Consolidated Judicial Retirement System of North Carolina

Principal Results of Actuarial Valuation as of December 31, 2021

October 27, 2022, Board of Trustees Meeting

Tonya Manning, FSA, EA, MAAA, FCA
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Valuation input

Member data

Inputs

Membership Data

Asset Data

Benefit Provisions

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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	569	558
Terminated members and survivors of deceased members entitled to benefits but not yet receiving benefits	57	52
Retired members and survivors of deceased members currently receiving benefits	792	761
Total	1,418	1,371

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

The number of active members has increased by 2.0% from the previous valuation date.

An increase in active members results in more benefits accruing but also more contributions supporting the system.

The number of retired members and survivors of deceased members currently receiving benefits increased by 4.1% from the previous valuation date.

The increase in retiree population is consistent with expectations.

Valuation input

Asset data

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Membership Data

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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	$ 695,354,777	$ 639,475,570
Employer Contributions	29,344,457	28,384,617
Employee Contributions	5,210,339	5,897,139
Benefit Payments Other Than Refunds	(52,663,696)	(48,697,356)
Refunds	(31,907)	(24,058)
Administrative Expense	(34,873)	(28,215)
Investment Income	66,364,430	70,347,080
Net Increase/(Decrease)	48,188,750	55,879,207
End of Year Market Value of Assets	$ 743,543,527	$ 695,354,777
Estimated Net Investment Return on Market Value	9.67%	11.13%

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

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

For 2021, incoming contributions covered over 66% 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.

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Net actuarial gain or loss

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

(in millions)	
Unfunded Actuarial Accrued Liability (UAAL) as of 12/31/2020	$ 134.6
Normal Cost and Administrative Expenses during 2021	13.9
Reduction due to Actual Contributions during 2021	(34.6)
Interest on UAAL, Normal Cost, and Contributions	8.5
Asset (Gain)/Loss	(17.4)
Actuarial Accrued Liability (Gain)/Loss	22.3
Impact of Assumption Changes	-
Impact of Benefit Changes	2.1
Unfunded Actuarial Accrued Liability (UAAL) as of 12/31/2021	$ 129.4

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

During 2021, the UAAL decreased by $5.2 million.

The decrease was primarily due to an asset gain of $17.4 million and contributions in excess of the normal cost and administrative expenses. These gains were partially offset by a loss of $7.3 million due to demographic experience and an increase in UAAL of $15.0 million due to valuation programming modifications and differences in methodology as a result of the transition from the prior actuarial firm to Buck.

Benefit changes (one-time supplement payable in October 2022) increased the UAAL by $2.1 million.

Valuation results

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

Fiscal year ending June 30, 2023 Preliminary ADEC (based on December 31, 2020 valuation)	37.01%
Impact of Benefit Changes*	2.64%
Fiscal year ending June 30, 2023 Final ADEC	39.65%
Change Due to Anticipated Reduction in UAAL**	(6.61%)
Change Due to Demographic (Gain)/Loss	4.50%
Change Due to Investment (Gain)/Loss	(2.64%)
Change Due to Contributions Less (Greater) than ADEC	(0.35%)
Impact of Assumption Changes	0.00%
Impact of Benefit Changes	0.32%
Impact of Direct Rate Smoothing	0.61%
Reversal of one-time Legislative Costs	(2.64%)
Fiscal year ending June 30, 2024 Preliminary ADEC (based on December 31, 2021 valuation)	32.84%

- Due to the one-time pension supplement to be paid October 2022.

**Amortization of the UAAL included a fresh-start 9-year amortization for the December 31, 2009, valuation with the first payment effective July 1, 2011. However, the Appropriations Act of 2011 changed the period over which the UAAL is amortized from nine years to 12 years, retroactive to July 1, 2011, as implemented in the December 31, 2010, valuation. As such, the original amortization balance with current annual payments of $4.7 million will be paid off as of June 30, 2023, which significantly reduces the ADEC.

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

The change in rate due to investment gain is based on the actuarial value of asset return of 9.17%, which was greater than the 6.50% assumed return.

The 12-year amortization of the fresh start unfunded actuarial accrued liability as of December 31, 2009 is paid off as of July 1, 2023, which significantly reduces the ADEC for fiscal year ending June 30, 2024.

Valuation results

Employer contributions and benefit enhancements

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

Valuation Date	Fiscal Year Ending	Normal Rate*	Accrued Liability Rate	Change due to Legislation**	Final ADEC	Appropriated Rate
12/31/2021	6/30/2024	14.16%	18.68%	N/A	N/A	N/A
12/31/2020	6/30/2023	13.02%	23.99%	2.64%	39.65%	39.95%
12/31/2019	6/30/2022	17.59%	21.11%	1.32%	40.02%	40.02%
12/31/2018	6/30/2021	17.43%	19.01%	0.00%	36.44%	36.44%
12/31/2017	6/30/2020	17.28%	16.32%	0.00%	33.60%	33.60%

* Includes Death Benefit rate

** The change due to legislation for the contribution for fiscal year ending June 30, 2023 provided for a 4% one-time supplement payable in October 2022. The change due to legislation for the contribution for fiscal year ending June 30, 2022 provided for a 2% one-time supplement payable in December 2021.

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

The appropriated rate for the fiscal year ending June 30, 2023 is 39.95%.

The preliminary ADEC for the fiscal year ending June 30, 2024 is 32.84%.

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 9.67% compared to 6.50% assumed at the beginning of the year
  - 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 beginning with the December 31, 2020 valuation
  - 12-year amortization of the fresh start unfunded actuarial accrued liability as of December 31, 2009 with current annual payments of $4.7 million will be paid off as of June 30, 2023, which significantly reduces the actuarially determined employer contribution rate
  - 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
  - Recent legislation signed into law since the prior valuation
    - One-time supplement payment for CJRS payees of 4% of their annual retirement allowance, payable in October 2022

Key takeaways (continued)

- When compared to the December 31, 2020 valuation, the above resulted in:
  - Higher funded ratio (84.4% in the December 31, 2021 valuation compared to 83.1% in the December 31, 2020 valuation)
  - Lower actuarially determined employer contribution rate (32.84% for fiscal year ending June 30, 2024 compared to the 37.01% preliminary ADEC calculated in the valuation for fiscal year ending June 30, 2023)

Key takeaways (continued)

- CJRS is well funded compared to its peers. This is due to:
  - Stakeholders working together to keep CJRS well-funded since inception
  - A history of appropriating and contributing the recommended contribution requirements
  - Assumptions that in aggregate are more conservative than peers
  - A funding policy that aggressively pays down unfunded liability over a 12-year period
  - An ad hoc cost-of-living adjustment that supports the health of the system
  - Modest changes in benefits when compared to peers
- Continued focus on these measures will be needed to maintain the solid status of CJRS 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, CMC performed no analysis of the potential range of such future differences, except for some limited analysis in financial projections or required disclosure information.

We meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained in this report. This report has been prepared in accordance with all applicable Actuarial Standards of Practice, and we are available to answer questions about it.

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

Consolidated Judicial Retirement System of North Carolina

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

October 2022

110 West Berry Street
Suite 1300
Fort Wayne, IN 46802

October 13, 2022

Board of Trustees
Consolidated Judicial 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 Consolidated Judicial Retirement System of North Carolina (referred to as "CJRS" or the "Judicial Plan") prepared as of December 31, 2021. The report has been prepared in accordance with North Carolina General Statute 135-50 through 135-75. 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 CJRS, 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 Global, LLC (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. 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, salary increase, 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 experience, 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)

Michael A Ribble, FSA, EA, MAAA, FCA
Principal, Retirement Actuary

Elizabeth A. Wiley, FSA, EA, MAAA, FCA
Senior Consultant, Retirement Actuary

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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 in the state of North Carolina. During the fiscal year ending June 30, 2022, RSD paid nearly $7.1 billion in pensions to more than 330,000 retirees. And as of June 30, 2022, RSD's 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.

In 1985, the Consolidated Judicial Retirement System (referred to as "CJRS" or the "Judicial Plan") was established. CJRS provides benefits to the elected judges and justices, district attorneys, clerks of superior court of the general court of justice and public defenders. As of December 31, 2021, CJRS has over $743 million in assets and over 1,400 members. This actuarial valuation report is our annual analysis of the financial health of CJRS. This report, prepared as of December 31, 2021, presents the results of the actuarial valuation of CJRS.

Purpose

An actuarial valuation is performed on CJRS annually as of the end of the calendar year. The actuary determines the amount of contributions to be made to CJRS 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 CJRS,
- 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

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. Table F-1 of this report demonstrates the sensitivity of valuation results to differing discount rates.
- 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 as compared to the December 31, 2020 valuation were:

- Market value returns of 9.67% compared to 6.50% assumed at the beginning of the year
- 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 beginning with the December 31, 2020 valuation
- 12-year amortization of the fresh start unfunded actuarial accrued liability as of December 31, 2009 with current annual payments of $4.7 million will be paid off as of June 30, 2023, which significantly reduces the actuarially determined employer contribution rate
- 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
- Recent legislation signed into law since the prior valuation
  - One-time supplement payment for CJRS payees of 4% of their annual retirement allowance, payable in October 2022

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

- Higher funded ratio (84.4% in the December 31, 2021 valuation compared to 83.1% in the December 31, 2020 valuation)
- Lower actuarially determined employer contribution rate (32.84% for fiscal year ending June 30, 2024 compared to 39.95% for fiscal year ending June 30, 2023)

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

- Stakeholders working together to keep CJRS well-funded since inception
- A history of appropriating and contributing the recommended contribution requirements
- Assumptions that in aggregate are more conservative than peers
- A funding policy that aggressively pays down unfunded liability over a 12-year period
- An ad hoc cost-of-living adjustment that supports the health of the system
- Modest changes in benefits when compared to peers

Continued focus on these measures will be needed to maintain the solid status of CJRS 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.

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.

1.1 Summary of Principal Results

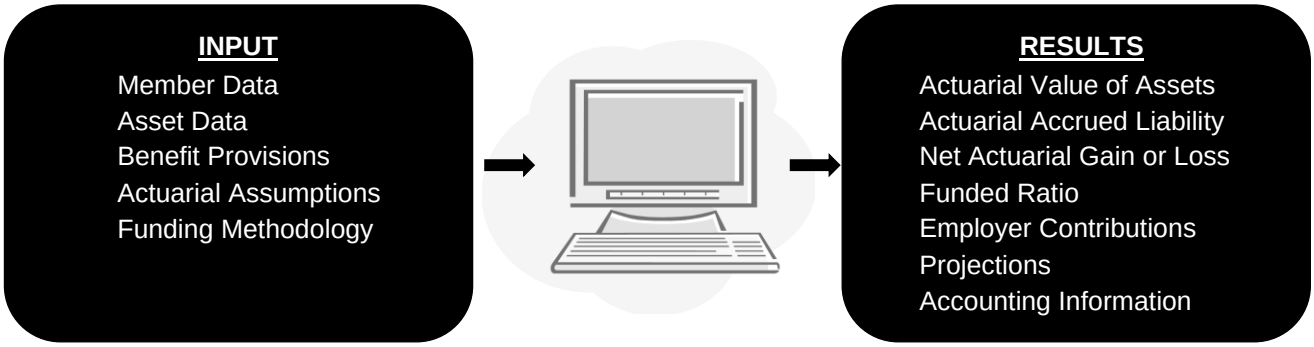
Valuation results as of	12/31/2021	12/31/2020
Active Members		
Number	569	558
Reported Compensation	$ 78,152,238	$ 75,253,272
Valuation Compensation*	$ 82,640,424	$ 79,854,003
Retired Members and Survivors of Deceased Members Currently Receiving Benefits		
Number	792	761
Annual Allowances	$ 52,488,539	$ 49,184,792
Assets		
Actuarial Value (AVA)	$ 702,706,558	$ 661,100,432
Market Value	$ 743,543,527	$ 695,354,777
Actuarial Accrued Liability (AAL)	$ 832,153,712	$ 795,678,308
Unfunded Accrued Liability (AAL-AVA)	$ 129,447,154	$ 134,577,876
Funded Ratio (AVA/AAL)**	84.4%	83.1%
Results for Fiscal Year Ending	**6/30/2024**	**6/30/2023**
Actuarially Determined Employer Contribution (ADEC), as a percentage of payroll		
Normal Cost	14.16%	13.02%
Accrued Liability	20.50%	26.42%
Total Preliminary ADEC	34.66%	39.44%
Total ADEC Based on Direct-Rate Smoothing	32.84%	37.01%
Impact of Benefit Changes	N/A	2.64%
Final ADEC	N/A	39.65%
Appropriations Act for Fiscal Year Ending	**6/30/2024**	**6/30/2023**
Employer Contribution Rate as a percentage of payroll		
Normal Cost	14.16%	13.02%
Accrued Liability	N/A	26.93%
Total	N/A	39.95%

* Reported compensation annualized for new hires and projected for valuation purposes.

** The Funded Ratio on a Market Value of Assets basis is 89.4% at 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 CJRS 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.

Valuation Process (continued)

Valuation Input: Membership Data (continued)

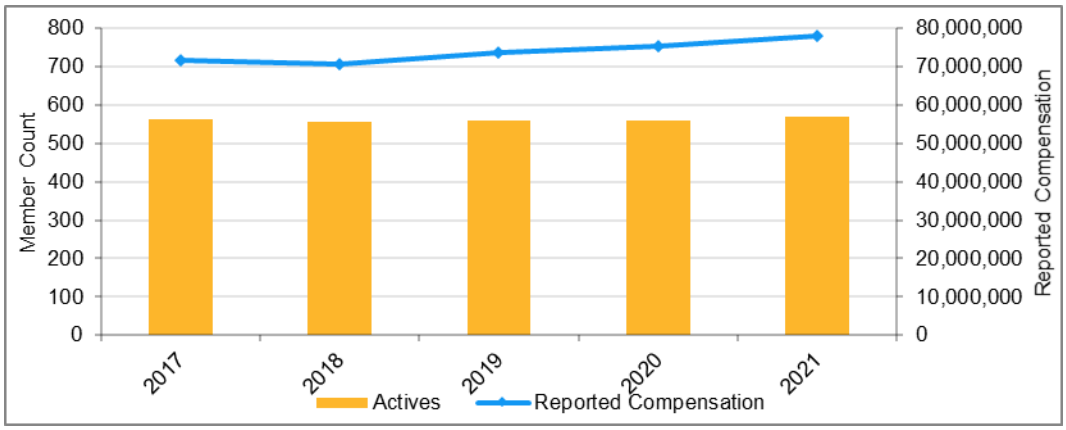
The table below provides a summary of the membership data used in this valuation compared to the prior valuation.

Number as of	12/31/2021	12/31/2020
Active members	569	558
Terminated members and survivors of deceased members entitled to benefits but not yet receiving benefits	57	52
Retired members and survivors of deceased members currently receiving benefits	792	761
Total	1,418	1,371

Commentary: The number of active members has increased by 2.0% from the previous valuation date. An increase in active members results in more benefits accruing but also greater contributions supporting the system. The number of retired members and survivors of deceased members currently receiving benefits increased by 4.1% from the previous valuation date. The increase in retiree population is consistent with expectations.

Graph 1: Active Members

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



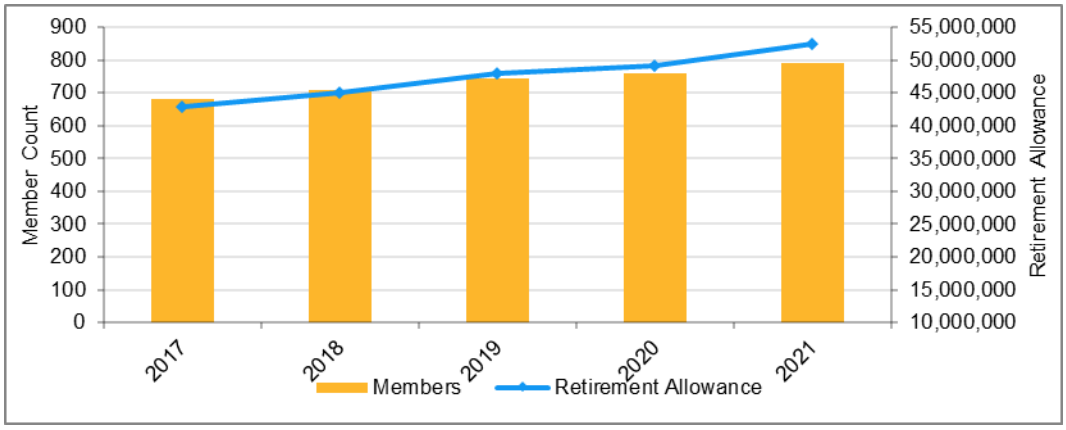
Commentary: Reported compensation has increased by 3.9% since the last valuation. Covered payroll is expected to increase annually by 3.25% beginning with the December 31, 2020 valuation. Payroll that is increasing faster than assumed results in more benefits accruing than we anticipated, but also greater contributions supporting the system.

Valuation Process (continued)

Valuation Input: Membership Data (continued)

Graph 2: Retired Members and Survivors of Deceased Members

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



Commentary: The number of retired members and survivors of deceased members and the benefits paid to these members has been increasing steadily, as expected based on plan assumptions.

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

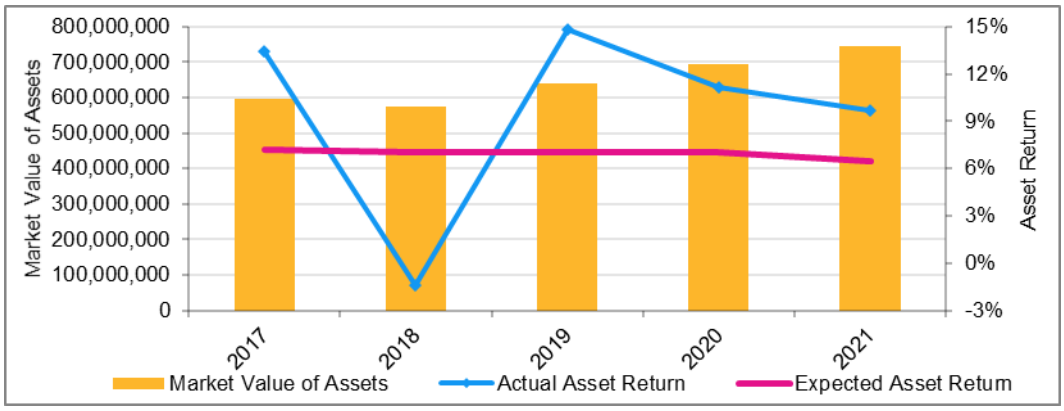
Valuation Process (continued)

Valuation Input: Asset Data

CJRS assets are held in trust and are invested for the exclusive benefit of plan members. The Market Value of Assets is $744 million as of December 31, 2021 and $695 million as of December 31, 2020. The investment return for the market value of assets for calendar year 2021 was 9.67%.

Graph 3: Market Value of Assets and Asset Returns

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



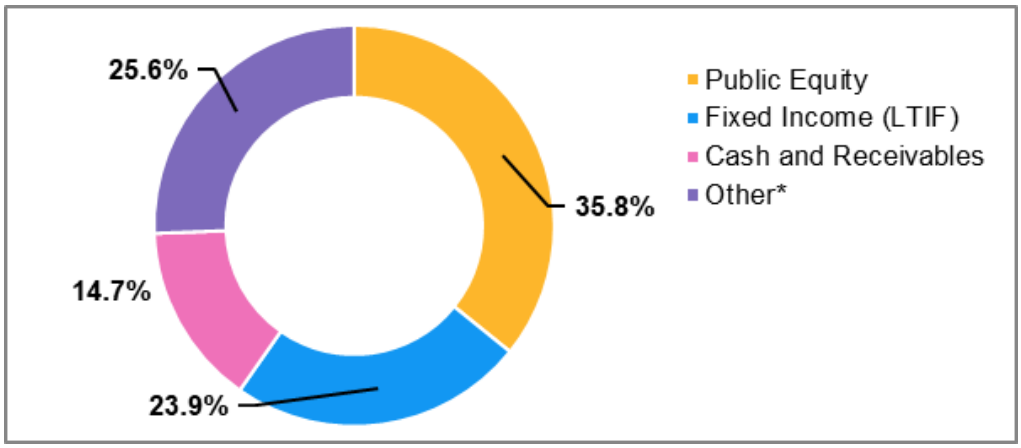
Commentary: Market value returns during 2021 were higher than the 6.50% assumed rate of return, resulting in lower contributions and higher funded ratio than anticipated, all else being equal.

Valuation Process (continued)

Valuation Input: Asset Data (continued)

Graph 4: Allocation of Investments by Category

The graph below provides the breakdown of the market value of assets at 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.

Valuation Process (continued)

Valuation Input: Benefit Provisions

Benefit provisions are described in North Carolina General Statutes, Chapter 135, Article 4.

There were no significant changes in benefit provisions from the prior year's valuation, other than a one-time benefit supplement payment equal to 4% of the member's annual retirement allowance for the fiscal year ending June 30, 2023, payable in October 2022. The one-time supplements do not change the ongoing monthly benefits, and absent additional action by governing authorities, the payments will not recur in future years.

Highlights of the benefit provisions are described below.

- An unreduced retirement allowance is payable to members who retire from service:
  - after attaining age 65 and five years of creditable service; or
  - after attaining age 50 and 24 years of creditable service.
- The unreduced retirement allowance is equal to:
  - 4.02% of a member's final average compensation multiplied by the number of years of creditable service rendered as a Justice of the Supreme Court or Judge of the Court of Appeals, plus
  - 3.52% of a member's final average compensation multiplied by the number of years of creditable service rendered as a Judge of the Superior Court or as Administrative Officer of the Courts, plus
  - 3.02% of a member's final average compensation multiplied by the number of years of creditable service rendered as a Judge of the District Court, District Attorney, Public Defender, or Clerk of the Superior Court.
  - The applicable formula accrual rate percentage of member's average final compensation multiplied by the number of years of creditable service transferred from the Teachers' and State Employees' Retirement System or the Local Governmental Employees' Retirement System.
- Maximum unreduced retirement allowance payable from CJRS is 75% of final compensation, less any unreduced allowances payable from the Teachers' and State Employees' Retirement System, the Local Governmental Employees' Retirement System, or the Legislative Retirement System.
- A reduced retirement allowance is payable to members who retire from service after attaining age 50 and five years of creditable service
- Ancillary benefits are also payable upon the death or disability of a member.
- CJRS does not provide for automatic cost of living increases as part of the benefit package. Instead, increases may be provided if certain financial conditions are met.

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 CJRS due to the legislature contributing the actuarially determined employer contribution, benefit cuts have not been made in North Carolina as they have been in most other states. However, if North Carolina's investment policy shifts substantively, or incurs other unfavorable investment, economic, or demographic experience, 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 Process (continued)

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, pay, and benefits of the members) and what may happen in the future. The actuarial assumptions of CJRS 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 assets of CJRS such as the interest rate, salary increases, the real return, and payroll growth.

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.

Valuation Input: Funding Methodology

The Funding Methodology is the payment plan for CJRS 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 stay level as a percent of payroll
- 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 CJRS is quite aggressive in that the policy pays down 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.

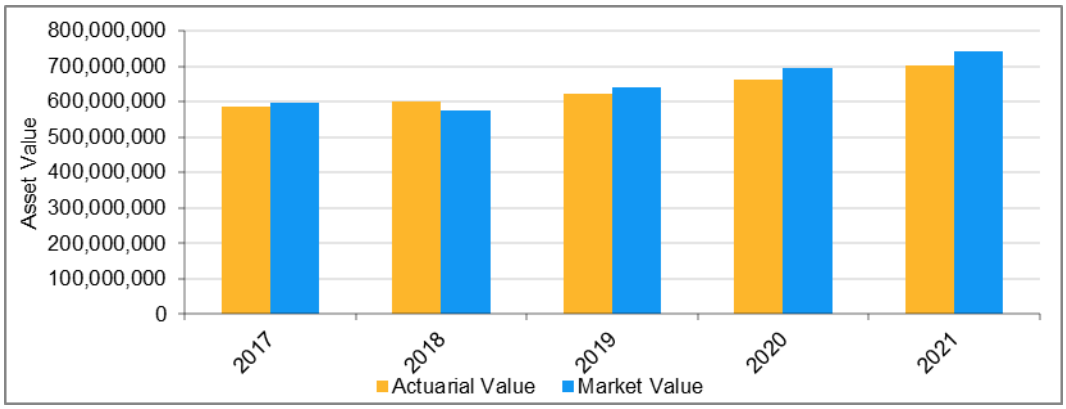
Valuation Process (continued)

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 CJRS, the Board adopted an asset valuation method to determine the Actuarial Value of Assets used for funding purposes. The Actuarial Value of Assets is $702.7 million as of December 31, 2021 and $661.1 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

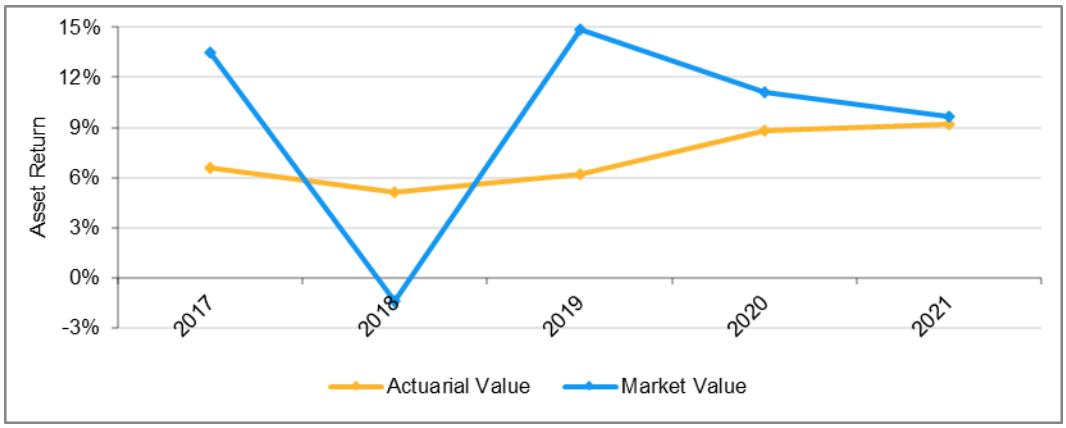
The market value of assets is higher than the actuarial value of assets, which is used to determine employer contributions. This indicates that overall, there are unrecognized asset gains to be recognized in future valuations.

Valuation Process (continued)

Valuation Results: Actuarial Value of Assets (continued)

Graph 6: Asset Returns

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



Commentary: The investment return for the market value of assets for calendar year 2021 was 9.67%. 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 9.17% and a recognized actuarial asset gain of $17.4 million during 2021. Even after recognizing this gain, the assets at actuarial value were $129.4 million less 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.

Valuation Process (continued)

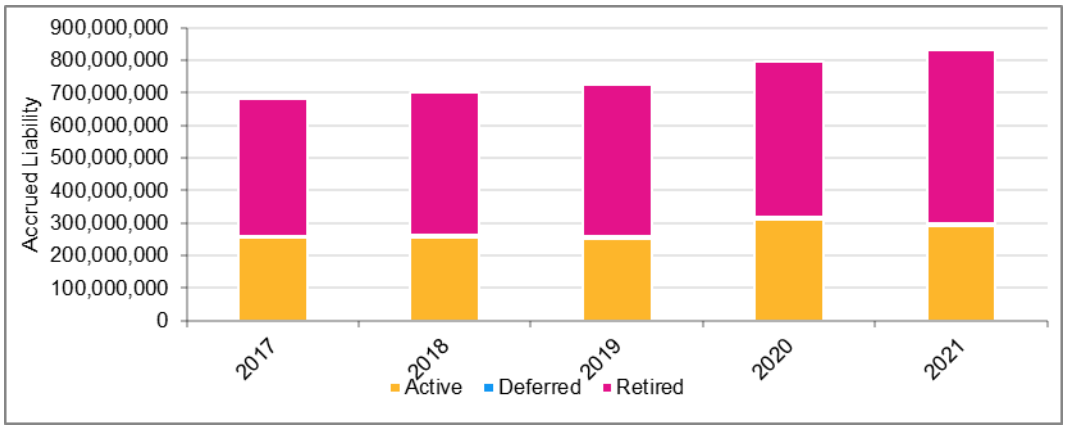
Valuation Results: Actuarial Accrued Liability

Using the provided membership data, benefit provisions, and actuarial assumptions, future benefit payments of CJRS 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 CJRS. 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 CJRS 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 $795.7 million to $835.2 million during 2021. CJRS 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 $7.3 million higher than expected, resulting primarily from demographic losses attributable to more retirements than assumed and fewer observed deaths than assumed for members in pay status. Since the prior valuation, a transition from the prior actuarial firm to Buck resulted in an increase in AAL of $11.2 million due to valuation programming modifications and differences in methodology. A detailed summary of the AAL is provided in Section 5 of this report.

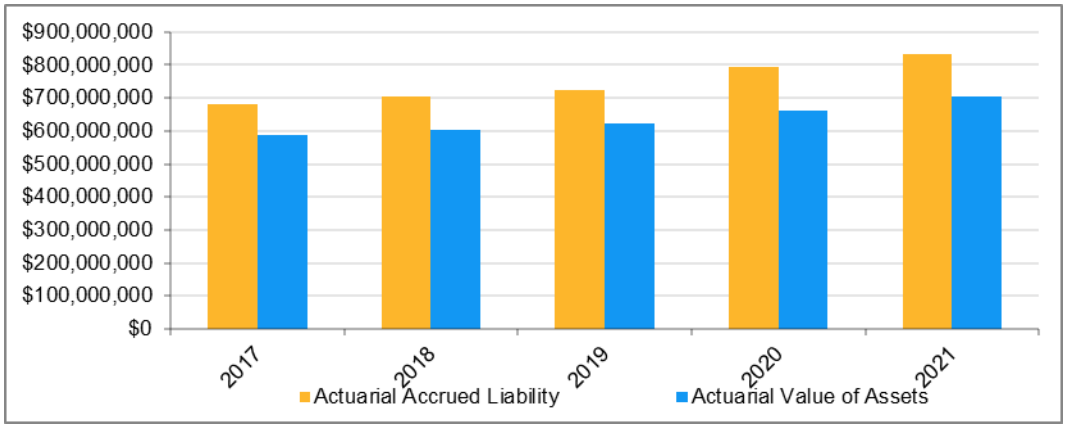
Valuation Process (continued)

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 CJRS actually has in the fund to the amount CJRS should have in the fund.

Graph 8: Actuarial Accrued Liability and Actuarial Value of Assets

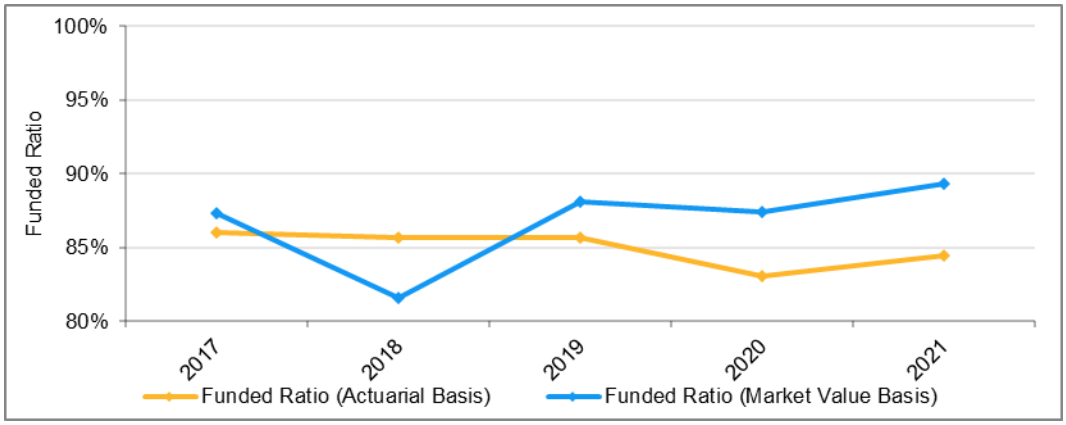
The graph below provides a history of the actuarial accrued liability and actuarial value of assets.



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 pension debt 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 83.1% at December 31, 2020 to 84.4% at December 31, 2021.

Valuation Process (continued)

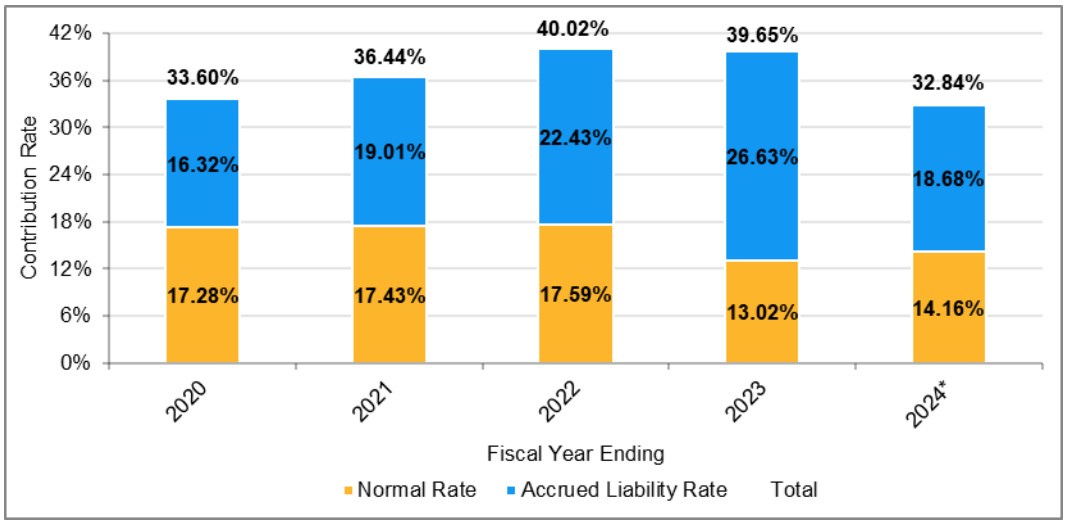
Valuation Results: Employer Contributions

G.S. 135-69 of the North Carolina General Statutes provides that the State shall make a normal contribution and an unfunded accrued liability contribution. In addition, G.S. 135-66 provides that the employer contribution rate recommended by the Board of Trustees to the General Assembly each year shall be no less than the actuarially determined employer contribution (ADEC), and the Board of Trustees may adopt a contribution policy that would recommend a contribution not less than the ADEC.

The December 31, 2020 valuation suggested that the preliminary total employer contribution rate be set at 37.01% of payroll for the fiscal year ending June 30, 2023. This rate was increased as a result of the One-Time Pension Supplement of 2.64%. As a result of this December 31, 2021 valuation, the preliminary actuarially determined employer contribution rate is 32.84% of payroll for the fiscal year ending June 30, 2024, subject to the impact of any future legislative changes effective during that fiscal year.

Graph 10: Actuarially Determined Employer Contribution Rates

The graph below provides a history of actuarially determined employer contribution rates over the past five fiscal years. The rates are split into the normal rate and the accrued liability rate. The normal rate is the employer's portion of the cost of benefits accruing after reducing for the member contribution. The accrued liability rate is the payment toward the unfunded liability.



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

Commentary: The actuarially determined employer required contribution rate 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 6% of pay contribution the members make. The 12-year period is a relatively short period for Public Sector Retirement Systems in the United States, with the funding period of most of these Systems much longer. The shorter period results in higher contributions and more benefit security.

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

Valuation Process (continued)

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 $174,571,000 (compared to $71,573,000 for fiscal year ending June 30, 2021). The required financial reporting information for CJRS 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 CJRS. 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	Reported Compensation
Justices of Supreme Court and Judges of Court of Appeals	22	55.90	10.27	$ 3,656,990
Judges of the Superior Court and Administrative Officers of the Court	107	57.42	13.66	16,391,460
Judges of the District Court, District Attorneys, Clerks of the Superior Court, and Public Defenders	440	53.70	11.58	58,103,788
Total	569	54.48	11.92	$ 78,152,238

The table above includes members not in receipt of benefits who had reported compensation in 2021.

Section 3: Membership Data (continued)

Table 3a: Terminated Vested Member Data

	Member Count	Average Age	Average Service	Annual Deferred Retirement Allowances	Accumulated Contributions
Justices of Supreme Court and Judges of Court of Appeals	1	64.25	24.17	$ 87,804	N/A
Judges of the Superior Court and Administrative Officers of the Court	6	57.03	11.11	214,297	N/A
Judges of the District Court, District Attorneys, Clerks of the Superior Court, and Public Defenders	24	54.67	6.32	442,996	N/A
Total	31	55.44	7.82	$ 745,097	N/A

Table 3b: Terminated Nonvested Member Data

	Member Count	Average Age	Average Service	Annual Deferred Retirement Allowances	Accumulated Contributions
Justices of Supreme Court and Judges of Court of Appeals	1	42.00	1.75	N/A	$ 15,663
Judges of the Superior Court and Administrative Officers of the Court	2	57.21	0.63	N/A	10,973
Judges of the District Court, District Attorneys, Clerks of the Superior Court, and Public Defenders	23	56.53	1.95	N/A	435,029
Total	26	56.02	1.84	N/A	$ 461,665

The tables above includes members not in receipt of benefits who did not have reported compensation in 2021.

Section 3: Membership Data (continued)

Table 4: Data for Members Currently Receiving Benefits

	Member Count	Average Age	Annual Retirement Allowances
Retired Members (Healthy at Retirement)			
Male	428	73.86	$ 32,676,174
Female	190	69.98	12,916,538
Total	618	72.67	$ 45,592,712
Retired Members (Disabled at Retirement)*			
Male	1	64.75	$ 69,696
Female	-	-	-
Total	1	64.75	$ 69,696
Survivors of Deceased Members			
Male	20	74.78	$ 770,237
Female	153	77.57	6,055,894
Total	173	77.25	$ 6,826,131
Grand Total	792	73.66	$ 52,488,539

* Includes retired members reported as disabled in a prior valuation and not subsequently reported as returned to work.

Section 4: Asset Data

Assets are held in trust and are invested for the exclusive benefit of CJRS 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	$ 695,354,777	$ 639,475,570
Employer Contributions	29,344,457	28,384,617
Employee Contributions	5,210,339	5,897,139
Benefit Payments Other Than Refunds	(52,663,696)	(48,697,356)
Refunds	(31,907)	(24,058)
Administrative Expense	(34,873)	(28,215)
Investment Income	66,364,430	70,347,080
Net Increase/(Decrease)	48,188,750	55,879,207
End of Year Market Value of Assets	$ 743,543,527	$ 695,354,777
Estimated Net Investment Return on Market Value	9.67%	11.13%

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

Asset Data as of	12/31/2021	12/31/2020
Allocation by Dollar Amount		
Public Equity	$ 266,309,997	$ 255,542,531
Fixed Income (LTIF)	177,879,486	185,548,849
Cash and Receivables	109,334,288	78,511,230
Other*	190,019,756	175,752,167
Total Market Value of Assets	$ 743,543,527	$ 695,354,777
Allocation by Percentage of Asset Value		
Public Equity	35.8%	36.7%
Fixed Income (LTIF)	23.9%	26.7%
Cash and Receivables	14.7%	11.3%
Other*	25.6%	25.3%
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 CJRS, 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
(a) Beginning of Year Actuarial Value of Assets	$ 661,100,432
(b) Beginning of Year Market Value of Assets	695,354,777
(c) Contributions	34,554,796
(d) Benefit Payments, Refunds and Administrative Expenses	(52,730,476)
(e) Net Cash Flow	(18,175,680)
(f) Expected Investment Return	44,616,650
(g) Expected End of Year Market Value of Assets	721,795,747
(h) End of Year Market Value of Assets	743,543,527
(h) Excess of Market Value over Expected Market Value of Assets	21,747,780
(i) 80% of 2021 Asset Gain/(Loss)	17,398,224
(j) 60% of 2020 Asset Gain/(Loss)	15,648,961
(k) 40% of 2019 Asset Gain/(Loss)	17,691,840
(l) 20% of 2018 Asset Gain/(Loss)	(9,902,056)
(m) Total Deferred Asset Gain/(Loss)	40,836,969
(n) Preliminary End of Year Actuarial Value of Assets	702,706,558
(o) Final End of Year Actuarial Value of Assets (not less than 80% and not greater than 120% of Market Value)	702,706,558
(p) Estimated Net Investment Return on Actuarial Value	9.17%

Commentary: The actuarial value of assets smooths investment gains/losses, resulting in less volatility in the 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 on December 31, 2014.

Higher than expected market returns in 2019, 2020, and 2021 resulted in an actuarial value of asset return for calendar year 2021 of 9.17% and a recognized actuarial asset gain of $17.4 million during 2021. Even after recognizing this gain, the assets at actuarial value were $129.4 million less than the actuarial accrued liability as of December 31, 2021.

Section 4: Asset Data (continued)

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

Table 8: Historical Asset Returns

Calendar Year	Actuarial Value of Asset Return	Market Value of Asset Return
2002	6.13%	-4.84%
2003	8.44%	18.33%
2004	8.95%	10.73%
2005	8.56%	6.94%
2006	9.17%	11.35%
2007	9.04%	8.35%
2008	3.01%	-19.39%
2009	4.88%	14.83%
2010	6.01%	11.49%
2011	5.25%	2.18%
2012	6.42%	11.79%
2013	7.52%	12.19%
2014	7.26%	6.19%
2015	5.87%	0.35%
2016	5.33%	6.22%
2017	6.57%	13.46%
2018	5.11%	-1.41%
2019	6.20%	14.84%
2020	8.79%	11.13%
2021	9.17%	9.67%
20- Yr Average	6.87%	6.86%
20-Yr Range	6.16%	37.72%

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 20 years of 6.87% compares with an average market return of 6.86%. But the range of returns on market value of assets is markedly more volatile, 37.72% versus 6.16%. This results in much lower employer contribution volatility using the actuarial value of assets versus market, while ensuring that the actuarial needs of CJRS are met.

Section 5: Liability Results

Using the provided membership data, benefit provisions, and actuarial assumptions, future benefit payments of CJRS 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	$ 421,322,280	$ 423,122,898
(2) Terminated Members	9,550,928	6,863,612
(3) Members Currently Receiving Benefits	532,708,904	478,478,019
(4) Total	$ 963,582,112	$ 908,464,529
(b) Present Value of Future Normal Costs	$ 131,428,400	$ 112,786,221
(c) Actuarial Accrued Liability: (a4) - (b)	$ 832,153,712	$ 795,678,308
(d) Actuarial Value of Assets	$ 702,706,558	$ 661,100,432
(e) Unfunded Accrued Liability: (c) - (d)	$ 129,447,154	$ 134,577,876

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 10: Reconciliation of Unfunded Actuarial Accrued Liability (in millions)

(in millions)	
Unfunded Actuarial Accrued Liability (UAAL) as of 12/31/2020	$ 134.6
Normal Cost and Administrative Expenses during 2021	13.9
Reduction due to Actual Contributions during 2021	(34.6)
Interest on UAAL, Normal Cost, and Contributions	8.5
Asset (Gain)/Loss	(17.4)
Actuarial Accrued Liability (Gain)/Loss	22.3
Impact of Assumption Changes	-
Impact of Benefit Changes	2.1
Unfunded Actuarial Accrued Liability (UAAL) as of 12/31/2021	$ 129.4

Commentary: During 2021, the UAAL decreased due to asset gain of 17.4 million. Additionally, demographic experience decreased the UAAL by $11.1 million, and the transition from the prior actuarial firm to Buck resulted in an increase in UAAL of $11.2 million due to valuation programming modifications and differences in methodology. These two figures sum to the $22.3 million increase in UAAL noted in the Actuarial Accrued Liability (Gain)/Loss line item in the table above. Benefitchanges increased the UAAL by $2.1 million.

Section 6: Actuarially Determined Employer Contribution

The actuarially determined employer contribution consists of a normal cost rate and an accrued liability rate. The normal cost rate is the employer's portion of the cost of benefits accruing during the year after reducing for the member contribution. The accrued liability rate 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 11: Calculation of the Actuarially Determined Contribution (ADEC)

Valuation Date ADEC for Fiscal Year Ending	12/31/2021 6/30/2024	12/31/2020 6/30/2023
Normal Cost Rate Calculation		
(a) Normal Cost Rate:	20.11%	18.97%
(b) Employee Contribution Rate	6.00%	6.00%
(c) Administrative Expenses	0.05%	0.05%
(d) Total Normal Cost Rate: (a) - (b) + (c)	14.16%	13.02%
Accrued Liability Rate Calculation		
(e) Total Annual Amortization Payments*	$ 17,652,395	$ 22,003,579
(f) Valuation Compensation**	86,121,339	83,277,849
(g) Accrued Liability Rate: (e) / (f)	20.50%	26.42%
Preliminary ADEC (d) + (g)	34.66%	39.44%
ADEC With Direct-Rate Smoothing	32.84%	37.01%
Impact of Benefit Changes	N/A	2.64%
Final ADEC	N/A	39.65%

* See Table 14 for more detail
** Beginning with the December 31, 2017 valuation, compensation is projected to the fiscal year over which contributions will occur.

Section 6: Actuarially Determined Employer Contribution (continued)

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

Table 12: Reconciliation of the Change in the ADEC

Fiscal year ending June 30, 2023 Preliminary ADEC (based on December 31, 2020 valuation)	37.01%
Impact of Benefit Changes*	2.64%
Fiscal year ending June 30, 2023 Final ADEC	39.65%
Change Due to Anticipated Reduction in UAAL**	(6.61%)
Change Due to Demographic (Gain)/Loss	4.50%
Change Due to Investment (Gain)/Loss	(2.64%)
Change Due to Contributions Less (Greater) than ADEC	(0.35%)
Impact of Assumption Changes	0.00%
Impact of Benefit Changes	0.32%
Impact of Direct Rate Smoothing	0.61%
Reversal of one-time Legislative Costs	(2.64%)
Fiscal year ending June 30, 2024 Preliminary ADEC (based on December 31, 2021 valuation)	32.84%

* Due to the one-time pension supplement to be paid October 2022.

** Amortization of the UAAL included a fresh-start 9-year amortization for the December 31, 2009, valuation with the first payment effective July 1, 2011. However, the Appropriations Act of 2011 changed the period over which the UAAL is amortized from nine years to 12 years, retroactive to July 1, 2011, as implemented in the December 31, 2010, valuation. As such, the original amortization balance with current annual payments of $4.7 million will be paid off as of June 30, 2023, which significantly reduces the ADEC.

Section 6: Actuarially Determined Employer Contribution (continued)

Amortization methods determine the payment schedule for the unfunded actuarial accrued liability. CJRS 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 13: Calculation of the New Amortization Base

Calculation as of	12/31/2021	12/31/2020
(a) Unfunded Actuarial Accrued Liability	$ 129,447,154	$ 134,577,876
(b) Prior Years' Outstanding Balances	126,566,945	95,540,227
(c) New Amortization Base: (a) - (b)	2,880,209	39,037,649
(d) New Amortization Payment	375,964	5,095,729

Table 14: Amortization Schedule for Unfunded Accrued Liability

Date Established	Original Balance	12/31/2021 Outstanding Balance	Annual Payment Effective July 1, 2023
December 31, 2009	$ 34,962,037	$ 6,765,273	$ -
December 31, 2010	3,913,729	1,219,963	527,481
December 31, 2011	10,017,079	4,226,925	1,345,874
December 31, 2012	(4,239,030)	(2,224,703)	(567,820)
December 31, 2013	(892,665)	(554,111)	(119,219)
December 31, 2014	(6,478,378)	(4,601,052)	(862,722)
December 31, 2015	36,271,204	28,783,367	4,815,940
December 31, 2016	13,868,882	12,074,511	1,834,777
December 31, 2017	19,189,149	18,079,585	2,529,226
December 31, 2018	10,337,549	10,446,941	1,360,103
December 31, 2019	10,042,676	10,775,150	1,317,062
December 31, 2020	39,037,649	41,575,096	5,095,729
December 31, 2021	2,880,209	2,880,209	375,964
Total		$ 129,447,154	$ 17,652,395

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

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 15: History of Actuarially Determined Employer Contributions and Appropriated Rates

Valuation Date	Fiscal Year Ending	Normal Rate*	Accrued Liability Rate	Change due to Legislation**	Final ADEC	Appropriated Rate
12/31/2021	6/30/2024	14.16%	N/A	N/A	N/A	N/A
12/31/2020	6/30/2023	13.02%	23.99%	2.64%	39.65%	39.95%
12/31/2019	6/30/2022	17.59%	21.11%	1.32%	40.02%	40.02%
12/31/2018	6/30/2021	17.43%	19.01%	0.00%	36.44%	36.44%
12/31/2017	6/30/2020	17.28%	16.32%	0.00%	33.60%	33.60%

* Includes Death Benefit rate

** The change due to legislation for the contribution for fiscal year ending June 30, 2023 provided for a one-time supplement equal to 4% of the annual retirement allowance payable in October 2022. The change due to legislation for the contribution for fiscal year ending June 30, 2022 provided for a 2% one-time supplement payable in December 2021.

Table 16: Cost of Benefit Enhancements

Calculation as of	12/31/2021	12/31/2020
Increase in UAAL for a 1% COLA*	$ 5,858,000	$ 5,244,000
Increase in ADEC for a 1% COLA*	0.89%	0.82%

* The 1% COLA in the 12/31/2021 column would be effective July 1, 2023 and includes expected costs of COLAs paid for retirements after December 31, 2021 and before June 30, 2023. The COLA would be paid in full to retired members and survivors of deceased members on the retirement roll on July 1, 2022 and would be prorated for retired members and survivors of deceased members who commence benefits after July 1, 2022 but before June 30, 2023.

Section 7: Valuation Balance Sheet

The valuation balance sheet shows the assets and liabilities of CJRS. 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 17: Valuation Balance Sheet on a Projected Basis

Balance Sheet as of	12/31/2021	12/31/2020
Assets		
Current Actuarial Value of Assets		
Annuity Savings Fund	$ 63,728,634	$ 67,314,874
Pension Accumulation Fund	638,977,924	593,785,558
Total	$ 702,706,558	$ 661,100,432
Future Member Contributions to the Annuity Savings Fund	$ 38,754,306	$ 35,482,517
Prospective Contributions to the Pension Accumulation Fund		
Normal Contributions	$ 92,674,094	$ 77,303,704
Unfunded Accrued Liability Contributions	129,447,154	134,577,876
Total	$ 222,121,248	$ 211,881,580
Total Assets	$ 963,582,112	$ 908,464,529
Liabilities		
Annuity Savings Fund		
Past Member Contributions	$ 63,728,634	$ 67,314,874
Future Member Contributions	38,754,306	35,482,517
Total Contributions	$ 102,482,940	$ 102,797,391
Pension Accumulation Fund		
Benefits Currently in Payment	$ 532,708,904	$ 478,478,019
Benefits to be Paid to Current Active Members and Inactive Members Not in Receipt of a Benefit	328,390,268	327,189,119
Reserve for Increase in Retirement Allowances	-	-
Total Benefits Payable	$ 861,099,172	$ 805,667,138
Total Liabilities	$ 963,582,112	$ 908,464,529

Section 8: Accounting Results

This 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 18: Number of Active and Retired Members as of December 31, 2021

Group	Number
Retired members and survivors of deceased members currently receiving benefits	792
Terminated members and survivors of deceased members entitled to benefits but not yet receiving benefits	57
Active members	569
Total	1,418

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 19: Schedule of Changes in Net Pension Liability (Asset)

Calculation as of	June 30, 2022
Total Pension Liability	
Service Cost	$ 14,320,000
Interest	51,397,000
Changes of Benefit Terms	2,127,000
Difference between Expected and Actual Experience	22,417,000
Change of Assumptions	0
Benefit Payments, including Refund of Member Contributions	(53,819,000)
Net Change in Total Pension Liability	$ 36,442,000
Total Pension Liability - Beginning of Year	$ 802,893,000
Total Pension Liability - End of Year	$ 839,335,000
Plan Fiduciary Net Position	
Employer Contributions	$ 33,428,000
Member Contributions	5,470,000
Net Investment Income	(51,610,000)
Benefit Payments, including Refund of Member Contributions	(53,819,000)
Administrative Expenses	(29,000)
Other	4,000
Net Change in Fiduciary Net Position	$ (66,556,000)
Plan Fiduciary Net Position - Beginning of Year	$ 731,320,000
Plan Fiduciary Net Position - End of Year	$ 664,764,000

Table 20: Net Pension Liability (Asset)

Calculation as of	June 30, 2022	June 30, 2021
Total Pension Liability	$ 839,335,000	$ 802,893,000
Plan Fiduciary Net Position	664,764,000	731,320,000
Net Pension Liability (Asset)	$ 174,571,000	$ 71,573,000
Plan Fiduciary Net Position as a Percentage of the Total Pension Liability	79.20%	91.09%

Section 8: Accounting Results (continued)

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

Table 21: Sensitivity of the Net Pension Liability at June 30, 2022 to Changes in the Discount Rate

	1% Decrease	Current	1% Increase
Discount Rate	5.50%	6.50%	7.50%
Net Pension Liability (Asset)	262,462,000	174,571,000	99,648,000

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 of Trustees on January 28, 2021. In addition, assumed contributions include contributions based on payroll from future employees of the System that are not associated with the accumulation of their plan benefits. 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 to equal 0.05% of projected payroll, but are limited to a flat dollar rate per active and in-pay member as of each valuation date. The flat dollar rate is $27 in 2022 and increased by 2.5% each 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.

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

Table 22: Additional Information for GASB Statement No. 67

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

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**	3.25% - 4.75%
*Includes Inflation of	2.50%
**Includes Inflation and Productivity of	3.25%
Cost-of-living Adjustments	N/A

Appendix A: Valuation Process and Glossary of Actuarial Terms

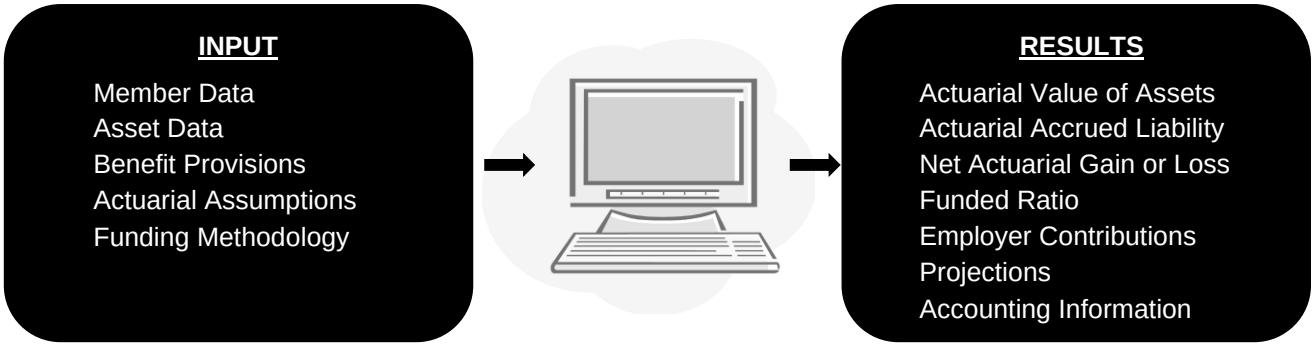
Purpose of an Actuarial Valuation

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") 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: Actuarial Assumptions and Methods (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.

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

Appendix A: Actuarial Assumptions and Methods (continued)

The Actuarial Valuation Process (continued)

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 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.

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.

Appendix A: Actuarial Assumptions and Methods (continued)

The Actuarial Valuation Process (continued)

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. 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: Actuarial Assumptions and Methods (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: Actuarial Assumptions and Methods (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

  An 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 CJRS 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.

Appendix A: Actuarial Assumptions and Methods (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 and Average Reported Compensation of Active 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	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
25 to 29	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0
30 to 34	0	9	0	0	0	0	0	0	0	0	9
	0	128,600	0	0	0	0	0	0	0	0	128,600
35 to 39	2	14	11	0	0	0	0	0	0	0	27
	48,631	120,828	126,716	0	0	0	0	0	0	0	117,879
40 to 44	1	31	17	5	1	0	0	0	0	0	55
	13,111	120,543	139,440	139,446	132,709	0	0	0	0	0	126,370
45 to 49	1	25	18	16	4	0	0	0	0	0	64
	9,754	120,392	131,735	142,806	155,689	0	0	0	0	0	129,663
50 to 54	0	34	28	18	26	10	7	3	0	0	126
	0	132,383	139,331	143,419	146,839	152,660	142,658	109,755	0	0	140,128
55 to 59	1	23	18	20	9	15	10	7	3	0	106
	24,952	127,509	134,160	144,593	153,811	156,075	146,015	143,635	131,893	0	140,105
60 to 64	0	23	23	9	14	6	9	9	2	2	97
	0	125,096	136,970	141,524	142,932	143,705	157,551	160,751	138,945	123,464	139,732
65 to 69	0	6	12	9	4	10	5	7	2	5	60
	0	114,710	140,620	148,457	164,735	156,259	159,921	162,205	140,281	143,850	147,803
70 & Up	0	3	3	3	3	5	1	1	1	5	25
	0	135,808	135,767	140,691	131,945	158,555	176,365	183,473	183,473	133,037	145,356
Total	5	168	130	80	61	46	32	27	8	12	569
	29,016	125,013	136,129	143,593	147,761	154,029	151,646	151,866	142,201	135,947	137,350

Appendix B: Detailed Tabulations of Member Data (continued)

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

	Men		Women	
Age	Number	Compensation	Number	Compensation
32			2	$ 269,357
33	2	254,872		
34	2	253,269	3	379,903
35	3	380,213	2	253,269
36	2	257,257	2	229,556
37	5	582,012	2	259,344
38	4	444,659	1	126,634
39	2	137,173	4	512,612
40	2	165,581		
41	12	1,567,802	2	246,911
42	6	752,263	2	194,716
43	11	1,386,363	6	826,146
44	7	890,352	7	920,212
45	10	1,335,261	4	429,192
46	10	1,107,549	7	966,295
47	8	1,136,962	6	728,462
48	1	126,634	4	546,189
49	9	1,223,406	5	698,473
50	20	2,866,265	7	1,013,986
51	15	2,137,511	13	1,699,994
52	11	1,589,930	9	1,208,088
53	14	1,944,523	16	2,249,636
54	14	1,991,299	7	954,870
55	14	2,039,438	8	1,144,763
56	14	2,019,352	11	1,511,685
57	10	1,346,431	8	1,032,990
58	8	1,136,587	11	1,588,151
59	11	1,679,215	11	1,352,476
60	11	1,513,908	7	961,962
61	14	2,046,777	9	1,203,353
62	15	2,179,201	5	693,629
63	8	1,129,659	11	1,436,449
64	11	1,637,720	6	751,393
65	11	1,760,104	5	604,876
66	10	1,559,778	1	143,287
67	14	2,136,082	1	92,477
68	4	542,275	2	230,674
69	10	1,522,889	2	275,751
70	10	1,452,049	1	189,082
71	2	331,602		
72	6	845,179	1	122,260
73	1	124,668	1	142,263
76			1	135,129
77	2	291,673		
Total	356	$ 49,825,743	213	$ 28,326,495

Appendix B: Detailed Tabulations of Member Data (continued)

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

	Men		Women	
Service	Number	Compensation	Number	Compensation
0	5	$ 145,080		
1	47	5,660,380	29	$ 3,235,313
2	8	1,013,075	6	833,575
3	35	4,687,852	25	3,251,658
4	11	1,448,483	7	871,869
5	19	2,566,816	20	2,553,655
6	10	1,487,012	1	130,407
7	32	4,542,758	14	1,897,563
8	10	1,394,976	3	382,510
9	11	1,432,519	10	1,308,566
10	2	251,154	2	269,656
11	16	2,328,101	13	1,769,208
12	7	1,058,122	5	767,741
13	12	1,804,107	11	1,537,816
14	7	1,001,867	5	699,665
15	17	2,430,777	4	599,364
16	6	937,367	1	144,872
17	9	1,365,581	5	794,792
18	2	256,083	2	257,667
19	8	1,221,836	7	1,005,055
20	2	338,540	3	426,955
21	12	1,899,669	5	778,885
22	7	1,072,370		
23	8	1,212,388	3	451,476
24	4	645,245	2	259,786
25	5	774,622	3	400,700
26	2	254,277	2	322,894
27	9	1,433,269	1	117,522
28	2	339,311	3	445,865
29	1	150,947	4	613,280
30	1	162,107	1	108,057
31	6	1,058,334	2	279,933
32	5	680,276	1	144,872
33	6	973,328	4	552,605
34	1	140,864		
35	2	279,235		
36				
37			3	360,210
38	2	355,978	1	142,180
40	1	124,668	1	122,260
42	2	380,161	1	108,413
45	1	122,260		
46	1	108,413	2	257,390
49	2	285,535		
50			1	122,260
Total	356	$ 49,825,743	213	$ 28,326,495

Appendix B: Detailed Tabulations of Member Data (continued)

Table B-4: The Number and Accumulated Contributions of Terminated Vested Members Distributed by Age as of December 31, 2021

	Men		Women	
Age	Number	Contributions	Number	Contributions
39	1	$ 3,863		
40	1	$ 23,768		
41			1	12,760
42	1	15,663		
45	1	67,489	1	12,916
46			1	12,844
47			1	5,311
48			1	140,213
49	1	44,995	1	7,356
50	1	49,510	1	269,301
51	3	31,233	1	101,850
52	1	53,995	2	70,564
53			1	65,831
54	3	98,538	1	93,314
55	2	16,944	1	5,155
56	5	156,859	1	5,719
57	2	56,574	1	56,125
58	1	17,075	1	6,126
59	2	104,511		
60			1	106,998
61	1	48,277		
62	1	7,669	1	47,706
63	1	23,111	1	11,631
64	3	355,100	1	229,632
68	1	36,977		
69	1	56,212		
71	2	27,941	1	51,193
73			1	330,372
Total	35	$ 1,296,304	22	$ 1,642,917

Appendix B: Detailed Tabulations of Member Data (continued)

Table B-5: The Number and Annual Retirement Allowances of Retired Members (Healthy at Retirement) and Survivors of Deceased Members Distributed by Age as of December 31, 2021

	Men		Women	
Age	Number	Allowances	Number	Allowances
43			1	$ 18,531
51	1	72,906	2	107,628
52			2	131,791
53	1	31,719		
54	2	131,946	2	53,973
55	1	117,348	6	390,606
56	2	239,194	1	135,805
57			8	523,846
58	4	248,320	1	64,895
59	4	362,232	6	299,184
60	3	151,478	12	788,024
61	4	192,885	3	180,647
62	6	460,891	6	431,490
63	3	295,225	5	318,593
64	3	277,955	7	377,374
65	13	1,084,427	18	1,109,832
66	6	538,354	14	1,093,728
67	18	1,297,611	18	1,023,936
68	19	1,433,623	13	702,306
69	19	1,356,803	9	513,199
70	24	1,785,539	14	784,320
71	19	1,456,179	14	888,742
72	33	2,437,136	15	1,019,479
73	32	2,399,346	11	807,778
74	28	1,975,124	6	492,587
75	37	2,842,851	10	477,142
76	29	2,067,669	16	893,984
77	17	1,209,127	8	391,474
78	19	1,345,128	6	262,933
79	18	1,285,973	10	695,668
80	11	836,262	15	574,802
81	9	772,334	2	15,034
82	11	1,041,001	7	420,872
83	7	633,996	9	371,057
84	8	569,635	9	282,157

Appendix B: Detailed Tabulations of Member Data (continued)

Table B-5: The Number and Annual Retirement Allowances of Retired Members (Healthy at Retirement) and Survivors of Deceased Members Distributed by Age as of December 31, 2021 (continued)

	Men		Women	
Age	Number	Allowances	Number	Allowances
85	6	$ 499,764	9	$ 458,868
86	6	345,884	3	92,572
87	4	179,558	7	356,730
88	5	288,065	4	118,104
89	2	216,866	9	336,031
90	3	226,048	3	209,753
91	2	152,179	3	210,127
92	3	221,633	3	193,470
93	4	235,277	4	73,862
94			4	85,240
95			2	47,506
96	1	25,896	2	55,637
97	1	105,024	1	9,773
99			1	11,326
101			1	20,263
104			1	49,753
Total	448	$ 33,446,411	343	$ 18,972,432

Appendix B: Detailed Tabulations of Member Data (continued)

Table B-6: The Number and Annual Retirement Allowances of Retired Members (Healthy at Retirement) and Survivors of Deceased Members Distributed by Annuity Type as of December 31, 2021

	Men		Women	
Annuity Type	Number	Allowances	Number	Allowances
Maximum	232	$ 18,009,755	150	$ 10,129,343
Option 1	3	271,138		
Option 2	54	3,332,087	7	446,872
Option 3	50	4,285,754	6	419,483
Option 4	2	163,490	7	308,071
Option 5-2				
Option 5-3				
Option 6-2	29	1,799,683	2	227,368
Option 6-3	57	4,799,657	18	1,385,401
Other	1	14,610		
Survivors of Deceased Members	20	770,237	153	6,055,894
Total	448	$ 33,446,411	343	$ 18,972,432

Table B-7: The Number and Annual Retirement Allowances of Retired Members (Disabled at Retirement) Distributed by Age as of December 31, 2021

	Men		Women	
Age	Number	Allowances	Number	Allowances
65	1	$ 69,696		
Total	1	$ 69,696		

Appendix B: Detailed Tabulations of Member Data (continued)

Table B-8: The Number and Annual Retirement Allowances of Retired Members (Disabled at Retirement) Distributed by Annuity Type as of December 31, 2021

	Men		Women	
Annuity Type	Number	Allowances	Number	Allowances
Maximum	1	$ 69,696		
Option 1				
Option 2				
Option 3				
Option 4				
Option 5-2				
Option 5-3				
Option 6-2				
Option 6-3				
Other				
Total	1	$ 69,696		

Appendix C: Summary of Main Benefits & Contribution Provisions

All justices, judges, district attorneys, and public defenders of the General Court of Justice, and clerks of the Superior Court are eligible for membership.

Final Compensation

The annual rate of compensation of the member at his date of termination or death.

Average Final Compensation

Average annual compensation during the 48 consecutive calendar months of membership producing the highest average.

Creditable Service

Creditable service includes all service rendered as a justice of the Supreme Court, judge of the Court of Appeals, judge of the Superior Court, judge of the District Court Division of the General Court of Justice, Administrative Officer of the Courts, District Attorney, Public Defender or as a Clerk of the Superior Court.

Service Retirement Allowance

Conditions for Allowance

A service retirement allowance is payable to any member who retires from service and

(a) had attained age 50 and was in service on October 8, 1981; or

(b) has attained age 50 and completed five or more years of creditable service; or

Retirement is compulsory at age 72 if the member is a justice or judge of the Appellate, Superior, or District Divisions of the General Court of Justice and at age 70 for each other member.

Unreduced Allowance

An unreduced annual service retirement allowance is payable to a member who:

(a) has attained age 65 and completed five years of creditable service; or

(b) has attained age 50 and completed 24 years of creditable service.

The Service Retirement Allowance is equal to:

(i) 4.02% of final compensation multiplied by the number of years of creditable service rendered as a justice of the Supreme Court or judge of the Court of Appeals, plus

(ii) 3.52% of final compensation multiplied by the number of years of creditable service rendered as a judge of the Superior Court or as Administrative Officer of the Courts, plus

(iii) 3.02% of final compensation multiplied by the number of years of creditable service rendered as a judge of the District Court, District Attorney, Public Defender, or Clerk of the Superior Court, plus

(iv) A service retirement allowance computed on average final compensation, service transferred from the Teachers' and State Employees' Retirement System or the Local Governmental Employees' Retirement System and the applicable formula accrual rate from the previous system.

Reduced Allowance

A reduced annual service retirement allowance is payable to a member who retires:

(a) prior to the earlier of attainment of age 65 and completion of five years of creditable service;

(b) prior to attainment of age 50 or the completion of 24 years of creditable service.

The reduced amount is an allowance as computed above reduced by 3% for each year that the member's retirement date precedes the date upon which the member would have attained age 65 or completed 24 years of service had he or she remained in service, whichever is earlier.

Appendix C: Summary of Main Benefits & Contribution (continued)

Maximum Amount

The maximum annual service retirement allowance (on an unreduced basis) is the amount which, when added to the member's benefit payable from the Teachers' and State Employees' Retirement System, Local Governmental Employees' Retirement System, or Legislative Retirement System (all on an unreduced basis) would total 75% of the member's final compensation.

Minimum Amount

In no event will a member whose creditable service commenced prior to January 1, 1974 as a justice of the Supreme Court, as a judge of the Court of Appeals, as an Administrative Officer of the courts, or as a judge of the Superior Court, receive a smaller retirement allowance than he or she would have received under Chapter 7A of the General Statutes.

Disability Retirement Allowance

Condition for Allowance

Any member who becomes permanently and totally disabled prior to the attainment of age 65 and who has completed at least five years of creditable service may be retired by the Board of Trustees on a disability retirement allowance. Any retired member may also apply for a disability retirement allowance within the first three years of retirement.

Amount of Allowance

The disability retirement allowance is computed as a Service Retirement Allowance based on the number of years of creditable service the member would have had had he or she remained in service to the earliest date he or she could have retired on an unreduced service retirement allowance.

Deferred Allowance

Any member who separates from service prior to age 50 and completion of five years of creditable service and who leaves his total accumulated contributions in the system may receive a deferred allowance, beginning at age 50, computed in the same way as a service retirement allowance on the basis of creditable service and compensation to the date of separation.

Spouse Benefit

Conditions for Benefit

Upon the death of a member in active service after attainment of age 50 and completion of five years of creditable service a death benefit is payable to his or her surviving spouse.

Amount of Benefit

The surviving spouse receives a lump sum payment equal to the member's final compensation. In addition, the surviving spouse receives an annual retirement allowance, until death or remarriage, equal to 50% of the service retirement allowance to which the member would have been entitled had retirement occurred on the first day of the calendar month coincident with or next following his or her date of death reduced by 2% for each year that the member's age exceeds that of the spouse.

Lump Sum Death Benefit

Upon the death of a member in active service prior to attainment of age 50 a lump sum payment equal to the member's accumulated contributions plus his or her final compensation is made to the designated beneficiary or estate.

Appendix C: Summary of Main Benefits & Contribution (continued)

Death after Retirement

Upon the death of a retired member while in receipt of a service retirement allowance or after age 65 if in receipt of a disability retirement allowance an allowance is paid to his or her spouse, until death or remarriage, equal to one-half the allowance which was payable to the member prior to death reduced by 2% for each year that the member's age exceeds that of the spouse.

Upon the death of a member in receipt of a disability retirement allowance prior to age 65, an allowance is paid to his or her spouse, until death or remarriage, equal to one-half the service retirement allowance the member would have received had he or she remained in service up to the date of death reduced by 2% for each year that the member's age exceeds that of the spouse.

Upon the death of a beneficiary who did not retire under an effective election of Option 2, 3, 5 or 6, an amount equal to the excess if any, of the member's accumulated contributions at retirement over the retirement allowance payments received is paid to a designated person or to the beneficiary's estate.

Upon the death of the survivor of a beneficiary who retired under an effective election of Option 2, 3, 5 or 6, an amount equal to the excess, if any, of the beneficiary's accumulated contributions at retirement over the total retirement allowance payments received is paid to such other person designated by the beneficiary or to the beneficiary's estate.

Other Death Benefits

Upon the death of a member in service, other benefits may be provided by the Death Benefit Plan.

Return of Contributions

Any member who terminates service other than by retirement or death is entitled to the return of accumulated contributions.

If the total retirement allowance payments to a retired member, spouse and/or beneficiary under option are less than the member's accumulated contributions at retirement, the excess is paid to the designated beneficiary or legal representatives.

The current interest rate on member contributions is 4%.

Optional Allowances

In lieu of the full retirement allowance, any member may elect to receive a reduced retirement allowance equal in value to the full allowance, with the provision that:

Option 1

A member retiring prior to July 1, 1993 may elect that at his or her death within 10 years from retirement date, an amount equal to his or her accumulated contributions at retirement, less 1/120 for each month he or she has received a retirement allowance payment, is paid to the estate, or to a person designated by the member, or

Option 2

At the death of the member his or her allowance shall be continued throughout the life of such other person as the member shall have designated at the time of retirement, or

Option 3

At the death of the member one-half of his or her allowance shall be continued throughout the life of such other person as the member shall have designated at the time of retirement, or

Appendix C: Summary of Main Benefits & Contribution (continued)

Option 4

At retirement, any member may elect to receive a retirement allowance in such amount that, together with his or her Social Security benefit, the member will receive approximately the same income per annum before and after the earliest age at which he or she becomes eligible to receive the Social Security benefit. A member who elects to receive his or her allowance under this option is deemed to have elected Option 1 also, or

Option 5

A member retiring prior to July 1, 1993 may elect to receive a reduced retirement allowance during his or her life with some other benefit approved by the Board of Trustees payable after death, or the member may elect to receive a reduced retirement allowance under the provisions of Option 2 or Option 3 in conjunction with the provisions of Option 1, or

Option 6

A member may elect either Option 2 or Option 3 with the added provision that in the event the designated beneficiary predeceases the member, the retirement allowance payable to the member after the designated beneficiary's death shall be equal to the retirement allowance which would have been payable had the member not elected the Option.

Unused Sick Leave

Unused sick leave counts as creditable service at retirement. Sick leave which was converted from unused vacation leave is also creditable. One month of credit is allowed for each 20 days of unused sick leave, plus an additional month for any part of 20 days left over.

Post-Retirement Increases in Allowance

Future increases in allowances may be granted at the discretion of the State.

Contributions

Member Contributions

Each member contributes 6% of annual compensation.

Employer Contributions

The State makes annual contributions consisting of a normal contribution and an accrued liability contribution. The normal contribution covers the liability on account of current service and is determined by the actuary after each valuation.

The accrued liability contribution covers the past service liability that exceeds the actuarial value of assets.

Changes Since Prior Valuation

The December 31, 2021 valuation reflects a one-time supplement for CJRS payees that is equal to 4% of their annual retirement allowance and payable in October 2022.

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.

Real Wage Growth

0.75% per annum.

Payroll Growth

3.25% per annum.

Withdrawal

2.00% termination rate assumed for all years.

Separations Before Retirement

Representative values of the assumed annual rates of separation are as follows:

	Annual Rates of		
	Disability	Base Mortality*	
Age	Male & Female	Male	Female
25	.00002	.00024	.00008
30	.00003	.00031	.00013
35	.00008	.00041	.00021
40	.00017	.00057	.00033
45	.00035	.00085	.00051
50	.00059	.00129	.00076
55	.00119	.00190	.00112
60	.00192	.00276	.00169
64	.00246	.00375	.00245

* Base mortality rates as of 2010.

Appendix D: Actuarial Assumptions and Methods (continued)

Service Retirement

Representative values of the assumed annual rates of service retirement are as follows:

Annual Rates of Retirement						
	Service					
Age	5	10	15	20	24	25 +
50	.020	.020	.020	.020	.150	.090
55	.020	.020	.020	.020	.050	.090
60	.040	.040	.040	.040	.200	.170
65	.120	.120	.120	.120	.120	.120
70	.250	.250	.250	.250	.250	.250

All members are assumed to retire no later than age 72.

Salary Increases (Merit Only)

Representative values of the assumed annual rates of salary merit increases are as follows:

Annual Rate of Salary Increase	
Service	Rate
0	.0150
5	.0100
10	.0050
>=15	.0000

Appendix D: Actuarial Assumptions and Methods (continued)

Deaths After Retirement

Representative values of the assumed post-retirement mortality rates in 2010 prior to any mortality improvements are as follows:

Annual Rate of Death after Retirement (Retired Members and Survivors of Deceased Members)						
	Retirement (Healthy at Retirement)		Survivors of Deceased Members		Retirees (Disabled at Retirement)	
Age	Male	Female	Male	Female	Male	Female
55	.00387	.00275	.01147	.00742	.02114	.01742
60	.00552	.00371	.01450	.00975	.02503	.01956
65	.00820	.00595	.02086	.01332	.03044	.02256
70	.01381	.01032	.03221	.01931	.03901	.02862
75	.02437	.01827	.04971	.02946	.05192	.04003.
80	.04391	.03260	.07802	.04698	.07348	.06007

Deaths After Retirement (Healthy Members at Retirement)

Mortality rates are based on the Pub-2010 General Retirees Above-Median Amount-Weighted Mortality.

Deaths After Retirement (Disabled Members at Retirement)

Mortality rates are based on the Pub-2010 General Disabled Retirees Amount-Weighted Mortality.

Deaths After Retirement (Survivors of Deceased Members)

Mortality rates are based on the Pub-2010 General Contingent Survivors Amount-Weighted Mortality.

Deaths Prior to Retirement

Mortality rates are based on the Pub-2010 General Employees Amount- Weighted Mortality.

Mortality Projection

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

Timing of Assumptions

All withdrawals, deaths, disabilities, retirements and salary increases 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.

Liability for Inactive Members

The liability for members who terminated prior to five years of creditable service is estimated to be 100% of the member's accumulated contributions. The liability for members who terminated after completing five years of creditable service is estimated based on the member's current age and the service and reported compensation at termination of employment.

Appendix D: Actuarial Assumptions and Methods (continued)

Administrative Expenses

0.05% of payroll added to the normal cost rate.

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 first name.

Reported Compensation

Calendar year compensation as furnished by the system's office.

Valuation Compensation

Reported compensation adjusted to reflect the assumed rate of pay as of the valuation date and the probability of decrement during the year.

Compensation Limits

No compensation limits are applied.

Actuarial Cost Method

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

Normal Cost

Normal cost rate reflects the impact of new entrants during the year.

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 7. 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 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 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 provisions for death benefits payable upon the death of a retired member. The impact of this enhancement this change increased the actuarial accrued liability by $15.0 million, as of December 31, 2021, or 1.86% of the expected actuarial accrued liability. Other minor differences lowered liabilities by $3.8 million, resulting in a net $11.2 million increase in the actuarial accrued liability as a result of the transition.

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	$ 743,544	$ 4,640	$ 21,535	$ 56,942	$ 38	$ (48,316)	$ 664,423
2023	664,423	4,496	26,845	56,590	37	42,380	681,517
2024	681,517	4,316	25,623	58,469	37	43,385	696,335
2025	696,335	4,135	27,421	60,245	38	44,343	711,951
2026	711,951	3,975	30,285	61,672	38	45,399	729,900
2027	729,900	3,745	34,786	63,526	38	46,643	751,510
2028	751,510	3,549	40,509	65,020	39	48,176	778,685
2029	778,685	3,339	41,517	66,575	39	49,919	806,846
2030	806,846	3,129	38,093	67,959	39	51,588	831,658
2031	831,658	2,921	35,261	69,169	39	53,065	853,697
2032	853,697	2,718	31,852	70,337	39	54,344	872,235
2033	872,235	2,520	28,632	71,330	39	55,408	887,426
2034	887,426	2,342	20,038	71,968	39	56,095	893,894
2035	893,894	2,160	10,949	72,597	39	56,198	890,565
2036	890,565	1,976	5,494	73,109	39	55,785	880,672
2037	880,672	1,806	4,336	73,366	39	55,094	868,503
2038	868,503	1,630	3,919	73,606	39	54,274	854,681
2039	854,681	1,463	3,522	73,650	38	53,356	839,334
2040	839,334	1,313	3,159	73,421	38	52,351	822,698
2041	822,698	1,151	2,769	73,291	37	51,254	804,544
2042	804,544	1,011	2,434	72,798	37	50,076	785,230
2043	785,230	866	2,074	72,321	36	48,819	764,632
2044	764,632	743	1,762	71,497	36	47,493	743,097
2045	743,097	648	1,526	70,246	35	46,123	721,113
2046	721,113	560	1,318	68,914	34	44,727	698,770
2047	698,770	461	1,080	67,602	33	43,305	675,981
2048	675,981	366	853	66,214	32	41,858	652,812
2049	652,812	291	668	64,561	32	40,398	629,576
2050	629,576	229	520	62,758	31	38,939	606,475
2051	606,475	168	380	60,904	30	37,489	583,578
2052	583,578	126	285	58,833	29	36,063	561,190
2053	561,190	88	196	56,734	28	34,670	539,382
2054	539,382	73	159	54,315	27	33,329	518,601
2055	518,601	56	118	51,973	26	32,051	498,827
2056	498,827	40	85	49,594	25	30,841	480,174
2057	480,174	28	57	47,214	24	29,703	462,724
2058	462,724	20	39	44,814	23	28,645	446,591
2059	446,591	11	23	42,463	22	27,670	431,810
2060	431,810	5	10	40,133	21	26,784	418,455
2061	418,455	2	3	37,817	20	25,990	406,613
2062	406,613	0	0	33,729	19	25,350	398,215
2063	398,215	0	0	31,421	18	24,878	391,654
2064	391,654	0	0	29,179	17	24,523	386,981
2065	386,981	0	0	27,007	16	24,289	384,247
2066	384,247	0	0	24,910	15	24,179	383,501
2067	383,501	0	0	22,892	14	24,195	384,790
2068	384,790	0	0	20,958	13	24,340	388,159
2069	388,159	0	0	19,111	12	24,618	393,654
2070	393,654	0	0	17,356	11	25,031	401,318
2071	401,318	0	0	15,696	10	25,583	411,195

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	$ 411,195	$ 0	$ -	$ 14,132	$ 10	$ 26,276	$ 423,329
2073	423,329	0	0	12,665	9	27,111	437,766
2074	437,766	0	0	11,296	8	28,093	454,555
2075	454,555	0	0	10,022	7	29,225	473,751
2076	473,751	0	0	8,843	6	30,511	495,413
2077	495,413	0	0	7,756	6	31,953	519,604
2078	519,604	0	0	6,760	5	33,558	546,397
2079	546,397	0	0	5,852	5	35,329	575,869
2080	575,869	0	0	5,030	4	37,270	608,105
2081	608,105	0	0	4,291	4	39,390	643,200
2082	643,200	0	0	3,630	3	41,692	681,259
2083	681,259	0	0	3,045	3	44,184	722,395
2084	722,395	0	0	2,531	2	46,875	766,737
2085	766,737	0	0	2,082	2	49,771	814,424
2086	814,424	0	0	1,695	2	52,883	865,610
2087	865,610	0	0	1,364	1	56,221	920,466
2088	920,466	0	0	1,085	1	59,795	979,175
2089	979,175	0	0	852	1	63,619	1,041,941
2090	1,041,941	0	0	661	1	67,706	1,108,985
2091	1,108,985	0	0	506	1	72,069	1,180,547
2092	1,180,547	0	0	382	0	76,722	1,256,887
2093	1,256,887	0	0	285	0	81,688	1,338,290
2094	1,338,290	0	0	211	0	86,983	1,425,062
2095	1,425,062	0	0	154	0	92,623	1,517,531
2096	1,517,531	0	0	113	0	98,636	1,616,054
2097	1,616,054	0	0	82	0	105,041	1,721,013
2098	1,721,013	0	0	60	0	111,864	1,832,817
2099	1,832,817	0	0	44	0	119,131	1,951,904
2100	1,951,904	0	0	33	0	126,873	2,078,744
2101	2,078,744	0	0	25	0	135,118	2,213,837
2102	2,213,837	0	0	19	0	143,899	2,357,717
2103	2,357,717	0	0	14	0	153,251	2,510,954
2104	2,510,954	0	0	11	0	163,212	2,674,155
2105	2,674,155	0	0	8	0	173,819	2,847,966
2106	2,847,966	0	0	6	0	185,118	3,033,078
2107	3,033,078	0	0	4	0	197,150	3,230,224
2108	3,230,224	0	0	3	0	209,964	3,440,185
2109	3,440,185	0	0	2	0	223,612	3,663,795
2110	3,663,795	0	0	1	0	238,146	3,901,940
2111	3,901,940	0	0	1	0	253,626	4,155,565
2112	4,155,565	0	0	1	0	270,112	4,425,676
2113	4,425,676	0	0	0	0	287,669	4,713,345
2114	4,713,345	0	0	0	0	306,367	5,019,712
2115	5,019,712	0	0	0	0	326,281	5,345,993
2116	5,345,993	0	0	0	0	347,490	5,693,483
2117	5,693,483	0	0	0	0	370,076	6,063,559
2118	6,063,559	0	0	0	0	394,131	6,457,690
2119	6,457,690	0	0	0	0	419,750	6,877,440
2120	6,877,440	0	0	0	0	447,034	7,324,474
2121	7,324,474	0	0	0	0	476,091	7,800,565

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%	Present Value of Benefit Payments: Unfunded Payments at 3.54%	Present Value of Benefit Payments: Using Single Discount Rate of 6.50%
2022	$ 743,544	$ 56,942	$ 56,942	$ 0	$ 55,177	$ 0	$ 55,177
2023	664,423	56,590	56,590	0	51,489	0	51,489
2024	681,517	58,469	58,469	0	49,952	0	49,952
2025	696,335	60,245	60,245	0	48,328	0	48,328
2026	711,951	61,672	61,672	0	46,453	0	46,453
2027	729,900	63,526	63,526	0	44,929	0	44,929
2028	751,510	65,020	65,020	0	43,179	0	43,179
2029	778,685	66,575	66,575	0	41,513	0	41,513
2030	806,846	67,959	67,959	0	39,790	0	39,790
2031	831,658	69,169	69,169	0	38,027	0	38,027
2032	853,697	70,337	70,337	0	36,309	0	36,309
2033	872,235	71,330	71,330	0	34,574	0	34,574
2034	887,426	71,968	71,968	0	32,754	0	32,754
2035	893,894	72,597	72,597	0	31,024	0	31,024
2036	890,565	73,109	73,109	0	29,336	0	29,336
2037	880,672	73,366	73,366	0	27,642	0	27,642
2038	868,503	73,606	73,606	0	26,040	0	26,040
2039	854,681	73,650	73,650	0	24,466	0	24,466
2040	839,334	73,421	73,421	0	22,901	0	22,901
2041	822,698	73,291	73,291	0	21,465	0	21,465
2042	804,544	72,798	72,798	0	20,019	0	20,019
2043	785,230	72,321	72,321	0	18,674	0	18,674
2044	764,632	71,497	71,497	0	17,335	0	17,335
2045	743,097	70,246	70,246	0	15,992	0	15,992
2046	721,113	68,914	68,914	0	14,731	0	14,731
2047	698,770	67,602	67,602	0	13,569	0	13,569
2048	675,981	66,214	66,214	0	12,479	0	12,479
2049	652,812	64,561	64,561	0	11,425	0	11,425
2050	629,576	62,758	62,758	0	10,428	0	10,428
2051	606,475	60,904	60,904	0	9,502	0	9,502
2052	583,578	58,833	58,833	0	8,619	0	8,619
2053	561,190	56,734	56,734	0	7,804	0	7,804
2054	539,382	54,315	54,315	0	7,015	0	7,015
2055	518,601	51,973	51,973	0	6,303	0	6,303
2056	498,827	49,594	49,594	0	5,648	0	5,648
2057	480,174	47,214	47,214	0	5,048	0	5,048
2058	462,724	44,814	44,814	0	4,499	0	4,499
2059	446,591	42,463	42,463	0	4,003	0	4,003
2060	431,810	40,133	40,133	0	3,553	0	3,553
2061	418,455	37,817	37,817	0	3,143	0	3,143
2062	406,613	33,729	33,729	0	2,632	0	2,632
2063	398,215	31,421	31,421	0	2,303	0	2,303
2064	391,654	29,179	29,179	0	2,008	0	2,008
2065	386,981	27,007	27,007	0	1,745	0	1,745
2066	384,247	24,910	24,910	0	1,511	0	1,511
2067	383,501	22,892	22,892	0	1,304	0	1,304
2068	384,790	20,958	20,958	0	1,121	0	1,121
2069	388,159	19,111	19,111	0	960	0	960
2070	393,654	17,356	17,356	0	818	0	818
2071	401,318	15,696	15,696	0	695	0	695

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%	Present Value of Benefit Payments: Unfunded Payments at 3.54%	Present Value of Benefit Payments: Using Single Discount Rate of 6.50%
2072	$ 411,195	$ 14,132	$ 14,132	$ 0	$ 588	$ 0	$ 588
2073	423,329	12,665	12,665	0	494	0	494
2074	437,766	11,296	11,296	0	414	0	414
2075	454,555	10,022	10,022	0	345	0	345
2076	473,751	8,843	8,843	0	286	0	286
2077	495,413	7,756	7,756	0	235	0	235
2078	519,604	6,760	6,760	0	193	0	193
2079	546,397	5,852	5,852	0	157	0	157
2080	575,869	5,030	5,030	0	126	0	126
2081	608,105	4,291	4,291	0	101	0	101
2082	643,200	3,630	3,630	0	80	0	80
2083	681,259	3,045	3,045	0	63	0	63
2084	722,395	2,531	2,531	0	49	0	49
2085	766,737	2,082	2,082	0	38	0	38
2086	814,424	1,695	1,695	0	29	0	29
2087	865,610	1,364	1,364	0	22	0	22
2088	920,466	1,085	1,085	0	16	0	16
2089	979,175	852	852	0	12	0	12
2090	1,041,941	661	661	0	9	0	9
2091	1,108,985	506	506	0	6	0	6
2092	1,180,547	382	382	0	5	0	5
2093	1,256,887	285	285	0	3	0	3
2094	1,338,290	211	211	0	2	0	2
2095	1,425,062	154	154	0	2	0	2
2096	1,517,531	113	113	0	1	0	1
2097	1,616,054	82	82	0	1	0	1
2098	1,721,013	60	60	0	0	0	0
2099	1,832,817	44	44	0	0	0	0
2100	1,951,904	33	33	0	0	0	0
2101	2,078,744	25	25	0	0	0	0
2102	2,213,837	19	19	0	0	0	0
2103	2,357,717	14	14	0	0	0	0
2104	2,510,954	11	11	0	0	0	0
2105	2,674,155	8	8	0	0	0	0
2106	2,847,966	6	6	0	0	0	0
2107	3,033,078	4	4	0	0	0	0
2108	3,230,224	3	3	0	0	0	0
2109	3,440,185	2	2	0	0	0	0
2110	3,663,795	1	1	0	0	0	0
2111	3,901,940	1	1	0	0	0	0
2112	4,155,565	1	1	0	0	0	0
2113	4,425,676	0	0	0	0	0	0
2114	4,713,345	0	0	0	0	0	0
2115	5,019,712	0	0	0	0	0	0
2116	5,345,993	0	0	0	0	0	0
2117	5,693,483	0	0	0	0	0	0
2118	6,063,559	0	0	0	0	0	0
2119	6,457,690	0	0	0	0	0	0
2120	6,877,440	0	0	0	0	0	0
2121	7,324,474	0	0	0	0	0	0

Appendix F: Additional Disclosures

Table F-1 illustrates the sensitivity of certain valuation results to changes in the discount rate on a market value of assets basis. Table F-2 provides an estimate of future market value of asset returns based on the current portfolio structure and summarized in the "NCRS Investment Policy Statement Review" presentation prepared by the DST Investment Management Division and dated May 25, 2022.

Section 6(c) of Session Law 2016-108 requires that the actuarial valuation report provide the valuation results using a 30-year treasury rate as of December 31 of the year of the valuation as the discount rate. This is 1.90% at December 31, 2021 and has been used as the lower bound of the sensitivity analysis presented. The range between the current discount rate (6.50%) and the 30-year treasury rate (1.90%) was used to establish an upper bound for sensitivity analysis (11.10%). Based on the DST Investment Management Division's analysis, the lower bound of 1.90% exceeds the 95th percentile of estimated future 30-year returns while the lower bound of 11.10% falls below the 5th and percentiles of estimated future 30-year returns.

Table F-1: Sensitivity of Valuation Results as of December 31, 2021

Discount Rate	1.90%	4.20%	6.50%	8.80%	11.10%
Market Value of Assets	$ 743,543,527	$ 743,543,527	$ 743,543,527	$ 743,543,527	$ 743,543,527
Actuarial Accrued Liability	$ 1,398,472,235	$ 1,058,146,280	$ 832,153,712	$ 675,950,663	$ 564,128,715
Unfunded Accrued Liability (UAL)	$ 654,928,708	$ 314,602,753	$ 88,610,185	$ (67,592,864)	$ (179,414,812)
Funded Ratio	53.2%	70.3%	89.4%	110.0%	131.8%
20-Year Amortization of UAL	$ 40,421,473	$ 24,550,324	$ 8,564,608	N/A	N/A
(as % of general state revenue)	0.10%	0.06%	0.02%	N/A	N/A

Other than the discount rate, these results are based on the other economic and demographic assumptions presented in the report. For purposes of simplicity in this disclosure, no adjustments to the valuation assumption for inflation were reflected in the sensitivities above. The statute also requires that the actuarial valuation report show the results using a market value of assets basis. The "funded ratio" and "unfunded accrued liability" in Table F-1 are based upon the market value of assets. In order to alleviate volatility, future employer contributions are determined based on the actuarial value of assets, which smooths market value returns.

None of the liability amounts shown are intended to imply the amount that might represent the cost of any settlement of the plan's obligations. The various caveats, constraints, and discussions presented earlier in the report apply to these results as well.

Appendix F: Additional Disclosures (continued)

Table F-2: Estimate of Future Asset Returns

Horizon	95% Chance (19 out of every 20 scenarios)	75% Chance (3 out of every 4 scenarios)	50% Chance (1 out of every 2 scenarios)	25% Chance (1 out of every 4 scenarios)	5% Chance (1 out of every 20 scenarios)
10 Years (2032)	0.4%	3.6%	5.7%	7.8%	11.1%
30 Years (2052)	3.3%	5.1%	6.3%	7.6%	9.3%

This analysis was commissioned by the Investment Management Division and presented to the Investment Advisory Committee on February 23, 2022.

Appendix G: Data for Section 2 graphs

The tables below provide the numbers associated with the graphs in Section 2 of this report.

Graph 1: Active Members

	Active Member Count	Reported Compensation
2017	562	$ 71,726,921
2018	557	70,565,420
2019	560	73,620,349
2020	558	75,253,272
2021	569	78,152,238

Graph 2: Retired Members and Survivors of Deceased Members

	Retired and Survivors of Deceased	Retirement Allowance
2017	682	$ 42,920,238
2018	707	45,108,774
2019	743	48,033,353
2020	761	49,184,793
2021	792	52,488,539

Graph 3: Market Value of Assets and Asset Returns

	Market Value of Assets	Asset Return
2017	$ 595,683,002	13.46%
2018	573,177,910	-1.41%
2019	639,475,570	14.84%
2020	695,354,777	11.13%
2021	743,543,527	9.67%

Graph 5: Actuarial Value and Market Value of Assets

	Actuarial Value of Assets	Market Value of Assets
2017	$ 586,776,499	$ 595,683,002
2018	602,207,449	573,177,910
2019	621,547,192	639,475,570
2020	661,100,432	695,354,777
2021	702,706,558	743,543,527

Appendix G: Data for Section 2 Graphs (continued)

Graph 6: Asset Returns

	Actuarial Value	Market Value
2017	6.57%	13.46%
2018	5.11%	-1.41%
2019	6.20%	14.84%
2020	8.79%	11.13%
2021	9.17%	9.67%

Graph 7: Actuarial Accrued Liability

	Liability for Active Members	Liability for Deferred Members	Liability for Retired Members	Total Liability
2017	$ 256,903,792	$ 4,174,484	$ 420,816,811	$ 681,895,087
2018	256,129,026	7,657,518	438,826,119	702,612,663
2019	250,648,664	8,217,784	466,586,096	725,452,544
2020	310,336,677	6,863,612	478,478,019	795,678,308
2021	289,893,880	9,550,928	532,708,904	832,153,712

Graph 8: Actuarial Accrued Liability and Actuarial Value of Assets

	Actuarial Accrued Liability	Actuarial Value of Assets
2017	$ 681,895,087	$ 586,776,499
2018	702,612,663	602,207,449
2019	725,452,544	621,547,192
2020	795,678,308	661,100,432
2021	832,153,712	702,706,558

Graph 9: Funded Ratios

	Funded Ratio (Actuarial Basis)	Funded Ratio (Market Value Basis)
2017	86.1%	87.4%
2018	85.7%	81.6%
2019	85.7%	88.1%
2020	83.1%	87.4%
2021	84.4%	89.4%

Appendix G: Data for Section 2 Graphs (continued)

Graph 10: Actuarially Determined Employer Contribution Rates

Fiscal Year Ending	Normal Rate	Accrued Liability Rate	Total Rate
2020	17.28%	16.32%	33.60%
2021	17.43%	19.01%	36.44%
2022	17.59%	22.43%	40.02%
2023	13.02%	26.63%	39.65%
2024*	14.16%	18.68%	32.84%

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