
40 to 44	305	1,538	1,088	892	910	823	111	0	0	0	5,667
45 to 49	224	1,186	898	761	744	1,000	641	87	0	0	5,541
50 to 54	189	965	744	651	603	1,103	814	567	85	0	5,721
55 to 59	99	587	482	395	347	306	123	101	30	1	2,471
60 to 64	58	256	217	204	213	102	18	6	1	3	1,078
65 to 69	25	113	102	94	102	38	4	2	1	0	481
70 & Up	30	87	79	71	53	23	3	3	1	0	350
Total	3,287	13,793	9,058	5,836	4,235	3,562	1,715	766	118	4	42,374

Appendix B: Detailed Tabulations of Member Data (continued)

Table B-2: The Number of Active and Lapsed Members Distributed by Age as of December 31, 2021

Age	Active Members Number	Lapsed Members Number
18	12	
19	132	
20	303	15
21	352	48
22	435	124
23	518	157
24	543	223
25	663	298
26	682	403
27	678	422
28	673	421
29	720	439
30	741	488
31	776	515
32	808	566
33	796	538
34	755	501
35	767	538
36	789	491
37	780	495
38	730	464
39	759	507
40	737	455
41	691	449
42	644	457
43	680	435
44	649	470
45	678	466
46	614	431
47	673	421
48	679	439
49	682	458
50	709	448
51	748	486
52	679	454
53	626	481
54	593	497
55	373	391
56	258	252
57	184	256

Appendix B: Detailed Tabulations of Member Data (continued)

Table B-2: The Number of Active and Lapsed Members Distributed by Age as of December 31, 2021 (continued)

Age	Active Members Number	Lapsed Members Number
58	218	203
59	191	145
60	148	154
61	125	116
62	106	103
63	87	84
64	97	58
65	60	60
66	56	52
67	64	38
68	41	39
69	45	26
70	26	28
71	26	28
72	24	17
73	26	18
74	17	15
75	11	9
76	8	8
77	8	6
78	6	13
79	7	5
80	3	8
81	1	4
82		5
83	2	2
84		6
85		4
86		1
87	1	2
88		1
89		1
90		2
91		1
Total	25,713	16,661

Appendix B: Detailed Tabulations of Member Data (continued)

Table B-3: The Number of Active and Lapsed Members Distributed by Service as of December 31, 2021

Service	Active Members Number	Lapsed Members Number
0	806	2,481
1	1,664	2,762
2	1,470	2,068
3	1,500	1,542
4	1,640	1,147
5	1,277	960
6	1,141	751
7	1,153	573
8	1,122	483
9	1,202	396
10	837	354
11	940	328
12	858	280
13	757	240
14	1,040	203
15	779	164
16	777	133
17	704	128
18	681	111
19	653	104
20	693	198
21	587	276
22	566	181
23	381	155
24	395	130
25	323	87
26	318	68
27	240	69
28	244	67
29	239	60
30	183	51
31	165	46
32	101	25
33	98	13
34	69	15

Appendix B: Detailed Tabulations of Member Data (continued)

Table B-3: The Number of Active and Lapsed Members Distributed by Service as of December 31, 2021 (continued)

Service	Active Members Number	Lapsed Members Number
35	63	6
36	25	2
37	13	4
38	3	
39	2	
40	3	
46	1	
Total	25,713	16,661

Appendix B: Detailed Tabulations of Member Data (continued)

Table B-4: The Number and Annual Retirement Allowances of Retired Members Distributed by Age as of December 31, 2021

Age	Number	Allowances
49	1	$ 2,040
52	1	2,040
55	226	461,040
56	450	918,000
57	507	1,034,280
58	576	1,175,040
59	555	1,132,200
60	590	1,203,600
61	612	1,248,480
62	553	1,128,120
63	629	1,283,160
64	530	1,081,200
65	624	1,272,960
66	559	1,140,360
67	629	1,283,160
68	609	1,242,360
69	600	1,224,000
70	565	1,152,600
71	545	1,111,800
72	507	1,034,280
73	461	940,440
74	477	973,080
75	505	1,030,200
76	344	701,760
77	364	742,560
78	356	726,240
79	364	742,560
80	270	550,800
81	258	526,320
82	239	487,560
83	188	383,520
84	167	340,680
85	152	310,080
86	154	314,160
87	132	269,280

Appendix B: Detailed Tabulations of Member Data (continued)

Table B-4:The Number and Annual Retirement Allowances of Retired Members Distributed by Age as of December 31, 2021 (continued)

Age	Number		Allowances
88	108	$	220,320
89	86		175,440
90	56		114,240
91	53		108,120
92	39		79,560
93	28		57,120
94	19		38,760
95	19		38,760
96	15		30,600
97	6		12,240
98	5		10,200
99	4		8,160
100	3		6,120
101	1		2,040
Total	14,741	$	30,071,640

Appendix B: Detailed Tabulations of Member Data (continued)

Table B-5: The Number and Annual Retirement Allowances of Disabled Members Eligible for Deferred Pensions Distributed by Age of December 31, 2021

Age	Number	Allowances
33	1	$ 2,040
36	2	4,080
38	3	6,120
39	3	6,120
41	1	2,040
42	2	4,080
43	3	6,120
44	2	4,080
46	7	14,280
47	4	8,160
48	2	4,080
49	3	6,120
50	8	16,320
51	11	22,440
52	13	26,520
53	8	16,320
54	10	20,400
55	5	10,200
56	2	4,080
57	4	8,160
58	2	4,080
59	3	6,120
60	2	4,080
61	1	2,040
63	1	2,040
68	1	2,040
70	3	6,120
73	1	2,040
Total	108	$ 220,320

Appendix C: Summary of Main Benefit and Contribution Provisions

All regular and volunteer firefighters of the State of North Carolina whose qualifications are certified by their departments are eligible to be members of the Fund. All rescue squad workers who are members of rescue squads eligible for membership in the North Carolina Association of Rescue Squads, Inc. and meet training requirements are eligible to be members of the Fund. Credit for prior service (that is, service rendered prior to July 1, 1959) is granted to firefighters who were eligible on July 1, 1959 and became members on or before June 30, 1961. Credit may also be given for certain special purchased service.

Benefits

Service Retirement Pension

Condition for Pension

A member who retires after he or she attained age 55 and has credit for 20 years of service as a firefighter or rescue squad worker in North Carolina is entitled to a monthly pension.

Amount of Pension

The amount of the pension is equal to $170 per month.

Deferred Early Retirement Pension

Condition for Pension

A member whose service is terminated after the member has credit for 20 years of service as a firefighter or rescue squad worker in North Carolina but before the member has attained age 55 is eligible to receive a deferred retirement pension, starting at age 55, provided the member continues to make regular contributions until age 55 or until the member has contributed for a total of 20 years, whichever event occurs earlier. Any member who is totally and permanently disabled while in the discharge of official duties and leaves service as a result of such disability is eligible for a deferred retirement pension commencing at age 55 without continuing to make contributions. Any member who becomes totally and permanently disabled for any cause, other than line of duty, after 10 years of credited service under the Pension Fund may continue to make monthly contributions until he or she has paid $2,400 into the Fund and receive a pension upon attainment of age 55.

Amount of Pension

The deferred pension is $170 per month.

Return of Contributions

Upon the death (not in the line of duty) or withdrawal of a member prior to retirement, the member's aggregate contributions are refunded in a lump sum.

Upon the death (not in the line of duty) of a retired member, the excess, if any, of his or her aggregate contributions over the total of the pension payments he or she has received is refunded.

Line of Duty Death Benefit

Upon the death (in the line of duty) of a retired or active member, an amount of $170 per month is payable to the member's beneficiary, if living, beginning the month following the month the member would have attained age 55, or if the member had already attained age 55, beginning the month following the member's death, payable until the beneficiary's death.

Appendix C: Summary of Main Benefit and Contribution Provisions (continued)

Contributions

By Members

Each member contributes $10 per month until retirement or until the member has contributed for a total of 20 years, whichever event occurs earlier.

By State

The State makes annual contributions sufficient, with the members' contributions, to meet the cost of the benefits under the Fund.

Changes in Assumptions and Methods Since Prior Valuation

The assumptions and methods used for the December 31, 2021 actuarial valuation are based on the experience study prepared as of December 31, 2019 and adopted by the Board of Trustees on January 28, 2021.

Since the prior valuation, a transition from the prior actuary to Buck resulted in valuation programming modifications and differences in methodology. Specifically, modifications included enhanced coding to better reflect the return-to-service assumption for lapsed members who have already attained 20 years of service. The impact of this change decreased the actuarial accrued liability by $2.9 million, as of December 31, 2021, or 0.57% of the expected actuarial accrued liability.

Appendix D: Actuarial Assumptions and Methods

Assumptions are based on the experience investigation prepared as of December 31, 2019 and adopted by the Board of Trustees on January 28, 2021 for use beginning with the December 31, 2020 annual actuarial valuation.

Interest Rate

6.50% per annum, compounded annually.

Price Inflation:

2.50% per annum, compounded annually.

Separations from Active Service

Representative values of the assumed annual rates of withdrawal and vesting, retirement, death, and disability are as follows:

Annual Rates of Withdrawal

	Service		
Age	<5	5-19	20+
< 55	0.030	0.015	1.000
55	0.100	0.075	0.000
> 55	0.000	0.000	0.000

Annual Rates of Retirement

	Service		
Age	<20	20	21+
55	0.000	0.850	0.850
56-79	0.000	0.750	0.600
80	1.000	1.000	1.000

Annual Rates of Base Mortality and Disability

	Base Mortality*		Disability
Age	Male	Female	Male
25	.00037	.00020	.0005
30	.00041	.00027	.0005
35	.00047	.00036	.0008
40	.00059	.00049	.0010
45	.00082	.00067	.0022
50	.00120	.00091	.0024
55	.00175	.00123	.0035
60	.00264	.00168	.0061
65	.00410	.00228	
70	.00766	.00454	
75	.01432	.00903	
79	.02361	.01566	

* Base mortality rates using Pub-2010 Safety Amount-Weighted mortality table

Appendix D: Actuarial Assumptions and Methods (continued)

Return to Service

The assumed rates in which a lapsed member returns to active service are based on the number of years that the member has been lapsed. These rates are as follows:

Number of Years Member has been Lapsed	Percentage of Members Assumed to Return to Active Service	Number of Years Member has been Lapsed	Percentage of Members Assumed to Return to Active Service*
1 Year	42.0%	5 Years	6.0%
2 Years	23.0%	6 Years	4.5%
3 Years	14.0%	7 Years	3.0%
4 Years	10.0%	8 Years	0.0%

* Members who are assumed to return to service are assumed to do so at the valuation date. Members who are assumed to not return to service (and have not yet attained 20 years of service) are assumed to receive a refund of contribution at age 55.

Post-Retirement Mortality

Representative values of the assumed post-retirement mortality rates are based on the Pub-2010 Safety Retirees Amount-Weighted mortality table for healthy retirees and the Pub-2010 General Disabled Retirees Amount-Weighted mortality table for disabled retirees, prior to any mortality improvements, are as follows:

Annual Rate of Death after Retirement				
	Healthy Retirees		Disabled Retirees	
Age	Male	Female	Male	Female
55	.00327	.00279	.01818	.01587
60	.00549	.00482	.02280	.01833
65	.00957	.00832	.02677	.02051
70	.01711	.01438	.03353	.02450
75	.03085	.02483	.04344	.03239
80	.05571	.04287	.05921	.04678

Mortality Assumption

All mortality rates use Pub-2010 amount-weighted tables.

Mortality Projection

All mortality rates are projected from 2010 using generational improvement with Scale MP-2019.

Deaths After Retirement (Healthy at Retirement)

Mortality rates are based on the Safety Retirees Mortality table. Rates for all members are multiplied by 97% and Set Forward 1 year. Because the retiree tables have no rates prior to age 45, the Safety Mortality Table for Employees is used for ages less than 45.

Death After Retirement (Disabled Members at Retirement)

Mortality rates are based on the General Mortality Table for Disabled Retirees. Rates for all members are Set Back 3 years.

Appendix D: Actuarial Assumptions and Methods (continued)

Deaths After Retirement (Survivors of Deceased Members)

Mortality rates are based on the Below-Median Teachers Mortality Table for Contingent Survivors. Rates for male members are Set Forward 3 years. Rates for female members are Set Forward 1 year. Because the contingent survivor tables have no rates prior to age 45, the Below- Median Teachers Mortality Table for Employees is used for ages less than 45.

Deaths Prior to Retirement

Mortality rates are based on the Safety Mortality Table for all Employees.

Line of Duty Death Assumption

10% of pre-retirement deaths are assumed to be in the line of duty.

Marriage Assumption

90% of male members married and 50% of female members married with the male spouses three years older than female spouses.

Missing Gender Code

For members reported on the data without a gender code, we use the prior year's code where available or assign a code based on inspection.

Timing of Assumptions

All withdrawals, deaths, disabilities, and retirements are assumed to occur July 1 of each year. The timing of retirement changes from mid-year to beginning of year at and after the 100% retirement age.

Future Expenses

Equal to prior year actual administrative expenses added to Normal Cost.

Actuarial Cost Method

Entry age normal cost method. Entry age is established on an individual basis.

Amortization Period

12-year closed, level-dollar amount. The first amortization base was created for the contribution payable for fiscal year ending 2012.

Asset Valuation Method

Actuarial value, as developed in Table 8. The actuarial value of assets is based upon a smoothed market value method. Under this method, asset returns in excess of or less than the expected return on market value of assets will be reflected in the actuarial value of assets over a five-year period. The Actuarial Value of Assets was reset to the market value of assets as of December 31, 2014. The calculation of the Actuarial Value of Assets is based on the following formula:

$MV - 80\% \times G/(L)_1 - 60\% \times G/(L)_2 - 40\% \times G/(L)_3 - 20\% \times G/(L)_4$

MV = the market value of assets as of the valuation date

$G/(L)_i$ = the asset gain or (loss) for the i-th year preceding the valuation date

Appendix D: Actuarial Assumptions and Methods (continued)

Changes Since Prior Valuation

Since the prior valuation, a transition from the prior actuary to Buck resulted in valuation programming modifications and differences in methodology. Specifically, modifications included enhanced coding to better reflect the return-to-service assumption for lapsed members who have already attained 20 years of service. The impact of this change decreased the actuarial accrued liability by $2.9 million, as of December 31, 2021, or 0.57% of the expected actuarial accrued liability.

Appendix E: GASB 67 Fiduciary Net Position Projection

Table E-1: Projection of Fiduciary Net Positions (in thousands)

Calendar Year	Beginning Fiduciary Position	Member Contributions	Employer Contributions	Benefit Payments	Administrative Expenses	Investment Earnings	Ending Fiduciary Position
2022	$ 538,379	$ 2,719	$ 19,527	$ 32,717	$ 990	$ (37,297)	$ 489,621
2023	489,621	2,643	19,877	32,310	1,049	31,478	510,260
2024	510,260	2,499	20,227	32,962	1,049	32,805	531,780
2025	531,780	2,358	20,577	33,589	1,049	34,191	554,268
2026	554,268	2,227	20,927	34,188	1,050	35,641	577,825
2027	577,825	2,087	10,551	34,628	1,050	36,821	591,606
2028	591,606	1,956	0	35,052	1,050	37,362	594,822
2029	594,822	1,808	0	35,500	1,050	37,553	597,633
2030	597,633	1,681	0	35,867	1,050	37,718	600,115
2031	600,115	1,559	0	36,152	1,050	37,868	602,340
2032	602,340	1,430	0	36,464	1,050	37,998	604,254
2033	604,254	1,314	0	36,660	1,050	38,113	605,971
2034	605,971	1,179	0	36,918	1,050	38,211	607,393
2035	607,393	1,052	0	37,085	1,050	38,295	608,605
2036	608,605	933	0	37,302	1,050	38,363	609,549
2037	609,549	813	0	37,626	1,050	38,410	610,096
2038	610,096	683	0	37,968	1,050	38,429	610,190
2039	610,190	544	0	38,314	1,050	38,421	609,791
2040	609,791	408	0	38,750	1,050	38,376	608,775
2041	608,775	282	0	39,183	1,050	38,293	607,117
2042	607,117	71	0	39,651	1,050	38,162	604,649
2043	604,649	10	0	39,998	1,050	37,990	601,601
2044	601,601	4	0	40,236	1,083	37,783	598,069
2045	598,069	1	0	40,421	1,119	37,546	594,076
2046	594,076	1	0	40,480	1,155	37,283	589,725
2047	589,725	0	0	40,480	1,189	37,000	585,056
2048	585,056	0	0	40,409	1,222	36,697	580,122
2049	580,122	0	0	40,250	1,253	36,381	575,000
2050	575,000	0	0	40,101	1,286	36,051	569,664
2051	569,664	0	0	39,953	1,319	35,708	564,100
2052	564,100	0	0	39,729	1,351	35,352	558,372
2053	558,372	0	0	39,301	1,377	34,993	552,687
2054	552,687	0	0	38,834	1,401	34,637	547,089
2055	547,089	0	0	38,240	1,420	34,291	541,720
2056	541,720	0	0	37,488	1,434	33,967	536,765
2057	536,765	0	0	36,660	1,443	33,671	532,333
2058	532,333	0	0	35,591	1,442	33,418	528,718
2059	528,718	0	0	34,365	1,432	33,221	526,142
2060	526,142	0	0	33,131	1,421	33,093	524,683
2061	524,683	0	0	31,907	1,408	33,039	524,407
2062	524,407	0	0	30,692	1,394	33,060	525,381
2063	525,381	0	0	29,489	1,378	33,162	527,676
2064	527,676	0	0	28,297	1,361	33,350	531,368
2065	531,368	0	0	27,117	1,342	33,629	536,538
2066	536,538	0	0	25,950	1,321	34,002	543,269
2067	543,269	0	0	24,795	1,299	34,479	551,654
2068	551,654	0	0	23,653	1,275	35,060	561,786
2069	561,786	0	0	22,524	1,249	35,755	573,768
2070	573,768	0	0	21,409	1,221	36,571	587,709
2071	587,709	0	0	20,309	1,192	37,514	603,722

Appendix E: GASB 67 Fiduciary Net Position Projection (continued)

Table E-1: Projection of Fiduciary Net Positions (in thousands) (continued)

Calendar Year	Beginning Fiduciary Position	Member Contributions	Employer Contributions	Benefit Payments	Administrative Expenses	Investment Earnings	Ending Fiduciary Position
2072	$ 603,722	$ 0	$ 0	$ 19,223	$ 1,160	$ 38,590	$ 621,929
2073	621,929	0	0	18,153	1,127	39,809	642,458
2074	642,458	0	0	17,099	1,091	41,178	665,446
2075	665,446	0	0	16,063	1,054	42,706	691,035
2076	691,035	0	0	15,047	1,015	44,403	719,376
2077	719,376	0	0	14,051	975	46,280	750,630
2078	750,630	0	0	13,077	932	48,342	784,963
2079	784,963	0	0	12,128	889	50,606	822,552
2080	822,552	0	0	11,205	844	53,081	863,584
2081	863,584	0	0	10,310	798	55,778	908,254
2082	908,254	0	0	9,445	751	58,710	956,768
2083	956,768	0	0	8,613	703	61,891	1,009,343
2084	1,009,343	0	0	7,816	655	65,336	1,066,208
2085	1,066,208	0	0	7,054	607	69,058	1,127,605
2086	1,127,605	0	0	6,332	560	73,074	1,193,787
2087	1,193,787	0	0	5,649	513	77,400	1,265,025
2088	1,265,025	0	0	5,008	466	82,052	1,341,603
2089	1,341,603	0	0	4,409	421	87,049	1,423,822
2090	1,423,822	0	0	3,855	378	92,414	1,512,003
2091	1,512,003	0	0	3,344	336	98,162	1,606,485
2092	1,606,485	0	0	2,878	297	104,319	1,707,629
2093	1,707,629	0	0	2,456	260	110,910	1,815,823
2094	1,815,823	0	0	2,077	225	117,954	1,931,475
2095	1,931,475	0	0	1,739	193	125,484	2,055,027
2096	2,055,027	0	0	1,441	164	133,525	2,186,947
2097	2,186,947	0	0	1,181	137	142,109	2,327,738
2098	2,327,738	0	0	955	114	151,269	2,477,938
2099	2,477,938	0	0	762	93	161,039	2,638,122
2100	2,638,122	0	0	599	75	171,457	2,808,905
2101	2,808,905	0	0	463	59	182,562	2,990,945
2102	2,990,945	0	0	352	46	194,398	3,184,945
2103	3,184,945	0	0	262	35	207,012	3,391,660
2104	3,391,660	0	0	192	26	220,450	3,611,892
2105	3,611,892	0	0	137	19	234,768	3,846,504
2106	3,846,504	0	0	96	14	250,019	4,096,413
2107	4,096,413	0	0	66	10	266,265	4,362,602
2108	4,362,602	0	0	44	7	283,568	4,646,119
2109	4,646,119	0	0	28	4	301,996	4,948,083
2110	4,948,083	0	0	18	3	321,624	5,269,686
2111	5,269,686	0	0	11	2	342,530	5,612,203
2112	5,612,203	0	0	7	1	364,793	5,976,988
2113	5,976,988	0	0	4	1	388,504	6,365,487
2114	6,365,487	0	0	2	1	413,757	6,779,241
2115	6,779,241	0	0	1	0	440,650	7,219,890
2116	7,219,890	0	0	1	0	469,293	7,689,182
2117	7,689,182	0	0	0	0	499,797	8,188,979
2118	8,188,979	0	0	0	0	532,283	8,721,262
2119	8,721,262	0	0	0	0	566,882	9,288,144
2120	9,288,144	0	0	0	0	603,730	9,891,874
2121	9,891,874	0	0	0	0	642,972	10,534,846

Appendix E: GASB 67 Fiduciary Net Position Projection (continued)

Table E-2: Actuarial Present Value of Projected Benefit Payments (in thousands)

Calendar Year	Beginning Fiduciary Position	Benefit Payments	Funded Benefit Payments	Unfunded Benefit Payments	Present Value of Benefit Payments		
					Funded Payments at 6.50%	Unfunded Payments at 3.54%	Using Single Discount Rate of 6.50%
2022	$ 538,379	$ 32,717	$ 32,717	$ 0	$ 31,703	$ 0	$ 31,703
2023	489,621	32,310	32,310	0	29,398	0	29,398
2024	510,260	32,962	32,962	0	28,160	0	28,160
2025	531,780	33,589	33,589	0	26,945	0	26,945
2026	554,268	34,188	34,188	0	25,751	0	25,751
2027	577,825	34,628	34,628	0	24,491	0	24,491
2028	591,606	35,052	35,052	0	23,278	0	23,278
2029	594,822	35,500	35,500	0	22,136	0	22,136
2030	597,633	35,867	35,867	0	21,000	0	21,000
2031	600,115	36,152	36,152	0	19,875	0	19,875
2032	602,340	36,464	36,464	0	18,823	0	18,823
2033	604,254	36,660	36,660	0	17,769	0	17,769
2034	605,971	36,918	36,918	0	16,802	0	16,802
2035	607,393	37,085	37,085	0	15,848	0	15,848
2036	608,605	37,302	37,302	0	14,968	0	14,968
2037	609,549	37,626	37,626	0	14,177	0	14,177
2038	610,096	37,968	37,968	0	13,432	0	13,432
2039	610,190	38,314	38,314	0	12,727	0	12,727
2040	609,791	38,750	38,750	0	12,087	0	12,087
2041	608,775	39,183	39,183	0	11,476	0	11,476
2042	607,117	39,651	39,651	0	10,904	0	10,904
2043	604,649	39,998	39,998	0	10,328	0	10,328
2044	601,601	40,236	40,236	0	9,755	0	9,755
2045	598,069	40,421	40,421	0	9,202	0	9,202
2046	594,076	40,480	40,480	0	8,653	0	8,653
2047	589,725	40,480	40,480	0	8,125	0	8,125
2048	585,056	40,409	40,409	0	7,616	0	7,616
2049	580,122	40,250	40,250	0	7,123	0	7,123
2050	575,000	40,101	40,101	0	6,663	0	6,663
2051	569,664	39,953	39,953	0	6,234	0	6,234
2052	564,100	39,729	39,729	0	5,820	0	5,820
2053	558,372	39,301	39,301	0	5,406	0	5,406
2054	552,687	38,834	38,834	0	5,016	0	5,016
2055	547,089	38,240	38,240	0	4,638	0	4,638
2056	541,720	37,488	37,488	0	4,269	0	4,269
2057	536,765	36,660	36,660	0	3,920	0	3,920
2058	532,333	35,591	35,591	0	3,573	0	3,573
2059	528,718	34,365	34,365	0	3,240	0	3,240
2060	526,142	33,131	33,131	0	2,933	0	2,933
2061	524,683	31,907	31,907	0	2,652	0	2,652
2062	524,407	30,692	30,692	0	2,395	0	2,395
2063	525,381	29,489	29,489	0	2,161	0	2,161
2064	527,676	28,297	28,297	0	1,947	0	1,947
2065	531,368	27,117	27,117	0	1,752	0	1,752
2066	536,538	25,950	25,950	0	1,574	0	1,574
2067	543,269	24,795	24,795	0	1,412	0	1,412
2068	551,654	23,653	23,653	0	1,265	0	1,265
2069	561,786	22,524	22,524	0	1,131	0	1,131
2070	573,768	21,409	21,409	0	1,010	0	1,010
2071	587,709	20,309	20,309	0	899	0	899

Appendix E: GASB 67 Fiduciary Net Position Projection (continued)

Table E-2: Actuarial Present Value of Projected Benefit Payments (in thousands) (continued)

Calendar Year	Beginning Fiduciary Position	Benefit Payments	Funded Benefit Payments	Unfunded Benefit Payments	Present Value of Benefit Payments		
					Funded Payments at 6.50%	Unfunded Payments at 3.54%	Using Single Discount Rate of 6.50%
2072	$ 603,722	$ 19,223	$ 19,223	$ 0	$ 799	$ 0	$ 799
2073	621,929	18,153	18,153	0	709	0	709
2074	642,458	17,099	17,099	0	627	0	627
2075	665,446	16,063	16,063	0	553	0	553
2076	691,035	15,047	15,047	0	486	0	486
2077	719,376	14,051	14,051	0	426	0	426
2078	750,630	13,077	13,077	0	373	0	373
2079	784,963	12,128	12,128	0	324	0	324
2080	822,552	11,205	11,205	0	281	0	281
2081	863,584	10,310	10,310	0	243	0	243
2082	908,254	9,445	9,445	0	209	0	209
2083	956,768	8,613	8,613	0	179	0	179
2084	1,009,343	7,816	7,816	0	153	0	153
2085	1,066,208	7,054	7,054	0	129	0	129
2086	1,127,605	6,332	6,332	0	109	0	109
2087	1,193,787	5,649	5,649	0	91	0	91
2088	1,265,025	5,008	5,008	0	76	0	76
2089	1,341,603	4,409	4,409	0	63	0	63
2090	1,423,822	3,855	3,855	0	52	0	52
2091	1,512,003	3,344	3,344	0	42	0	42
2092	1,606,485	2,878	2,878	0	34	0	34
2093	1,707,629	2,456	2,456	0	27	0	27
2094	1,815,823	2,077	2,077	0	22	0	22
2095	1,931,475	1,739	1,739	0	17	0	17
2096	2,055,027	1,441	1,441	0	13	0	13
2097	2,186,947	1,181	1,181	0	10	0	10
2098	2,327,738	955	955	0	8	0	8
2099	2,477,938	762	762	0	6	0	6
2100	2,638,122	599	599	0	4	0	4
2101	2,808,905	463	463	0	3	0	3
2102	2,990,945	352	352	0	2	0	2
2103	3,184,945	262	262	0	2	0	2
2104	3,391,660	192	192	0	1	0	1
2105	3,611,892	137	137	0	1	0	1
2106	3,846,504	96	96	0	0	0	0
2107	4,096,413	66	66	0	0	0	0
2108	4,362,602	44	44	0	0	0	0
2109	4,646,119	28	28	0	0	0	0
2110	4,948,083	18	18	0	0	0	0
2111	5,269,686	11	11	0	0	0	0
2112	5,612,203	7	7	0	0	0	0
2113	5,976,988	4	4	0	0	0	0
2114	6,365,487	2	2	0	0	0	0
2115	6,779,241	1	1	0	0	0	0
2116	7,219,890	1	1	0	0	0	0
2117	7,689,182	0	0	0	0	0	0
2118	8,188,979	0	0	0	0	0	0
2119	8,721,262	0	0	0	0	0	0
2120	9,288,144	0	0	0	0	0	0
2121	9,891,874	0	0	0	0	0	0

Appendix F: Data for Corresponding Graphs in Valuation Input Process and Valuation Results

The tables below provide the numbers associated with the graphs in the valuation input process and valuation results of this report.

Graph 1: Active Members

	Lapsed Member Count	Active Member Count
2017	13,134	25,068
2018	14,091	25,154
2019	15,225	24,994
2020	16,465	24,655
2021	16,661	25,713

Graph 2: Retired Members

	Retired Member Count	Retirement Allowance
2017	14,308	$ 29,188,320
2018	14,422	29,420,880
2019	14,765	30,120,600
2020	14,922	30,440,880
2021	14,741	30,071,640

Graph 3: Market Value of Assets and Annualized Asset Returns

	Market Value of Assets	Annualized Asset Return*
2017	$ 424,211,921	13.33%
2018	408,109,943	-1.40%
2019	458,687,909	14.87%
2020	499,936,606	11.22%
2021	538,379,184	9.72%

Graph 5: Actuarial Value and Market Value of Assets

	Actuarial Value of Assets	Market Value of Assets
2017	$ 418,265,538	$ 424,211,921
2018	429,031,975	408,109,943
2019	445,876,956	458,687,909
2020	475,032,285	499,936,606
2021	508,510,376	538,379,184

Appendix F: Data for Corresponding Graphs in Valuation Input Process and Valuation Results (continued)

Graph 6: Asset Returns

	Asset Return* (Actuarial Value)	Asset Return* (Market Value)
2017	6.54%	13.33%
2018	5.08%	-1.40%
2019	6.19%	14.87%
2020	8.80%	11.22%
2021	9.18%	9.72%

Graph 7: Actuarial Accrued Liability

	Liability for Active Members	Liability for Retired and Deferred Members	Total Liability
2017	$ 187,805,856	$ 282,113,410	$ 469,919,266
2018	189,040,602	284,919,963	473,960,565
2019	192,551,174	290,265,691	482,816,865
2020	203,435,241	292,577,066	496,012,307
2021	209,302,255	287,180,992	496,483,247

Graph 8: Actuarial Accrued Liability and Actuarial Value of Assets

	Actuarial Accrued Liability	Actuarial Value of Assets
2017	$ 469,919,266	$ 418,265,538
2018	473,960,565	429,031,975
2019	482,816,865	445,876,956
2020	496,012,307	475,032,285
2021	496,483,247	508,510,376

Graph 9: Funded Ratios

	Funded Ratio (Actuarial Basis)	Funded Ratio (Market Basis)
2017	89.0%	90.3%
2018	90.5%	86.1%
2019	92.3%	95.0%
2020	95.8%	100.8%
2021	102.4%	108.4%

Appendix F: Data for Corresponding Graphs in Valuation Input Process and Valuation Results (continued)

Graph 10: Actuarially Determined Employer Contribution Rates

Fiscal Year Ending	Normal Contribution	Accrued Liability Contribution	Total Contribution
2020	$ 5,775,743	$ 9,694,236	$ 15,469,979
2021	5,930,372	9,488,384	15,418,756
2022	5,899,243	9,283,280	15,182,523
2023	5,729,089	7,357,430	13,086,519
2024*	5,732,168	(1,936,295)	3,795,873

* Subject to the impact of future legislative changes during that fiscal year