



## **State Police Retirement System of New Jersey**

### **Actuarial Valuation Report as of July 1, 2019**

**Produced by Cheiron**

**April 2020**

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***LETTER OF TRANSMITTAL***

April 23, 2020

Board of Trustees  
State Police Retirement System of New Jersey  
State of New Jersey  
Department of the Treasury  
Division of Pension and Benefits, CN 295  
Trenton, NJ 08625-0295

Dear Board Members:

At your request, we have performed the July 1, 2019 Actuarial Valuation of the State Police Retirement System of New Jersey (SPRS or System).

In preparing our report, we relied on information (some oral and some written) supplied by the Division of Pensions and Benefits. This information includes, but is not limited to, plan provisions, employee data, and financial information. We performed an informal examination of the obvious characteristics of the data for reasonableness and consistency in accordance with Actuarial Standard of Practice No. 23.

The results of this report are only applicable to the System's contribution for Fiscal Year Ending 2021. Future results may differ significantly from the current results presented in this report due to such factors as the following: plan experience differing from that anticipated by the assumptions; changes in assumptions; and changes in plan provisions or applicable law.

The demographic and economic (other than the investment rate of return) actuarial assumptions are based on the July 1, 2014 – June 30, 2018 Experience Study, approved by the Board of Trustees on January 28, 2020. The assumed investment rate of return of 7.30% was recommended by the State Treasurer.

This report and its contents have been prepared in accordance with generally recognized and accepted actuarial principles and practices and our understanding of the Code of Professional Conduct and applicable Actuarial Standards of Practice set out by the Actuarial Standards Board as well as applicable laws and regulations. Furthermore, as credentialed actuaries we meet the Qualification Standards of the American Academy of Actuaries to render the opinion contained in this report. This report does not address any contractual or legal issues. We are not attorneys, and our firm does not provide any legal services or advice.

State Police Retirement System of New Jersey

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This actuarial valuation report was prepared exclusively for the State Police Retirement System of New Jersey for the purposes described herein and for the plan auditor in completing an audit related to the matters herein. Other users of this report are not intended users as defined in the Actuarial Standards of Practice, and Cheiron assumes no duty or liability to such other users.

Sincerely,

Cheiron



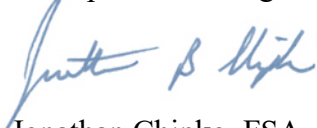
Janet Cranna, FSA, FCA, MAAA, EA

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**STATE POLICE RETIREMENT SYSTEM OF NEW JERSEY  
JULY 1, 2019 ACTUARIAL VALUATION**

**SECTION I – BOARD SUMMARY**

The primary purpose of the actuarial valuation and this report is to disclose the following as of the valuation date:

- The financial condition of the State Police Retirement System of New Jersey,
- Past and expected future trends and risks to the System’s financial condition,
- The State’s Pension Contribution for the Fiscal Year Ending (FYE) 2021.

In this Section we present a summary of the principal valuation results. This includes the basis upon which the July 1, 2019 valuation was completed and an examination of the current financial condition of the System. In addition, we present a review of the key historical trends as well as the System’s projected financial outlook. The stress testing in accordance with the requirements set out in Chapter 277, P. L. 2017 follows in Section II.

This report does not include reporting requirements under GASB Statements No. 67 and 68 which were provided in separate reports.

Results shown in this report for years prior to July 1, 2018 are based on the prior actuary’s valuation reports.

**STATE POLICE RETIREMENT SYSTEM OF NEW JERSEY  
JULY 1, 2019 ACTUARIAL VALUATION**

**SECTION I – BOARD SUMMARY**

**Valuation Basis**

The July 1, 2019 valuation results are based on the same actuarial methods as used in the July 1, 2018 valuation. The demographic and economic assumptions, aside from the valuation interest rate, are based on the July 1, 2014 – June 30, 2018 Experience Study, which was approved by the Board of Trustees on January 28, 2020. The valuation is based on a 7.30% interest rate, which was recommended by the State Treasurer.

This valuation is based on plan provisions in effect as of July 1, 2019 and does not reflect the impact of any changes in benefits that may have been approved after the valuation date.

This report is prepared using census data and financial information as of July 1, 2019 provided by the Division of Pensions and Benefits and does not reflect any subsequent changes in the membership or the assets.

The Appropriations Act of Fiscal Year 2019 reduces the State pension contribution from the Statutory amount of \$159,162,729 to \$96,000,000. The potential impact of the Appropriations Act of 2020 reduces the State pension contribution for Fiscal Year 2020 from the Statutory amount of \$165,576,179 to \$115,903,326 (70% of the Statutory contribution). This valuation reflects the potential impact of the Appropriations Act of 2020.

Chapter 83, P.L. 2016 calls for the State to make the required pension contributions on a quarterly basis in each fiscal year according to the following schedule: at least 25% by September 30, at least 50% by December 31, at least 75% by March 31, and at least 100% by June 30. As such, contributions are assumed to be made on a quarterly basis.

The valuation excludes assets and liabilities under the Non-Contributory Group Insurance Premium Fund. The Non-Contributory Group Insurance premiums are separately funded on a pay-as-you-go basis.

**STATE POLICE RETIREMENT SYSTEM OF NEW JERSEY  
JULY 1, 2019 ACTUARIAL VALUATION**

**SECTION I – BOARD SUMMARY**

**Key Results**

The following Table I-1 summarizes the key results of the valuation with respect to the System’s membership, assets and liabilities, and contributions. The results are presented and compared for both the current and prior year.

<b>Table I-1 Summary of Key Valuation Results</b>			
<b>Valuation Date Fiscal Year Ending (FYE)</b>	<b>July 1, 2019 2021</b>	<b>July 1, 2018 2020</b>	<b>% Change</b>
<b><u>Member Data</u></b>			
Contributing Actives	2,766	2,661	3.9%
Non-Contributing Actives	54	52	3.8%
Deferred Vested Members	0	0	N/A
Retirees and Beneficiaries <sup>1</sup>	3,400	3,404	-0.1%
<b>Total Members</b>	<b>6,220</b>	<b>6,117</b>	<b>1.7%</b>
Appropriation Payroll <sup>2</sup>	\$ 296,189,926	\$ 275,790,087	7.4%
Annual Retirement Allowances	223,394,278	222,196,734	0.5%
<b><u>Assets and Liabilities</u></b>			
Actuarial Liability	\$ 3,595,361,713	\$ 3,430,821,762	4.8%
Actuarial Value of Assets (AVA) <sup>3</sup>	1,971,653,600	1,939,304,839	1.7%
Unfunded Actuarial Liability/(Surplus)	\$ 1,623,708,113	\$ 1,491,516,923	8.9%
Funded Ratio (AVA)	54.8%	56.5%	-1.7%
Market Value of Assets (MVA) <sup>3</sup>	\$ 1,902,721,169	\$ 1,881,340,538	1.1%
Unfunded Actuarial Liability/(Surplus)	\$ 1,692,640,544	\$ 1,549,481,224	9.2%
Funded Ratio (MVA)	52.9%	54.8%	-1.9%
<b><u>Contribution Amounts</u></b>			
State Normal Cost at End of Year	\$ 44,022,882	\$ 39,287,598	12.1%
Amortization Payment of UAL	134,814,030	126,288,581	6.8%
<b>Total Statutory Contribution for FYE</b>	<b>\$ 178,836,912</b>	<b>\$ 165,576,179</b>	<b>8.0%</b>
Percent Appropriated	80.0%	70.0%	10.0%
Net State Contribution	\$ 143,069,530	\$ 115,903,326	23.4%

<sup>1</sup> Retiree and Beneficiary counts do not include QDROs

<sup>2</sup> Annual compensation for contributing actives only

<sup>3</sup> Includes discounted State appropriations receivable

**STATE POLICE RETIREMENT SYSTEM OF NEW JERSEY  
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**SECTION I – BOARD SUMMARY**

The key results of the July 1, 2019 actuarial valuation are as follows:

- The Statutory contributions increased from \$165.6 million for fiscal year ending 2020 to \$178.8 million for fiscal year ending 2021.
- The funded ratio, the ratio of actuarial asset value over liabilities, decreased from 56.5% as of July 1, 2018 to 54.8% as of July 1, 2019.
- The unfunded actuarial liability increased from \$1,491.5 million as of July 1, 2018 to \$1,623.7 million as of July 1, 2019 on an actuarial asset value basis.
- During the year there was a total actuarial experience loss of \$16 million, consisting of an asset loss of \$18 million, offset by a liability gain of \$2 million. The rate of return on the actuarial value of assets was 6.54% compared to the expected return of 7.50%, resulting in the \$18 million asset loss.
- The reduction in the assumed rate of investment return from 7.50% to 7.30% increased the actuarial liability by \$81.3 million.
- The update in the assumed rates of termination, retirement, mortality, and inflation as a result of the recently completed experience study decreased the actuarial liability by \$1.4 million.



**STATE POLICE RETIREMENT SYSTEM OF NEW JERSEY  
JULY 1, 2019 ACTUARIAL VALUATION**

**SECTION I – BOARD SUMMARY**

**Recent Trends**

Although most of the attention given to the valuation reflects the most recently computed unfunded actuarial liability, funded ratio, and contribution amounts, each valuation is merely a snapshot of the long-term progress of a pension fund. It is important to take a step back from these latest results and view them in the context of the System’s recent history. Below, we present a series of graphs which display key factors in the valuations of the last 10 years. Additionally, in Appendix D we provide the numerical values of the historical unfunded actuarial liability, funded ratio, and contribution amounts.

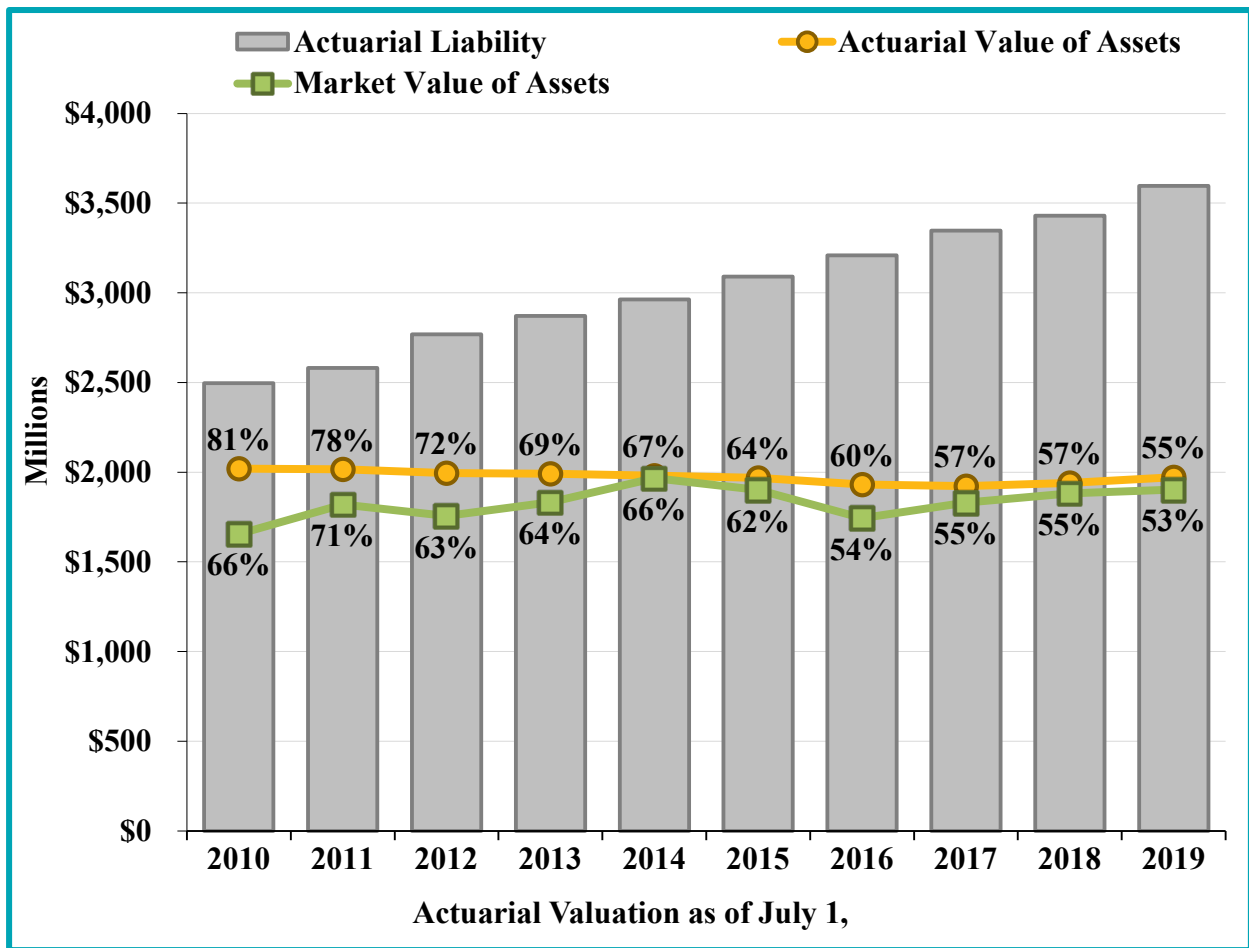
In reviewing the historic trends over the 10 year period, the System’s declining funded status coupled with significant negative net cash flow highlights the potential risk of running out of assets to pay benefits unless the State consistently contributes the full amount of the Statutory required contributions.

**STATE POLICE RETIREMENT SYSTEM OF NEW JERSEY  
JULY 1, 2019 ACTUARIAL VALUATION**

**SECTION I – BOARD SUMMARY**

Assets and Liabilities

The gray bars represent the Actuarial Liability (AL). The green line is the Market Value of Assets (MVA) and the gold line is the Actuarial Value of Assets (AVA). The System’s funded ratio (ratio of assets to actuarial liability), on both a MVA basis and an AVA basis, is shown next to the respective assets lines. The liability has been increasing over time in part due to additional benefit accruals but also due to decreases in the discount rate. The funded ratio has been decreasing over time in part due to decreases in the discount rate, recognition of the 2008/2009 market losses and because the State has not been making the full Statutory contribution for the entire period shown.



The information above is based on the final actuarial valuation reports for the given years. The amounts do not reflect differences between the discounted State appropriations receivable and the actual State contribution amounts that became known after the issuance of the reports.

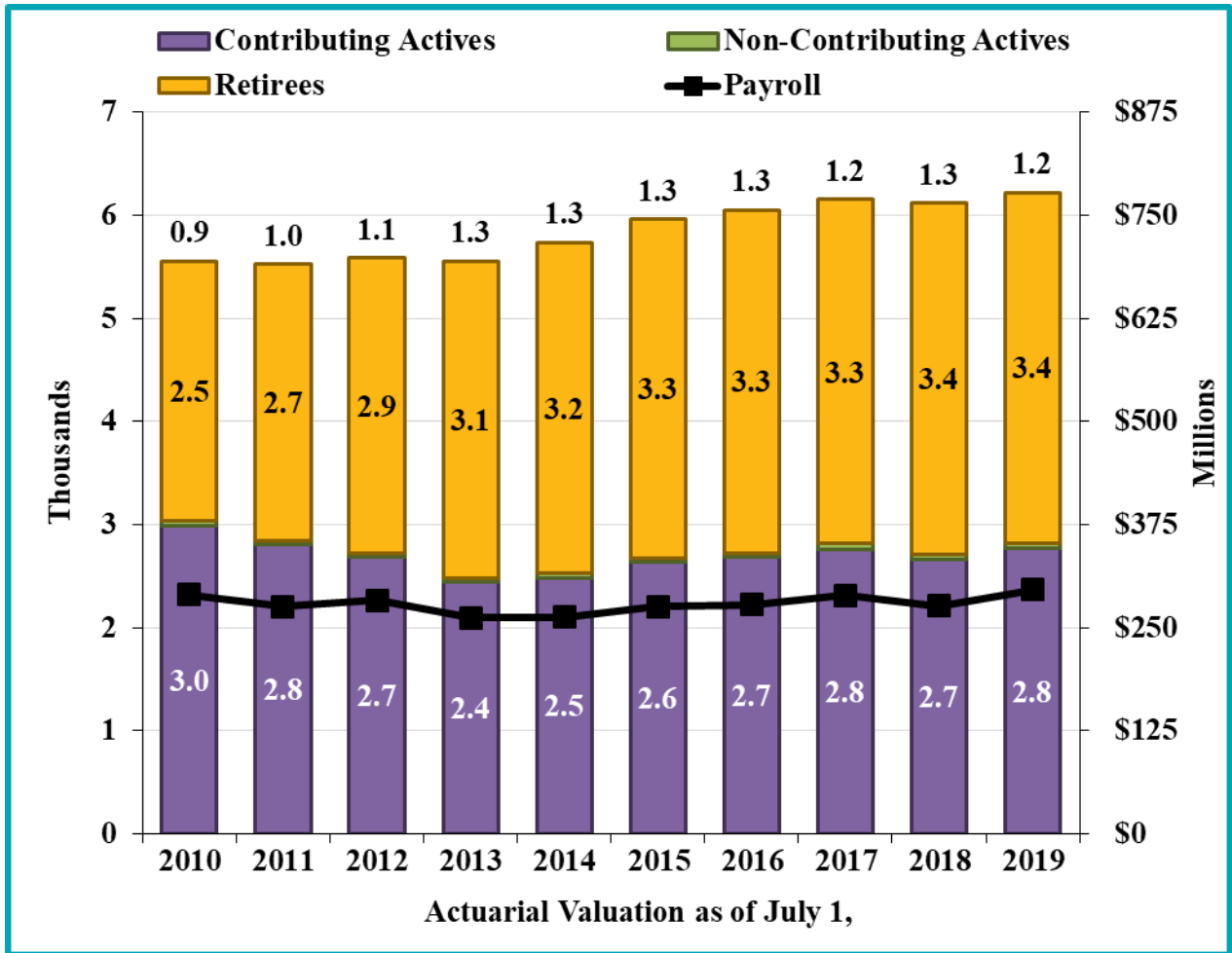
**STATE POLICE RETIREMENT SYSTEM OF NEW JERSEY  
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**SECTION I – BOARD SUMMARY**

Membership Trends

The graph below shows the membership counts of the System for the last ten valuations. The numbers which appear above each bar represent the ratio of the number of inactive members to active members at each valuation date, and provide a measure of the maturity of the System. We refer to this ratio as the *support ratio*. The support ratio has generally increased over the period. As more of the liability moves from actives to inactive, the System will experience more volatility in contribution rates when actuarial gains and losses are recognized.

The numbers that are shown in the middle of the bars represent the number of actives or inactive members in thousands. The black line represents the appropriation payroll over the period, and corresponds with the scale on the right. For valuation years prior to 2018, appropriation payroll includes payroll for non-contributing actives and the appropriation payroll beginning in 2018 excludes the payroll for non-contributing actives.

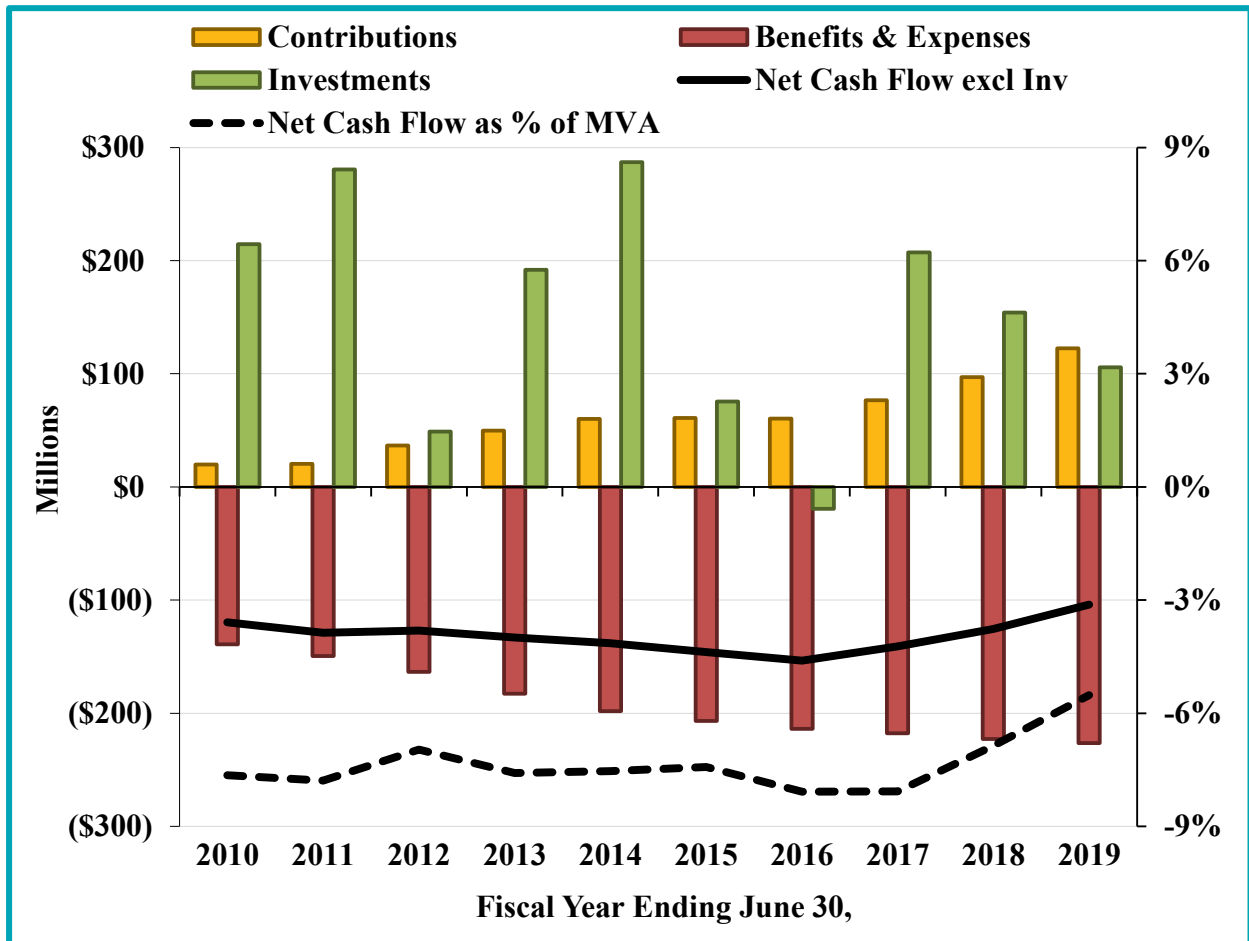


**STATE POLICE RETIREMENT SYSTEM OF NEW JERSEY  
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**SECTION I – BOARD SUMMARY**

Cash Flows

The following graph shows the System net cash flow (contributions less benefit payments and expenses) at the end of each fiscal year. For the entire period shown, the net cash flow which excludes investment return has been negative. This illustrates that contributions have not been sufficient to cover benefits and expenses in any years over the past decade. A major implication of a negative cash flow is that the difference each year must be met first from cash generated by investments and then be paid out of the principal assets, representing additional risk for the System if investments need to be sold in a down market to cover benefit payments. The black dotted line shows the net cash flow as a percent of the market assets and goes with the axis on the right. As seen in the graph below, the negative net cash flow has been gradually improving from -8.1% for FYE 2017 to -5.5% for FYE 2019 as the State appropriation amounts have increased by 10% each year.



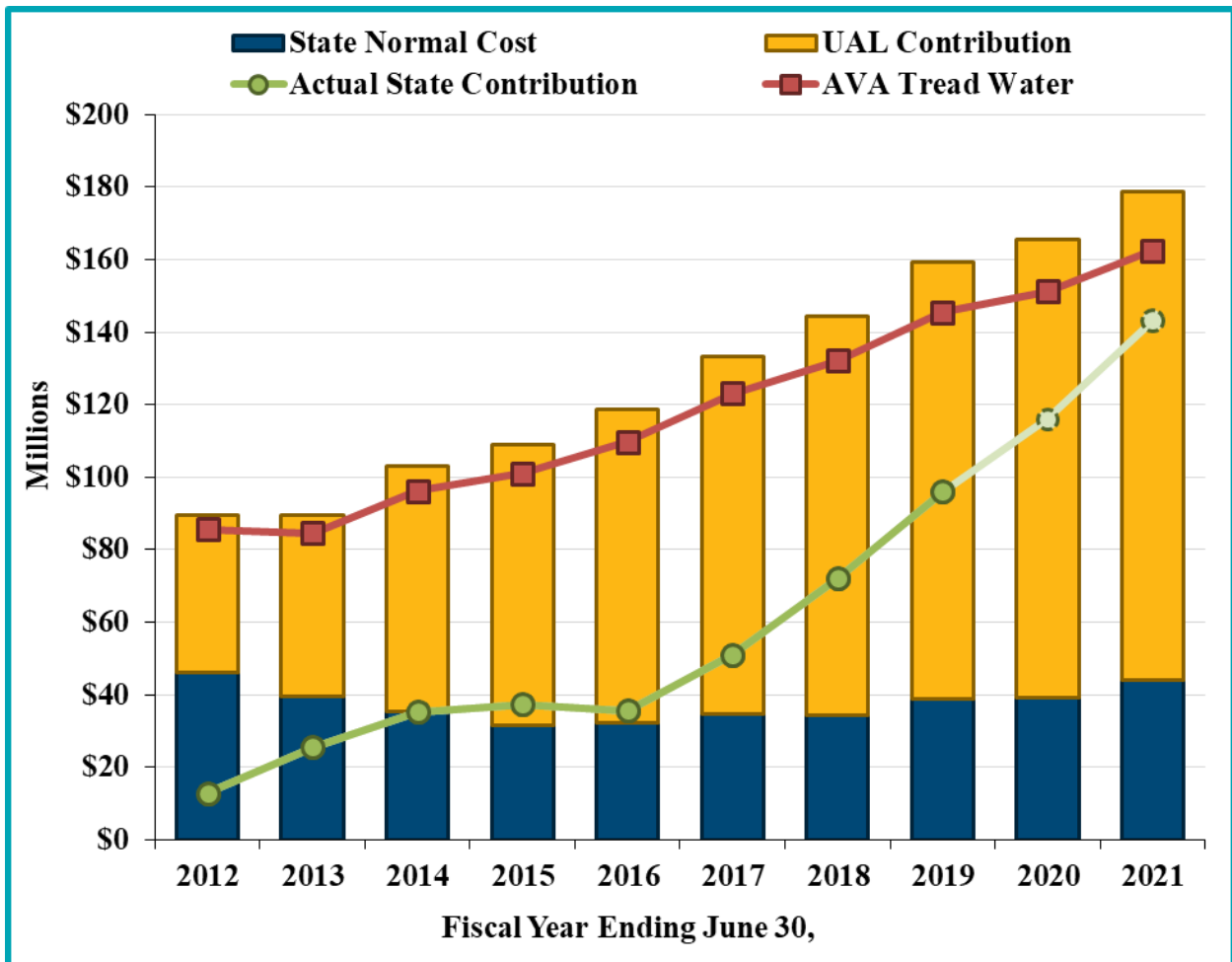
**STATE POLICE RETIREMENT SYSTEM OF NEW JERSEY  
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**SECTION I – BOARD SUMMARY**

Contributions

This graph shows the historical trends for the State contributions. The Statutory contributions are comprised of the State normal cost (blue bars) and the amortization of the UAL (gold bars). The green line shows the actual State contributions over the period. For FYE 2020 and 2021, the green line has a lighter shade to indicate that these are expected, rather than actual, contributions. The expected contributions are based on the anticipated appropriations shown in Table I-1.

The red line is the **tread water line**, which is the State normal cost plus the interest on the UAL. The tread water line shows the minimum contributions needed to avoid an increase in the UAL. The graph shows that not only has the State been making contributions less than required by Statute, but that the State contributions are significantly below the tread water line. When contributions are lower than the normal cost plus interest on the UAL, the UAL is expected to grow from one year to the next. For FYE 2020 and 2021, the State is expected to appropriate 70% and 80% of the Statutory contribution, respectively.



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SECTION I – BOARD SUMMARY

**Projected Future Outlook**

The analysis of projected financial trends is perhaps the most important component of the valuation. This has been recognized by the State Legislature in their adoption of Chapter 277, P.L. 2017 requiring the System to have stress testing performed annually. The graphs presented in this section and Section II show the expected progress of the System’s funded status over the next 30 years, measured in terms of the expected funded ratios and State contributions assuming that the System is ongoing.

While experience will not conform exactly to the assumptions every year, the trends reflect reasonable expectations. As a result, in addition to the baseline projection in this section, we provide additional **stress testing** in Section II based on varying investment returns in the future. It is our opinion that the stress testing analyses shown in Section II meet the requirements of Chapter 277, P. L. 2017.

The projections assume a constant active population. As members retire, terminate and die based on the current valuation assumptions, it is assumed that new members will replace them based on characteristics (age/gender/salary) similar to recent new members.

Additional assumptions used for these projections, including the investment rate of return for each subsequent valuation as recommended by the State Treasurer, as well as the anticipated appropriation percentages, are shown in Appendix B.

Baseline Scenario

The baseline projection shows the outcome if all actuarial assumptions, including the ultimate long-term rate of return assumption of 7.00%, as recommended by the State Treasurer, are exactly met. For each scenario we show two graphs.

The top graph compares the Market Value of Assets (green line) and the Actuarial or smoothed Value of Assets (gold line) to the System’s Actuarial Liabilities (gray bars). In addition, at the top of the graph, we show the System’s funded ratio on an Actuarial Value of Assets basis (ratio of Actuarial Value of Assets to Actuarial Liabilities). The years shown in the graph signify the valuation date as of July 1 of the labeled year.

The System’s funded ratio on an Actuarial Value of Assets basis is projected to drop slightly over the next few years, as the State appropriates less than the Statutory amount and the valuation investment rate of return assumption decreases from 7.30% to 7.00%, before beginning a slow but steady increase to 92% by 2049.

The bottom graph shows the contributions by fiscal year. The member contributions are in purple and the State contributions are in gold. The gold outline shows the State’s full Statutory contributions with the shaded portion showing the anticipated appropriated amount. The projection assumes the State appropriates 80% of the Statutory contribution in FYE 2021, and increases the percent by 10% a year, until reaching 100% of the Statutory contribution beginning with FYE 2023. Both the appropriated State contributions and the member contributions are also shown in dollar amounts.

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**SECTION I – BOARD SUMMARY**

The dashed black line in the bottom graph shows the gross normal cost. The difference between the dashed black line and the purple bar is the State portion of the normal cost.

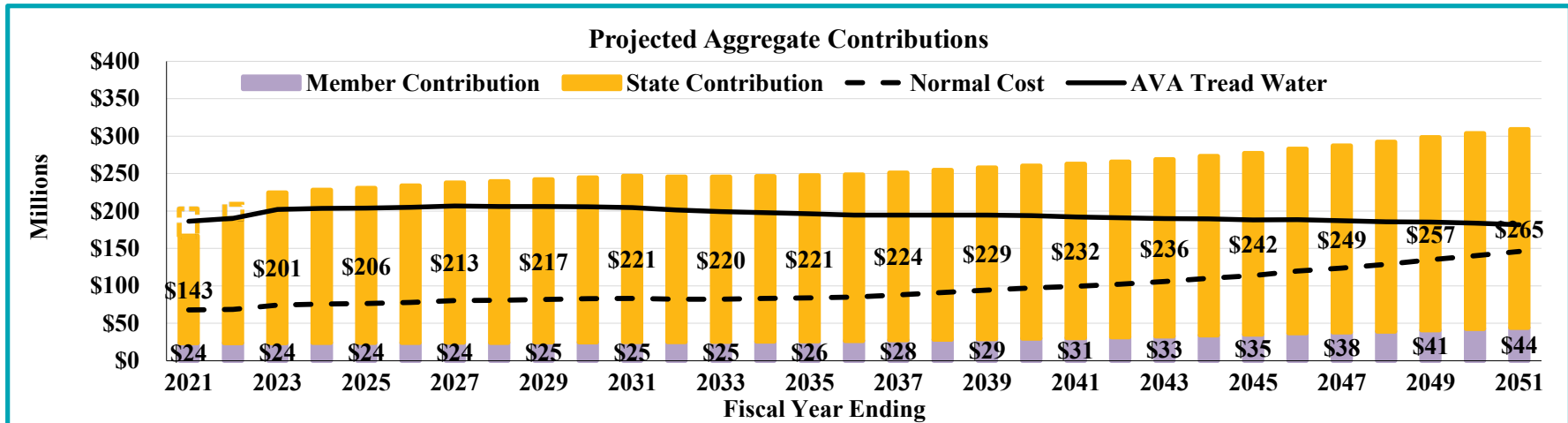
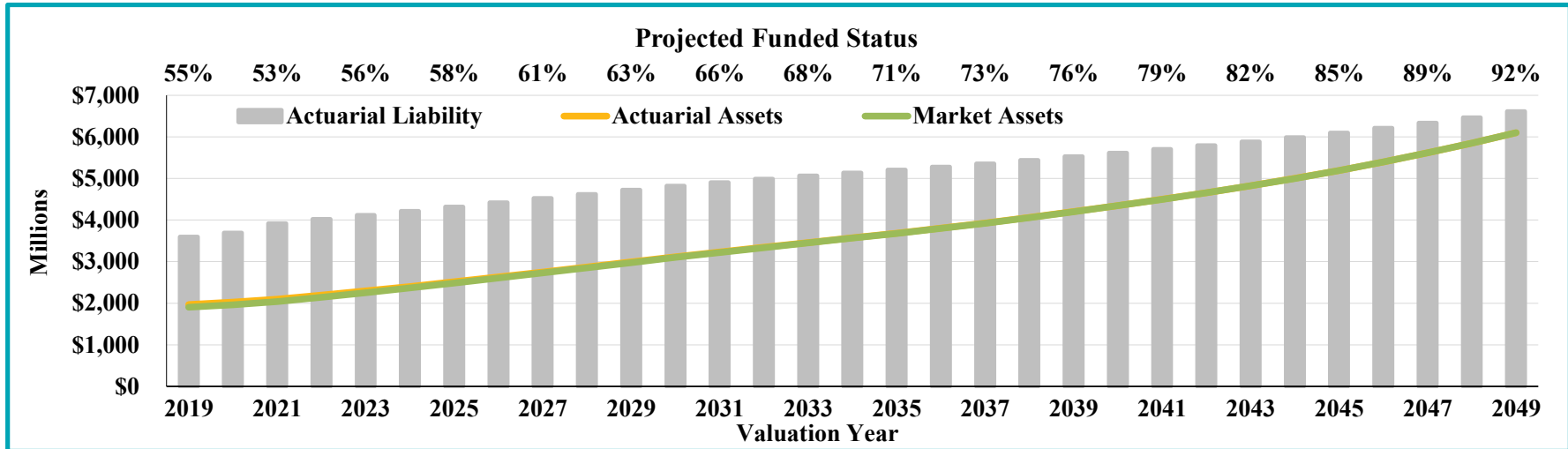
The solid black line is the tread water line based on the Actuarial Value of Assets. Because the tread water metric equals the normal cost plus interest on the UAL, the difference between the solid black line and the dashed black line is the interest on the UAL. When contributions fall below the solid black line, as is the case through FYE 2022, the UAL grows and the funded ratio falls. When the contributions exceed the solid line, as is the case beginning in FYE 2023, the UAL decreases and the funded ratio increases.

The Statutory contributions increase steadily through FYE 2023 as the State appropriates less than the Statutory amount and the valuation investment rate of return assumption decreases from 7.30% to 7.00%. Thereafter, the Statutory contributions increase more gradually. Once the appropriated amount equals the Statutory contribution, beginning in FYE 2023, the contributions reach the level necessary to pay down the UAL and the tread water line begins to decrease relative to the Statutory contribution.

STATE POLICE RETIREMENT SYSTEM OF NEW JERSEY  
 JULY 1, 2019 ACTUARIAL VALUATION

SECTION I – BOARD SUMMARY

**Baseline: 7.0% return for all years**





## SECTION II – ASSESSMENT AND DISCLOSURE OF RISK

Actuarial valuations are based on a set of assumptions about future economic and demographic experience. These assumptions represent a reasonable estimate of future experience, but actual future experience will undoubtedly be different and may be significantly different. This section of the report is intended to identify the primary risks to the System, provide some background information about those risks, and provide an assessment of those risks.

### Identification of Risks

The fundamental risk to the System is that the contributions needed to pay the benefits become unaffordable. While there are a number of factors that could lead to contribution amounts becoming unaffordable, we believe the primary risks are:

- Investment risk,
- Assumption change risk, and
- Contribution risk.

Other risks that we have not identified may also turn out to be important.

*Investment risk* is the potential for investment returns to be different than expected. Lower investment returns than anticipated will increase the unfunded actuarial liability necessitating higher contributions in the future unless there are other gains that offset these investment losses. The potential volatility of future investment returns is determined by the System's asset allocation and the affordability of the investment risk is determined by the amount of assets invested relative to the size of the plan sponsor or other contribution base.

*Assumption change risk* is the potential for the environment to change such that future valuation assumptions are different than the current assumptions. For example, declines in interest rates over the last three decades resulted in higher investment returns for fixed income investments, but lower expected future returns necessitating either a change in investment policy, a reduction in discount rate, or some combination of the two. Assumption change risk is an extension of the other risks identified, but rather than capturing the risk as it is experienced, it captures the cost of recognizing a change in environment when the current assumption is no longer reasonable.

*Contribution risk* is the potential for actual future contributions to deviate from expected future contributions. There are different sources of contribution risk ranging from the sponsor choosing to not make contributions in accordance with the funding policy to material changes in the contribution base (e.g., covered employees, covered payroll, sponsor revenue) that affect the amount of contributions the System can collect.

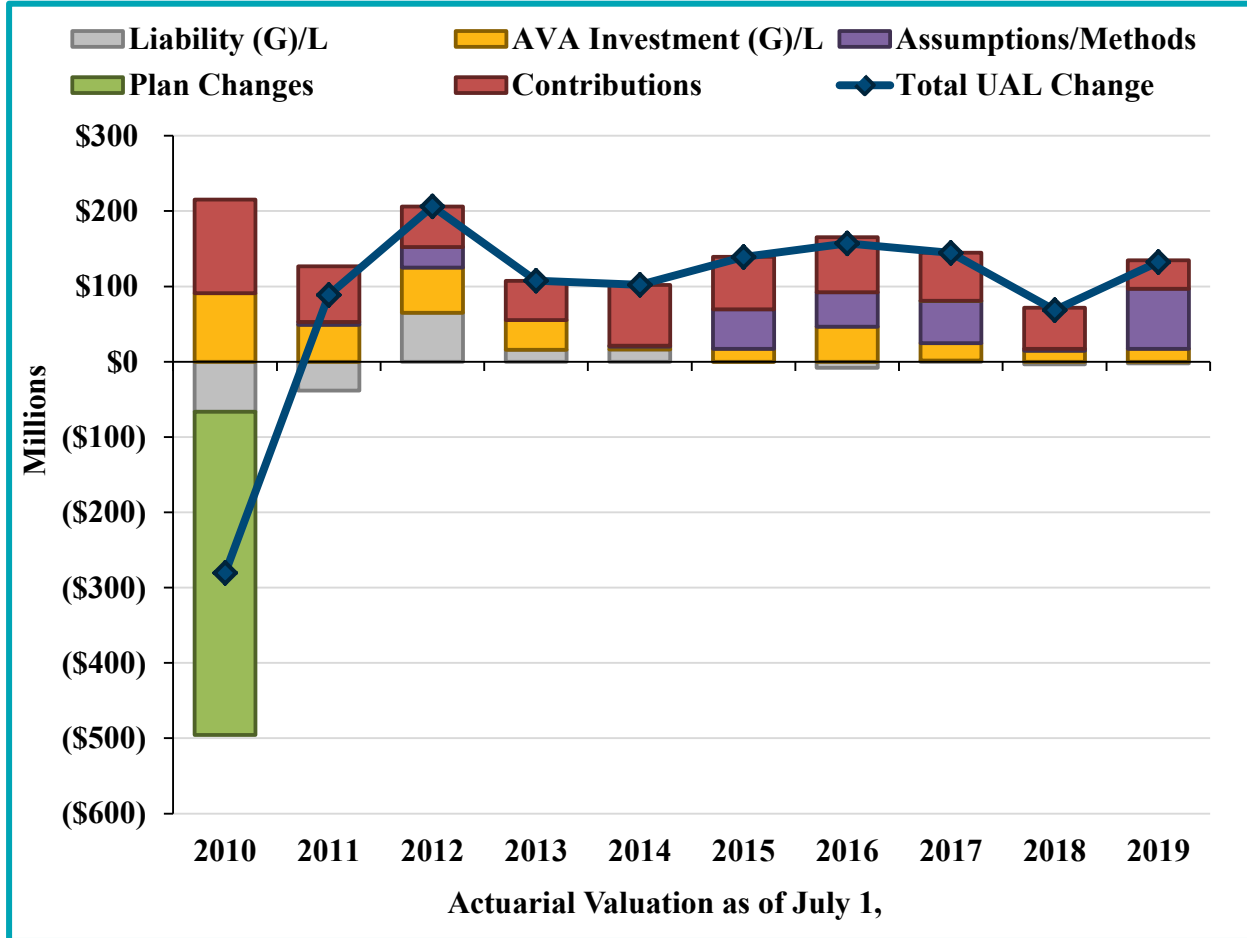
The chart below shows the components of changes in the Unfunded Actuarial Liability (UAL) for the System over the last 10 years, including investment gains and losses on the Actuarial Value of Assets, liability gains and losses, assumption and plan changes, and contributions compared to the tread water level of contributions (normal cost plus interest on the UAL.) The net UAL change is shown by the dark blue line. Table II-1 below the chart summarizes the changes in the UAL over the last 10 years.

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**SECTION II – ASSESSMENT AND DISCLOSURE OF RISK**

These total changes in UAL support our identification of investment returns, assumption changes, and contributions as the primary risks to the System.

**Historical Changes in UAL 2010-2019**



**TABLE II-1  
Changes in Unfunded Actuarial Liability  
(Dollar amounts in millions)**

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Total
<b>Discount Rate</b>	8.25%	7.95%	7.90%	7.90%	7.90%	7.90%	7.65%	7.50%	7.50%	7.30%	
<b>Source</b>											
AVA Investment (G)/L	\$ 90.8	\$48.8	\$ 60.0	\$ 39.5	\$ 3.6	\$ 17.1	\$ 46.7	\$ 23.2	\$14.5	\$ 17.2	\$361.3
Liability (G)/L	(66.5)	(38.3)	65.1	15.6	16.5	0.1	(8.0)	1.5	(3.3)	(2.4)	(19.7)
Assumptions/Methods	0.0	4.2	27.3	0.0	1.3	52.4	45.7	55.9	2.8	79.8	269.4
Plan Changes	(429.2)	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	(428.9)
Contributions <sup>1</sup>	124.4	73.9	53.6	52.3	80.7	69.6	72.9	63.8	54.6	37.5	683.4
<b>Net UAL Change</b>	<b>\$(280.5)</b>	<b>\$88.6</b>	<b>\$206.1</b>	<b>\$107.4</b>	<b>\$102.0</b>	<b>\$139.2</b>	<b>\$157.3</b>	<b>\$144.7</b>	<b>\$68.6</b>	<b>\$132.2</b>	<b>\$865.5</b>

<sup>1</sup> UAL change due to contributions (greater)/less than normal cost plus interest on the UAL.

**STATE POLICE RETIREMENT SYSTEM OF NEW JERSEY  
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**SECTION II – ASSESSMENT AND DISCLOSURE OF RISK**

On a smoothed asset basis, the investment gains and losses (gold bars) from 2010 to 2019 reflect material investment losses driven by the market decline of 2008 and 2009, which was spread over the five successive years. In aggregate, over the 10-year period, investment losses have added approximately \$361.3 million to the UAL.

On the liability side (gray bars), the System has experienced a combination of gains and losses, however much smaller in magnitude compared to the assets, decreasing the UAL by approximately \$19.7 million over the 10-year period.

Assumption and method changes (purple bars) over the last 10 years have increased the UAL by approximately \$269.4 million. The significant assumption changes have included reductions in the discount rate from 8.25% to 7.30% as well as decreases in mortality rates and projected mortality improvement. It is important to note that the discount rate changes simply reflect a downward revision to the estimate of future investment earnings and ultimately costs will be determined by actual investment earnings.

Plan changes (green bars) over the last 10 years have decreased the UAL by approximately \$428.9 million. The significant plan change that occurred in 2010 was the suspension of future COLAs.

Each year the UAL is expected to increase for benefit accruals attributable to the current year (the normal cost) and interest on the UAL. This expected increase is referred to as the tread water level. If contributions are greater than the tread water level, the UAL is expected to decrease. Conversely, if contributions are less than the tread water level, the UAL is expected to increase. Changes due to contributions greater or less than the tread water level (red bars) have increased the UAL by approximately \$683.4 million over the last 10 years.

In general, the amortization methods used to determine the Statutory contributions are designed to collect more than the tread water level. However, contributions may be less than this threshold due to the State appropriating less than the Statutory contributions.

### **Plan Maturity Measures**

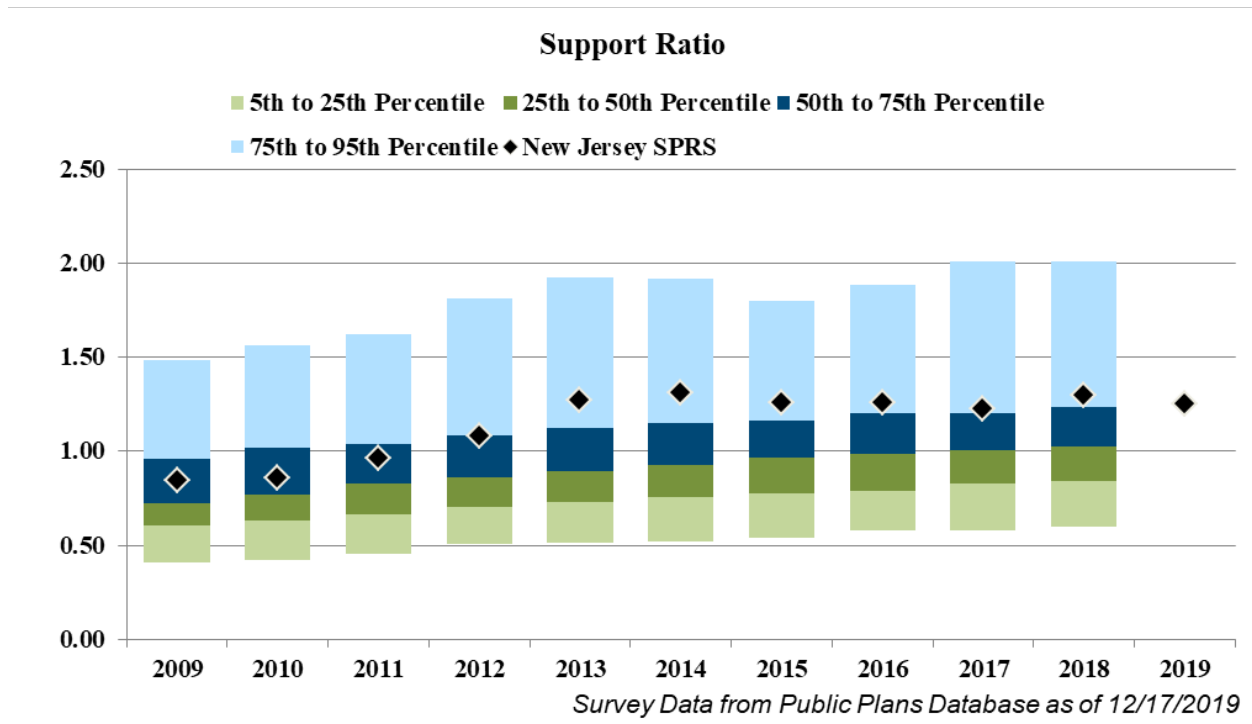
The future financial condition of a mature pension plan is more sensitive to each of the risks identified above than a less mature plan. Before assessing each of these risks, it is important to understand the maturity of the plan compared to other plans and how the maturity has changed over time.

Plan maturity can be measured in a variety of ways, but they all get at one basic dynamic - the larger the plan is compared to the contribution or revenue base that supports it, the more sensitive the plan will be to risk. The measures below have been selected as the most important in understanding the primary risks identified for the System.

**SECTION II – ASSESSMENT AND DISCLOSURE OF RISK**

**Inactives per Active (Support Ratio)**

One simple measure of plan maturity is the ratio of the number of inactive members (those receiving benefits or entitled to a deferred benefit) to the number of active members. We refer to this ratio as the *support ratio*. The revenue base supporting the plan is usually proportional to the number of active members, so a relatively high number of inactives compared to actives indicates a larger plan relative to its revenue base as well. We also discussed this risk metric in Section I.



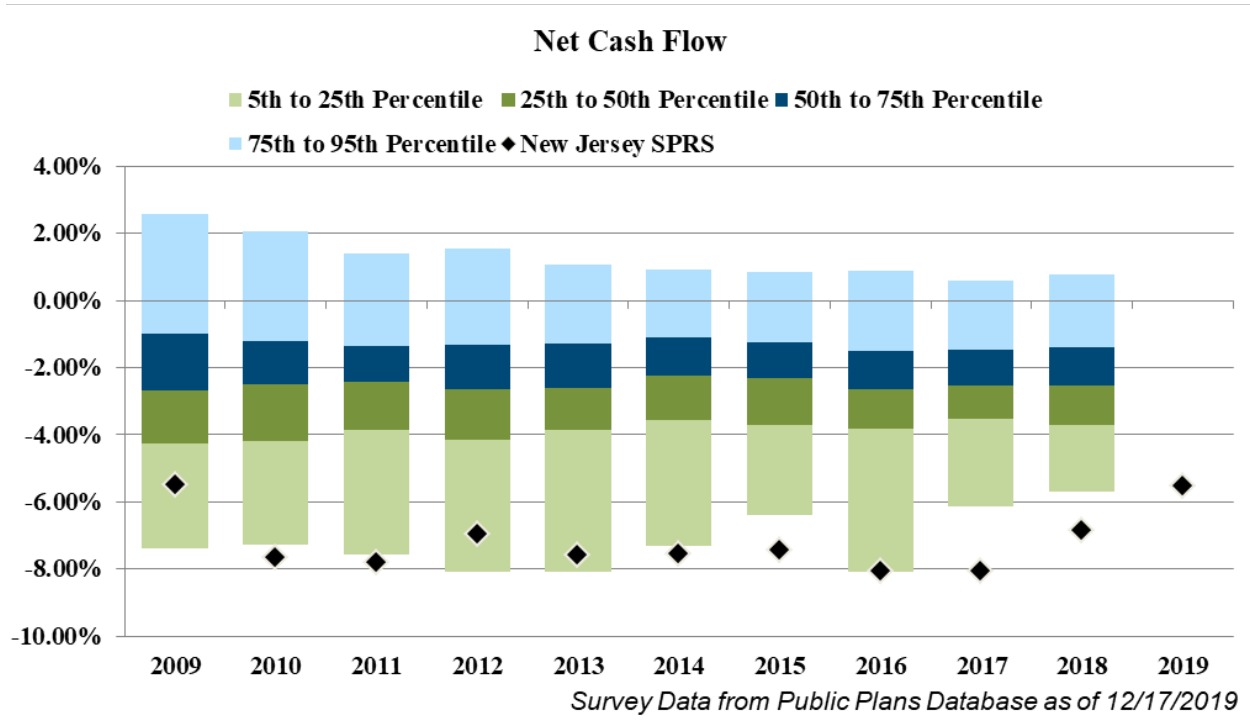
The chart above shows the distribution from the 5<sup>th</sup> to 95<sup>th</sup> percentile of support ratios for the plans in the Public Plans Database. The black diamond shows how SPRS compares dating back to 2009. Through 2010, SPRS was slightly more mature than the median plan. The support ratio increased following the Great Recession, but has since stabilized at a level just above the 75<sup>th</sup> percentile.

**Net Cash Flow**

The net cash flow of the plan as a percentage of the beginning of year assets indicates the sensitivity of the plan to short-term investment returns. Net cash flow is equal to contributions less benefit payments and administrative expenses. Mature plans can have large amounts of benefit payments compared to contributions, particularly if they are well funded. Investment losses in the short-term are compounded by the net withdrawal from the plan leaving a smaller asset base to try to recover from the investment losses. Large negative cash flows can also create liquidity issues. We also discussed this metric in Section I.

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**SECTION II – ASSESSMENT AND DISCLOSURE OF RISK**



The chart above shows the distribution from the 5<sup>th</sup> to 95<sup>th</sup> percentile of net cash flow for the plans in the Public Plans Database. The black diamond shows how SPRS compares. Since the Great Recession, SPRS has generally been at or below the 5<sup>th</sup> percentile compared to the database of other public plans in terms of negative cash flow as a percentage of assets.

**Assessing Costs and Risks**

The fundamental risk to the System is that the contributions needed to fund the benefits become unaffordable. Assessing this risk, however, is complex because there is no bright line of what is unaffordable and the contribution amounts themselves are affected not just by the experience of the System, but also by the interaction of that experience and decisions by the State and the Board related to the amount of contributions appropriated, assumptions, asset smoothing methods, and amortization periods.

**Investment Risk - Stress Testing**

This section illustrates stress testing of the investment return assumption and is an extension of the baseline projections provided in the Summary section. Under the baseline results, we assumed the ultimate 7.00% investment return assumption each and every year beginning July 1, 2019.

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**SECTION II – ASSESSMENT AND DISCLOSURE OF RISK**

For stress testing purposes, we developed six hypothetical scenarios to illustrate the impact actual investment returns may have on future funded status and contribution amounts. The scenarios are balanced between positive and negative scenarios and are based on a lognormal distribution of one and five year expected returns as shown in the table below using the capital market assumptions from the New Jersey Division of Investments (Geometric return of 7.07%, standard deviation of 11.89%).

<b>Distribution of Expected Average Annual Returns</b>		
<b>Percentile</b>	<b>1 Year</b>	<b>5 Year</b>
5%	-10.7%	-1.3%
25%	-0.6%	3.6%
50%	7.1%	7.1%
75%	15.3%	10.7%
95%	28.3%	16.1%

The scenarios include: a one-year shock using the 5th and 95th percentile returns for one year; a 5-year moderate scenario using the 25th and 75th percentile returns for five years; and a 5-year significant scenario using the 5th and 95th percentile returns for five years. The table below summarizes the theoretical scenarios.

<b>FYE</b>	<b>Theoretical Scenarios</b>					
	<b>1-Yr Shock</b>		<b>5-Yr Moderate</b>		<b>5-Yr Significant</b>	
	<b>Neg</b>	<b>Pos</b>	<b>Neg</b>	<b>Pos</b>	<b>Neg</b>	<b>Pos</b>
2020	-10.7%	28.3%	3.6%	10.7%	-1.3%	16.1%
2021	7.0%	7.0%	3.6%	10.7%	-1.3%	16.1%
2022	7.0%	7.0%	3.6%	10.7%	-1.3%	16.1%
2023	7.0%	7.0%	3.6%	10.7%	-1.3%	16.1%
2024	7.0%	7.0%	3.6%	10.7%	-1.3%	16.1%
2025+	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%

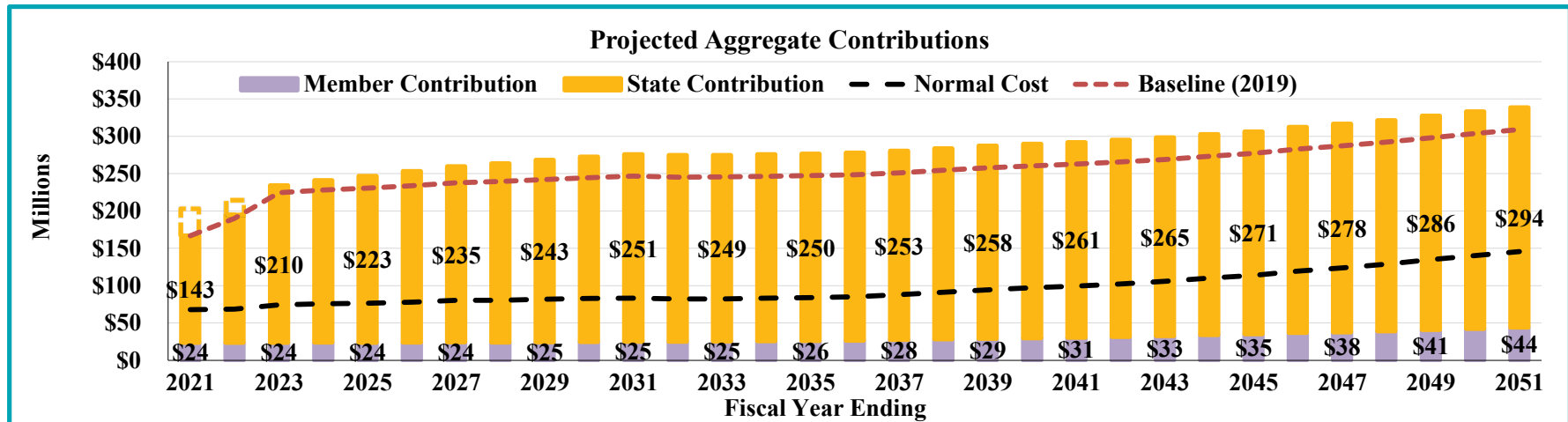
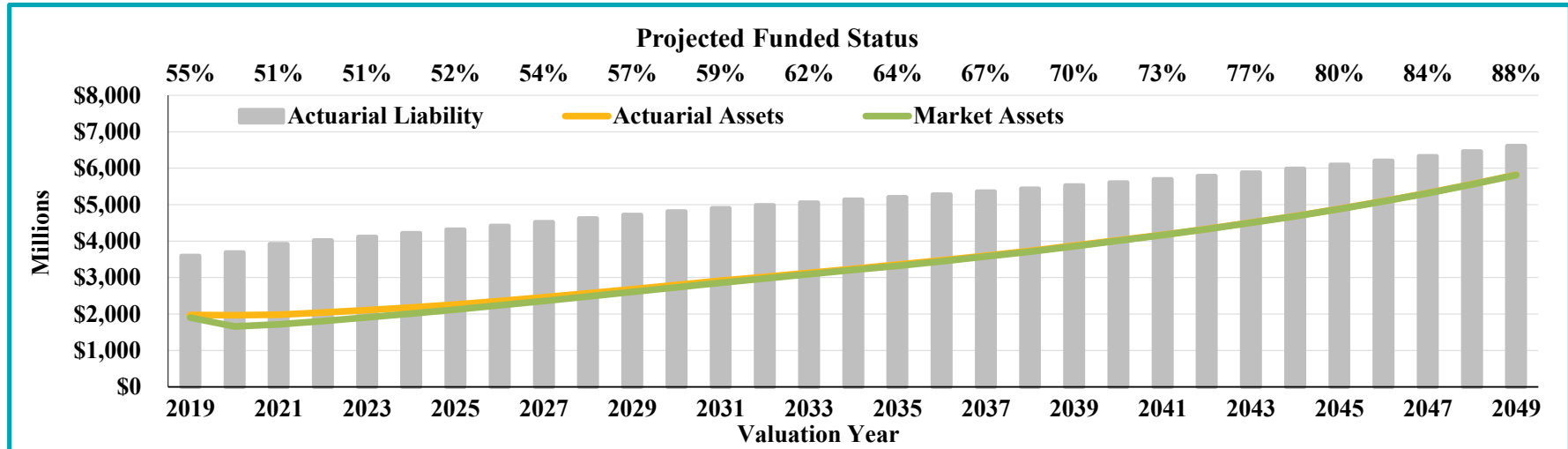
In reviewing each of these projections, it is the future trends, not necessarily the actual values, that are important to observe in consideration of the risks of the System and the potential volatility of future funded ratios and Statutory contribution levels.

The graphs on the following pages show the projections under each of these theoretical scenarios. Instead of the tread water line shown for the baseline projection, the contribution graphs include a dashed red line representing the expected contributions under the baseline projections shown in the Summary section to facilitate the comparison between the particular scenario and the baseline projections assuming all assumptions are met.

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SECTION II – ASSESSMENT AND DISCLOSURE OF RISK

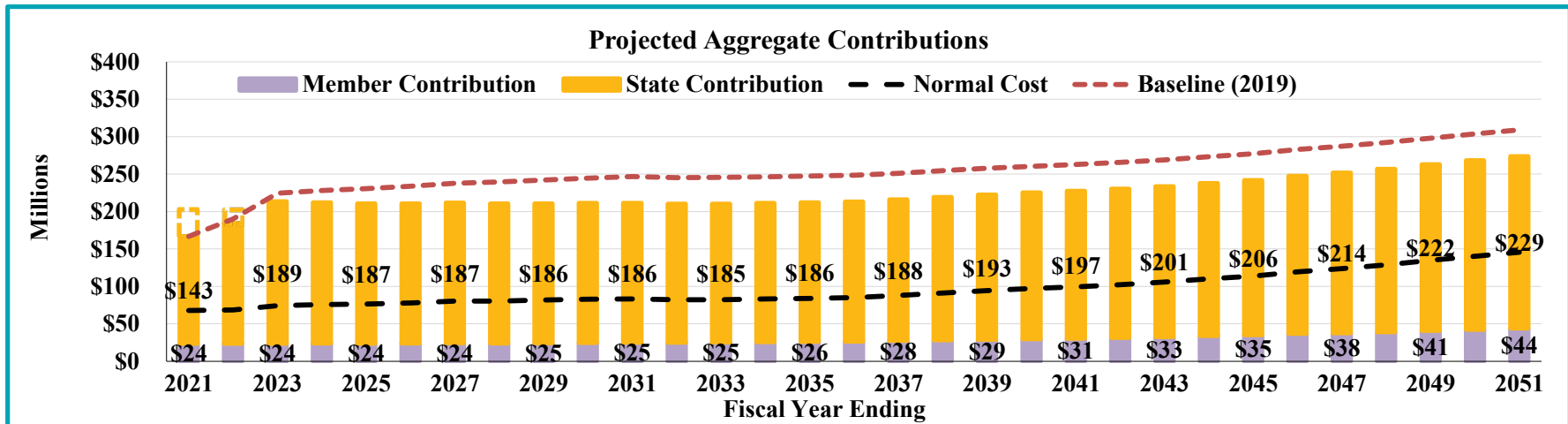
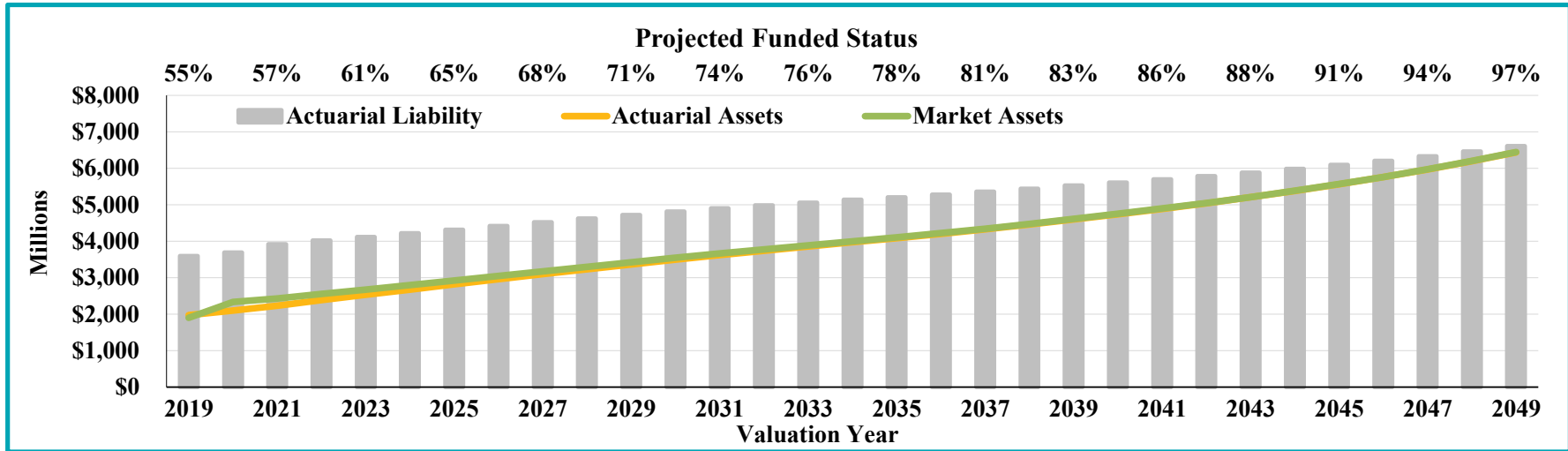
**One-Year Negative Shock Scenario: -10.7% return FYE 2020, 7.0% after**



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**One-Year Positive Shock Scenario: 28.3% return FYE 2020, 7.0% after**

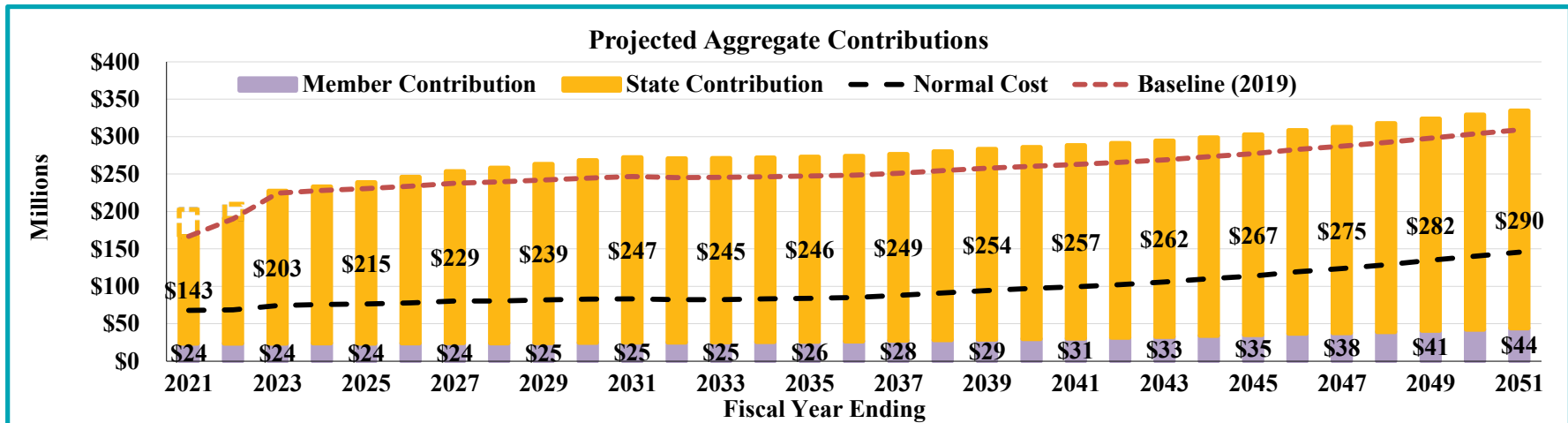
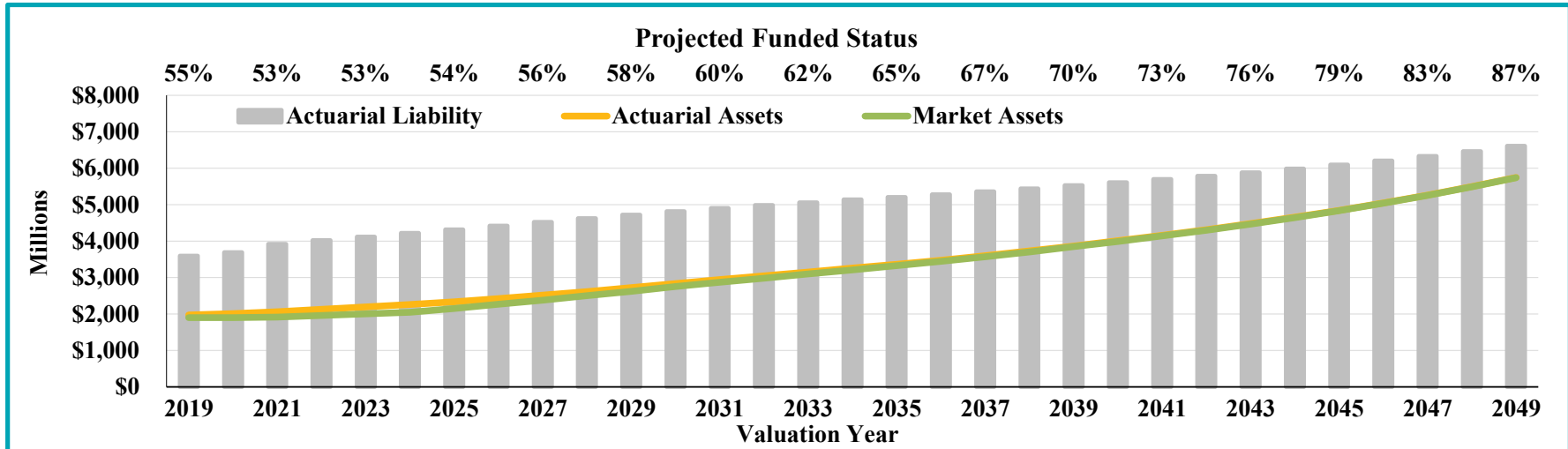




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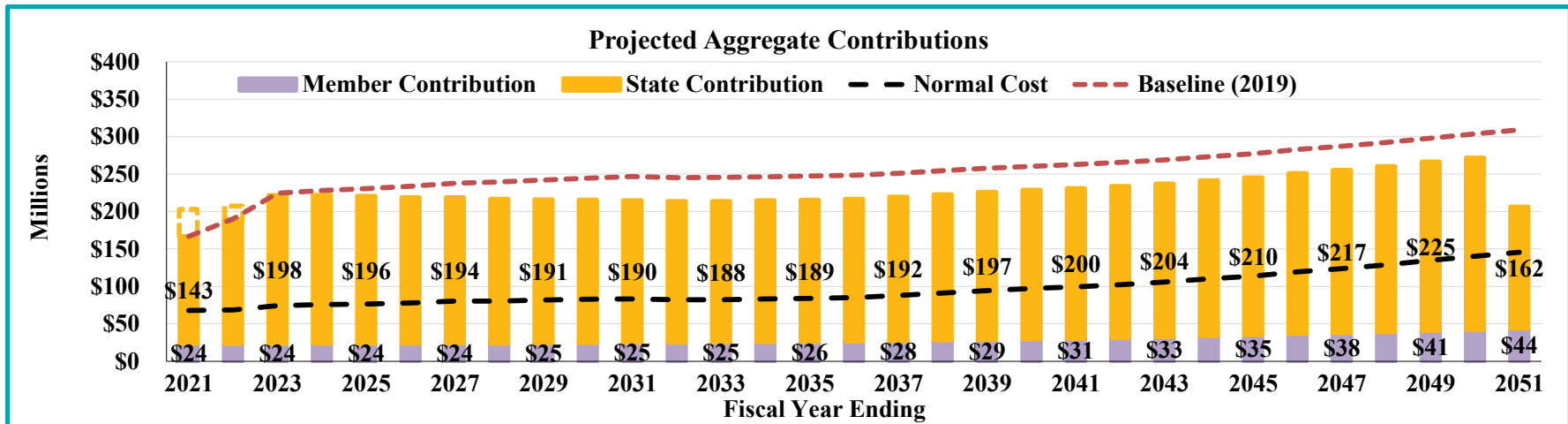
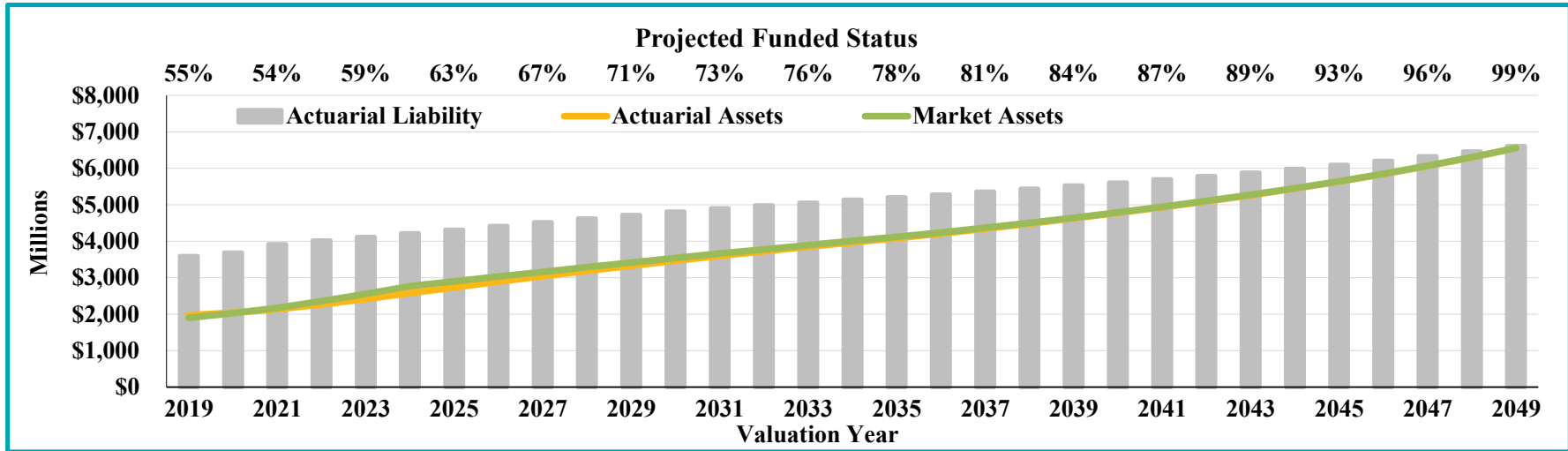
**Five-Year Moderate Negative Scenario: 3.6% return FYE 2020-2024, 7.0% after**



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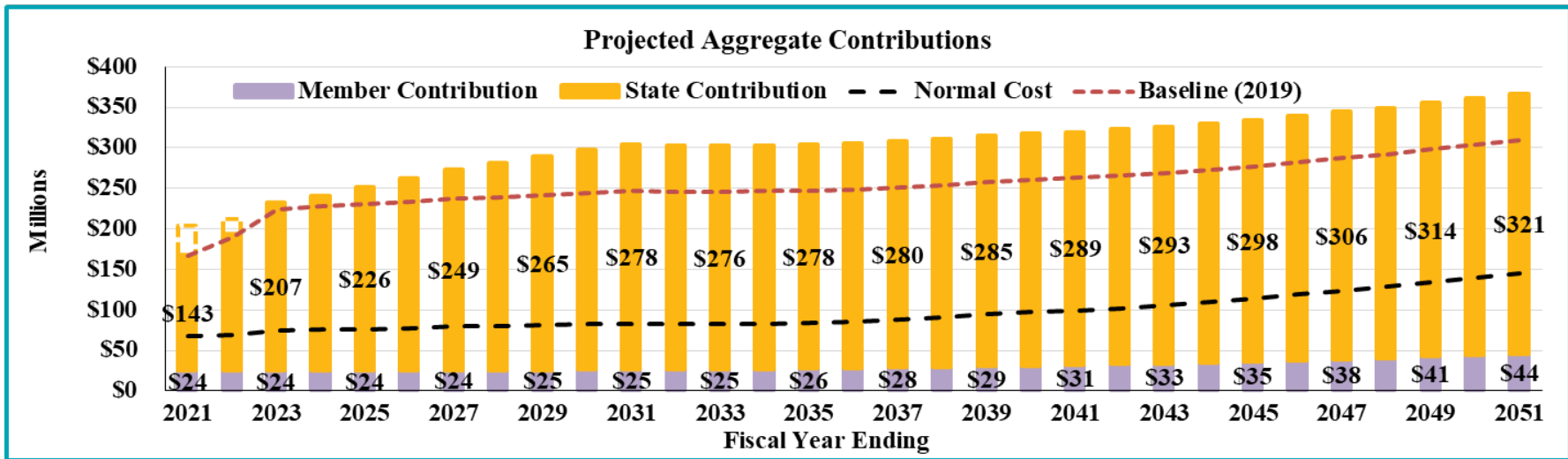
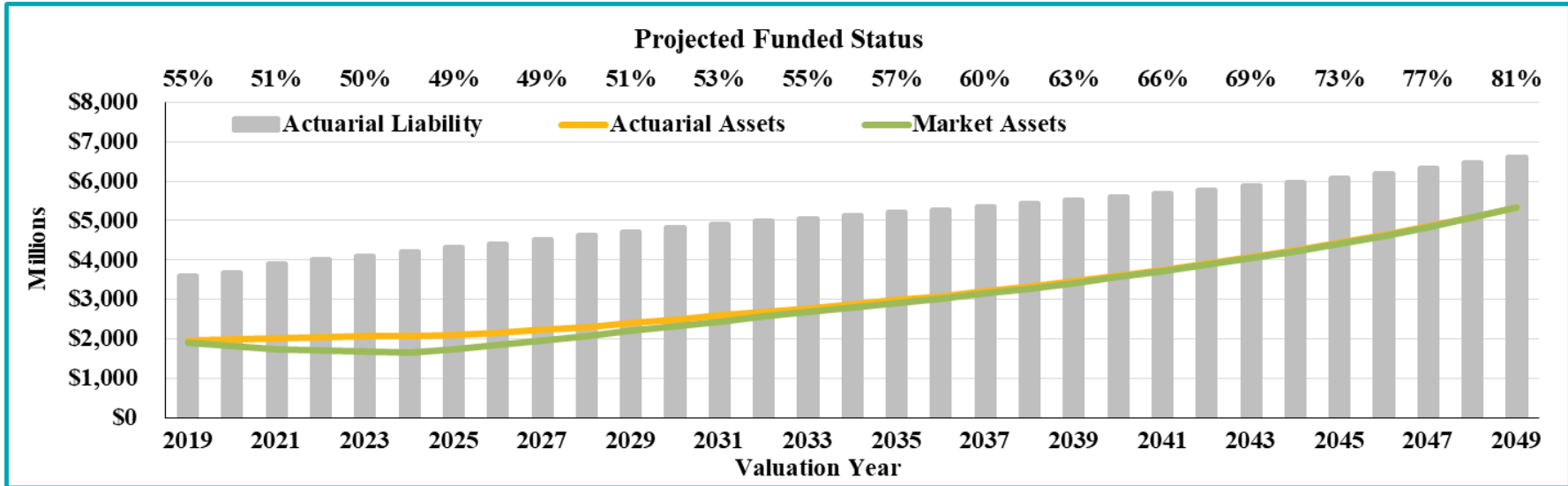
**Five-Year Moderate Positive Scenario: 10.7% return FYE 2020-2024, 7.0% after**



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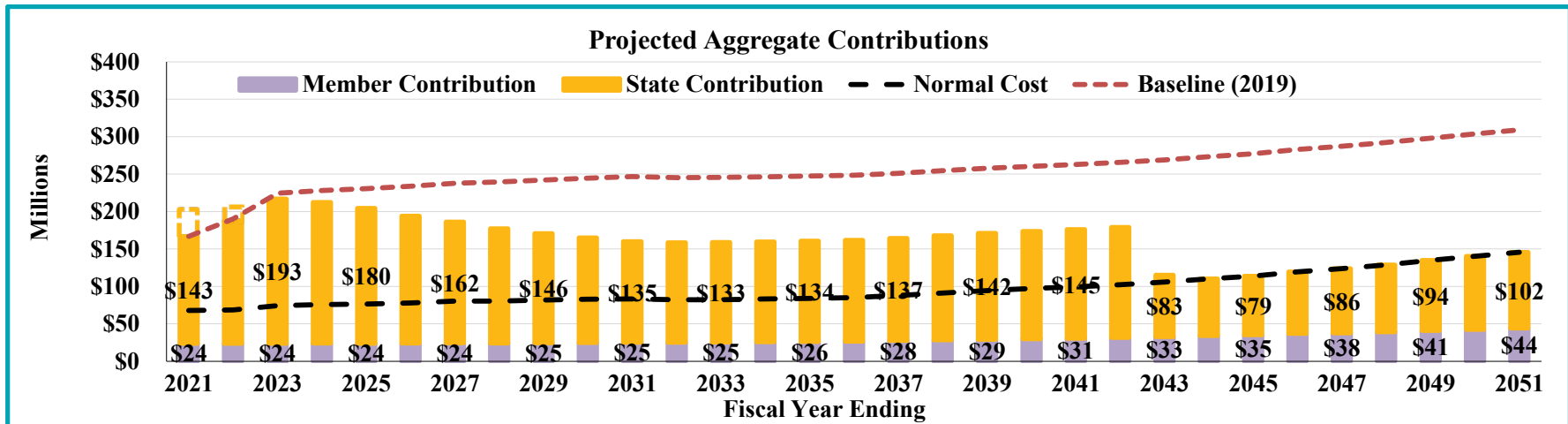
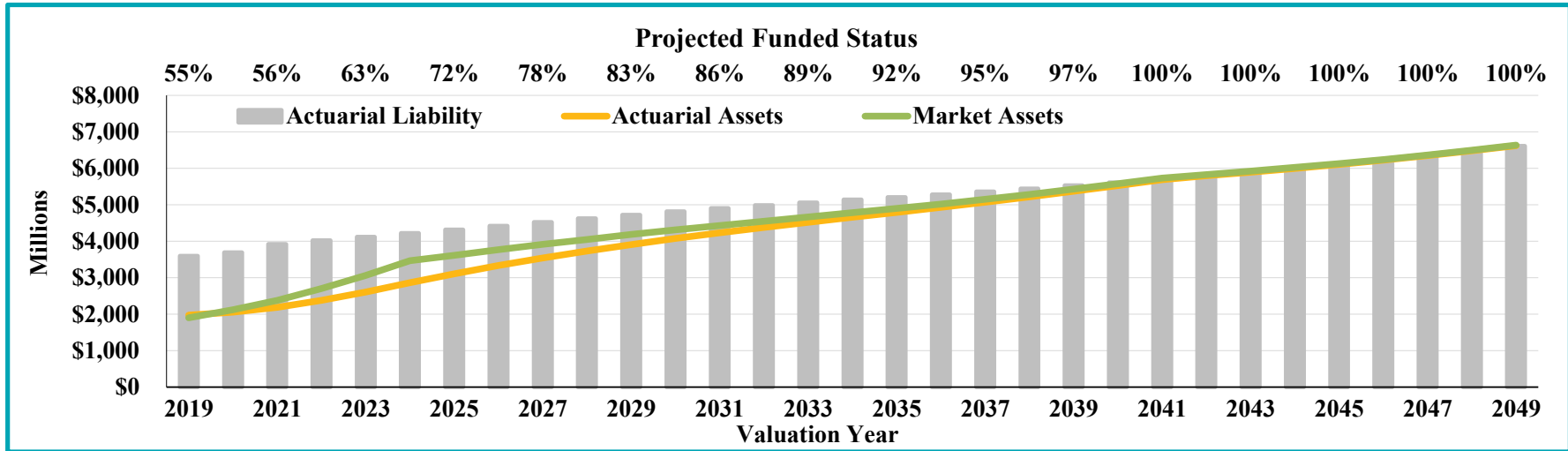
**Five-Year Significant Negative Scenario: -1.3% return FYE 2020-2024, 7.0% after**



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**Five-Year Significant Positive Scenario: 16.1% return FYE 2020-2024, 7.0% after**



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**SECTION II – ASSESSMENT AND DISCLOSURE OF RISK**

These scenarios show that actual future investment returns have a significant impact on future State contribution amounts. In each of the scenarios, the State contribution amounts gradually increase through FYE 2033 as the State is assumed to appropriate an increasing percentage of the Statutory amount and the valuation investment rate of return assumption decreases from 7.30% to 7.00%. The following table summarizes the impact on the State contributions in FYE 2033 for each of the investment return scenarios.

<b>Table II-2 Impact on Contributions for FYE 2033 (dollar amounts in millions)</b>						
	<b>1-Yr Shock</b>		<b>5-Yr Moderate</b>		<b>5-Yr Significant</b>	
	<b>Neg</b>	<b>Pos</b>	<b>Neg</b>	<b>Pos</b>	<b>Neg</b>	<b>Pos</b>
Amount	\$29	(\$35)	\$25	(\$32)	\$56	(\$87)
Percent	13%	-16%	11%	-15%	25%	-40%

The five-year significant positive scenario shows the system achieving a 100% funded status during the 30-year projection period, which results in the State contribution decreasing to equal the employer normal cost.

**The investment returns used in the projections above were selected solely to illustrate the impact of investment volatility on the pattern of future funded status and contribution amounts. They are not intended to be predictive of actual future contributions or funded status or even to represent a realistic pattern of investment returns.**

**Assumption Change Risk – Sensitivity Testing**

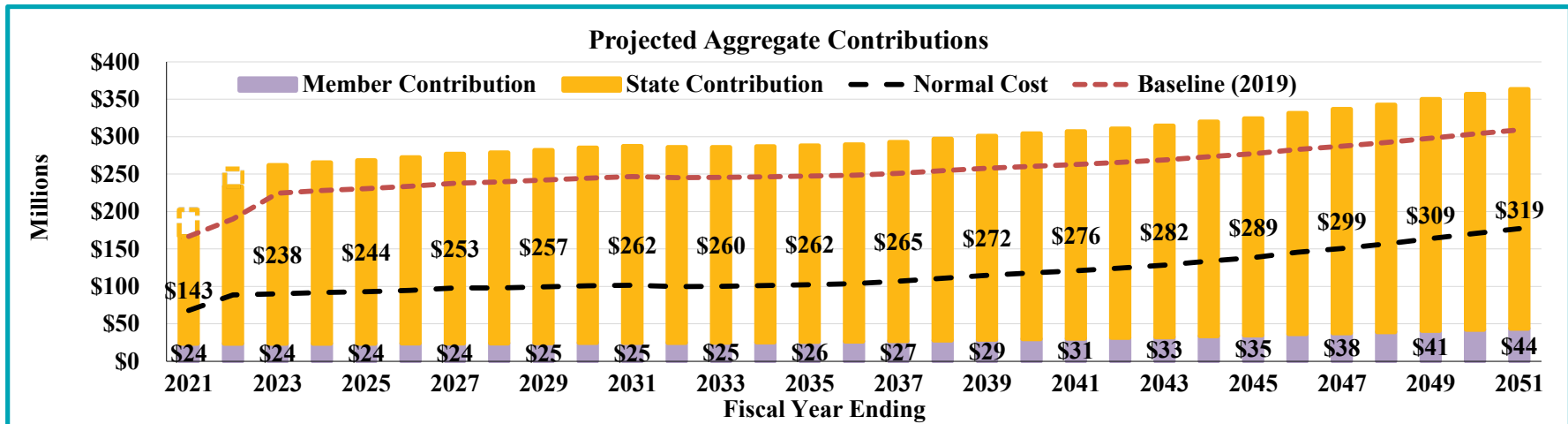
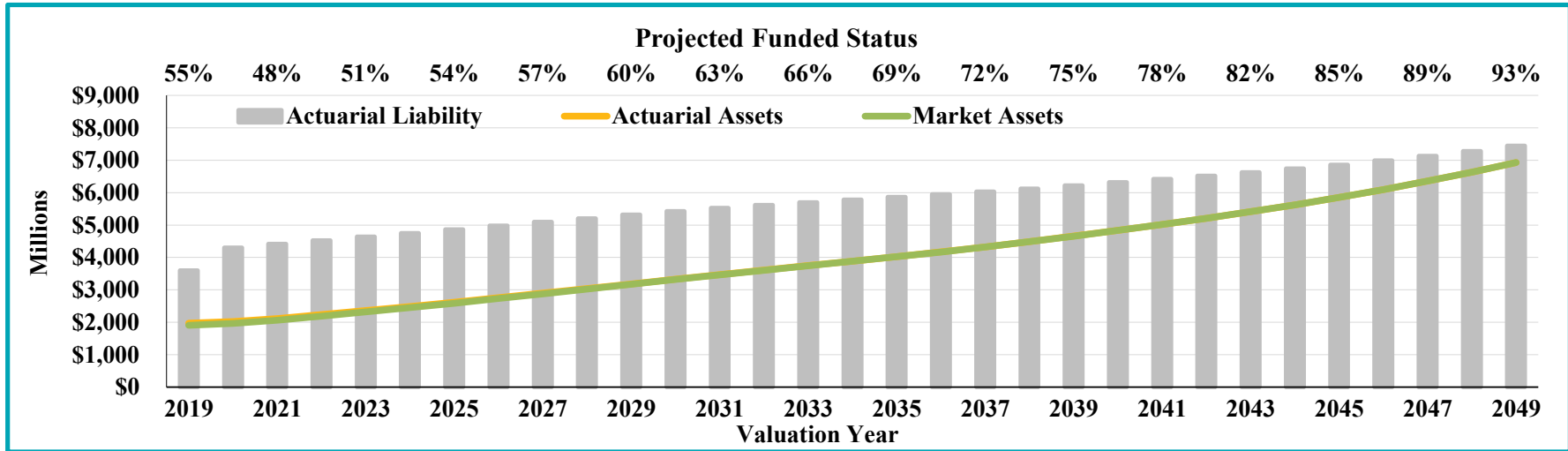
As shown in Table II-1, assumption changes over the last decade have increased the UAL by approximately \$269 million. The most significant changes were reductions in the discount rate and projections of mortality improvement. The reductions in discount rates have been largely driven by declines in interest rates that affect expectations of future investment returns. If there are further declines in interest rates or if there is a desire or need to reduce investment risk that reduces expected returns, the discount rate and expected returns may need to be reduced further. The charts on the following page show the impact on projected future funded status and contribution amounts if the discount rate and expected returns were reduced by 100 basis points to 6.00% beginning with the July 1, 2020 valuation.

This scenario results in Statutory contribution amounts in FYE 2033 that are about 18% more than the baseline.

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SECTION II – ASSESSMENT AND DISCLOSURE OF RISK

**6.00% Discount Rate and Investment Return Assumption Effective July 1, 2020**



**STATE POLICE RETIREMENT SYSTEM OF NEW JERSEY  
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**SECTION II – ASSESSMENT AND DISCLOSURE OF RISK**

**Contribution Risk – Sensitivity Testing**

The amortization method used to determine the Statutory contributions is designed to collect more than the tread water level and, therefore, gradually pay down the UAL. However, appropriated contributions have consistently been less than the Statutory contributions and the tread water level, causing an increase in the UAL of about \$683 million over the last 10 years. The baseline projections assume the State appropriates 80% of the Statutory contribution in FYE 2021, and increases the percent by 10% a year, until reaching 100% of the Statutory contribution beginning with FYE 2023, at which time contributions are projected to be greater than the tread water level.

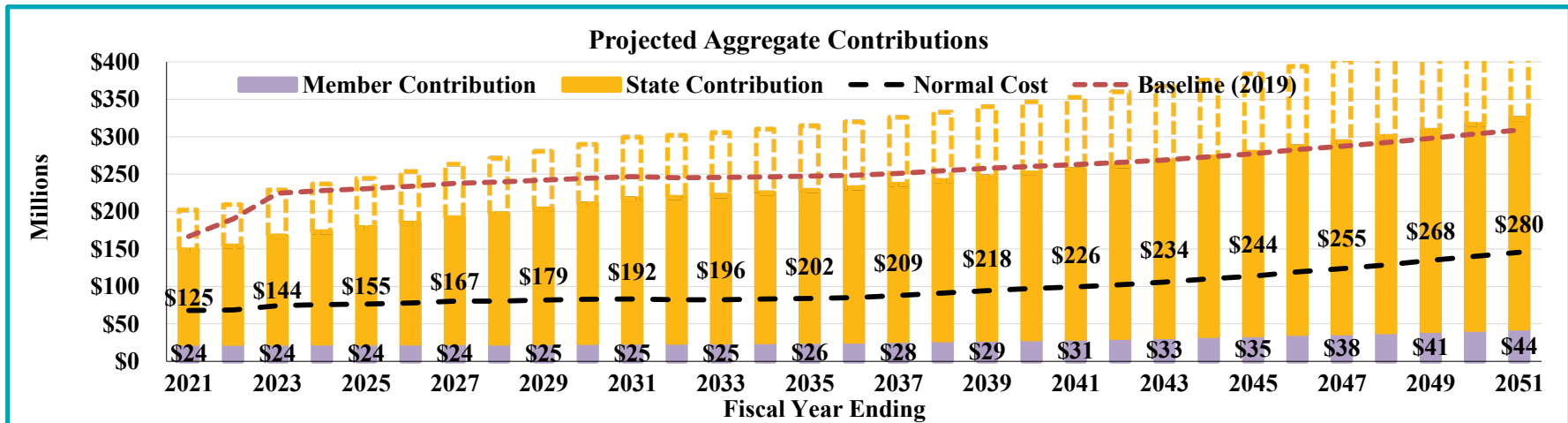
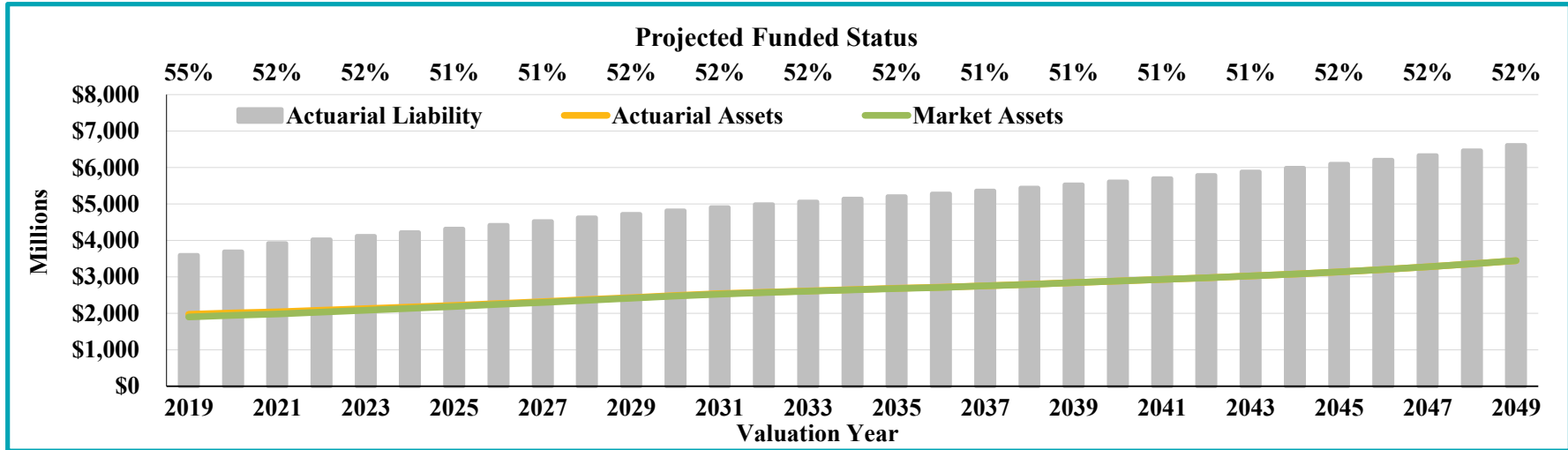
Contribution risk is the potential for actual future contributions to deviate from expected future contributions. The charts on the following page illustrate the impact on projected future funded status and contribution amounts if the State appropriation remains at 70% of the Statutory contribution for each year in the future, rather than gradually increasing to 100% of the Statutory contribution. In illustrating contribution risk sensitivity, we assume the State's appropriation percent remains at the current level of 70%.

This scenario shows both the Statutory and appropriated contributions gradually increasing over time. The Statutory contributions quickly exceed the baseline. The appropriated contributions are below the baseline initially but eventually grow to reach to the same level, but with a much lower funded ratio. The funded ratio at the end of the projection period is 52% compared to 92% under the baseline projections.

STATE POLICE RETIREMENT SYSTEM OF NEW JERSEY  
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SECTION II – ASSESSMENT AND DISCLOSURE OF RISK

**State Appropriates 70% of Statutory Contribution for Fiscal Year Ending June 30, 2021 and Thereafter**





STATE POLICE RETIREMENT SYSTEM OF NEW JERSEY  
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SECTION II – ASSESSMENT AND DISCLOSURE OF RISK

**More Detailed Assessment**

While a more detailed assessment is always valuable to enhance the understanding of the risks identified above, we believe the scenarios illustrated above cover the primary risks facing the System at this time. We would be happy to provide the Board with a more in-depth analysis at their request.

**STATE POLICE RETIREMENT SYSTEM OF NEW JERSEY  
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**SECTION III – ASSETS**

The System uses and discloses two different asset measurements for funding, which are presented in this section of the report: market value and actuarial value of assets. The market value represents the value of the assets if they were liquidated on the valuation date. The actuarial value of assets is a value that smooths annual investment returns to reduce annual investment volatility and is used in determining contribution levels. In compliance with New Jersey Statute, the method used to calculate the actuarial value of assets recognizes 20% of the difference between the market value of assets and the expected actuarial value of assets each year.

Actuarial Standards of Practice (ASOP) No. 44 states that the asset valuation method should produce an actuarial value of assets that falls within a reasonable range of market value, recognizes the difference between the market value and actuarial value of assets within a reasonably short period of time, and is likely to produce actuarial value of assets that are sometimes greater than and sometimes less than the corresponding market values. The asset method required under N. J. Statute does not meet the requirements of ASOP No. 44 because this method has produced actuarial value of assets which have consistently been greater than the market value of assets and recognizes investment losses slowly over time. Additionally, the method may produce an actuarial value of assets that falls outside of a reasonable range of the market value.

On the following pages, we present detailed information on the System’s assets:

- Disclosure of assets at July 1, 2018 and July 1, 2019,
- Statement of cash flows during the year,
- Development of the actuarial value of assets, and
- Disclosure of investment performance for the year.

### **Disclosure**

The market value of assets represents a “snap-shot” value as of the last day of the fiscal year that provides the principal basis for measuring financial performance from one year to the next. Market values, however, can fluctuate widely with corresponding swings in the value of the investments. Because these fluctuations would cause volatility in employer contributions, an actuarial value of assets is developed. Table III-1 on the following page presents the market value as of June 30, 2018 and June 30, 2019. Table III-2 presents the System’s net cash flows from June 30, 2018 to June 30, 2019. Table III-3 presents the development of the Actuarial Value of Assets as of July 1, 2019.

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**SECTION III – ASSETS**

<b>Table III-1</b>		
<b>Statement of Assets at Market Value</b>		
	<b>June 30, 2019</b>	<b>June 30, 2018</b>
<b>Assets</b>		
Cash	\$ 985,575	\$ 17,904,920
Securities Lending Collateral	22,948,963	19,294,715
Investment Holdings	1,795,727,098	1,775,794,796
Accrued Interest on Investments	3,964	3,102
Interest Receivable on Loans	63,253	647,651
Employer Contributions Receivable		
State NGCI	151,066	385,181
Members' Contributions Receivable	2,314,582	1,086,870
Loans Receivable	11,628,128	13,118,653
Accounts Receivable	98,472	50,580
Total Assets	<u>\$ 1,833,921,101</u>	<u>\$ 1,828,286,468</u>
<b>Liabilities</b>		
Pension Payroll Payable	\$ (14,268,898)	\$ (14,104,667)
Pension Adjustment Payroll Payable	(1,657,582)	(1,727,275)
Death Benefits Payable	(100,081)	(385,181)
Withholdings Payable	(2,654,125)	(2,621,074)
Securities Lending Collateral and Rebate Payable	(22,921,221)	(19,294,168)
Administrative Expense Payable	(358,621)	(31,494)
Accounts Payable - Other	(171,006)	(77,927)
Total Liabilities	<u>\$ (42,131,534)</u>	<u>\$ (38,241,786)</u>
<b>Preliminary Market Value of Assets</b>	<b>\$ 1,791,789,567</b>	<b>\$ 1,790,044,682</b>
Discounted State Appropriations Receivable	110,931,602	91,295,856
<b>Market Value of Assets</b>	<b><u>\$ 1,902,721,169</u></b>	<b><u>\$ 1,881,340,538</u></b>

**STATE POLICE RETIREMENT SYSTEM OF NEW JERSEY  
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**SECTION III – ASSETS**

**System Cash Flows as of June 30, 2019**

<b>Table III-2</b>	
<b>Changes in Market Values for FYE June 30, 2019</b>	
<b>Additions</b>	
Pension Contributions	
Members' Contributions	\$ 24,183,990
Transfers from Other Systems	67,045
Employers' Contributions	
State Appropriations	96,000,000
Non-Contributory Group Insurance	2,182,956
Transfers from Other Systems	43,798
Administrative Fee Loans	5,235
Income	
Per Statement	105,696,140
<b>Total Additions</b>	<b>\$ 228,179,164</b>
<b>Deductions</b>	
Benefits Provided by Members	
Withdrawal of Members' Contributions - Regular & Death	\$ 178,123
Withdrawal of Members' Contributions - Transfer	30,165
Adjustment - Member Account Loans - State	3,674
Benefits Provided by Employers and Members	
Retirement Allowances	203,065,592
Benefits Provided by Employers	
Benefit Expense - Pension Adjustment	20,251,885
Administrative Expense	607,003
Withdrawals - Employer Transfers	120,512
Administrative Expense Loans	5,850
Adjustment - Member Accounts Expense - State	(10,291)
NCGI Premium Expense	2,182,956
Miscellaneous Expense	(1,190)
<b>Total Deductions</b>	<b>\$ 226,434,279</b>
<b>Net Increase/(Decrease)</b>	<b>\$ 1,744,885</b>
Preliminary Market Value of Assets Beginning of Year	\$ 1,790,044,682
<b>Preliminary Market Value of Assets End of Year</b>	<b>\$ 1,791,789,567</b>
Discounted State Appropriations Receivable	110,931,602
<b>Market Value of Assets</b>	<b>\$ 1,902,721,169</b>
<b>Approximate Return</b>	<b>6.12%</b>

**STATE POLICE RETIREMENT SYSTEM OF NEW JERSEY  
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**SECTION III – ASSETS**

**Actuarial Value of Assets**

To determine on-going funding requirements, most pension systems utilize an actuarial value of assets that differs from the market value of assets. The actuarial value of assets represents an asset value based on averaging or smoothing year-to-year market value returns for purposes of reducing contribution volatility. Each year, 20% of the difference between the market value of assets and the expected actuarial value of assets is added to the expected actuarial value of assets.

<b>Table III-3 Development of Actuarial Value of Assets for July 1, 2019</b>		
1. Preliminary Actuarial Value of Assets as of 7/1/2018 <sup>1</sup>	\$	1,848,008,983
2. Net Cash Flow excluding Investment Income	\$	(103,951,255)
3. Expected Investment Income <sup>2</sup>	\$	133,897,378
4. Expected Actuarial Value of Assets as of 7/1/2019: (1+2+3)	\$	1,877,955,106
5. Preliminary Market Value as of 6/30/2019	\$	1,791,789,567
6. 20% of Difference from MVA = (5-4) x 0.2	\$	(17,233,108)
7. Preliminary Actuarial Value of Assets as of 7/1/2019: (4+6)	\$	1,860,721,998
8. Discounted State Appropriations Receivable	\$	110,931,602
9. Actuarial Value of Assets as of 7/1/2019: (7+8)	\$	1,971,653,600
10. Rate of Return on Actuarial Value of Assets		6.54%
11. Ratio of Actuarial Value of Assets to Market Value of Assets		103.62%

<sup>1</sup> Excludes discounted State appropriations receivable

<sup>2</sup> Refer to Appendix B, Actuarial Methods, for details on the assumed timing of contributions

**STATE POLICE RETIREMENT SYSTEM OF NEW JERSEY  
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**SECTION III – ASSETS**

**Investment Performance**

The market value of assets rate of return was 6.12% for the year ending June 30, 2019. This is compared to an assumed return of 7.50% for the same period. On an actuarial value of assets basis, the return for FYE 2019 was 6.54%. Table III-4 shows the historical asset returns and the investment return assumption for the last ten years.

The prior actuary did not calculate a market value return prior to 2017.

<b>Table III-4 Annual Rates of Return</b>			
<b>Year Ended June 30</b>	<b>Investment Return Assumption</b>	<b>Market Value</b>	<b>Actuarial Value</b>
2010	8.25%		3.72%
2011	8.25%		5.75%
2012	7.95%		4.83%
2013	7.90%		5.77%
2014	7.90%		7.64%
2015	7.90%		6.91%
2016	7.90%		5.32%
2017	7.65%	12.77%	6.26%
2018	7.50%	9.11%	6.69%
2019	7.50%	6.12%	6.54%
<b>10-Year Compound Average</b>		<b>N/A</b>	<b>5.94%</b>
<b>5-Year Compound Average</b>		<b>N/A</b>	<b>6.34%</b>

**STATE POLICE RETIREMENT SYSTEM OF NEW JERSEY  
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**SECTION IV – LIABILITIES**

In this section, we present detailed information on the liabilities of the System, including:

- Disclosure of liabilities at July 1, 2018 and July 1, 2019,
- Active liabilities broken down by Tier, and
- The development of the actuarial gain and loss.

**Disclosure**

The Actuarial Liability is used for determining employer contributions. For SPRS, the funding method employed is the Projected Unit Credit (PUC) Actuarial Cost Method. Under this funding method, the actuarial liability is calculated as the actuarial present value of the projected benefits allocated to periods prior to the valuation year.

This liability is determined for funding purposes and is not appropriate for measuring the cost of settling plan liabilities by purchasing annuities or paying lump sums.

**STATE POLICE RETIREMENT SYSTEM OF NEW JERSEY  
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**SECTION IV – LIABILITIES**

Table IV-1 shows the actuarial liability, unfunded actuarial liability and funded ratio as of July 1, 2019 and July 1, 2018 for the System.

<b>Table IV-1 Actuarial Liability</b>		
	<b>July 1, 2019</b>	<b>July 1, 2018</b>
<b>Actuarial Liability</b>		
Contributing Actives	\$ 1,023,333,772	\$ 909,324,086
Non-Contributing Actives	9,783,868	8,974,136
Deferred Vested	0	0
Retirees	2,235,894,823	2,214,517,629
Disabled	181,876,049	165,943,307
Beneficiaries	144,473,201	132,062,604
<b>Total</b>	<b>\$ 3,595,361,713</b>	<b>\$ 3,430,821,762</b>
Actuarial Value of Assets	\$ 1,971,653,600	\$ 1,939,304,839
Unfunded Actuarial Liability/(Surplus)	\$ 1,623,708,113	\$ 1,491,516,923
Funded Ratio	54.8%	56.5%



**STATE POLICE RETIREMENT SYSTEM OF NEW JERSEY  
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**SECTION IV – LIABILITIES**

Tables IV-2 and IV-3 show the Actuarial Liability of active members by Tier as of July 1, 2019.

<b>Table IV-2 Contributing Active Liabilities by Tier</b>				
	<b>Number of Members</b>	<b>Appropriation Payroll</b>	<b>Actuarial Liability</b>	<b>Gross Normal Cost</b>
Tier 1	1,822	\$ 219,330,515	\$ 960,484,977	\$ 50,364,299
Tier 2	944	76,859,411	62,848,795	12,871,512
<b>Total</b>	<b>2,766</b>	<b>\$ 296,189,926</b>	<b>\$1,023,333,772</b>	<b>\$ 63,235,811</b>

<b>Table IV-3 Non-Contributing Active Liabilities by Tier</b>				
	<b>Number of Members</b>	<b>Last Reported Payroll</b>	<b>Actuarial Liability</b>	<b>Gross Normal Cost</b>
Tier 1	31	\$ 2,872,305	\$ 9,062,417	\$ 0
Tier 2	23	1,687,052	721,451	0
<b>Total</b>	<b>54</b>	<b>\$ 4,559,357</b>	<b>\$ 9,783,868</b>	<b>\$ 0</b>

**STATE POLICE RETIREMENT SYSTEM OF NEW JERSEY  
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**SECTION IV – LIABILITIES**

Table IV-4 presents the change in the actuarial liabilities, actuarial assets, and unfunded actuarial liability during the plan year. In general, the unfunded actuarial liability (UAL) of any retirement system is expected to change at each subsequent valuation for a variety of reasons. In each valuation, we report on those elements of change in the UAL which are of particular significance, potentially affecting the long-term financial outlook of the System.

<b>Table IV-4 Development of 2019 Experience (Gain)/Loss</b>			
	<b>Actuarial Liability</b>	<b>Actuarial Value of Assets</b>	<b>Unfunded Actuarial Liability</b>
1. Value as of July 1, 2018	\$ 3,430,821,762	\$ (1,939,304,839)	\$ 1,491,516,923
2. Additions			
a.) Normal Cost	\$ 57,265,977	\$ 0	\$ 57,265,977
b.) Statutory State Contributions	0	(165,576,179)	(165,576,179)
c.) Expected Member Contributions	0	(21,482,304)	(21,482,304)
d.) Total Additions	\$ 57,265,977	\$ (187,058,483)	\$ (129,792,506)
3. Deductions			
a.) Benefit Payments	\$ (223,499,274)	\$ 223,499,274	\$ 0
b.) Expected Administrative Expenses	0	0	0
c.) Total Deductions	\$ (223,499,274)	\$ 223,499,274	\$ 0
4. Net Transfers from Other Systems			
a.) State Contributions	\$ (76,714)	\$ 76,714	\$ 0
b.) Member Contributions	36,880	(36,880)	0
c.) Total Net Transfers	\$ (39,834)	\$ 39,834	\$ 0
5. Expected Interest	\$ 253,375,408	\$ (138,007,714)	\$ 115,367,695
6. Expected Value as of July 1, 2019: [1 + 2 + 3 + 4 + 5]	\$ 3,517,924,039	\$ (2,040,831,928)	\$ 1,477,092,112
7. Other Changes			
a.) Appropriation Adjustment	\$ 0	\$ 49,156,575	\$ 49,156,575
b.) Contribution Timing	0	4,971,723	4,971,723
c.) Actual Member Contributions	0	(2,801,167)	(2,801,167)
d.) Assumption Changes			
i.) Experience Study	(1,412,472)	0	(1,412,472)
ii.) Investment Rate of Return	81,262,251	0	81,262,251
e.) Change in Benefits	0	0	0
f.) Total Other Changes	\$ 79,849,779	\$ 51,327,131	\$ 131,176,910
8. Expected value after changes: [6 + 7]	\$ 3,597,773,818	\$ (1,989,504,797)	\$ 1,608,269,021
9. Actual Value as of July 1, 2019	\$ 3,595,361,713	\$ (1,971,653,600)	\$ 1,623,708,113
10. Actuarial (Gain)/Loss: [9 - 8]	\$ (2,412,105)	\$ 17,851,196	\$ 15,439,091

**STATE POLICE RETIREMENT SYSTEM OF NEW JERSEY  
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**SECTION IV – LIABILITIES**

Table IV-5 shows the components of the Actuarial (Gain)/Loss for the System as of July 1, 2019 and July 1, 2018.

<b>Table IV-5 Actuarial (Gain)/Loss Analysis</b>		
<b>Components</b>	<b>July 1, 2019</b>	<b>July 1, 2018</b>
<b>Actuarial Value of Assets</b>		
Investment Return	\$ 17,233,108	\$ 14,491,075
Administrative Expenses	618,088	391,082
Total	<u>\$ 17,851,196</u>	<u>\$ 14,882,157</u>
<b>Actuarial Liability</b>		
Salary Increases	\$ 1,965,147	\$ (12,102,861)
New Entrants	1,957,712	0
Demographic Experience		
Contributing Actives	619,657	4,662,735
Non-Contributing Actives	(1,156,129)	(622,963)
Inactives	<u>(5,839,793)</u>	<u>4,978,473</u>
Sub-Total	<u>\$ (2,453,406)</u>	<u>\$ (3,084,616)</u>
Impact of Net Transfers from Other Systems	41,301	(197,932)
Total	<u>\$ (2,412,105)</u>	<u>\$ (3,282,548)</u>
<b>Actuarial (Gain)/Loss</b>	<b>\$ 15,439,091</b>	<b>\$ 11,599,609</b>

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**SECTION V – CONTRIBUTIONS**

In the process of evaluating the financial condition of any pension plan, the actuary analyzes the assets and liabilities to determine what level (if any) of contributions is needed to properly maintain the funded status of the Plan. Typically, the actuarial process will use a funding technique that will result in a pattern of contributions that are both stable and predictable.

Under the current funding policy, the State funding requirement contains two components: the employer normal cost and an amortization of the unfunded actuarial liability (UAL). The funding methodology prescribed by NJ State Statute does not include a cost component for administrative expenses, and therefore administrative expenses are implicitly covered by the investment rate of return assumption. Because the investment rate of return assumption is recommended by the State Treasurer, we provide no opinion on the reasonableness of the assumption.

For SPRS, the funding method employed is the Projected Unit Credit (PUC) Actuarial Cost Method. Under this funding method, the actuarial liability is calculated as the actuarial present value of the projected benefits allocated to periods prior to the valuation year. The unfunded actuarial liability is the actuarial liability on the valuation date less the actuarial value of assets.

In accordance with Chapter 78, P. L. 2011, the unfunded actuarial liability as of July 1, 2018 was amortized over an open 30 year period as a level dollar amount. Beginning with the July 1, 2019 valuation, the unfunded actuarial liability is amortized over a closed 30 year period as a level dollar amount.

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**SECTION V – CONTRIBUTIONS**

Table V-1 shows the development of the Statutory Pension Contribution for the current and prior year. Table V-2 summarizes the contributions as a percentage of appropriation payroll.

<b>Table V-1 Development of Statutory Pension Contribution</b>		
<b>Valuation Date Fiscal Year Ending</b>	<b>July 1, 2019 2021</b>	<b>July 1 2018 2020</b>
1. Actuarial Liability	\$ 3,595,361,713	\$ 3,430,821,762
2. Actuarial Value of Assets	<u>1,971,653,600</u>	<u>1,939,304,839</u>
3. Unfunded Actuarial Liability [1 - 2]	\$ 1,623,708,113	\$ 1,491,516,923
4. Amortization Period (years)	30	30
5. Level-Dollar Amortization of UAL payable Beginning of Fiscal Year	\$ 134,814,030	\$ 126,288,581
6. a. Gross Normal Cost	\$ 63,235,811	\$ 57,265,977
b. Expected Member Contributions	<u>22,207,962</u>	<u>20,719,374</u>
c. State Normal Cost [a - b]	\$ 41,027,849	\$ 36,546,603
d. State Normal Cost payable Beginning of Fiscal Year [c * (1.073, 1.075)]	\$ 44,022,882	\$ 39,287,598
7. Total Statutory Pension Contribution payable Beginning of Fiscal Year [5 + 6d]	\$ 178,836,912	\$ 165,576,179

<b>Table V-2 Statutory Contributions as a Percent of Appropriation Payroll</b>		
<b>Valuation Date Fiscal Year Ending</b>	<b>July 1, 2019 2020</b>	<b>July 1, 2018 2019</b>
Statutory Contribution		
State Normal Cost	14.86%	14.25%
UAL Amortization Payment	<u>45.52%</u>	<u>45.79%</u>
Total Statutory Pension Contribution	60.38%	60.04%

Rates are based only on contributing active compensation

**STATE POLICE RETIREMENT SYSTEM OF NEW JERSEY  
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**APPENDIX A – MEMBERSHIP INFORMATION**

The data for this valuation was provided by the New Jersey Division of Pensions and Benefits as of July 1, 2019. Cheiron did not audit any of the data. However, we did perform an informal examination of the obvious characteristics of the data for reasonableness and consistency in accordance with Actuarial Standard of Practice No. 23. The following is a list of data charts contained in this section:

- A-1: Contributing Active Member Data by Tier
- A-2: Non-Contributing Active Member Data by Tier
- A-3: Inactive Member Data, Total Annual and Average Retirement Allowances by Status
- A-4: Reconciliation of Plan Membership
- A-5 through A-6: Contributing Active Member Data by Age and Service
- A-7 through A-8: Inactive Member Data by Age and Status

**Table A-1  
Contributing Active Member Data by Tier**

	July 1, 2019	July 1, 2018	% Change
<b><u>Tier 1</u></b>			
Count	1,822	1,877	-2.9%
Average Age	43.5	42.6	2.0%
Average Service	17.3	16.4	5.4%
Average Appropriation Pay	\$ 120,379	\$ 116,265	3.5%
Total Appropriation Payroll	\$ 219,330,515	\$ 218,229,434	0.5%
<b><u>Tier 2</u></b>			
Count	944	784	20.4%
Average Age	31.5	31.1	1.0%
Average Service	4.5	4.1	10.3%
Average Appropriation Pay	\$ 81,419	\$ 73,419	10.9%
Total Appropriation Payroll	\$ 76,859,411	\$ 57,560,653	33.5%
<b><u>Total</u></b>			
Count	2,766	2,661	3.9%
Average Age	39.4	39.2	0.4%
Average Service	12.9	12.8	1.2%
Average Appropriation Pay	\$ 107,082	\$ 103,642	3.3%
Total Appropriation Payroll	\$ 296,189,926	\$ 275,790,087	7.4%

STATE POLICE RETIREMENT SYSTEM OF NEW JERSEY  
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APPENDIX A – MEMBERSHIP INFORMATION

Table A-2 Non-Contributing Active Member Data by Tier				
	July 1, 2019		July 1, 2018	% Change
<b><u>Tier 1</u></b>				
Count	31		29	6.9%
Average Age	47.3		47.8	-1.0%
Average Service	11.9		11.7	1.0%
Average Last Reported Pay	\$ 92,655	\$	91,036	1.8%
Total Last Reported Pay	\$ 2,872,305	\$	2,640,041	8.8%
<b><u>Tier 2</u></b>				
Count	23		23	0.0%
Average Age	31.8		31.5	1.1%
Average Service	2.5		2.7	-4.9%
Average Last Reported Pay	\$ 73,350	\$	73,941	-0.8%
Total Last Reported Pay	\$ 1,687,052	\$	1,700,650	-0.8%
<b><u>Total</u></b>				
Count	54		52	3.8%
Average Age	40.7		40.5	0.4%
Average Service	7.9		7.7	2.1%
Average Last Reported Pay	\$ 84,433	\$	83,475	1.1%
Total Last Reported Pay	\$ 4,559,357	\$	4,340,691	5.0%

STATE POLICE RETIREMENT SYSTEM OF NEW JERSEY  
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APPENDIX A – MEMBERSHIP INFORMATION

<b>Table A-3</b>				
<b>Inactive Member Data by Status</b>				
	<b>July 1, 2019</b>	<b>July 1, 2018</b>	<b>% Change</b>	
<b>Retirees</b>				
Count	2,676	2,694	-0.7%	
Annual Retirement Allowances	\$ 191,944,688	\$ 191,956,729	0.0%	
Average Retirement Allowance	\$ 71,728	\$ 71,253	0.7%	
<b>Beneficiaries</b>				
Count	440	432	1.9%	
Annual Retirement Allowances	\$ 16,905,526	\$ 16,133,043	4.8%	
Average Retirement Allowance	\$ 38,422	\$ 37,345	2.9%	
<b>Ordinary Disability</b>				
Count	128	125	2.4%	
Annual Retirement Allowances	\$ 5,176,409	5,058,044	2.3%	
Average Retirement Allowance	\$ 40,441	\$ 40,464	-0.1%	
<b>Accidental Disability</b>				
Count	156	153	2.0%	
Annual Retirement Allowances	\$ 9,367,655	9,048,918	3.5%	
Average Retirement Allowance	\$ 60,049	\$ 59,143	1.5%	
<b>In-Pay Total</b>				
Count	3,400	3,404	-0.1%	
Annual Retirement Allowances	\$ 223,394,278	\$ 222,196,734	0.5%	
Average Retirement Allowance	\$ 65,704	\$ 65,275	0.7%	
<b>Deferred Vested Members</b>				
Count	0	0	N/A	
Annual Retirement Allowances	\$ 0	\$ 0	N/A	
Average Retirement Allowance	\$ 0	\$ 0	N/A	

QDRO benefits included with member records for valuation purposes.



**STATE POLICE RETIREMENT SYSTEM OF NEW JERSEY  
JULY 1, 2019 ACTUARIAL VALUATION**

**APPENDIX A – MEMBERSHIP INFORMATION**

**Table A-4  
Reconciliation of Plan Membership from July 1, 2018 to July 1, 2019**

	Contributing Actives	Non-Contrib. Actives	Deferred Vested	Retired	Disabled	Beneficiaries	Total
1. July 1, 2018	2,661	52	0	2,694	278	432	6,117
2. Additions							
a. New entrants	159	2					161
b. New dependent							0
c. Data Correction						4	4
d. Total	<u>159</u>	<u>2</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>4</u>	<u>165</u>
3. Reductions							
a. Withdrawal	(1)	(10)					(11)
b. Died without beneficiary				(21)	(2)	(28)	(51)
c. Payments ceased							0
d. Total	<u>(1)</u>	<u>(10)</u>	<u>0</u>	<u>(21)</u>	<u>(2)</u>	<u>(28)</u>	<u>(62)</u>
4. Changes in Status							
a. Contributing Active	2	(2)					0
b. Non-Contributing Active	(13)	13					0
c. Deferred Vested							0
d. Retired	(33)			33			0
e. Disabled	(9)	(1)			10		0
f. Died with beneficiary				(30)	(2)	32	0
g. Total	<u>(53)</u>	<u>10</u>	<u>0</u>	<u>3</u>	<u>8</u>	<u>32</u>	<u>0</u>
5. July 1, 2019	2,766	54	0	2,676	284	440	6,220

**STATE POLICE RETIREMENT SYSTEM OF NEW JERSEY  
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**APPENDIX A – MEMBERSHIP INFORMATION**

QDRO benefits included with member records for valuation purposes.

**Table A-5  
Counts by Age and Service of Contributing Active Members**

Attained Age	Years of Service								Total
	Under 1	1 to 4	5 to 9	10 to 14	15 to 19	20 to 24	25 to 29	30 & up	
Under 30	113	165	34	0	0	0	0	0	312
30 to 34	33	219	233	70	2	0	0	0	557
35 to 39	2	43	64	449	63	0	0	0	621
40 to 44	0	0	6	221	287	41	0	0	555
45 to 49	0	0	0	44	133	297	15	0	489
50 to 54	0	0	0	0	31	149	38	13	231
55 & up	0	0	0	0	0	1	0	0	1
<b>Total</b>	<b>148</b>	<b>427</b>	<b>337</b>	<b>784</b>	<b>516</b>	<b>488</b>	<b>53</b>	<b>13</b>	<b>2,766</b>

**Table A-6  
Average Appropriation Pay by Age and Service of Contributing Active Members**

Attained Age	Years of Service								Total
	Under 1	1 to 4	5 to 9	10 to 14	15 to 19	20 to 24	25 to 29	30 & up	
Under 30	\$ 71,879	\$ 77,861	\$ 84,276	\$ 0	\$ 0	\$ 0	\$ 0	\$ 0	\$ 76,393
30 to 34	71,879	80,843	87,080	102,371	94,821	0	0	0	85,677
35 to 39	71,879	81,941	88,391	110,002	114,633	0	0	0	106,179
40 to 44	0	0	91,663	113,156	119,790	124,801	0	0	117,214
45 to 49	0	0	0	114,254	121,852	132,385	137,387	0	128,042
50 to 54	0	0	0	0	122,768	135,369	136,138	134,736	133,769
55 & up	0	0	0	0	0	129,065	0	0	129,065
<b>Total</b>	<b>\$ 71,879</b>	<b>\$ 79,801</b>	<b>\$ 87,128</b>	<b>\$ 110,449</b>	<b>\$ 119,774</b>	<b>\$ 132,652</b>	<b>\$ 136,492</b>	<b>\$ 134,736</b>	<b>\$ 107,082</b>

**STATE POLICE RETIREMENT SYSTEM OF NEW JERSEY  
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**APPENDIX A – MEMBERSHIP INFORMATION**

<b>Table A-7 Counts by Age and Status of Inactive Members</b>					
<b>Attained Age</b>	<b>Status</b>				<b>Total</b>
	<b>Retiree</b>	<b>Beneficiary</b>	<b>Ordinary Disability</b>	<b>Accidental Disability</b>	
Under 45	0	11	10	25	46
45 to 49	5	2	8	24	39
50 to 54	355	8	24	34	421
55 to 59	668	19	31	33	751
60 to 64	436	30	22	15	503
65 to 69	288	34	10	9	341
70 to 74	376	72	8	4	460
75 to 79	310	94	11	8	423
80 to 84	135	50	4	4	193
85 & up	103	120	0	0	223
<b>Total</b>	<b>2,676</b>	<b>440</b>	<b>128</b>	<b>156</b>	<b>3,400</b>

<b>Table A-8 Average Retirement Allowances by Age and Status of Inactive Members</b>					
<b>Attained Age</b>	<b>Status</b>				<b>Total</b>
	<b>Retiree</b>	<b>Beneficiary</b>	<b>Ordinary Disability</b>	<b>Accidental Disability</b>	
Under 45	\$ 0	\$ 50,502	\$ 39,817	\$ 64,660	\$ 55,874
45 to 49	77,257	64,120	40,789	64,455	61,225
50 to 54	83,812	60,889	40,298	65,277	79,399
55 to 59	82,660	52,172	42,119	61,441	79,283
60 to 64	78,037	47,946	49,860	57,480	74,397
65 to 69	72,799	46,840	41,125	54,437	68,797
70 to 74	63,730	39,540	32,851	47,939	59,270
75 to 79	54,514	38,216	28,502	32,085	49,792
80 to 84	48,525	34,629	23,642	39,172	44,216
85 & up	40,633	29,515	0	0	34,651
<b>Total</b>	<b>\$ 71,728</b>	<b>\$ 38,422</b>	<b>\$ 40,441</b>	<b>\$ 60,049</b>	<b>\$ 65,704</b>

QDRO benefits included with member records for valuation purposes.

**STATE POLICE RETIREMENT SYSTEM OF NEW JERSEY  
JULY 1, 2019 ACTUARIAL VALUATION**

**APPENDIX B – SUMMARY OF ACTUARIAL ASSUMPTIONS AND METHODS**

**A. Actuarial Assumptions**

- 1. Investment Rate of Return** 7.30% per annum, compounded annually.
  
- 2. Administrative Expenses** No explicit assumption is made for administrative expenses for funding purposes per the funding methodology prescribed by NJ State Statute.
  
- 3. Cost-of-Living Adjustments (COLAs)** No future COLAs are assumed. Previously granted COLAs are included in the data.
  
- 4. Salary Increases** Salaries are assumed to increase by 2.95% per year through fiscal year 2025 and 3.95% per year for fiscal years 2026 and thereafter.  
  
Salary increases are assumed to occur on January 1.
  
- 5. 401(a)(17) Pay Limit** \$280,000 in 2019 increasing 2.75% per annum, compounded annually.
  
- 6. Social Security Wage Base** \$132,900 in 2019 increasing 3.25% per annum, compounded annually.
  
- 7. Termination** Termination rates are as follows:

Service	Rates
0 - 3	0.450%
4	0.300
5	0.225
6	0.200
7	0.175
8	0.150
9	0.125
10	0.100
11-19	0.075
20	0.000

No termination is assumed after attainment of retirement eligibility.

All members with 10 or more years of service at termination are assumed to elect a deferred retirement benefit.

STATE POLICE RETIREMENT SYSTEM OF NEW JERSEY  
JULY 1, 2019 ACTUARIAL VALUATION

APPENDIX B – SUMMARY OF ACTUARIAL ASSUMPTIONS AND METHODS

8. Disability

Representative disability rates are as follows:

Age	Ordinary Disability	Accidental Disability
20	0.027%	0.015%
25	0.041	0.025
30	0.061	0.053
35	0.169	0.194
40	0.172	0.208
45	0.218	0.214
50	0.375	0.220
54	0.505	0.295

No ordinary disability is assumed prior to attainment of ordinary disability retirement eligibility at four years of service or after attainment of special retirement eligibility at 25 years of service.

Accidental disability rates apply at all ages until the mandatory retirement age of 55.

Members retiring under the ordinary disability decrement with 20 or more years of service are assumed to receive the involuntary disability retirement benefit.

Members are assumed to receive the greater of the applicable disability benefit or the service or special retirement benefit, depending on eligibility.

9. Mortality

Pre-Retirement: The Pub-2010 Public Safety Above-Median Income Employee mortality table [*PubS-2010(A) Employee*] as published by the Society of Actuaries (SOA), unadjusted, and with future improvement from the base year of 2010 on a generational basis using SOA's Scale MP-2018.

35% of the deaths are assumed to be accidental.

For purposes of pre-retirement accidental death benefits based on Adjusted Final Compensation, the benefit is assumed to increase at the same rate as active salaries.

Healthy Retirees (Healthy Annuitants): The Pub-2010 Public Safety Above-Median Income Healthy Retiree mortality table [*PubS-2010(A) Healthy Retiree*] as published by the Society of Actuaries, unadjusted, and with future improvement from the base year of 2010 on a generational basis using SOA's Scale MP-2018.

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APPENDIX B – SUMMARY OF ACTUARIAL ASSUMPTIONS AND METHODS

Beneficiaries (Contingent Annuitants): The Pub-2010 General Above-Median Income Healthy Retiree mortality table [*PubG-2010(A) Healthy Retiree*] as published by the Society of Actuaries, unadjusted, and with future improvement from the base year of 2010 on a generational basis using SOA’s Scale MP-2018.

Disabled Retirees (Disabled Annuitants): The Pub-2010 Public Safety Disabled Retiree mortality table [*PubS-2010 Disabled Retiree*] as published by the Society of Actuaries, unadjusted, and with future improvement from the base year of 2010 on a generational basis using SOA’s Scale MP-2018.

**10. Retirement**

For those with 24 years of service or less: 0.50%

For those with 25 years of service:

Age	Rates
48 or younger	25.00%
49-54	50.00

For those with 26 or more years of service: 35.00%

Mandatory retirement at age 55.

**11. Family  
Composition  
Assumptions**

For members not currently in receipt, 83.3% of members are assumed married to spouses of the opposite sex. Males are assumed to be three years older than females.

For purposes of the post-retirement death benefit for members currently in receipt, beneficiary status is based on the beneficiary allowance reported. If no beneficiary date of birth is provided, the beneficiary is assumed to be the member’s spouse of the opposite sex with males assumed to be three years older than females.

No additional dependent children or parents are assumed.

For current dependents receiving a pre-retirement accidental death benefit, those under age 24 are assumed to receive a benefit until age 24 while those over age 24 are assumed to receive a benefit for the remainder of their lifetime.

For current dependents receiving a benefit other than a pre-retirement accidental death benefit, those under age 18 are assumed to receive a benefit until age 18 while those over age 18 are assumed to receive a benefit for the remainder of their lifetime.

**STATE POLICE RETIREMENT SYSTEM OF NEW JERSEY  
JULY 1, 2019 ACTUARIAL VALUATION**

**APPENDIX B – SUMMARY OF ACTUARIAL ASSUMPTIONS AND METHODS**

- 12. Data** Information provided by the prior actuary was relied upon for the purposes of setting the status of and valuing non-contributing active records.
- For current beneficiaries with missing data, reasonable assumptions were made based on the information available in prior years.
- Inactives receiving benefits according to the 2018 data but omitted from the 2019 data are assumed to have died without a beneficiary.
- 13. Rationale for Assumptions** The demographic and economic assumptions used in this report, except for the investment return assumption, reflect the results of the July 1, 2014 – June 30, 2018 Experience Study, which was approved by the Board of Trustees on January 28, 2020. The investment return assumption was recommended by the State Treasurer.
- 14. Changes in Assumptions Since Last Valuation** The assumed rates of termination, retirement, mortality, and inflation were updated based on the July 1, 2014 – June 30, 2018 Experience Study, which was approved by the Board of Trustees on January 28, 2020. For a detailed description of each of the assumptions before and after the changes reflected in this valuation, please reference the Experience Study.
- The assumed rate of investment return was decreased from 7.50% to 7.30% per annum, compounded annually.

**STATE POLICE RETIREMENT SYSTEM OF NEW JERSEY  
JULY 1, 2019 ACTUARIAL VALUATION**

**APPENDIX B – SUMMARY OF ACTUARIAL ASSUMPTIONS AND METHODS**

**B. Projection Assumptions**

- 1. Investment Rate of Return**
  - July 1, 2020 valuation: 7.30% per annum, compounded annually.
  - July 1, 2021 and later valuations: 7.00% per annum, compounded annually.
  
- 2. Appropriation Percentages**      The State is assumed to appropriate 80% of the Statutory contribution in FYE 2021, and to increase the percent by 10% a year, until reaching 100% of the Statutory contribution beginning with FYE 2023.
  
- 3. Administrative Expenses**      0.27% of expected pension benefit payments for the year.
  
- 4. New Entrants**
  - Contributing active population assumed to remain at 2019 levels.
  - Assumed to join mid-year.
  - Age/sex distributions based on the last three years of new hires.
  - Salary based on salary for most recent hires reported on 2019 data.
  
- 5. Demographic Assumptions**      Same as those used for valuation purposes.



## APPENDIX B – SUMMARY OF ACTUARIAL ASSUMPTIONS AND METHODS

### C. Actuarial Methods

The actuarial methods used for determining State contributions are described as follows.

#### 1. Actuarial Cost Method

The actuarial cost method for funding calculations is the Projected Unit Credit Cost Method.

The actuarial liability is calculated as the actuarial present value of the projected benefits linearly allocated to periods prior to the valuation year based on service. The unfunded actuarial liability is the actuarial liability on the valuation date less the actuarial value of assets.

In accordance with Chapter 78, P.L. 2011:

- Beginning with the July 1, 2010 actuarial valuation, the accrued liability contribution shall be computed so that if the contribution is paid annually in level dollars, it will amortize the unfunded accrued liability over an open 30 year period.
- Beginning with the July 1, 2019 actuarial valuation, the accrued liability contribution shall be computed so that if the contribution is paid annually in level dollars, it will amortize the unfunded accrued liability over a closed 30 year period (i.e., for each subsequent actuarial valuation the amortization period shall decrease by one year).
- Beginning with the July 1, 2029 actuarial valuation, when the remaining amortization period reaches 20 years, any increase or decrease in the unfunded accrued liability as a result of actuarial losses or gains for subsequent valuation years shall serve to increase or decrease, respectively, the amortization period for the unfunded accrued liability, unless an increase in the amortization period will cause it to exceed 20 years. If an increase in the amortization period as a result of actuarial losses for a valuation year would exceed 20 years, the accrued liability contribution shall be computed for the valuation year using a 20 year amortization period.

To the extent that the amortization period remains an open period in future years and depending upon the specific circumstances, it should be noted that in the absence of emerging actuarial gains or contributions made in excess of the actuarially determined contribution, any existing unfunded accrued liability may not be fully amortized in the future.

**STATE POLICE RETIREMENT SYSTEM OF NEW JERSEY  
JULY 1, 2019 ACTUARIAL VALUATION**

**APPENDIX B – SUMMARY OF ACTUARIAL ASSUMPTIONS AND METHODS**

**2. Asset Valuation Method**

For the purposes of determining contribution rates, an actuarial value of assets is used that dampens the volatility in the market value of assets, resulting in a smoother pattern of contributions.

The actuarial value of assets is adjusted to reflect actual contributions, benefit payments and administrative expenses and an assumed return on the previous year's assets and the current year's cash flow at the prior year's actuarial valuation interest rate, with a further adjustment to reflect 20% of the difference between the resulting value and the actual market value of Plan assets.

**3. State Contribution Payable Dates**

Chapter 83, P.L. 2016 requires the State to make the required pension contributions on a quarterly basis in each fiscal year according to the following schedule: at least 25% by September 30, at least 50% by December 31, at least 75% by March 31, and at least 100% by June 30. As such, contributions are assumed to be made on a quarterly basis.

**4. Changes in Methods Since the Last Valuation**

None.

**STATE POLICE RETIREMENT SYSTEM OF NEW JERSEY  
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**APPENDIX C – SUMMARY OF PLAN PROVISIONS**

This summary of Plan provisions provides an overview of the major provisions of the SPRS used in the actuarial valuation. It is not intended to replace the more precise language of the NJ State Statutes, Title 53, Chapter 5A, and if there is any difference between the description of the plan herein and the actual language in the NJ State Statutes, the NJ State Statutes will govern. This valuation is prepared based on plan provisions in effect as of July 1, 2019 and does not reflect the impact of any changes in benefits that may have been approved after the valuation date.

**1. Eligibility of Membership**

All members of the former State Police and Benevolent Fund and full-time commissioned officers, non-commissioned officers or troopers of the Division of State Police. Membership is a condition of employment.

- a) Tier 1 Member: Any member hired on or before May 21, 2010.
- b) Tier 2 Member: Any member hired after May 21, 2010.

**2. Plan Year**

The 12-month period beginning on July 1 and ending on June 30.

**3. Service Credit**

Service rendered while a member as described above.

**4. Credited Service**

A year is credited for each year of service as an officer or trooper in the State Police.

**5. Compensation**

Base salary in accordance with established salary policies of the state for all employees in the same position. Compensation does not include individual salary adjustments granted primarily in anticipation of the retirement or for temporary or extracurricular duties beyond the regular work day or shift. Effective June 30, 1996, Chapter 113, P. L. 1997 provided that the amount of compensation used for employer and member contributions and benefits under the program cannot exceed the compensation limitation of Section 401(a)(17) of the Internal Revenue Code. Chapter 1, P. L. 2010 provides that for members hired on or after May 22, 2010, the amount of compensation used for employer and member contributions and benefits under the System cannot exceed the annual maximum wage contribution base for Social Security, pursuant to the Federal Insurance Contributions Act.

**6. Final Compensation**

Average compensation received by the member in the last 12 months of credited service preceding retirement or death. Such term includes the value of the member's maintenance allowance for the same period. Chapter 1, P. L. 2010 provides that for members hired on or after May 22, 2010, Final Compensation means the average annual compensation for service for which contributions are made during any three fiscal years of membership providing the largest possible benefit to the member or the member's beneficiary.

STATE POLICE RETIREMENT SYSTEM OF NEW JERSEY  
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APPENDIX C – SUMMARY OF PLAN PROVISIONS

**7. Aggregate Contributions**

The sum of all amounts deducted from the compensation of a member or contributed by him or on his behalf.

**8. Member Contributions**

Each member contributes 9.0% of base salary. For contribution purposes, compensation does not include overtime, bonuses, maintenance or any adjustments before retirement.

**9. Adjusted Final Compensation**

For purposes of the pre-retirement accidental death benefit, the amount of compensation or compensation as adjusted, as the case may be, increased by the same percentage increase which is applied in any adjustments of the compensation schedule of active members after the member's death and before the date on which the deceased member of the retirement system would have accrued 25 years of service under an assumption of continuous service, at which time that amount will become fixed. Adjustments to compensation or adjusted compensation shall take effect at the same time as any adjustments in the compensation schedule of active members.

**10. Benefits**

**a) Service and Special Retirement:**

Mandatory retirement at age 55. Voluntary retirement prior to age 55.

- (1) Service Retirement: 20 years of service credit, or members as of August 29, 1985 who would not have 20 years of service credit at age 55.

Benefit is an annual retirement allowance equal to 50% of final compensation.

- (2) Special Retirement: 25 years of service credit.

Benefit is an annual retirement allowance equal to 65% of final compensation, plus 1% for each year of service credit in excess of 25 years, to a maximum of 70% of final compensation.

- (3) Members as of August 29, 1985 who would have 20 years of service credit but not 25 years at age 55.

Benefit is an annual retirement allowance equal to 50% of final compensation, plus 3% for each year of service credit in excess of 20 years.

STATE POLICE RETIREMENT SYSTEM OF NEW JERSEY  
JULY 1, 2019 ACTUARIAL VALUATION

APPENDIX C – SUMMARY OF PLAN PROVISIONS

**b) Deferred Retirement:**

Termination of service prior to age 55 with 10 years of service credit.

Benefit is either a refund of aggregate contributions, or a deferred life annuity beginning at age 55 equal to 2% of final compensation for each year of service credit up to 25 years.

For members who die during the deferral period, the benefit is a return of aggregate contributions.

**c) Non-Vested Termination:**

Termination of service prior to age 55 and less than 10 years of service credit.

Benefit is a return of aggregate contributions.

**d) Death Benefits**

(1) Ordinary Death Before Retirement: Death of an active member of the plan. Benefit is equal to:

- a. Lump sum payment equal to 350% of final compensation, also known as the noncontributory group life insurance benefit, plus
- b. Spousal life annuity of 50% of final compensation payable until spouse's death or remarriage. If there is no surviving spouse, or upon death or remarriage, a total of 20% (35%, 50%) of final compensation payable to one (two, three or more) dependent child(ren). If there is no surviving spouse or dependent child(ren), 25% (40%) of final compensation to one (two) dependent parent(s). If there is no surviving spouse, dependent child(ren) or parent(s), the benefit is a refund of accumulated contributions.

(2) Accidental Death Before Retirement: Death of an active member of the plan resulting during performance of duties. Benefit is equal to:

- a. Lump sum payment equal to 350% of final compensation, also known as the noncontributory group life insurance benefit, plus
- b. Spousal life annuity of 70% of final compensation or adjusted final compensation (if appropriate) payable until spouse's death. If there is no surviving spouse, or upon death of the surviving spouse, 70% of final compensation or adjusted final compensation (if appropriate) payable to surviving children in equal shares. If there is no surviving spouse or dependent children, 25% (40%) of final compensation or adjusted final compensation (if appropriate) to one (two) dependent parents. If there is no surviving spouse, dependent child(ren) or parent(s), the benefit is a refund of accumulated contributions.

**STATE POLICE RETIREMENT SYSTEM OF NEW JERSEY  
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**APPENDIX C – SUMMARY OF PLAN PROVISIONS**

- (3) Death After Retirement: Death of a retired member of the plan. Benefit is equal to:
- a. Lump sum payment equal to 50% of final compensation for a member retired under service, special or deferred retirement. For a member receiving a disability benefit, lump sum payment of 350% of final compensation if death occurs prior to age 55 and 50% of final compensation if death occurs after age 55. This benefit is also known as the noncontributory group life insurance benefit, plus
  - b. Spousal life annuity of 50% of final compensation payable until spouse's death or remarriage. If there is no surviving spouse, or upon death or remarriage, a total of 20% (35%, 50%) of final compensation payable to one (two, three or more) dependent child(ren). Previously granted COLAs also apply.

**e) Disability Retirement**

- (1) Ordinary Disability Retirement: Four years of service credit and mentally or physically incapacitated for the performance of his usual duty and of any other available duty in the Division of State Police and such incapacity is likely to be permanent.

Benefit is an immediate life annuity equal to the greater of:

- a. 40% of final compensation, or
- b. 1.5% of final compensation for each year of service credit.

- (2) Involuntary Ordinary Disability Retirement: Ordinary Disability Retirement applied for by the employer.

Benefit is an immediate life annuity equal to:

- a. For members with 20 years of service credit but less than 25 years, 50% of final compensation plus 3% of final compensation for each year of service credit in excess of 20 years, to a maximum of 65% of final compensation.
- b. For all other members, the Ordinary Disability benefit.

- (3) Accidental Disability Retirement: Totally and permanently disabled as a direct result of a traumatic event occurring during and as a result of his regular or assigned duties and such member is mentally or physically incapacitated for the performance of his usual duties in the Division of State Police.

Benefit is an immediate life annuity equal to 2/3 of annual rate of compensation, including the maintenance allowance, at the time of the traumatic event or retirement, whichever is greater.

STATE POLICE RETIREMENT SYSTEM OF NEW JERSEY  
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APPENDIX C – SUMMARY OF PLAN PROVISIONS

**11. Forms of Payment**

No optional forms of payment available.

**12. Changes in Plan Provisions since Last Valuation**

None.

**STATE POLICE RETIREMENT SYSTEM OF NEW JERSEY  
JULY 1, 2019 ACTUARIAL VALUATION**

**APPENDIX D – HISTORICAL DATA AND REQUIRED CAFR EXHIBITS**

<b>Table D-1 Historical Summary of Assets and Liabilities</b>					
<b>Valuation Date July 1,</b>	<b>Market Value of Assets</b>	<b>Actuarial Value of Assets</b>	<b>Actuarial Liability</b>	<b>Funded Ratio</b>	
				<b>Market Value</b>	<b>Actuarial Value</b>
2019	\$ 1,902,721,169	\$ 1,971,653,600	\$ 3,595,361,713	52.9%	54.8%
2018	1,881,340,538	1,939,304,839	3,430,821,762	54.8%	56.5%
2017	1,830,429,239	1,923,127,122	3,346,082,274	54.7%	57.5%
2016	1,744,462,405	1,931,131,875	3,209,386,033	54.4%	60.2%
2015	1,900,695,725	1,969,239,472	3,090,220,484	61.5%	63.7%
2014	1,967,141,815	1,981,376,495	2,963,182,120	66.4%	66.9%
2013	1,832,851,456	1,990,797,312	2,870,590,700	63.8%	69.4%
2012	1,755,429,511	1,995,388,133	2,767,768,813	63.4%	72.1%
2011	1,820,438,444	2,015,624,130	2,581,950,846	70.5%	78.1%
2010	1,656,194,924	2,019,350,048	2,497,094,137	66.3%	80.9%

<b>Table D-2 Historical Summary of State Appropriations</b>					
<b>Fiscal Year Ending June 30,</b>	<b>Actuarially Determined Contribution</b>	<b>Actual Pension Contributions</b>	<b>Contribution Deficiency (Excess)</b>	<b>Percentage of Contribution Covered</b>	
2020	\$ 165,576,179	\$ 115,903,326	\$ 49,672,853	70.00%	
2019	159,162,729	96,000,000	63,162,729	60.32%	
2018	144,208,823	72,104,000	72,104,823	50.00%	
2017	133,217,662	51,038,000	82,179,662	38.31%	
2016	118,600,705	35,580,000	83,020,705	30.00%	
2015	108,904,703	37,358,000	71,546,703	34.30%	
2014	103,193,378	35,231,000	67,962,378	34.14%	
2013	89,535,903	25,582,000	63,953,903	28.57%	
2012	89,671,744	12,810,000	76,861,744	14.29%	
2011	103,745,281	0	103,745,281	0.00%	

FYE 2020 actual contribution is based on the State's anticipated appropriation of 70% of the Statutory Contribution.

The information above is based on the final actuarial valuation reports for the given years. The amounts do not reflect differences between the discounted State appropriations receivable and the actual State contribution amounts that became known after the issuance of the reports



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**APPENDIX D – HISTORICAL DATA AND REQUIRED CAFR EXHIBITS**

In accordance with the Government Finance Officers Association (GFOA) and their recommended checklist for Comprehensive Annual Financial Reports (CAFRs), we prepared the following schedules for the Fund. The GFOA checklist uses the term Actuarial Accrued Liability, which is the same as the Actuarial Liability used elsewhere in this report.

**Table D-3  
Schedule Retirees and Beneficiaries Added to and Removed From Rolls**

Valuation Date July 1,	Added to Rolls		Removed from Rolls		Rolls at End of Year		Average Annual Allowance <sup>1</sup>	% Increase in Average Annual Allowance <sup>1</sup>
	Number	Annual Allowance	Number <sup>1</sup>	Annual Allowance	Number <sup>1</sup>	Annual Allowance		
2019	79	\$ 5,012,378	83	\$ 3,855,314	3,400	\$ 223,394,278	\$ 65,704	0.66%
2018	127	9,003,637	64	2,802,076	3,404	222,196,734	65,275	8.54%
2017	101	5,551,153	79	3,074,257	3,588	215,773,680	60,138	0.54%
2016	137	8,351,556	82	3,165,408	3,566	213,292,784	59,813	0.91%
2015	160	10,330,374	58	2,732,284	3,511	208,106,636	59,273	0.77%
2014	201	14,131,655	45	1,563,031	3,409	200,508,546	58,817	1.81%
2013	291	20,641,305	68	2,192,736	3,253	187,939,922	57,774	3.28%
2012	256	17,483,694	44	1,557,365	3,030	169,491,353	55,938	3.06%
2011	232	14,848,311	66	2,030,490	2,818	152,950,538	54,276	3.65%
2010	107	6,656,153	40	1,345,937	2,652	138,873,702	52,366	1.34%

<sup>1</sup> Beginning with the 2018 valuation, QDRO records excluded from headcounts and QDRO benefits included with member records. This change resulted in 247 fewer records on the rolls as of July 1, 2018.

**Table D-4  
Schedule of Active Member Valuation Data**

Valuation Date July 1,	Number of Contributing Active Members <sup>1</sup>	Annual Compensation <sup>1</sup>	Annual Average Compensation <sup>1</sup>	% Increase/ (Decrease) in Average Annual Compensation <sup>1</sup>
2019	2,766	\$ 296,189,926	\$ 107,082	3.32%
2018	2,661	275,790,087	103,642	0.84%
2017	2,812	289,022,222	102,782	0.83%
2016	2,725	277,771,135	101,934	(0.98%)
2015	2,676	275,477,457	102,944	(1.09%)
2014	2,522	262,496,289	104,083	(1.46%)
2013	2,481	262,063,829	105,628	1.48%
2012	2,721	283,219,927	104,086	7.56%
2011	2,844	275,219,752	96,772	1.12%
2010	3,030	289,980,657	95,703	0.48%

<sup>1</sup> Prior to July 1, 2018, includes non-contributing active members

**STATE POLICE RETIREMENT SYSTEM OF NEW JERSEY  
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**APPENDIX D – HISTORICAL DATA AND REQUIRED CAFR EXHIBITS**

**Table D-5  
Schedule of Funding Progress**

Valuation Date July 1,	Actuarial Value of Assets <sup>1</sup> (a)	Actuarial Accrued Liability (b)	(Surplus)/Unfunded Actuarial Liability (c) = (b) - (a)	Funded Ratio (a) / (b)	Covered Payroll <sup>2</sup> (d)	(Surplus)/Unfunded Actuarial Accrued Liability as % of Covered Payroll
						(c) / (d)
2019	\$ 1,971,653,600	\$ 3,595,361,713	\$ 1,623,708,113	54.84%	\$ 296,189,926	548.20%
2018	1,939,304,839	3,430,821,762	1,491,516,923	56.53%	275,790,087	540.82%
2017	1,923,127,122	3,346,082,274	1,422,955,152	57.47%	289,022,222	492.33%
2016	1,931,131,875	3,209,386,033	1,278,254,158	60.17%	277,771,135	460.18%
2015	1,969,239,472	3,090,220,484	1,120,981,012	63.72%	275,477,457	406.92%
2014	1,981,376,495	2,963,182,120	981,805,625	66.87%	262,496,289	374.03%
2013	1,990,797,312	2,870,590,700	879,793,388	69.35%	262,063,829	335.72%
2012	1,995,388,133	2,767,768,813	772,380,680	72.09%	283,219,927	272.71%
2011	2,015,624,130	2,581,950,846	566,326,716	78.07%	275,219,752	205.77%
2010	2,019,350,048	2,497,094,137	477,744,089	80.87%	289,980,657	164.75%

<sup>1</sup> Includes receivable amounts

<sup>2</sup> Prior to July 1, 2018, includes non-contributing active members

**Table D-6  
Schedule of Funded Liabilities by Type (Solvency Test)**

Valuation Date July 1,	Actuarial Accrued Liability for			Actuarial Value of Assets <sup>1</sup>	Portion of Actuarial Accrued Liabilities Covered by Actuarial Value of Assets		
	Contributing & Non-Contributing Active Member Contributions (1)	Retirees, Beneficiaries & Deferred Vested (2)	Contributing & Non-Contributing Active Member Benefits Financed by Employer (3)		(1)	(2)	(3)
2019	\$ 232,360,668	\$ 2,562,244,073	\$ 800,756,972	\$ 1,971,653,600	100.00%	67.88%	0.00%
2018	215,026,809	2,512,523,540	703,271,413	1,939,304,839	100.00%	68.63%	0.00%
2017	206,680,622	2,445,366,686	694,034,966	1,923,127,122	100.00%	70.19%	0.00%
2016	190,955,019	2,401,980,284	616,450,730	1,931,131,875	100.00%	72.45%	0.00%
2015	181,536,046	2,289,865,821	618,818,617	1,969,239,472	100.00%	78.07%	0.00%
2014	173,529,948	2,173,442,158	616,210,014	1,981,376,495	100.00%	83.18%	0.00%
2013	171,462,709	2,034,551,263	664,576,728	1,990,797,312	100.00%	89.42%	0.00%
2012	180,407,372	1,822,707,659	764,653,782	1,995,388,133	100.00%	99.58%	0.00%
2011	182,626,003	1,634,856,377	764,468,466	2,015,624,130	100.00%	100.00%	25.92%
2010	185,587,970	1,466,806,024	844,700,143	2,019,350,048	100.00%	100.00%	43.44%

<sup>1</sup> Includes receivable amounts

**STATE POLICE RETIREMENT SYSTEM OF NEW JERSEY  
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**APPENDIX D – HISTORICAL DATA AND REQUIRED CAFR EXHIBITS**

**Table D-7  
Analysis of Financial Experience  
Change in Unfunded Actuarial Accrued Liability**

Valuation Date July 1,	Actuarial Value Of Asset Investment (Gain)/Loss	Actuarial Accrued Liability (Gain)/Loss	Assumption & Method Changes	Plan Changes	Contributions <sup>1</sup>	Change in Unfunded Actuarial Accrued Liability
2019	\$ 17,233,108	\$ (2,412,105)	\$ 79,849,779	\$ 0	\$ 37,520,408	\$ 132,191,190
2018	14,491,075	(3,282,548)	2,791,271	0	54,561,973	68,561,771
2017	23,174,471	1,508,647	55,934,385	239,606	63,843,885	144,700,994
2016	46,667,367	(8,038,512)	45,696,315	0	72,947,976	157,273,146
2015	17,135,937	71,841	52,383,620	0	69,583,989	139,175,387
2014	3,558,670	16,454,524	1,252,085	0	80,746,958	102,012,237
2013	39,486,464	15,629,542	0	0	52,296,702	107,412,708
2012	59,989,655	65,124,479	27,320,457	0	53,619,373	206,053,964
2011	48,796,422	(38,262,822)	4,163,121	0	73,885,906	88,582,627
2010	90,788,781	(66,486,808)	0	(429,182,535)	124,411,960	(280,468,602)

<sup>1</sup> Change due to contributions (greater)/less than normal cost plus interest on the Unfunded Actuarial Accrued Liability.

STATE POLICE RETIREMENT SYSTEM OF NEW JERSEY  
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**APPENDIX E – GLOSSARY OF TERMS**

**1. Actuarial Assumptions**

Assumptions as to the occurrence of future events affecting pension costs, such as: mortality, withdrawal, disability, and retirement; changes in compensation; inflation; rates of investment earnings, and asset appreciation or depreciation; and other relevant items.

**2. Actuarial Cost Method**

A procedure for determining the Actuarial Present Value of pension plan benefits and expenses and for developing an allocation of such value to each year of service, usually in the form of a Normal Cost and an Actuarial Liability.

**3. Actuarial Gain/(Loss)**

A measure of the difference between actual experience and that expected based upon a set of Actuarial Assumptions during the period between two Actuarial Valuation dates, as determined in accordance with a particular Actuarial Cost Method.

**4. Actuarial Liability**

The portion of the Actuarial Present Value of Projected Benefits which will not be paid by future Normal Costs. It represents the value of the past Normal Costs with interest to the valuation date.

**5. Actuarial Present Value (Present Value)**

The value as of a given date of a future amount or series of payments. The Actuarial Present Value discounts the payments to the given date at the assumed investment return and includes the probability of the payment being made. As a simple example: assume you owe \$100 to a friend one year from now. Also, assume there is a 1% probability of your friend dying over the next year, in which case you won't be obligated to pay him. If the assumed investment return is 10%, the actuarial present value is:

$$\frac{\text{Amount}}{\text{Payment}} \times \frac{\text{Probability of}}{(1 - .01)} \times \frac{1/(1+\text{Investment Return})}{1/(1+.1)} = \$90$$

**6. Actuarial Valuation**

The determination, as of a specified date, of the Normal Cost, Actuarial Liability, Actuarial Value of Assets, and related Actuarial Present Values for a pension plan.

**APPENDIX E – GLOSSARY OF TERMS**

**7. Actuarial Value of Assets**

The value of cash, investments and other property belonging to a pension plan as used by the actuary for the purpose of an Actuarial Valuation. The purpose of an Actuarial Value of Assets is to smooth out fluctuations in market values. This way long-term costs are not distorted by short-term fluctuations in the market.

**8. Actuarially Equivalent**

Of equal Actuarial Present Value, determined as of a given date with each value based on the same set of Actuarial Assumptions.

**9. Amortization Payment**

The portion of the pension plan contribution which is designed to pay interest and principal on the Unfunded Actuarial Liability in order to pay for that liability in a given number of years.

**10. Funded Ratio**

The ratio of the Actuarial Value of Assets to the Actuarial Liabilities.

**11. Investment Return Assumption**

The assumed interest rate used for projecting dollar related values in the future.

**12. Mortality Table**

A set of percentages which estimate the probability of death at a particular point in time. Typically, the rates are annual and based on age and sex.

**13. Normal Cost**

That portion of the Actuarial Present Value of pension plan benefits and expenses, which is allocated to a valuation year by the Actuarial Cost Method.

**14. Projected Benefits**

Those pension plan benefit amounts which are expected to be paid in the future under a particular set of Actuarial Assumptions, taking into account such items as the effect of advancement in age and increases in future compensation and service credits.

STATE POLICE RETIREMENT SYSTEM OF NEW JERSEY  
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APPENDIX E – GLOSSARY OF TERMS

**15. Projected Unit Credit Cost Method**

A method under which the Actuarial Liability is calculated as the Actuarial Present Value of the Projected Benefits allocated to periods prior to the valuation year.

**16. Unfunded Actuarial Liability**

The excess of the Actuarial Liability over the Actuarial Value of Assets.