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Firefighters' and Rescue Squad Workers' Pension Fund
Principal Results of Actuarial Valuation
as of December 31, 2017

October 25, 2018 Board of Trustees Meeting

Larry Langer, ASA, FCA, EA, MAAA
Jonathan Craven, ASA, FCA, EA, MAAA

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Member Data

Inputs
Membership Data
Asset Data
Benefit Provisions
Assumptions
Funding Methodology
↓
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	12/31/2017	12/31/2016
Active Members	25,068	25,210
Lapsed Members	13,134	17,235
Terminated members and survivors of deceased members entitled to benefits but not yet receiving benefits	120	139
Retired members and survivors of deceased members killed in the Line of Duty currently receiving benefits	14,308	13,940
Total	52,630	56,524

The number of fully active members declined slightly and the number of lapsed members decreased significantly. This is likely due to RSD's effort to encourage certain lapsed members to apply for contribution refunds. The number of retired members increased by 2.6% from the previous valuation date. The increase in retiree population is consistent with expectations.

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

Asset Data

Inputs
Membership Data
Asset Data
Benefit Provisions
Assumptions
Funding Methodology
↓
Results
Actuarial Value of Assets
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Net Actuarial Gain or Loss
Funded Ratio
Employer Contributions
Benefit Enhancement
Additional Disclosures
Projections

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

Asset Data as of	12/31/2017	12/31/2016
Beginning of Year Market Value of Assets	$ 383,865,563	$ 372,572,223
Contributions	20,819,255	18,070,953
Benefit Payments	(30,964,763)	(29,675,409)
Investment Income	50,491,866	22,897,796
Net Increase/(Decrease)	40,346,358	11,293,340
End of Year Value of Assets	$ 424,211,921	$ 383,865,563
Estimated Net Investment Return on Market Value (Annualized)	13.33%	6.24%

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

Incoming contributions cover over 60% 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.

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

Net Actuarial Gain or Loss

Inputs
Membership Data
Asset Data
Benefit Provisions
Assumptions
Funding Methodology
↓
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 reconciliation of the prior year's unfunded actuarial accrued liability to the current year's unfunded actuarial accrued liability.

(in millions)		
Unfunded Actuarial Accrued Liability (UAAL) as of 12/31/2016	$	49.6
Normal Cost and Administrative Expense during 2017		7.9
Decrease due to Transition to New Actuary		(1.1)
Reduction due to Actual Contributions during 2017		(20.8)
Interest on UAAL, Normal Cost, and Contributions		3.3
Asset (Gain) / Loss		2.6
Actuarial Accrued Liability (Gain) / Loss		(0.4)
Impact of Assumption Changes		10.5
Impact of Legislative Changes		0.0
Unfunded Actuarial Accrued Liability (UAAL) as of 12/31/2017	$	51.6

During 2017, there was a transition from the prior actuary to CMC, resulting in valuation programing, modifications and differences in methodologies that decreased the UAAL by $1.1 million. In addition during 2017, the UAAL increased more than expected primarily due to assumption changes. The change to the interest rate from 7.20% to 7.00% increased the UAAL by $10.5 million. The loss recognized in the actuarial value of assets increased the UAAL by $2.6 million. These increases were partially offset by a liability gain of $0.4 million and SCRSP contributions exceeding the actuarially determined contribution.

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

Employer Contributions

Inputs
Membership Data
Asset Data
Benefit Provisions
Assumptions
Funding Methodology
↓
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 reconciliation of the actuarially determined employer contribution.

Fiscal year ending June 30, 2018 Preliminary ADEC (estimated based on December 31, 2016 Valuation)	14,544,083
Impact of Legislative Changes	0
Fiscal year ending June 30, 2019 Final ADEC	14,544,083
Change Due to Transition (Gain)/Loss	(85,355)
Change Due to Demographic (Gain)/Loss	(280,935)
Change Due to Investment (Gain)/Loss	355,205
Change Due to Contributions Greater than ADEC	(782,461)
Impact of Assumption Changes	1,719,441
ADEC Before Direct Rate Smoothing	15,469,978
Impact of Direct Rate Smoothing	(1,146,294)
Fiscal year ending June 20, 2020 Preliminary ADEC (estimated based on December 31, 2017 Valuation)	$ 14,323,684

The change in rate due to investment loss is based on the actuarial value of assets returns, which was less than the 7.20% assumed return.

The impact of the assumption change, the reduction from 7.20% assumed return to 7.00% totaled $1.7 million. This will be phased in over the next three years, being fully reflected for the June 30, 2022 results.

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

Employer Contributions

Inputs
Membership Data
Asset Data
Benefit Provisions
Assumptions
Funding Methodology
↓
Results
Actuarial Value of Assets
Actuarial Accrued Liability
Net Actuarial Gain or Loss
Funded Ratio
Employer Contributions
Benefit Enhancement
Additional Disclosures
Projections

- Session Law 2016-108 requires that the Board develop a State Contribution Rate Stabilization Policy (SCRSP) for the FRSWPF
- Below is a summary of the SCRSP that the Board adopted on January 26, 2017
- – State Contributions
  - Board will recommend to the General Assembly the higher of the underlying ADEC or $350,000 greater than the current year's appropriation
  - SCRSP Minimum Contribution Rate for FYE 2020 is $18,652,208 (Greater of ADEC of $14,323,684 and FYE 2019 appropriation of $18,302,208 plus $350,000)
- Benefit Increases and Member Contribution Increases
  - The cost of benefit improvements under the SCRSP are to be paid for by undistributed investment gains
  - With a goal of a 50/50 split between member and state contributions toward the normal cost portion of the annual contribution, monthly member contributions will be increased by $5 in any year that a benefit increase is granted AND the member's share of the Fund's normal cost is less than 50%
- See next slides for metrics the Board must use to recommend benefit and/or member contribution increases

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

State Contribution Rate Stabilization Policy

Inputs
Membership Data
Asset Data
Benefit Provisions
Assumptions
Funding Methodology
↓
Results
Actuarial Value of Assets
Actuarial Accrued Liability
Net Actuarial Gain or Loss
Funded Ratio
Employer Contributions
Benefit Enhancement
Additional Disclosures
Projections

- A $1 increase in monthly benefit could be recommended to the General Assembly
  - These are to be paid out of undistributed investment gains of $5.95 million
  - $3,182,229 in funding is available to ensure that the UAAL does not grow
    - Funding available to improve the benefit without adding unfunded liability:
      - SCRSP Minimum Contribution Rate for FYE 2020 $18,652,208
      - ADEC before direct rate smoothing $15,469,978
      - Funding available to improve benefit $ 3,182,229
    - This is sufficient to pay the AAL of $2,764,231
  - The $1 increase represents a 0.6% increase, which is less than the CPI-U of 2.1%
  - Thus benefit increase triggers a member contribution increase from $10 per month to $15 per month
    - The $5 increase is sufficient to pay for the increase in normal cost of $41,998
    - This increases member percent share of total normal cost from 32.06% to 47.84%, inclusive of benefit and member contribution increase

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

State Contribution Rate Stabilization Policy Metrics

Inputs
Membership Data
Asset Data
Benefit Provisions
Assumptions
Funding Methodology
↓
Results
Actuarial Value of Assets
Actuarial Accrued Liability
Net Actuarial Gain or Loss
Funded Ratio
Employer Contributions
Benefit Enhancement
Additional Disclosures
Projections

- Metrics the Board must use in recommending benefit increases and/or member contribution increases based on the December 31, 2017 valuation are as follows:
  - Undistributed investment gains to reserve for benefit increases: $5.95 million
  - Impact of a $1 increase in benefit on the
    - Actuarial Accrued Liability $ 2,764,231
    - Normal Cost $ 41,998
  - Amount of benefit increase to be paid with undistributed investment gains: $1
  - Year-over-year increase in CPI-U as of December, 2017: 2.1%
  - State's share of normal cost per active member: $254.27
  - Member's share of normal cost per active member: $120.00
  - Member percent share of total normal cost: 32.06%
  - Would a benefit increase trigger a member contribution increase? Yes
  - Amount of monthly increase in member contribution (*to nearest $5*) to make member's share 50%: $5.00

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

Key Takeaways

- Key results of the December 31, 2017 valuation were:
  - Market value returns of 13.33% during calendar year 2017 compared to 7.20% assumed at the beginning of the plan year
  - The assumed rate of return on plan assets was lowered from 7.20% to 7.00% effective December 31, 2017. The assumed rate of return is the discount rate used to value plan liabilities. The impact of this change on the actuarially determined employer contribution will be phased in over 3 years.
  - Fewer lapsed members reported due to RSD's effort to encourage certain lapsed members to apply for contribution refunds.

Key Takeaways (continued)

- When compared to the December 31, 2016 actuarial valuation, the previous resulted in:
  - No change in funded ratio (89.0% in the December 31, 2017 valuation compared to the December 31, 2016 valuation)
  - Lower actuarially determined employer contribution ($14,323,684 for fiscal year ending June 30, 2020 compared to the preliminary $14,544,083 calculated in the December 31, 2016 valuation for fiscal year ending June 30, 2019)
- Recommended contribution under the State Contribution Rate Stabilization Policy (SCRSP) of $18,652,208 which is the greater of:
  - The ADEC of $14,323,684 and
  - The FYE 2018 appropriation of $18,302,208 plus $350,000

Key Takeaways (continued)

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

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

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

Certification

Future actuarial measurements may differ significantly from current measurements due to plan experience differing from that anticipated by the economic and demographic assumptions, increases or decreases expected as part of the natural operation of the methodology used for these measurements, and changes in plan provisions or applicable law. Because of limited scope, Cavanaugh Macdonald performed no analysis of the potential range of such future differences, except for some limited analysis in financial projections or required disclosure information. Results prior to December 31, 2017 were provided by the prior consulting actuary.

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.

Larry Langer, ASA, EA, FCA, MAAA
Principal and Consulting Actuary

Jonathan T. Craven, ASA, EA, FCA, MAAA
Consulting Actuary

Cavanaugh Macdonald
CONSULTING, LLC
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North Carolina Firefighters' and Rescue Squad Workers' Pension Fund

Report on the Actuarial Valuation
Prepared as of December 31, 2017

October 2018

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CONSULTING, LLC
The experience and dedication you deserve

October 18, 2018

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

Members of the Board:

We submit herewith our report on the actuarial valuation of the North Carolina Firefighters' and Rescue Squad Workers' Pension Fund (referred to as "FRSWPF" or the "Firefighter and Rescue Squad Worker Plan") prepared as of December 31, 2017. Information contained in our report for plan years prior to December 31, 2017 is based upon valuations performed by the prior actuary.

The primary purpose of the valuation report is to determine the required member and employer contribution rate (state appropriation), to describe the current financial condition of FRSWPF, and to analyze changes in such condition. In addition, the report provides information that the Office of the State Controller (OSC) requires for its Comprehensive Annual Financial Report (CAFR) 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 Cavanaugh Macdonald Consulting (CMC) to review any statement you wish to make on the results contained in this report. CMC 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 reviewed for reasonableness and consistency with the prior valuation, these elements have not been audited by CMC and we cannot certify as to the accuracy and completeness of the data supplied. Sometimes assumptions are made by CMC to interpret membership data that is imperfect. The valuation is also based on benefit and contribution provisions as presented in this report. If you have reason to believe that the plan provisions are incorrectly described, that important plan provisions relevant to this valuation are not described, or that conditions have changed since the calculations were made, you should contact the authors of this actuarial report prior to relying on this information.

The valuation is further based on the actuarial valuation assumptions, approved by the Board of Trustees, as presented in this report. We believe that these assumptions are appropriate and reasonable and also comply with the requirements of GASB Statement No. 67. We prepared this valuation in accordance with the requirements of this standard and in accordance with all applicable Actuarial Standards of Practice.

The return to service assumption was adopted by the Board of Trustees on July 21, 2016. The discount rate of 7.00% was adopted by the Board of Trustees on April 26, 2018. All other assumptions were adopted for use with the December 31, 2017 actuarial valuation, based on the experience study prepared as of December 31, 2014 and adopted by the Board of Trustees on January 21, 2016. 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.

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 is 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.

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.

Larry Langer, ASA, EA, FCA, MAAA
Principal and Consulting Actuary

Jonathan T. Craven, ASA, EA, FCA, MAAA
Consulting Actuary

Table of Contents

Executive Summary 1
Overview 1
Purpose 1
Key Takeaways 2

Section 1: Principal Results 3
Table 1 – Summary of Principal Results 3

Section 2: The Valuation Process 4
Valuation Input: Membership Data 4
Valuation Input: Asset Data 8
Valuation Input: Benefit Provisions 10
Valuation Input: Actuarial Assumptions 10
Valuation Input: Funding Methodology 11
Valuation Results: Actuarial Value of Assets 12
Valuation Results: Actuarial Accrued Liability 14
Valuation Results: Funded Ratio 15
Valuation Results: State Contributions 17
Valuation Results: Accounting Information 18

Section 3: Membership Data 19
Table 2 – Active and Lapsed Member Data 19
Table 3 – Data for Members Currently Receiving Benefits 19
Table 4 – Data for Disabled Members Eligible for Deferred Pensions 19

Section 4: Asset Data 20
Table 5 – Market Value of Assets 20
Table 6 – Allocation of Investments by Category of the Market Value of Assets 20
Table 7 – Actuarial Value of Assets 21
Table 8 – Historical Asset Returns 22

Table of Contents

Section 5: Liability Results 23
Table 9 – Liability Summary 23
Table 10 – Funding Allocation 24
Table 11 – Reconciliation of Unfunded Actuarial Accrued Liability 25

Section 6: Actuarially Determined Employer Contribution 26
Table 12 – Calculation of the Actuarially Determined Employer Contribution Payable per Active Member 26
Table 13 – Actuarially Determined Employer Contribution (ADEC) 27
Table 14 – Reconciliation of the Change in the ADEC 28
Table 15 – Calculation of the New Amortization Base 29
Table 16 – Amortization Schedule for Unfunded Accrued Liability 29
Table 17 – History of Actuarially Determined Employer Contributions and Appropriated Rates 30

Section 7: Valuation Balance Sheet 31
Table 18 – Valuation Balance Sheet 31

Section 8: Accounting Results 32
Table 19 – Number of Active and Retired Members 32
Table 20 – Schedule of Changes in Net Pension Liability (Asset) 33
Table 21 – Net Pension Liability (Asset) 33
Table 22 – Sensitivity of the Net Pension Liability (Asset) to Changes in the Discount Rate 34
Table 23 – Additional Information for GASB Statement No. 67 34

Appendices 35
Appendix A – Valuation Process and Glossary of Actuarial Terms 35
Appendix B – Detailed Tabulations of Member Data 43
Appendix C – Summary of Main Benefit and Contribution Provisions 51
Appendix D – Actuarial Assumptions and Methods 53
Appendix E – GASB 67 Fiduciary Net Position Projection 56
Appendix F – Data for Section 2 Graphs 60

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, 2017, the RSD defined benefit plans cover over one million current and prior public servants of the state of North Carolina. During the fiscal year ending June 30, 2017, RSD paid over $6.0 billion in pensions to more than 300,000 retirees. And as of June 30, 2018, RSD's defined benefit plan assets were valued at over $98 billion.

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

The Firefighters' and Rescue Squad Workers' Pension Fund ("FRSWPF") provides benefits to all paid and volunteer certified firefighters and rescue squad workers. FRSWPF has approximately $424 million in assets and over 52,000 members as of December 31, 2017. This actuarial valuation report is our annual analysis of the financial health of FRSWPF. This report, prepared as of December 31, 2017, presents the results of the actuarial valuation of the Retirement System.

Purpose

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

In addition, the annual actuarial valuation is performed to:

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

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

Executive Summary (continued)

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, 2017 valuation as compared to the December 31, 2016 valuation were:

- Market value returns of 13.33% during calendar year 2017 compared to 7.20% assumed at the beginning of the plan year
- The assumed rate of return on plan assets was lowered from 7.20% to 7.00% effective December 31, 2017. The assumed rate of return is the discount rate used to value plan liabilities. The impact of this change on the actuarially determined employer contribution will be phased in over 3 years.

When compared to the December 31, 2016 actuarial valuation, the above resulted in:

- No change in funded ratio (89.0% in the December 31, 2017 valuation compared to the December 31, 2016 valuation)
- Lower actuarially determined employer contribution ($14,323,684 for fiscal year ending June 30, 2020 compared to the preliminary $14,544,083 calculated in the December 31, 2016 valuation for fiscal year ending June 30, 2019)

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

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

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

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

Section 1: Principal Results

This report, prepared as of December 31, 2017, presents the results of the actuarial valuation of the system. The principal results of the valuation and a comparison with the preceding year's results are summarized below.

Table 1: Summary of Principal Results

Valuation Results as of	12/31/2017	12/31/2016
Active Members		
Non-lapsed Members	25,068	25,210
Lapsed Members	13,134	17,235
Retired Members and Survivors of Deceased Members Killed in the Line of Duty		
Number	14,308	13,940
Annual Pensions	$ 29,188,320	$ 28,437,600
Number of Deferred Members	120	139
Assets		
Actuarial Value (AVA)	$ 418,265,538	$ 402,431,609
Market Value (MVA)	$ 424,211,921	$ 383,865,563
Actuarial Accrued Liability (AAL)	$ 469,919,266	$ 452,065,480
Unfunded Accrued Liability (AAL - AVA)	$ 51,653,728	$ 49,633,871
Funded Ratio* (AVA / AAL)	89.0%	89.0%
Results for Fiscal Year Ending	**6/30/2020**	**6/30/2019**
Actuarially Determined Employer Contribution (ADEC)		
Normal Cost	$ 5,775,743	$ 5,591,401
Accrued Liability	9,694,236	$ 8,952,682
Total	$ 15,469,979	$ 14,544,083
Total Based on Direct Rate Smoothing	$ 14,323,684	N/A
Impact of Legislative Changes	N/A	0
Final ADEC	N/A	$ 14,544,083
SCRSP Minimum Contribution Rate	18,652,208	18,302,208
Appropriation Act for Fiscal Year Ending	**6/30/2019**	**6/30/2018**
Legislative Appropriation	18,302,208	17,952,208

* The Funded Ratio on a Market Value of Assets basis is 90.3% at December 31, 2017

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Section 2: The Valuation Process

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

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

Valuation Input: Membership Data

As with any estimate, the actuary collects information that we know now. Under the actuarial valuation process, current information about FRSWPF members is collected annually by the Retirement Systems Division staff at the direction of the actuary. This 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, 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.

Section 2: The Valuation Process

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	12/31/2017	12/31/2016
Active Members	25,068	25,210
Lapsed Members	13,134	17,235
Terminated members and survivors of deceased members entitled to benefits but not yet receiving benefits	120	139
Retired members and survivors of deceased members killed in the Line of Duty currently receiving benefits	14,308	13,940
Total	52,630	56,524

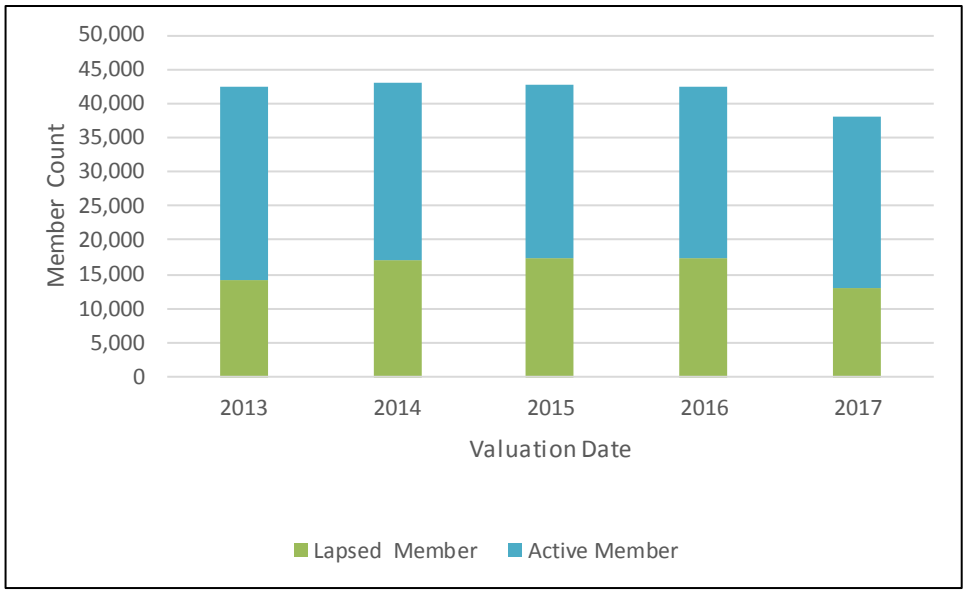
Commentary: The number of fully active members declined slightly and the number of lapsed members decreased significantly. This is likely due to RSD's effort to encourage certain lapsed members to apply for contribution refunds. The number of retired members increased by 2.6% from the previous valuation date. The increase in retiree population is consistent with expectations.

Section 2: The Valuation Process

Valuation Input: Membership Data (continued)

Graph 1: Active and Lapsed Members

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



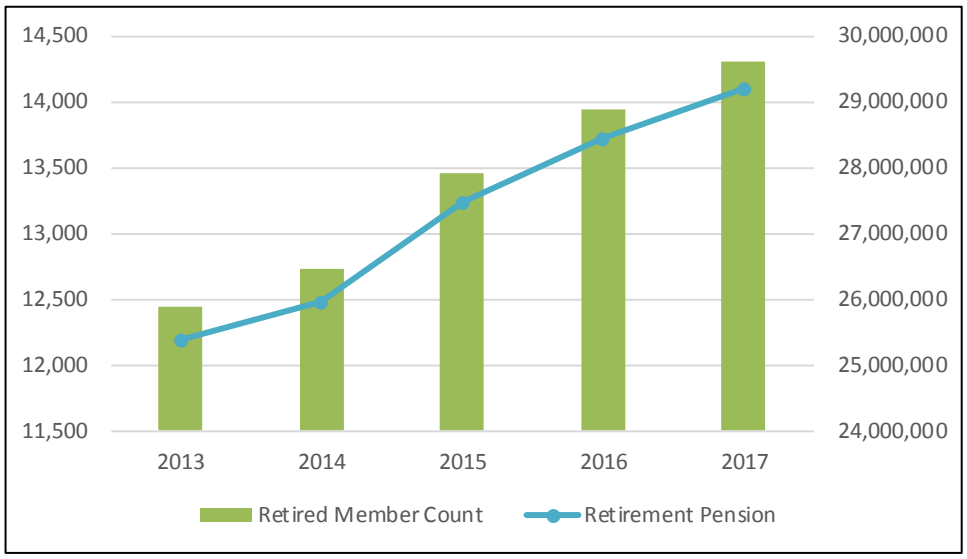
Commentary: Since the December 31, 2013 valuation, members who are not in receipt of benefits and who have not received a refund of employee contributions are split into active members and lapsed members. Lapsed members include members who did not accrue a year of service in the past year. The return to service assumption, which was implemented on a preliminary basis for the December 31, 2013 valuation and was finalized for the December 31, 2015 valuation, assumes that a lapsed member returns to active service at a rate based on the number of years that the member has been lapsed.

Section 2: The Valuation Process

Valuation Input: Membership Data (continued)

Graph 2: Retired Members

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



Commentary: The number of retired members and the benefits paid to these members 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.

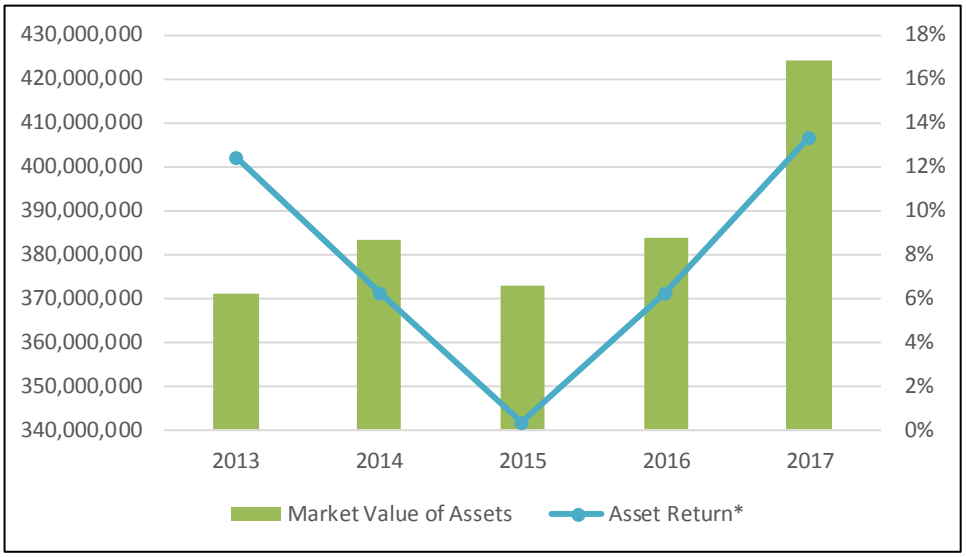
Section 2: The Valuation Process

Valuation Input: Asset Data

FRSWPF assets are held in trust and are invested for the exclusive benefit of plan members. The Market Value of Assets is $424 million as of December 31, 2017 and $384 million as of December 31, 2016. The investment return for the market value of assets for 2017 was 13.33%.

Graph 3: Market Value of Assets and Annualized Asset Returns

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



* Equals the asset return for the year preceding the valuation date except for the asset return at 12/31/2013 which equals the annualized asset return between 6/30/2012 and 12/31/2013

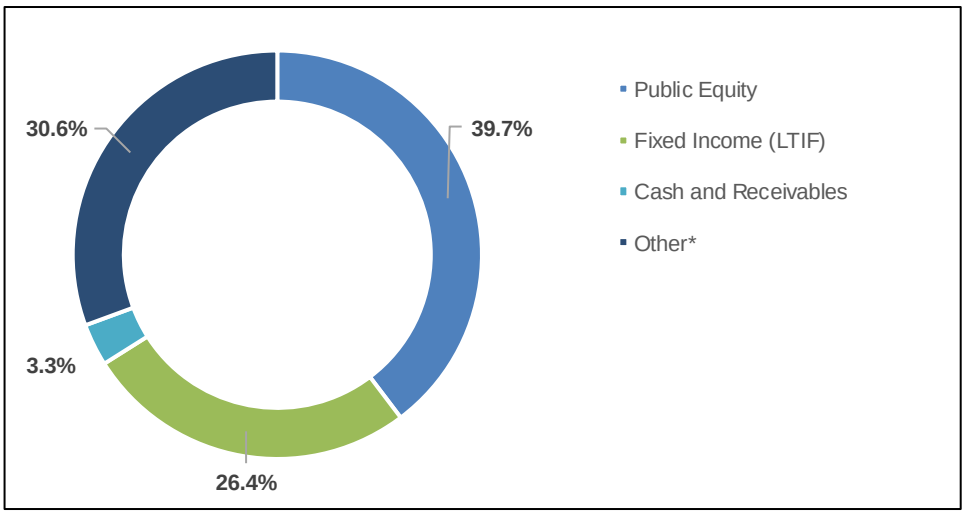
Commentary: Market value returns exceeded the assumed rate of return for the first time since 2013. However, the return on the actuarial value of assets which is used to determine the contribution rates did not exceed the 7.20% assumed rate of return in 2017, because of delayed recognition of the less than expected returns that occurred in 2015 and 2016.

Section 2: The Valuation Process

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, 2017 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 7.00% discount rate used in this valuation is reasonable and appropriate.

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

Section 2: The Valuation Process

Valuation Input: Benefit Provisions

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

Highlights of the benefit provisions are described below.

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

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

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

Valuation Input: Actuarial Assumptions

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

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

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

With the exception of the discount rate, the assumptions used for the December 31, 2017 actuarial valuation are based on the experience study prepared as of December 31, 2014 and adopted by the Board of Trustees on January 21, 2016. The discount rate was updated to be 7.00% as adopted by the Board of Trustees on April 26, 2018.

Section 2: The Valuation Process

Valuation Input: Funding Methodology

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

- Actuarial Cost Methods allocate costs to the actuarial accrued liability (i.e. the amount of money that should be in the fund) for past service and normal cost (i.e. the cost of benefits accruing during the year) for current service.
  - The Board of Trustees has adopted Entry Age Normal as its actuarial cost method
  - Develops normal costs that stays level
- Asset Valuation Methods smooth or average the market value returns over time to alleviate contribution volatility that results from market returns.
  - 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)
  - 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.

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

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

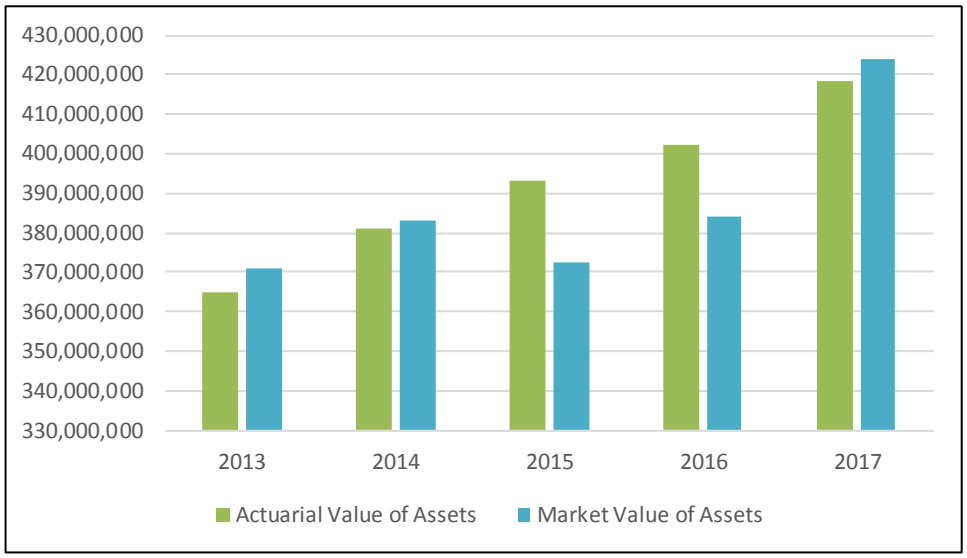
Section 2: The Valuation Process

Valuation Results: Actuarial Value of Assets

In order to reduce the volatility that investment gains and losses can have on required contributions and funded status of FRSWPF, the Board adopted an asset valuation method to determine the Actuarial Value of Assets used for funding purposes. The Actuarial Value of Assets is $418 million as of December 31, 2017 and $402 million as of December 31, 2016.

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.



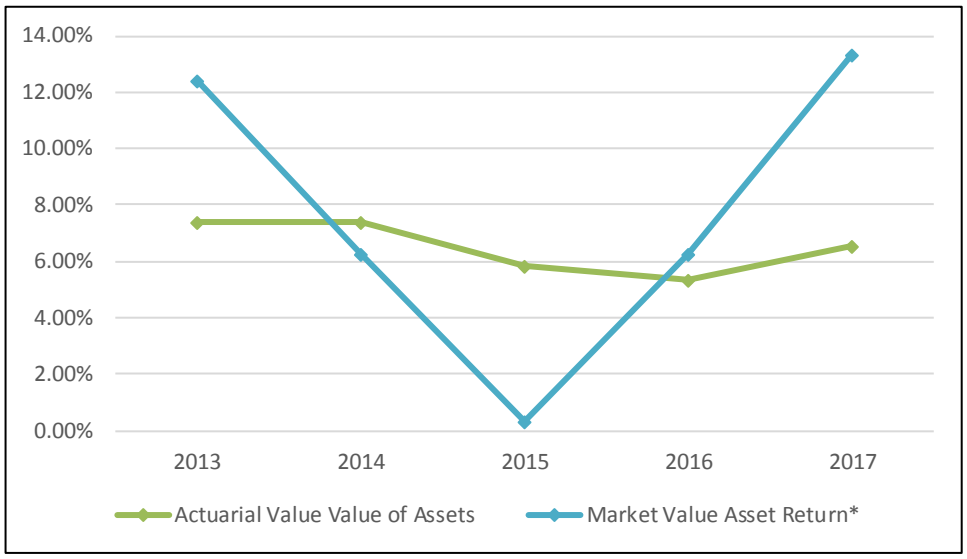
Commentary: The market value of assets is higher than the actuarial value of assets, which is used to determine employer contributions. This indicates that overall there are unrecognized asset gains to be recognized in future valuations. However, if the investments earn the expected 7.00% over the next four years, a loss will be recognized in both the December 31, 2018 and the December 31, 2019 valuations, and a gain will be recognized in both the December 31, 2020 and the December 31, 2021 valuations.

Section 2: The Valuation Process

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 year.



* Equals the asset return for the year preceding the valuation date except for the asset return at 12/31/2013 which equals the annualized asset return between 6/30/2012 and 12/31/2013

Commentary: The investment return for the market value of assets for 2017 was 13.33%. The actuarial value of assets smooths investment gains and losses. Lower than expected market returns in 2015 and 2016, which were partially offset by greater than expected market returns for 2017, resulted in an actuarial value of asset return for 2017 of 6.54% and a recognized actuarial asset loss of $2.6 million during 2017.

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

Section 2: The Valuation Process

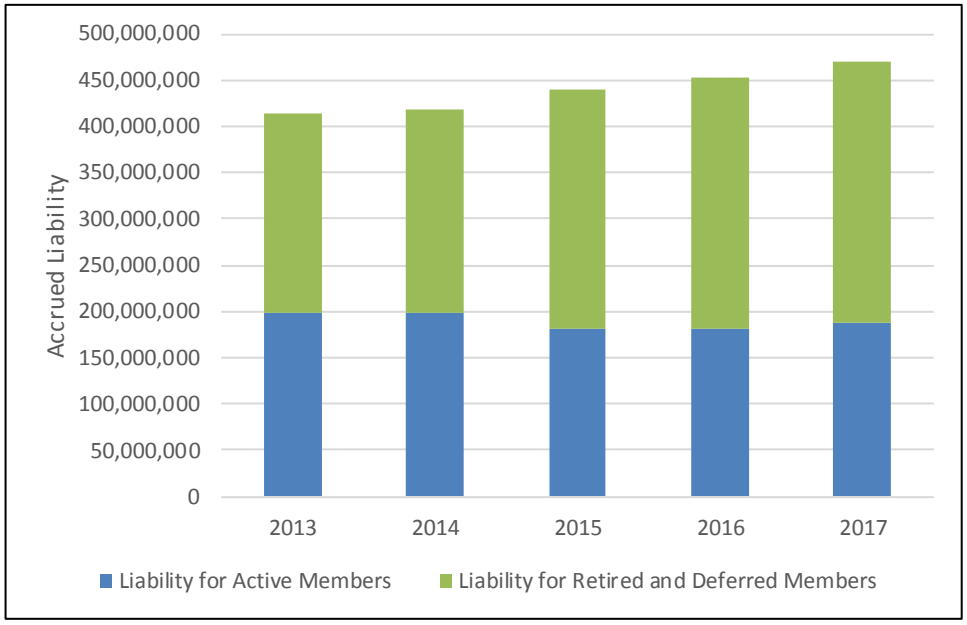
Valuation Results: Actuarial Accrued Liability

Using the provided membership data, benefit provisions, and actuarial assumptions, the Retirement System's future benefit payments 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 the Retirement System. The PVFB is an estimate of the current value of the benefits promised to all members as of a valuation date.

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

Graph 7: Actuarial Accrued Liability

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



Commentary: The AAL increased from $452 million to $470 million in 2017. FRSWPF is an open plan, which means that new members enter the plan each year. In an open plan, liabilities are expected to grow from one year to next as more benefits accrue and the membership approaches retirement. Assumption changes increased the AAL by $10.5 million.

A detailed summary of the AAL is provided in Section 5 of this report.

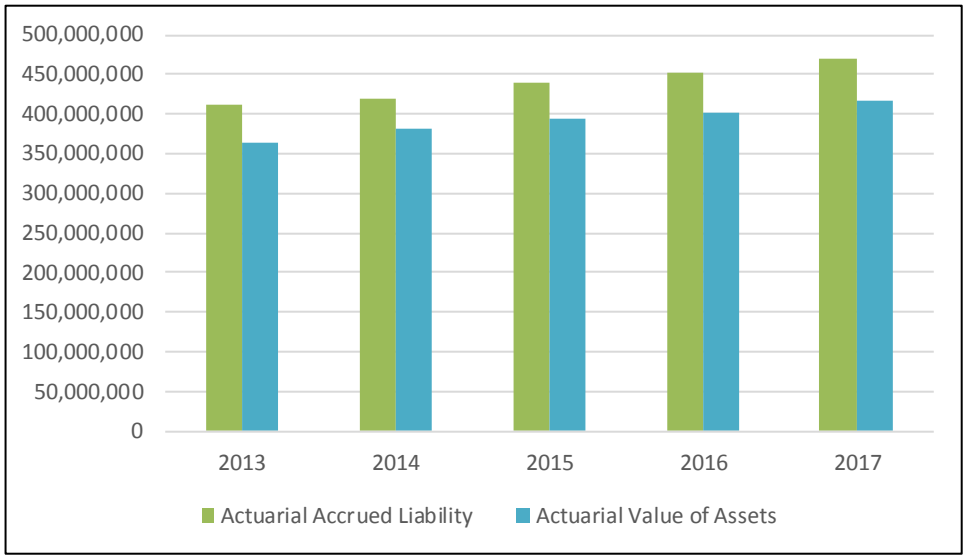
Section 2: The Valuation Process

Valuation Results: Funded Ratio

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

Graph 8: Actuarial Accrued Liability and Actuarial Value of Assets

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



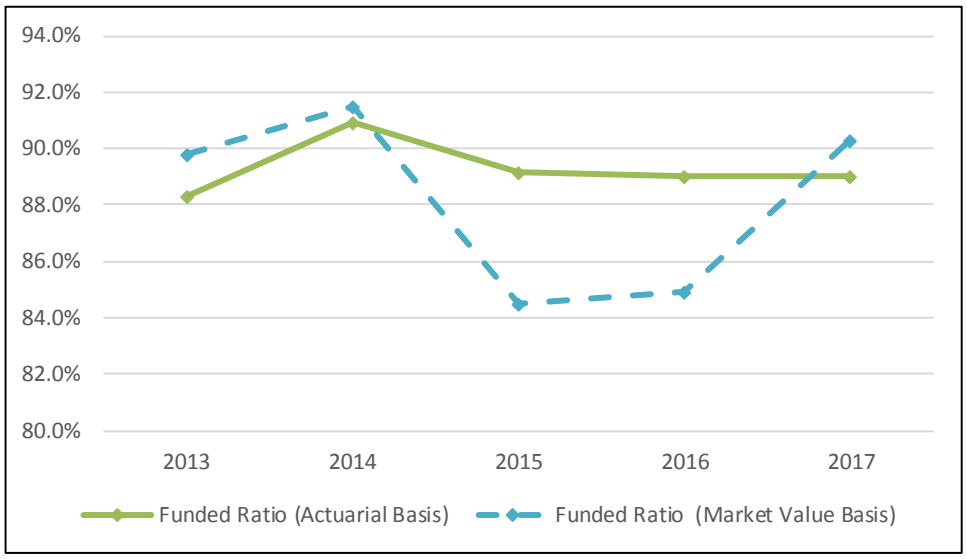
Commentary: The actuarial value of assets basis is used for computing contributions to alleviate contribution volatility. The difference in the actuarial accrued liability and the actuarial value of assets is the amount of pension debt to be paid off in 12 years.

Section 2: The Valuation Process

Valuation Results: Funded Ratio (continued)

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 did not change and remained at 89.0%.

Section 2: The Valuation Process

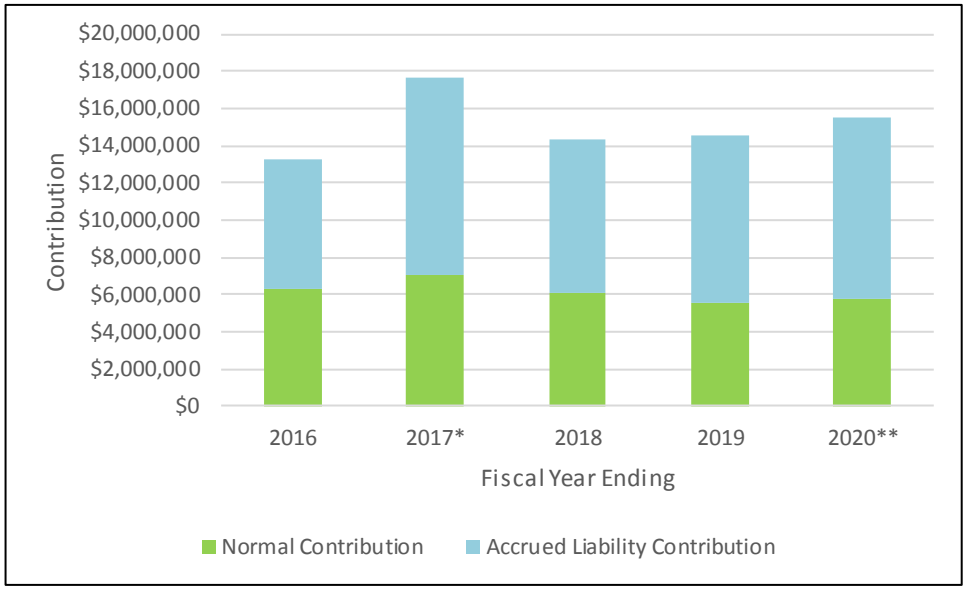
Valuation Results: State Contributions

The North Carolina General Statutes provide that the contributions of employers shall consist of a normal contribution and an accrued liability contribution.

The December 31, 2016 valuation suggested that the preliminary total contribution be set at$14,544,083 for the fiscal year ending June 30, 2019. Subsequently, the 2018 Appropriations Act (Session Laws 2018-5) set the legislative appropriation at $18,302,208 for the fiscal year ending June 30, 2019, in order to account for the State Contribution Rate Stabilization Policy (SCRSP). As a result of this December 31, 2017 valuation, the preliminary actuarially determined contribution is $14,323,684 for the fiscal year ending June 30, 2020, subject to the SCRSP (which would suggest a contribution of at least $18,652,208) and the impact of any future legislative changes effective during that fiscal year.

Graph 10: Actuarially Determined Employer Contributions

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



* The actuarially determined employer contribution shown for fiscal year ending 6/30/2017 includes the impact of the experience study and legislative changes but does not include the impact of the return to service assumption, which would have reduced the contribution by approximately $3.3 million for fiscal year ending 6/30/2017.

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

Section 2: The Valuation Process

Valuation Results: State Contributions (continued)

Commentary: The actuarially determined employer contribution is the amount needed to pay for the cost of the benefits accruing and to pay off the pension debt over 12 years, offset for the $10 monthly contribution the members make until they attain 20 years of service. The 12-year period is a short period for Public Sector Retirement Systems in the United States, with most Systems using a period of 25 years or more to pay off the pension debt. The shorter period results in higher contributions and more benefit security. A detailed summary of the actuarially determined employer contributions rates is provided in Section 6 of this report.

Valuation Results: Accounting Information

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

The valuation has been prepared in accordance with the parameters of Statement No. 67 of the GASB and all applicable Actuarial Standards of Practice. The Net Pension Liability (Asset) under GASB 67 for the fiscal year ending June 30, 2018, is $48,840,000 (compared to $48,512,000 for fiscal year ending June 30, 2017). The required financial reporting information for the Retirement System under GASB No. 67 can be found in Section 8 of this report.

Section 3: Membership Data

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

Table 2: Active and Lapsed Member Data

	Member Count	Average Age	Average Service
Lapsed Members	13,134	40.11	5.80
Active Members	25,068	39.02	10.91
Total	38,202	39.40	9.15

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

Table 3: Data for Members Currently Receiving Benefits

Member Count	Average Age	Annual Retirement Pension
14,308	68.20	$ 29,188,320

Table 4: Data for Disabled Members Eligible for Deferred Pensions

Member Count	Average Age	Annual Retirement Pension
120	50.35	$ 242,760

Section 4: Asset Data

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

Table 5: Market Value of Assets

Asset Data as of	12/31/2017	12/31/2016
Beginning of Year Market Value of Assets	$ 383,865,563	$ 372,572,223
Contributions	20,819,255	18,070,953
Benefit Payments	(30,964,763)	(29,675,409)
Investment Income	50,491,866	22,897,796
Net Increase/(Decrease)	40,346,358	11,293,340
End of Year Value of Assets	$ 424,211,921	$ 383,865,563
Estimated Net Investment Return on Market Value (Annualized)	13.33%	6.24%

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

Category	12/31/2017	12/31/2016
Allocation by Dollar Amount		
Public Equity	$ 168,553,232	$ 165,706,987
Fixed Income (LTIF)	$ 111,465,946	$ 103,052,537
Cash and Receivables	$ 14,197,654	$ 4,181,997
Other*	$ 129,995,089	$ 110,924,042
Total Market Value of Assets	$ 424,211,921	$ 383,865,563
Public Equity	39.7%	43.2%
Fixed Income (LTIF)	26.4%	26.8%
Cash and Receivables	3.3%	1.1%
Other*	30.6%	28.9%
Total Market Value of Assets	100.0%	100.0%

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

Section 4: Asset Data

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

Table 7: Actuarial Value of Assets

Asset Data as of	12/31/2017
Beginning of Year Market Value of Assets	$ 383,865,563
Contributions	20,819,255
Benefit Payments	(30,964,763)
Net Cash Flow	(10,145,508)
Expected Investment Return	27,279,430
Expected End of Year Market Value of Assets	400,999,485
End of Year Market Value of Assets	424,211,921
Excess of Market Value over Expected Marted Value of Assets	23,212,436
80% of 2017 Asset Gain/(Loss)	18,569,949
60% of 2016 Asset Gain/(Loss)	(2,215,817)
40% of 2015 Asset Gain/(Loss)	(10,407,749)
20% of 2014 Asset Gain/(Loss)	N/A
Total Deferred Asset Gain/(Loss)	5,946,383
Preliminary End of Year Actuarial Value of Assets	418,265,538
Final End of Year Actuarial Value of Asset (not less than 80% and not greater than 120% of Market Value)	418,265,538
Estimated Net Investment Return on Actuarial Value	6.54%

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

Lower than expected market returns in 2015 and 2016, which were partially offset by greater than expected market returns in 2017, resulted in an actuarial value of asset return for calendar year 2017 of 6.54% and a recognized actuarial asset loss of $2.6 million during 2017.

Section 4: Asset Data

The valuation assumes that the funds will earn a 7.00% asset return. The table below provides a history of the Actuarial Value and Market Value of Asset returns.

Table 8: Historical Asset Returns (Annualized)

Calendar Year	Actuarial Value of Asset Return	Market Value of Asset Return
2008	7.43%	(1.92)%
2009	3.09%	(14.15)%
2010	4.47%	12.09%
2011	6.88%	18.47%
2012	5.96%	2.25%
2013	7.43%	12.42%
2014	7.42%	6.24%
2015	5.87%	0.35%
2016	5.33%	6.24%
2017	6.54%	13.33%
Average	6.03%	5.13%
Range	4.34%	32.62%

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

Commentary: The average investment return recognized for purposes of determining the annual change in contribution each year is the actuarial value of assets return. Currently, the average actuarial return of 6.03% exceeds the average market return of 5.13% because the market value losses of 2008 and 2009. The range of returns is quite large – 4.34% versus 32.62%. This results in much lower actuarially determined employer contribution volatility using the actuarial value of assets versus market, while ensuring that the actuarial needs of FRSWPF are met.

Section 5: Liability Results

Using the provided membership data, benefit provisions, and actuarial assumptions, the Retirement System's future benefit payments 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	12/31/2017	12/31/2016
(a) Present Value of Future Benefits		
(1) Active Members	$ 237,424,566	$ 229,166,150
(2) Members Currently Receiving Benefits and Members with Deferred Benefits	282,113,410	270,958,443
(3) Total	$ 519,537,976	$ 500,124,593
(b) Present Value of Future Normal Costs		
(1) Employee Future Normal Costs	$ 17,727,240	$ 17,911,966
(2) Employer Future Normal Costs	31,891,470	30,147,147
(3) Total	$ 49,618,710	$ 48,059,113
(c) Actuarial Accrued Liability: (a3) - (b3)	$ 469,919,266	$ 452,065,480
(d) Actuarial Value of Assets	$ 418,265,538	$ 402,431,609
(e) Unfunded Actuarial Accrued Liability: (c) - (d)	$ 51,653,728	$ 49,633,871

Section 5: Liability Results

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

Table 10: Funding Allocation

	12/31/2017	12/31/2016
Allocation by Dollar Amount		
Assets (Actuarial Value)	$ 418,265,538	$ 402,431,609
Future Employee Contributions	17,727,240	17,911,966
Future Normal Contributions	31,891,470	30,147,147
Present Value of Funded Benefits	$ 467,884,248	$ 450,490,722
Present Value of Unfunded Benefits	51,653,728	49,633,871
Total Present Value of Benefits	$ 519,537,976	$ 500,124,593
Allocation by Percentage of PVB		
Assets (Actuarial Value)	80.5%	80.5%
Future Employee Contributions	3.4%	3.6%
Future Normal Contributions	6.1%	6.0%
Present Value of Funded Benefits	90.0%	90.1%
Present Value of Unfunded Benefits	10.0%	9.9%
Total Present Value of Benefits	100.0%	100.0%

Section 5: Liability Results

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

Table 11: Reconciliation of Unfunded Actuarial Accrued Liability

(in millions)		
Unfunded Actuarial Accrued Liability (UAAL) as of 12/31/2016	$	49.6
Normal Cost and Administrative Expense during 2017		7.9
Decrease due to Transition to New Actuary		(1.1)
Reduction due to Actual Contributions during 2017		(20.8)
Interest on UAAL, Normal Cost, and Contributions		3.3
Asset (Gain) / Loss		2.6
Actuarial Accrued Liability (Gain) / Loss		(0.4)
Impact of Assumption Changes		10.5
Impact of Legislative Changes		0.0
Unfunded Actuarial Accrued Liability (UAAL) as of 12/31/2017	$	51.6

Commentary: During 2017, there was a transition from the prior actuary to CMC, resulting in valuation programing, modifications and differences in methodologies that decreased the UAAL by $1.1 million. In addition during 2017, the UAAL increased more than expected primarily due to assumption changes. The change to the interest rate from 7.20% to 7.00% increased the UAAL by $10.5 million. The loss recognized in the actuarial value of assets increased the UAAL by $2.6 million. These increases were partially offset by a liability gain of $0.4 million and SCRSP contributions exceeding the actuarially determined contribution.

Section 6: Actuarially Determined Employer Contribution

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

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

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

Valuation Date	12/31/2017
ADEC for Fiscal Year Ending	6/30/2020
Normal Cost Rate	
(a) Total Normal Rate	$ 336.32
(b) Employee Normal Cost	$ 120.00
(c) Employer Normal Cost: (a) - (b)	$ 216.32
(d) Expenses Rate*	$ 37.95
(e) Total Normal Cost Rate: (c) + (d)	$ 254.27
Accrued Liability Rate Calculation	
(f) Total Annual Amortization Payments **	$ 9,694,236
(g) Active Member Count***	22,715
(h) Accrued Liability Rate: (f) / (g)	$ 426.78
Total ADEC (e)+(h)	$ 681.04

* Based on actual expenses during the previous year.
** See Table 16 for more detail.
*** The active member count reflects the number of currently active or lapsed members who are expected to accrue additional benefits in the next year.

Section 6: Actuarially Determined Employer Contribution

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

Table 13: Actuarially Determined Employer Contribution (ADEC)

Valuation Date ADEC for Fiscal Year Ending	12/31/2017 6/30/2020	12/31/2016 6/30/2019
(a) Current Active Member Count*	22,715	23,223
(b) Normal Cost Rate	254.27	240.77
(c) Normal Cost Contribution (a) x (b)	$ 5,775,743	$ 5,591,401
(d) Accrued Liability Contribution	$ 9,694,236	$ 8,952,682
(e) Preliminary ADEC: (c) + (d)	15,469,979	14,544,083
(f) ADEC: Direct Rate Smoothing	$ 14,323,684	N/A
Impact of Legislative Changes	N/A	0
Final ADEC	N/A	$ 14,544,083
SCRSP Minimum Contribution	$18,652,208	$18,302,208

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

Section 6: Actuarially Determined Employer Contribution

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

Table 14: Reconciliation of the Change in the ADEC

Fiscal year ending June 30, 2018 Preliminary ADEC (estimated based on December 31, 2016 Valuation)	14,544,083
Impact of Legislative Changes	0
Fiscal year ending June 30, 2019 Final ADEC	14,544,083
Change Due to Transition (Gain)/Loss	(85,355)
Change Due to Demographic (Gain)/Loss	(280,935)
Change Due to Investment (Gain)/Loss	355,205
Change Due to Contributions Greater than ADEC	(782,461)
Impact of Assumption Changes	1,719,441
ADEC Before Direct Rate Smoothing	15,469,978
Impact of Direct Rate Smoothing	(1,146,294)
Fiscal year ending June 20, 2020 Preliminary ADEC (estimated based on December 31, 2017 Valuation)	$ 14,323,684

Section 6: Actuarially Determined Employer Contribution

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

Table 15: Calculation of the New Amortization Base

Calculation as of	12/31/2017	12/31/2016
(a) Unfunded Actuarial Accrued Liability	$ 51,653,728	$ 49,633,871
(b) Prior Years' Outstanding Bases	$ 45,772,644	$ 44,062,245
(c) New Amortization Base: (a) - (b)	$ 5,881,084	$ 5,571,626
(d) New Amortization Payment	$ 792,261	$ 760,101

Table 16: Amortization Schedule for Unfunded Accrued Liability

Date Established	Original Balance	12/31/2017 Outstanding Balance	Annual Payment
June 30, 2010	$ 51,963,371	$ 31,330,851	$ 6,823,231
June 30, 2011	8,122,313	5,602,329	1,065,460
June 30, 2012	3,813,072	2,938,669	499,699
December 31, 2013	(11,374,070)	(10,795,667)	(1,540,738)
December 31, 2014	(4,939,476)	(5,023,912)	(668,504)
December 31, 2015	14,577,214	15,747,591	1,970,851
December 31, 2016	5,571,626	5,972,783	751,976
December 31, 2017	5,881,084	5,881,084	792,261
Total		$ 51,653,728	$ 9,694,236

Commentary: This is the payment schedule for the pension debt of FRSWPF.

Section 6: Actuarially Determined Employer Contribution

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

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

Valuation Date	Fiscal Year Ending	Preliminary ADEC	Subsequent Changes to ADEC *	Final ADEC	Appropriated Rate
12/31/2017	6/30/2020	$ 14,323,684	N/A	N/A	N/A
12/31/2016	6/30/2019	14,544,083	-	14,544,083	18,302,208
12/31/2015	6/30/2018	14,287,301	-	14,287,301	17,952,208
12/31/2014	6/30/2017	12,830,706	4,874,502	17,705,208	17,602,208
12/31/2013	6/30/2016	13,240,552	-	13,240,552	13,550,000

*The change due to legislation for the contribution for fiscal year ending 6/30/2017 includes a $4,771,502 increase in the ADEC due to the experience study and a $103,000 increase in the ADEC due to legislation passed in the past year that allows for the payment line of duty death benefits.

Section 7: Valuation Balance Sheet

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

Table 18: Valuation Balance Sheet

Balance Sheet as of	12/31/2017	12/31/2016
Assets		
Current Actuarial Value of Assets		
Annuity Savings Fund	$ 38,979,689	$ 40,905,890
Pension Accumulation Fund	379,285,849	361,525,719
Total	$ 418,265,538	$ 402,431,609
Future Member Contributions to the		
Annuity Savings Fund	$ 17,727,240	$ 17,911,966
Prospective Appropriations to the Pension Accumulation Fund		
Normal Appropriations	$ 31,891,470	$ 30,147,147
Unfunded Accrued Liability Appropriations	51,653,728	49,633,871
Total	$ 83,545,198	$ 79,781,018
Total Assets	$ 519,537,976	$ 500,124,593
Liabilities		
Annuity Savings Fund		
Past Member Contributions	$ 38,979,689	$ 40,905,890
Future Member Contributions	17,727,240	17,911,966
Total Contributions	$ 56,706,929	$ 58,817,856
Pension Accumulaton Fund		
Benefits Currently in Payment	$ 282,113,410	$ 270,958,443
Benefits to be Paid to Currrent Active Members	180,717,637	170,348,294
Total Benefits Payable	$ 462,831,047	$ 441,306,737
Total Liabilities	$ 519,537,976	$ 500,124,593

Section 8: Accounting Results

The section contains the accounting information for Governmental Accounting Standards Board (GASB) Statement No. 67 for fiscal year ending June 30, 2018 based on a valuation date of December 31, 2017.

Please note that GASB Statement No. 67 (*Financial Reporting for Pension Plans) is applicable* for fiscal years ending 2014 and later.

The June 30, 2018 total pension liability presented in this section was determined by an actuarial valuation as of December 31, 2017, based on the assumptions, methods and plan provisions described in this report. The actuarial cost method used to develop the total pension liability is the Entry Age Normal Cost method, as required by GASB Statement No. 67.

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

Table 19: Number of Active and Retired Members as of December 31, 2017

Number of Active and Retired Participants as of December 31, 2017	
Group	**Number**
Retired members and survivors of deceased members currently receiving benefits	14,308
Terminated members and survivors of deceased members entitled to benefits but not yet receiving benefits	120
Active members*	38,202
Total	52,630

* Includes all members who have not received a refund of contributions. This group includes 25,068 active members and 13,134 lapsed members whose service did not increase during 2017.

Section 8: Accounting Results

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

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

Schedule of Changes in Net Pension Liability as of June 30, 2018	
Total Pension Liability	
Service Cost	$ 7,542,000
Interest	31,686,000
Changes of Benefit Terms	0
Difference between Expected and Actual Experience	(121,000)
Change of Assumptions	10,593,000
Benefit Payments, including Refund of Member Contributions	(31,727,000)
Net Change in Total Pension Liability	$ 17,973,000
Total Pension Liability - Beginning of Year	$ 455,675,000
Total Pension Liability - End of Year	$ 473,648,000
Plan Fiduciary Net Position	
Employer Contributions	$ 17,952,000
Member Contributions	2,790,000
Net Investment Income	29,505,000
Benefit Payments, including Refund of Member Contributions	(31,727,000)
Administrative Expenses	(885,000)
Other	10
Net Change in Plan Fiduciary Net Position	$ 17,645,000
Plan Fiduciary Net Position - Beginning of Year	$ 407,163,000
Plan Fiduciary Net Position - End of Year	$ 424,808,000

Table 21: Net Pension Liability (Asset)

Net Pension Liability (Asset)	June 30, 2018	June 30, 2017
Total Pension Liability	$ 473,648,000	$455,675,000
Plan Fiduciary Net Position	424,808,000	407,163,000
Net Pension Liability (Asset)	$ 48,840,000	$ 48,512,000
Plan Fiduciary Net Position as a Percentage of the Total Pension Liability	89.69%	89.35%

Section 8: Accounting Results

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

Table 22: Sensitivity of the Net Pension Liability (Asset) at June 30, 2018 to Changes in the Discount Rate

Sensitivity of the Net Pension Liability to Changes in the Discount Rate			
	1% Decrease	Current	1% Increase
Discount Rate	6.00%	7.00%	8.00%
Net Pension Liability (Asset)	$ 108,412,000	$ 48,840,000	$ (27,000)

The discount rate used to measure the total pension liability was 7.20%. The projection of cash flows used to determine the discount rate assumed that System appropriations will continue to follow the current funding policy. 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 23: Additional Information for GASB Statement No. 67

Valuation Date	12/31/2017
Actuarial Cost Method	Entry Age
Amortization Method	Level dollar closed
Amortization Period	12 year closed periods
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	7.00%
Projected Salary Increases	N/A
*Includes Inflation of	3.00%
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 (the "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. 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. These assumptions are

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

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, 2019 and will be presented during 2020. 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. Most of the North Carolina Retirement Systems use the entry age normal cost method.

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

The actuarial accrued liability (AAL) is also referred to as the amount of money the Retirement System should ideally have in the trust. The unfunded actuarial accrued liability (UAAL) is the portion of actuarial accrued liability that is not covered by the assets of the Retirement System. The UAAL can be a negative number, which means that the Retirement System has more assets than actuarial accrued liability. We refer to this condition as overfunded liability in this summary. Having UAAL does not indicate that the Retirement System is in failing actuarial health. UAAL is a common occurrence. Currently, many retirement systems in the United States have UAAL as a result of the Great Recession of 2008. 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, although longer periods are becoming more common. 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 of UAAL results in North Carolina being home to many of the best funded Public Retirement Systems in the United States.

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

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

An actuarial valuation report is produced annually, which contains the contribution for the fiscal year as well as the funded ratio of the Retirement System. The primary purpose of performing an actuarial valuation annually is to replace the estimated activities from the previous valuation, which were based on assumptions, with the actual experience of the Retirement System for the prior year. The experience gain (loss) is the difference between the expected and the actual UAAL of the Retirement System. An experience loss can be thought of as the amount of additional UAAL over and above the amount that was expected from the prior year due to deviation of actual experience from the assumption. Similarly, an experience gain can be thought of as having less UAAL than that which was expected from the prior year assumptions. As an example, if the Retirement System achieves an asset return of 15% when the assumption was a 7.00% return, an actuarial gain is said to have happened, which typically results in lower contributions and higher funded ratio, all else being equal. Alternatively, a return of 2% under the same circumstances would result in an actuarial loss, requiring an increase in contributions and a funded ratio that is lower than anticipated. Experience gains and losses are common within the valuation process. Typically gains and losses offset each other over time. To the extent that does not occur, the reasons for the gains and losses should be understood, and appropriate recommendations should be made by the actuary after an experience review to adjust the assumptions.

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

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

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

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. CMC works with the North Carolina Retirement Systems Division to make your reports and presentations understandable and actionable. If something doesn't make sense – speak up!!

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

Glossary

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

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

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

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

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

Actuarial Equivalent. Benefits whose actuarial present values are equal.

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

Actuarial Value of Assets (AVA). A smoothed value of assets which is used to limit contribution volatility. Also known as the funding value of assets. *Smoothed value of assets.*

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

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

- Amortization Period Length – Generally amortization periods of up to 15 to 20 years (and certainly not longer than 30) are allowed. Similar to a mortgage, the shorter the amortization period, the higher the payment and the faster the UAAL is paid off.
- Amortization payment increases – Future payments can be level dollar, like a mortgage, or as a level percent of pay. Most Retirement Systems amortize UAAL as a level percent of pay which when combined with the employer normal cost that is developed as a level percent of pay can result in contributions that are easier to budget.
- Amortization type – Amortization schedule can be closed or open. A closed amortization schedule is similar to a mortgage – at the end of the amortization period the UAAL is designed to be paid off. An open amortization period is similar to refinancing the UAAL year after year.
- Amortization schedule – UAAL can be amortized over a single amortization period, or it can be amortized over a schedule.

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

Asset Valuation Method. Asset Valuation Method. The components of how the actuarial value of assets is to be developed. LRS 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: Valuation Process and Glossary of Actuarial Terms (continued)

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

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

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

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

Appendix B: Detailed Tabulations of Member Data

Table B-1: The Number of Active Members Distributed by Age and Service as of December 31, 2017

Age	Years of Service										
	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	555	2,499	351	1	0	0	0	0	0	0	3,406
25 to 29	606	2,427	1,863	302	0	0	0	0	0	0	5,198
30 to 34	509	2,097	1,526	1,318	187	1	0	0	0	0	5,638
35 to 39	302	1,658	1,188	1,174	919	134	2	0	0	0	5,377
40 to 44	235	1,292	979	939	902	810	120	0	0	0	5,277
45 to 49	186	1,071	887	804	816	1,037	703	104	2	0	5,610
50 to 54	114	697	576	503	626	999	833	481	52	1	4,882
55 to 59	49	324	338	279	335	136	38	13	5	0	1,517
60 to 64	23	166	159	139	193	30	6	2	0	2	720
65 to 69	13	83	90	66	63	25	5	0	0	0	345
70 & Over	18	57	59	39	44	12	1	1	1	0	232
Total	2,610	12,371	8,016	5,564	4,085	3,184	1,708	601	60	3	38,202

Appendix B: Detailed Tabulations of Member Data (continued)

Table B-2: The Number of Active Members Distributed by Age as of December 31, 2017

	Active Members	Lapsed Members
Age	Number	Number
17	1	0
18	20	1
19	178	4
20	314	41
21	460	108
22	543	193
23	505	249
24	544	246
25	624	254
26	612	352
27	671	382
28	729	407
29	758	409
30	742	380
31	705	431
32	744	389
33	763	393
34	712	379
35	729	412
36	719	389
37	693	365
38	642	386
39	689	352
40	658	377
41	716	372
42	667	358
43	702	352
44	710	365
45	709	393
46	733	376
47	779	408
48	763	360
49	726	363
50	697	363
51	626	357
52	587	356
53	544	402

Appendix B: Detailed Tabulations of Member Data (continued)

Table B-2: The Number of Active Members Distributed by Age as of December 31, 2017 (continued)

	Active Members	Lapsed Members
Age	Number	Number
54	580	370
55	288	149
56	215	135
57	168	109
58	151	85
59	143	74
60	134	58
61	86	67
62	85	45
63	91	37
64	66	51
65	56	29
66	38	34
67	44	27
68	41	18
69	36	22
70	35	15
71	16	8
72	14	14
73	12	6
74	10	12
75	13	7
76	7	6
77	3	6
78	2	7
79	6	2
80	3	5
81	2	4
82	1	2
83	2	1
84	1	0
85	0	1
86	0	2
87	2	1
88	0	0
89	0	0
90	3	1
Total	25,068	13,134

Appendix B: Detailed Tabulations of Member Data (continued)

Table B-3: The Number of Active Members Distributed by Service as of December 31, 2017

Service	Active Members Number	Lapsed Members Number
0	499	2,111
1	1,771	2,304
2	1,564	1,636
3	1,569	1,176
4	1,449	902
5	1,659	660
6	1,019	549
7	1,147	406
8	1,012	339
9	903	322
10	1,232	252
11	898	226
12	887	196
13	802	150
14	774	147
15	726	110
16	763	97
17	718	101
18	737	104
19	629	100
20	646	195
21	500	262
22	436	161
23	354	147
24	359	124
25	359	85
26	304	76
27	303	48
28	234	33
29	228	38
30	170	29
31	160	28
32	90	7
33	63	8

Appendix B: Detailed Tabulations of Member Data (continued)

Table B-3: The Number of Active Members Distributed by Service as of December 31, 2017 (continued)

Service	Active Members Number	Lapsed Member Number
34	45	1
35	28	3
36	24	1
37	4	0
38	0	0
39	0	0
40	1	0
41	1	0
42	1	0
Total	25,068	13,134

Appendix B: Detailed Tabulations of Member Data (continued)

Table B-4: The Number and Annual Retirement Pensions of Retired Members Distributed by Age as of December 31, 2017

Age	Number	Annual Pensions
54	22	$ 44,880
55	456	930,240
56	554	1,130,160
57	589	1,201,560
58	538	1,097,520
59	604	1,232,160
60	519	1,058,760
61	628	1,281,120
62	574	1,170,960
63	649	1,323,960
64	614	1,252,560
65	623	1,270,920
66	591	1,205,640
67	580	1,183,200
68	542	1,105,680
69	495	1,009,800
70	527	1,075,080
71	545	1,111,800
72	393	801,720
73	414	844,560
74	412	840,480
75	427	871,080
76	315	642,600
77	328	669,120
78	303	618,120
79	247	503,880
80	233	475,320
81	213	434,520
82	214	436,560
83	198	403,920
84	175	357,000
85	156	318,240
86	118	240,720
87	110	224,400

Appendix B: Detailed Tabulations of Member Data (continued)

Table B-4: The Number and Annual Retirement Pensions of Retired Members Distributed by Age as of December 31, 2017 (continued)

Age	Number	Annual Pensions
88	87	$ 177,480
89	60	122,400
90	64	130,560
91	61	124,440
92	48	97,920
93	34	69,360
94	18	36,720
95	12	24,480
96	6	12,240
97	3	6,120
98	5	10,200
99	2	4,080
100	2	4,080
Total	14,308	$ 29,188,320

Appendix B: Detailed Tabulations of Member Data (continued)

Table B-5: The Number and Annual Retirement Pensions of Disabled Members Eligible for Deferred Pensions Distributed by Age as of December 31, 2017

Age	Number	Annual Pensions
32	1	$ 2,040
34	1	2,040
35	3	6,120
37	1	2,040
39	3	6,120
40	1	2,040
42	2	4,080
43	4	8,160
44	2	4,080
46	7	14,280
47	9	18,360
48	9	18,360
49	5	10,200
50	8	16,320
51	6	12,240
52	10	20,400
53	16	32,640
54	12	24,480
55	3	6,120
56	1	2,040
57	3	6,120
58	1	2,040
59	3	6,120
60	1	2,040
61	2	4,080
64	1	2,040
66	3	6,120
68	1	2,040
Total	119	$ 242,760

Appendix C: Summary of Main Benefit and Contribution Provisions

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

Benefits

Service Retirement Pension

Condition for Pension	A member who retires after attaining age 55 and with credit for 20 years of service as a firefighter or rescue squad worker in North Carolina is entitled to a monthly pension.
Amount of Pension	The amount of the pension is equal to $170 per month.

Deferred Early Retirement Pension

Condition for Pension	A member whose service is terminated after credit for 20 years of service as a firefighter or rescue squad worker in North Carolina but before age 55 is eligible to receive a deferred retirement pension, starting at age 55, provided he or she continues to make regular contributions until age 55 or until he or she has contributed for a total of 20 years, whichever event occurs earlier. Any member who is totally and permanently disabled while in the discharge of official duties and leaves service as a result of such disability is eligible for a deferred retirement pension commencing at age 55 without continuing to make contributions. Any member who becomes totally and permanently disabled for any cause, other than line of duty, after 10 years of credited service under the Pension Fund may continue to make monthly contributions until he or she has paid $2,400 into the Fund and receive a pension upon attainment of age 55.
Amount of Pension	The deferred pension is $170 per month.

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

Return of Contributions	Upon the death (not in the line of duty) or withdrawal of a member prior to retirement, the member's aggregate contributions are refunded in a lump sum. Upon the death (not in the line of duty) of a retired member, the excess, if any, of the member's aggregate contributions over the total of the pension payments the member has received is refunded.
Line of Duty Death Benefit	Upon the death (in the line of duty) of a retired or active member, an amount of $170 per month is payable to the member's beneficiary, if living, beginning the month following the month the member would have attained age 55, or if the member had already attained age 55, beginning the month following the member's death, payable until the beneficiary's death.
Contributions	
By Members	Each member contributes $10 per month until retirement or until the member has contributed for a total of 20 years, whichever event occurs earlier.
By State	The State makes annual contributions sufficient, with the members' contributions, to meet the cost of the benefits under the Fund.
Changes Since Prior Valuation:	None.

Appendix D: Actuarial Assumptions and Methods

The withdrawal rates and return to service assumptions are based on the findings of the data audit of the FRSWPF and adopted by the Board of Trustees on July 21, 2016. The interest rate of 7.00% was adopted by the Board of Trustees on April 26, 2018 based upon a review of the existing portfolio structure as well as recent and anticipated experience. All other assumptions are based on the experience investigation prepared as of December 31, 2014 and adopted by the Board of Trustees on January 21, 2016 for use with the December 31, 2017 annual actuarial valuation.

Interest Rate: 7.00% per annum, compounded annually.

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

	Annual Rates of		
Service	Withdrawal	Age	Retirement*
0	0.0754	55+	1.00
1	0.0609		
2	0.0551		
3	0.0493		
4	0.0435		

* These rates apply only after 20 years of membership in the system.

	Annual Rates of					
Age	Withdrawal and Vesting*		Base Mortality		Disability	
	Male	Female	Male	Female	Male	Female
25	.0203	.0203	.0005	.0002	.0010	.0006
30	.0232	.0232	.0005	.0002	.0010	.0009
35	.0174	.0174	.0005	.0003	.0015	.0024
40	.0145	.0145	.0006	.0004	.0040	.0038
45	.0145	.0145	.0010	.0007	.0055	.0048
50	.0145	.0145	.0017	.0011	.0100	.0076
55	.0145	.0145	.0028	.0017	.0150	.0176
60	.0145	.0145	.0047	.0024	.0150	.0276
65			.0083	.0037		
69			.0125	.0057		

* These rates apply only after five years of membership in the system.

** Base mortality rates as of 2014.

Appendix D: Actuarial Assumptions and Methods (continued)

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

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

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

Post-Retirement Mortality: Representative values of the assumed post-retirement mortality rates as of 2014 prior to any mortality improvements are as follows:

	Annual Rate of Death after Retirement			
Age	Male Healthy Retirees	Female Healthy Retirees	Male Disabled Retirees	Female Disabled Retirees
55	.0057	.0036	.0241	.0143
60	.0078	.0052	.0274	.0168
65	.0110	.0080	.0326	.0207
70	.0168	.0129	.0416	.0279
75	.0268	.0209	.0559	.0406
80	.0447	.0348	.0789	.0604

Deaths After Retirement (Healthy at Retirement): Mortality rates are based on the RP-2014 Total Data Set for Healthy Annuitants Mortality Table. The RP-2014 annuitant tables have no rates prior to age 50. The RP-2014 Total Data Set Employee Mortality Table (with no adjustments) is used for ages less than 50.

Death After Retirement (Disabled at Retirement): Mortality rates are based on the RP-2014 Total Data Set for Disabled Annuitants Mortality Table. Rates for male members are multiplied by 103% for all ages. Rates for female members are multiplied by 99% for all ages.

Appendix D: Actuarial Assumptions and Methods (continued)

Deaths Prior to Retirement: Mortality rates are based on the RP-2014 Total Data Set Employee Mortality Table.

Mortality Projection: All mortality rates are projected from 2014 using generational improvement with Scale MP-2015.

Line of Duty Death Assumption: 10% of pre-retirement deaths are assumed to be in the line of duty.

Timing of Assumptions: All withdrawals, deaths, disabilities, retirements and salary increases are assumed to occur January 1 of each year.

Future Expenses: Equal to prior year actual administrative expenses.

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

Changes Since Prior Valuation: The interest rate was changed from 7.20% to 7.00% as of December 31, 2017, with this change phased into the employer contribution using direct-rate smoothing over a three-year period.

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
2018	$ 424,212	$ 2,726	$ 14,762	$ 30,519	$ 862	$ 29,271	$ 439,535
2019	439,535	2,587	14,531	30,872	818	30,266	455,229
2020	455,229	2,430	13,802	31,643	769	31,309	470,359
2021	470,359	2,276	13,806	32,297	720	32,342	485,767
2022	485,767	2,135	10,402	33,002	675	33,276	497,904
2023	497,904	2,003	6,226	33,781	633	33,952	505,671
2024	505,671	1,880	5,212	34,479	595	34,434	512,123
2025	512,123	1,756	4,720	35,232	555	34,840	517,652
2026	517,652	1,635	5,225	36,046	517	35,214	523,162
2027	523,162	1,508	6,080	36,667	477	35,604	529,211
2028	529,211	1,385	5,105	37,326	438	35,969	533,906
2029	533,906	1,234	3,533	37,879	390	36,221	536,624
2030	536,624	1,120	2,463	38,426	354	36,353	537,780
2031	537,780	1,000	1,751	38,947	316	36,388	537,656
2032	537,656	874	1,524	39,459	276	36,351	536,670
2033	536,670	760	1,150	40,092	240	36,245	534,493
2034	534,493	597	881	40,603	189	36,062	531,240
2035	531,240	457	582	40,996	145	35,807	526,945
2036	526,945	320	297	41,474	101	35,477	521,464
2037	521,464	191	14	42,045	60	35,061	514,625
2038	514,625	54	-	42,315	17	34,569	506,916
2039	506,916	-	-	42,303	-	34,029	498,641
2040	498,641	-	-	42,371	-	33,447	489,717
2041	489,717	-	-	42,372	-	32,822	480,168
2042	480,168	-	-	42,268	-	32,157	470,057
2043	470,057	-	-	42,166	-	31,453	459,344
2044	459,344	-	-	42,094	-	30,706	447,956
2045	447,956	-	-	41,944	-	29,914	435,925
2046	435,925	-	-	41,674	-	29,081	423,332
2047	423,332	-	-	41,304	-	28,212	410,240
2048	410,240	-	-	40,882	-	27,310	396,668
2049	396,668	-	-	40,362	-	26,378	382,684
2050	382,684	-	-	39,777	-	25,419	368,326
2051	368,326	-	-	39,197	-	24,434	353,564
2052	353,564	-	-	38,471	-	23,426	338,519
2053	338,519	-	-	37,534	-	22,405	323,390
2054	323,390	-	-	36,427	-	21,384	308,347
2055	308,347	-	-	35,145	-	20,375	293,577
2056	293,577	-	-	33,851	-	19,386	279,112
2057	279,112	-	-	32,566	-	18,417	264,964
2058	264,964	-	-	31,292	-	17,471	251,142
2059	251,142	-	-	30,031	-	16,547	237,657
2060	237,657	-	-	28,785	-	15,646	224,518
2061	224,518	-	-	27,553	-	14,768	211,733
2062	211,733	-	-	26,338	-	13,915	199,311
2063	199,311	-	-	25,141	-	13,087	187,257
2064	187,257	-	-	23,963	-	12,283	175,577
2065	175,577	-	-	22,805	-	11,506	164,278
2066	164,278	-	-	21,669	-	10,754	153,363
2067	153,363	-	-	20,555	-	10,028	142,836

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

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

(in thousands)

Calendar Year	Beginning Fiduciary Position	Member Contributions	Employer Contributions	Benefit Payments	Administrative Expenses	Investment Earnings	Ending Fiduciary Position
2068	$ 142,836	$ -	$ -	$ 19,463	$ -	$ 9,329	$ 132,702
2069	132,702	-	-	18,396	-	8,656	122,963
2070	122,963	-	-	17,352	-	8,010	113,621
2071	113,621	-	-	16,334	-	7,391	104,679
2072	104,679	-	-	15,341	-	6,800	96,138
2073	96,138	-	-	14,373	-	6,235	88,000
2074	88,000	-	-	13,432	-	5,698	80,266
2075	80,266	-	-	12,517	-	5,188	72,937
2076	72,937	-	-	11,629	-	4,705	66,013
2077	66,013	-	-	10,769	-	4,250	59,495
2078	59,495	-	-	9,937	-	3,823	53,380
2079	53,380	-	-	9,134	-	3,422	47,669
2080	47,669	-	-	8,361	-	3,049	42,357
2081	42,357	-	-	7,619	-	2,703	37,440
2082	37,440	-	-	6,909	-	2,383	32,915
2083	32,915	-	-	6,231	-	2,090	28,773
2084	28,773	-	-	5,588	-	1,822	25,007
2085	25,007	-	-	4,981	-	1,579	21,605
2086	21,605	-	-	4,409	-	1,361	18,557
2087	18,557	-	-	3,876	-	1,166	15,847
2088	15,847	-	-	3,380	-	993	13,460
2089	13,460	-	-	2,924	-	842	11,378
2090	11,378	-	-	2,506	-	723	9,595
2091	9,595	-	-	2,128	-	598	8,066
2092	8,066	-	-	1,788	-	503	6,781
2093	6,781	-	-	1,485	-	424	5,719
2094	5,719	-	-	1,219	-	358	4,859
2095	4,859	-	-	987	-	306	4,179
2096	4,179	-	-	787	-	265	3,657
2097	3,657	-	-	618	-	235	3,274
2098	3,274	-	-	477	-	213	3,009
2099	3,009	-	-	362	-	198	2,846
2100	2,846	-	-	269	-	190	2,767
2101	2,767	-	-	195	-	187	2,759
2102	2,759	-	-	139	-	188	2,808
2103	2,808	-	-	96	-	193	2,905
2104	2,905	-	-	65	-	201	3,042
2105	3,042	-	-	43	-	211	3,210
2106	3,210	-	-	27	-	224	3,407
2107	3,407	-	-	17	-	238	3,628
2108	3,628	-	-	10	-	254	3,871
2109	3,871	-	-	6	-	271	4,136
2110	4,136	-	-	3	-	289	4,422
2111	4,422	-	-	2	-	310	4,730
2112	4,730	-	-	1	-	331	5,060
2113	5,060	-	-	-	-	354	5,414
2114	5,414	-	-	-	-	379	5,793
2115	5,793	-	-	-	-	405	6,198
2116	6,198	-	-	-	-	434	6,632
2117	6,632	-	-	-	-	464	7,096

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 7.00%	Present Value of Benefit Payments: Unfunded Payments at 3.87%	Present Value of Benefit Payments: Using Single Discount Rate of 7.00%
2018	$ 424,212	$ 30,519	$ 30,519	$ -	$ 29,504	$ -	$ 29,504
2019	439,535	30,872	30,872	-	27,893	-	27,893
2020	455,229	31,643	31,643	-	26,719	-	26,719
2021	470,359	32,297	32,297	-	25,487	-	25,487
2022	485,767	33,002	33,002	-	24,339	-	24,339
2023	497,904	33,781	33,781	-	23,284	-	23,284
2024	505,671	34,479	34,479	-	22,211	-	22,211
2025	512,123	35,232	35,232	-	21,211	-	21,211
2026	517,652	36,046	36,046	-	20,281	-	20,281
2027	523,162	36,667	36,667	-	19,281	-	19,281
2028	529,211	37,326	37,326	-	18,343	-	18,343
2029	533,906	37,879	37,879	-	17,397	-	17,397
2030	536,624	38,426	38,426	-	16,494	-	16,494
2031	537,780	38,947	38,947	-	15,624	-	15,624
2032	537,656	39,459	39,459	-	14,794	-	14,794
2033	536,670	40,092	40,092	-	14,048	-	14,048
2034	534,493	40,603	40,603	-	13,296	-	13,296
2035	531,240	40,996	40,996	-	12,547	-	12,547
2036	526,945	41,474	41,474	-	11,863	-	11,863
2037	521,464	42,045	42,045	-	11,239	-	11,239
2038	514,625	42,315	42,315	-	10,571	-	10,571
2039	506,916	42,303	42,303	-	9,877	-	9,877
2040	498,641	42,371	42,371	-	9,245	-	9,245
2041	489,717	42,372	42,372	-	8,641	-	8,641
2042	480,168	42,268	42,268	-	8,056	-	8,056
2043	470,057	42,166	42,166	-	7,511	-	7,511
2044	459,344	42,094	42,094	-	7,007	-	7,007
2045	447,956	41,944	41,944	-	6,526	-	6,526
2046	435,925	41,674	41,674	-	6,059	-	6,059
2047	423,332	41,304	41,304	-	5,613	-	5,613
2048	410,240	40,882	40,882	-	5,192	-	5,192
2049	396,668	40,362	40,362	-	4,791	-	4,791
2050	382,684	39,777	39,777	-	4,412	-	4,412
2051	368,326	39,197	39,197	-	4,063	-	4,063
2052	353,564	38,471	38,471	-	3,727	-	3,727
2053	338,519	37,534	37,534	-	3,399	-	3,399
2054	323,390	36,427	36,427	-	3,083	-	3,083
2055	308,347	35,145	35,145	-	2,780	-	2,780
2056	293,577	33,851	33,851	-	2,502	-	2,502
2057	279,112	32,566	32,566	-	2,250	-	2,250
2058	264,964	31,292	31,292	-	2,020	-	2,020
2059	251,142	30,031	30,031	-	1,812	-	1,812
2060	237,657	28,785	28,785	-	1,623	-	1,623
2061	224,518	27,553	27,553	-	1,452	-	1,452
2062	211,733	26,338	26,338	-	1,297	-	1,297
2063	199,311	25,141	25,141	-	1,157	-	1,157
2064	187,257	23,963	23,963	-	1,031	-	1,031
2065	175,577	22,805	22,805	-	917	-	917
2066	164,278	21,669	21,669	-	814	-	814
2067	153,363	20,555	20,555	-	722	-	722

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

(in thousands)

Calendar Year	Beginning Fiduciary Position	Benefit Payments	Present Value of Benefit Payments: Funded Benefit Payments	Unfunded Benefit Payments	Funded Payments at 7.00%	Unfunded Payments at 3.87%	Using Single Discount Rate of 7.00%
2068	$ 142,836	$ 19,463	$ 19,463	$ -	$ 639	$ -	$ 639
2069	132,702	18,396	18,396	-	564	-	564
2070	122,963	17,352	17,352	-	497	-	497
2071	113,621	16,334	16,334	-	438	-	438
2072	104,679	15,341	15,341	-	384	-	384
2073	96,138	14,373	14,373	-	336	-	336
2074	88,000	13,432	13,432	-	294	-	294
2075	80,266	12,517	12,517	-	256	-	256
2076	72,937	11,629	11,629	-	222	-	222
2077	66,013	10,769	10,769	-	192	-	192
2078	59,495	9,937	9,937	-	166	-	166
2079	53,380	9,134	9,134	-	142	-	142
2080	47,669	8,361	8,361	-	122	-	122
2081	42,357	7,619	7,619	-	104	-	104
2082	37,440	6,909	6,909	-	88	-	88
2083	32,915	6,231	6,231	-	74	-	74
2084	28,773	5,588	5,588	-	62	-	62
2085	25,007	4,981	4,981	-	52	-	52
2086	21,605	4,409	4,409	-	43	-	43
2087	18,557	3,876	3,876	-	35	-	35
2088	15,847	3,380	3,380	-	29	-	29
2089	13,460	2,924	2,924	-	23	-	23
2090	11,378	2,506	2,506	-	19	-	19
2091	9,595	2,128	2,128	-	15	-	15
2092	8,066	1,788	1,788	-	12	-	12
2093	6,781	1,485	1,485	-	9	-	9
2094	5,719	1,219	1,219	-	7	-	7
2095	4,859	987	987	-	5	-	5
2096	4,179	787	787	-	4	-	4
2097	3,657	618	618	-	3	-	3
2098	3,274	477	477	-	2	-	2
2099	3,009	362	362	-	1	-	1
2100	2,846	269	269	-	1	-	1
2101	2,767	195	195	-	1	-	1
2102	2,759	139	139	-	-	-	-
2103	2,808	96	96	-	-	-	-
2104	2,905	65	65	-	-	-	-
2105	3,042	43	43	-	-	-	-
2106	3,210	27	27	-	-	-	-
2107	3,407	17	17	-	-	-	-
2108	3,628	10	10	-	-	-	-
2109	3,871	6	6	-	-	-	-
2110	4,136	3	3	-	-	-	-
2111	4,422	2	2	-	-	-	-
2112	4,730	1	1	-	-	-	-
2113	5,060	-	-	-	-	-	-
2114	5,414	-	-	-	-	-	-
2115	5,793	-	-	-	-	-	-
2116	6,198	-	-	-	-	-	-
2117	6,632	-	-	-	-	-	-

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

Graph 1: Active and Lapsed Members

	Lapsed Member Count	Active Member Count
2013	14,054	28,410
2014	17,164	25,970
2015	17,295	25,526
2016	17,235	25,210
2017	13,134	25,068

Graph 2: Retired Members

	Retired Member Count	Retirement Pension
2013	12,445	$ 25,387,800
2014	12,730	25,969,200
2015	13,463	27,464,520
2016	13,940	28,437,600
2017	14,308	29,188,320

Appendix F: Data for Section 2 Graphs (continued)

Graph 3: Market Value of Assets and Asset Returns

	Market Value of Assets	Asset Return*
2013	371,122,130	12.42%
2014	383,327,980	6.24%
2015	372,572,223	0.35%
2016	383,865,563	6.24%
2017	424,211,921	13.33%

* Equals the asset return for the year preceding the valuation date except for the asset return at 12/31/2013 which equals the annualized asset return between 6/30/2012 and 12/31/2013

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Graph 5: Actuarial Value and Market Value of Assets

	Actuarial Value of Assets	Market Value of Assets
2013	364,836,260	371,122,130
2014	380,885,154	383,327,980
2015	393,387,721	372,572,223
2016	402,431,609	383,865,563
2017	418,265,538	424,211,921

Appendix F: Data for Section 2 Graphs (continued)

Graph 6: Asset Returns

	Actuarial Value Value of Assets	Market Value Asset Return*
2013	7.43%	12.42%
2014	7.42%	6.24%
2015	5.87%	0.35%
2016	5.33%	6.24%
2017	6.54%	13.33%

* Equals the asset return for the year preceding the valuation date except for the asset return at 12/31/2013 which equals the annualized asset return between 6/30/2012 and 12/31/2013

Graph 7: Actuarial Accrued Liability

Fiscal Year Ending	Liability for Active Members	Liability for Retired and Deferred Members	Total
2013	197,492,759	215,560,754	413,053,513
2014	198,286,225	220,628,896	418,915,121
2015	180,540,546	260,259,878	440,800,424
2016	181,107,137	270,958,443	452,065,580
2017	187,805,856	282,113,410	469,919,266

Graph 8: Actuarial Accrued Liability and Actuarial Value of Assets

	Actuarial Accrued Liability	Actuarial Value of Assets
2013	413,053,513	364,836,260
2014	418,915,121	380,885,154
2015	440,800,424	393,387,721
2016	452,065,480	402,431,609
2017	469,919,266	418,265,538

Appendix F: Data for Section 2 Graphs (continued)

Graph 9: Funded Ratios

	Funded Ratio (Actuarial Basis)	Funded Ratio (Market Value Basis)
2013	88.3%	89.8%
2014	90.9%	91.5%
2015	89.2%	84.5%
2016	89.0%	84.9%
2017	89.0%	90.3%

Graph 10: Actuarially Determined Employer Contribution Rates

Fiscal Year Ending	Normal Contribution	Accrued Liability Contribution	Total Contribution
2016	$ 6,354,036	$ 6,886,516	$ 13,240,552
2017*	7,083,948	10,621,260	17,705,208
2018	6,082,027	8,205,274	14,287,301
2019	5,591,401	8,952,682	14,544,083
2020**	5,775,743	9,694,236	15,469,979

* The actuarially determined employer contribution shown for fiscal year ending 6/30/2017 includes the impact of the experience study and legislative changes but does not include the impact of the return to service assumption, which would have reduced the contribution by approximately $3.3 million for fiscal year ending 6/30/2017.

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