



**TEACHERS' PENSION AND ANNUITY FUND
OF NEW JERSEY**

GASB 67 DISCLOSURE

Fiscal Year: July 1, 2016 to June 30, 2017

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Certification

Actuarial computations presented in this report under Statement No. 67 of the Governmental Accounting Standards Board are for purposes of assisting the State of NJ in fulfilling its financial accounting requirements. No attempt is being made to offer any accounting opinion or advice. This report is for fiscal year July 1, 2016 to June 30, 2017. The reporting date for determining plan assets and obligations is June 30, 2017. The calculations enclosed in this report have been made on a basis consistent with our understanding of the plan provisions. Determinations for purposes other than meeting financial reporting requirements may be significantly different than the results contained in this report. Accordingly, additional determinations may be needed for other purposes, such as judging benefit security or meeting employer funding requirements.

In preparing this report, we relied, without audit, on information as of July 1, 2016 as well as asset information as of June 30, 2017 furnished by the State of NJ. This information includes, but is not limited to, statutory provisions, member census data, and financial information. The breakdown as of July 1, 2016 includes 140,563 active participants, 13,822 terminated vested and other inactive participants (13,600 non-contributory members are treated as inactive for this purpose), and 101,246 retirees and beneficiaries. Please see Milliman's funding valuation report dated February 3, 2017 for more information on the plan's participants as of July 1, 2016 as well as a summary of the plan provisions and actuarial methods. Other actuarial assumptions are based on the Experience Study report dated January 16, 2017. Please refer to that report for more information. Furthermore, this report reflects a reduction in the investment return assumption. For the determination of projected statutory contributions, it is reduced to 7.5% for July 1, 2017 and 2018 valuations, 7.3% for July 1, 2019 and 2020 valuations, and 7% for 2021 and later valuations. For GASB 67 purposes, it is reduced to 7% effective June 30, 2017.

We performed a limited review of the census and financial information used directly in our analysis and have found them to be reasonably consistent and comparable with information used for other purposes. The valuation results depend on the integrity of this information. If any of this information is inaccurate or incomplete our results may be different and our calculations may need to be revised.

We hereby certify that, to the best of our knowledge, this report, including all costs and liabilities based on actuarial assumptions and methods adopted by the Board or mandated by statute, is complete and accurate and determined in conformance with generally recognized and accepted actuarial principles and practices, which are consistent with the Actuarial Standards of Practice promulgated by the Actuarial Standards Board and the applicable Guides to Professional Conduct, amplifying Opinions and supporting Recommendations of the American Academy of Actuaries.

This valuation report is only an estimate of the Plan's financial condition as of a single date. It can neither predict the Plan's future condition nor guarantee future financial soundness. Actuarial valuations do not affect the ultimate cost of Plan benefits, only the timing of Plan contributions. While the valuation is based on an array of assumptions adopted by the Board and/or set by the Treasurer, other assumption sets may also be reasonable and valuation results based on those assumptions would be different. No one set of assumptions is uniquely correct. Determining results using alternative assumptions is outside the scope of our engagement.

Certification

Future actuarial measurements may differ significantly from the current measurements presented in this report due to factors such as, but not limited to, the following: plan experience differing from that anticipated by the economic or demographic assumptions; changes in economic or demographic assumptions; increases or decreases expected as part of the natural operation of the methodology used for these measurements (such as the end of an amortization period or additional cost or contribution requirements based on the plan's funded status); and changes in plan provisions or applicable law. Due to the limited scope of the actuarial assignment, we did not perform an analysis of the potential range of such future measurements.

Milliman's work is prepared solely for the use and benefit of the State of New Jersey Division of Pensions and Benefits. To the extent that Milliman's work is not subject to disclosure under applicable public records laws, Milliman's work may not be provided to third parties without Milliman's prior written consent. Milliman does not intend to benefit or create a legal duty to any third party recipient of its work product. Milliman's consent to release its work product to any third party may be conditioned on the third party signing a Release, subject to the following exceptions: (a) the Plan Sponsor may provide a copy of Milliman's work, in its entirety, to the Plan Sponsor's professional service advisors who are subject to a duty of confidentiality and who agree to not use Milliman's work for any purpose other than to benefit the Fund; and (b) the Plan Sponsor may provide a copy of Milliman's work, in its entirety, to other governmental entities, as required by law.

No third party recipient of Milliman's work product should rely upon Milliman's work product. Such recipients should engage qualified professionals for advice appropriate to their specific needs.

The consultants who worked on this assignment are pension actuaries. Milliman's advice is not intended to be a substitute for qualified legal or accounting counsel.

The signing actuaries are independent of the plan sponsor. We are not aware of any relationship that would impair the objectivity of our work.

On the basis of the foregoing, we hereby certify that, to the best of our knowledge and belief, this report is complete and has been prepared in accordance with generally recognized accepted actuarial principles and practices. We are members of the American Academy of Actuaries and meet the Qualification Standards to render the actuarial opinion contained herein.



Scott F. Porter, FSA
Consulting Actuary



Richard L. Gordon, FSA
Consulting Actuary

Executive Summary

This report presents the results of the actuarial valuation in accordance with GASB 67 as of June 30, 2017 for the Teachers' Pension and Annuity Fund. There are several differences in actuarial assumptions and methods specified by GASB 67 versus those used to determine the statutory contribution in accordance with New Jersey statute. These differences include treatment of receivable contributions, amortization methods, actuarial cost methods, inclusion of insurance benefits and potentially the discount rate.

The discount rate is based on the single equivalent rate that results in the same actuarial present value as the long-term expected rate of return applied to benefit payments, to the extent that the plan's fiduciary net position is projected to be sufficient to make projected benefit payments, and the municipal bond rate applied to benefit payments, to the extent that the plan's fiduciary net position is not projected to be sufficient. As of June 30, 2017, the plan's fiduciary net position is not projected to be sufficient in year 19 of the projection or by June 30, 2036. The depletion date has increased seven years from the prior year GASB 67 valuation.

The depletion date determination reflects Chapter 98, P.L. 2017, which transfers the Lottery Enterprise, and thus future Lottery revenues, to the State pension funds for a period of 30 years. TPAF will receive 77.78% of the Lottery revenues. The inclusion of future Lottery revenues delayed the year of depletion by three years. The value of the Lottery is not considered an asset for GASB purposes until the actual revenue is transferred into the pension funds.

The primary assumption in determining the sufficiency of a plan's fiduciary net position relates to expected State contributions. Beginning with the 2018 fiscal year, 40% of the projected gross statutory pension contributions less any Lottery offset was assumed to be made by the State each year. This assumption represents the percentage of actual State contributions made towards the statutory contribution for the Fiscal Year Ending June 30, 2017 in accordance with GASB Statement No. 67. In determining the projected gross statutory pension contributions, a 7.5% investment return for the July 1, 2017 and 2018 valuations, 7.3% for the July 1, 2019 and 2020 valuations, and 7% for the July 1, 2021 and later valuations, was used as specified by the State Treasurer. To the extent actual contributions are higher (lower) than shown, any date of depletion would be later (sooner) than shown in this report.

Since a date of depletion is determined, the discount rate is much lower than the investment return assumption of 7% as of June 30, 2017 for GASB 67 purposes. After assets are expected to be depleted, projected benefit payments are discounted using the municipal bond index. The State of New Jersey chose the Bond Buyer GO 20-Bond Municipal Bond Index. Both the investment return assumption and the bond index changed from June 30, 2016 to June 30, 2017. The investment return assumption was reduced from 7.65% to 7%, and the bond index increased from 2.85% to 3.58%. The combined effect of the changes to the assumptions and updated depletion date projections is an increase in the single equivalent rate from 3.22% as of July 1, 2016 to 4.25% as of June 30, 2017. The impact of the increase in the discount rate decreased the unfunded liability by approximately \$13.3 billion. The unfunded liability, referred to as the Net Pension Liability, is \$67.7 billion for a funded ratio of 25.4% as of June 30, 2017.

The benefits covered under this valuation include pension benefits and noncontributory group insurance benefits (NCGI). The depletion date has been determined based on the funding of pension benefits only whereas the weighted average discount rate reflects pension and NCGI benefits.

Overview of GASB 67 and GASB 68

The Governmental Accounting Standards Board (GASB) released new accounting standards for public pension plans and participating employers in 2012. These standards, GASB Statements No. 67 and 68, have substantially revised the accounting requirements previously mandated under GASB Statements No. 25 and 27. The most notable change is the distinct separation of funding from financial reporting. The Annual Required Contribution (ARC) has been eliminated under GASB 67 and 68 and is no longer relevant for financial reporting purposes. As a result, plan sponsors have been encouraged to establish a formal funding policy that is separate from financial reporting calculations.

GASB 67 applies to financial reporting for public pension plans and is required to be implemented for plan fiscal years beginning after June 15, 2013. Note that a plan's fiscal year might not be the same as the employer's fiscal year. Even if the plan does not issue standalone financial statements, but rather is considered a pension trust fund of a government, it is subject to GASB 67. Under GASB 67, enhancements to the financial statement disclosures are required, along with certain required supplementary information.

GASB 68 governs the specifics of accounting for public pension plan obligations for participating employers and is required to be implemented for employer fiscal years beginning after June 15, 2014. GASB 68 requires a liability for pension obligations, known as the Net Pension Liability, to be recognized on the balance sheets of participating employers. Changes in the Net Pension Liability will be immediately recognized as Pension Expense on the income statement or reported as deferred inflows/outflows of resources depending on the nature of the change.

Statement of Fiduciary Net Position

	June 30, 2016	June 30, 2017
Assets		
Cash and cash equivalents	\$2,414,775	\$353,178,098
Receivables and prepaid expenses:		
Receivable contributions and loans	386,888,140	386,281,892
Receivable investment income	33,129	41,228
Receivables from brokers for unsettled trades	0	0
Prepaid expenses	2,551,217	12,647,936
Total receivables	389,472,486	398,971,056
Investments:		
Pension Fund A	0	0
Pension Fund B	0	0
Pension Fund D	14,568,762,228	15,621,176,710
Pension Fund E	7,797,708,833	7,066,359,178
Short-term investments	394,124,066	61,465,645
Total investments	22,760,595,127	22,749,001,533
Invested securities lending cash collateral	0	0
Capital assets net of accumulated depreciation	0	0
Total assets	23,152,482,388	23,501,150,687
Liabilities		
Accrued expenses and benefits payable	435,116,731	445,076,097
Securities lending cash collateral (net)	(497,310)	(87,239)
CGIPF Payable	0	0
Total liabilities	434,619,421	444,988,858
Net position restricted for pensions ¹	\$22,717,862,967	\$23,056,161,829

¹ Excludes any statutory pension and ERI contribution receivables not reflected in TPAF's financial statements.

Statement of Changes in Fiduciary Net Position

June 30, 2017

Additions

Member contributions	\$790,788,033
Employer contributions (State, Local, and NCGI)	1,127,018,480
Transfers from other systems	1,338,431
Other	357,659
Total contributions	1,919,502,603
Investment income (loss):	
Interest	413,729,524
Dividends	0
Net increase in fair value of investments	2,300,089,571
Securities lending income	0
Less investment expenses:	
Direct investment expense	6,055,521
Securities lending management fees	0
Securities lending borrower rebates	0
Net investment income	2,707,763,574
Other income	29,225,217
Total additions	4,656,491,394

Deductions

Pension benefits	4,198,977,288
Refunds of member contributions	68,191,977
Noncontributory Group Insurance Premium Payment	39,099,480
Administrative expenses	11,923,787
Total deductions	4,318,192,532
Net increase (decrease)	338,298,862

Net position restricted for pensions

Beginning of year (06/30/2016)	22,717,862,967
End of year (06/30/2017)	\$23,056,161,829

Schedule of Investment Returns

Fiscal Year Ending June 30	Net Money-Weighted Rate of Return
2008	N/A
2009	N/A
2010	N/A
2011	N/A
2012	N/A
2013	N/A
2014	16.79%
2015	4.08%
2016	-1.15%
2017	13.01%

Calculation of Money-Weighted Rate of Return

The money-weighted rate of return considers the changing amounts actually invested during a period and weights the amount of pension plan investments by the proportion of time they are available to earn a return during that period. External cash flows are determined on a monthly basis and are assumed to occur at the end of each month. External cash inflows are netted with external cash outflows, resulting in a net external cash flow in each month. The money-weighted rate of return is calculated net of investment expenses and has been determined by the New Jersey Division of Investments.

Net Pension Liability

Net Pension Liability	June 30, 2016	June 30, 2017
Total pension liability	\$101,746,770,000	\$90,726,371,000
Fiduciary net position	<u>22,717,862,967</u>	<u>23,056,161,829</u>
Net pension liability	79,028,907,033	67,670,209,171
Fiduciary net position as a % of total pension liability	22.33%	25.41%
Covered payroll	10,305,472,484	10,436,205,103
Net pension liability as a % of covered payroll	766.86%	648.42%

The total pension liability was determined by an actuarial valuation as of the valuation date, calculated based on the discount rate and actuarial assumptions below, and was then projected forward to the measurement date. There have been no significant changes to plan provisions between the valuation date and the fiscal year end. Any significant changes during this period must be reflected as prescribed by GASB 67 and 68. Covered Payroll is as of June 30, 2015 and June 30, 2016, respectively.

Discount Rate

The plan's fiduciary net position was not projected to be available to make all projected future benefit payments of current active and inactive employees. Therefore, the discount rate for calculating the total pension liability is equal to the single equivalent rate that results in the same actuarial present value as the long-term expected rate of return applied to benefit payments, to the extent that the plan's fiduciary net position is projected to be sufficient to make projected benefit payments, and the municipal bond rate applied to benefit payments, to the extent that the plan's fiduciary net position is not projected to be sufficient.

Discount rate	4.25%
Long-term expected rate of return net of investment expense	7.00%
Municipal bond rate ¹	3.58%

Other Key Actuarial Assumptions

The actuarial assumptions that determined the total pension liability as of June 30, 2017 were based on the results of an actuarial experience study for the period July 1, 2012 - July 1, 2015. Please refer to that report for more information.

Valuation date	July 1, 2016
Measurement date	June 30, 2017
Actuarial cost method	Entry Age Normal ²

All other assumptions used are consistent with the assumptions used in the June 30, 2016 Actuarial Valuation Report prepared as of July 1, 2016 dated February 3, 2017, except the change in the statutory interest rate to 7.5% effective June 30, 2017 is reflected.

¹ Bond Buyer 20-Bond General Obligation Bond Index as of June 29, 2017; 2.85% as of June 30, 2016

² Total projected compensation is used to allocate costs under Entry Age Normal even if pensionable compensation is limited to the Social Security Taxable Wage Base. The select period for the salary scale is assumed to occur during the period July 1, 2011 through June 30, 2026. The ultimate scale applies to all other time periods.

Changes in Net Pension Liability

Changes in Net Pension Liability	Increase (Decrease)		
	Total Pension Liability (a) ¹	Plan Fiduciary Net Position (b)	Net Pension Liability (a) - (b)
Balances as of June 30, 2016	\$101,746,770,000	\$22,717,862,967	\$79,028,907,033
Changes for the year:			
Service cost	\$3,028,689,581		3,028,689,581
Interest on total pension liability	\$3,304,988,177		3,304,988,177
Effect of plan changes	\$0		0
Effect of economic/demographic (gains) or losses	\$236,377,556		236,377,556
Effect of assumptions changes or inputs	(\$13,285,524,000)		(13,285,524,000)
Benefit payments	(\$4,306,268,745)	(4,306,268,745)	0
Transfers from other Systems	\$1,338,431	1,338,431	0
Administrative expenses		(11,923,787)	11,923,787
Member contributions		790,788,033	(790,788,033)
Net investment income		2,736,988,791	(2,736,988,791)
Employer contributions		1,127,018,480	(1,127,018,480)
Other		357,659	(357,659)
Balances as of June 30, 2017	90,726,371,000	23,056,161,829	67,670,209,171

¹ Total Pension Liability as of June 30, 2016 is based on a single equivalent discount rate of 3.22%

Sensitivity Analysis

The following presents the net pension liability of the Teachers' Pension and Annuity Fund of New Jersey, calculated using the discount rate of 4.25%, as well as what the System's net pension liability would be if it were calculated using a discount rate that is 1 percentage point lower (3.25%) or 1 percentage point higher (5.25%) than the current rate.

	1% Decrease 3.25%	Current Discount Rate 4.25%	1% Increase 5.25%
Total pension liability	\$103,450,493,000	\$90,726,371,000	\$80,244,184,000
Fiduciary net position	23,056,161,829	23,056,161,829	23,056,161,829
Net pension liability	80,394,331,171	67,670,209,171	57,188,022,171

Long-Term Expected Rate of Return

The following information was provided by the State: The best-estimate long-term expected rate of return for the Pension Fund is based on the targeted asset allocation, long-term capital market assumptions (including compound expected returns, volatility of returns, and correlation of returns), and the application of modern portfolio theory. Long-term capital market assumptions are determined by a survey of a wide universe of third party investment professionals and reflect nominal return expectations, as well as the analysis of the Division of Investment and its team of outside investment consultants.

Asset Class	Target Allocation ¹	Long-Term Expected Rate of Return
Risk Mitigation Strategies	5.00%	5.51%
Cash Equivalents	5.50%	1.00%
US Treasuries	3.00%	1.87%
Investment Grade Credit	10.00%	3.78%
High Yield Bonds	0.00%	6.82%
Gloval Diversified Credit	5.00%	7.10%
Credit-Oriented Hedge Funds	1.00%	6.60%
Debt Related Private Equity	2.00%	10.63%
Debt Related Real Estate	1.00%	6.61%
Private Real Assets	2.50%	11.83%
Equity Related Real Estate	6.25%	9.23%
US Equity	30.00%	8.19%
Non-US Developed Market Equities	11.50%	9.00%
Emerging Market Equities	6.50%	11.64%
Buyouts/Venture Capital	8.25%	13.08%
Portfolio Arithmetic Mean Return		7.83%
Portfolio Standard Deviation		12.27%
Portfolio Geometric Expected Return		7.14%
Long-Term Expected Rate of Return for GASB 67 purposes selected by State Treasurer		7.00%

¹ Based on target asset allocation for 2017 fiscal year

Schedule of Changes in Net Pension Liability and Related Ratios (\$ in Millions)

	Fiscal Year Ending June 30									
	2017	2016	2015	2014	2013	2012	2011	2010	2009	2008
Total Pension Liability										
Service cost	\$3,029	\$2,344	\$2,022	\$1,871	\$0	\$0	\$0	\$0	\$0	\$0
Interest on total pension liability	3,305	3,695	3,797	3,794	0	0	0	0	0	0
Effect of plan changes	0	0	0	0	0	0	0	0	0	0
Effect of assumption changes or inputs	(13,286)	10,827	5,914	2,614	0	0	0	0	0	0
Effect of economic/demographic (gains) or losses	236	(135)	365	(25)	0	0	0	0	0	0
Benefit payments	(4,306)	(4,169)	(4,015)	(3,838)	0	0	0	0	0	0
Transfers from other Systems	1	2	0	0	0	0	0	0	0	0
Net change in total pension liability	(11,020)	12,564	8,087	4,417	0	0	0	0	0	0
Total pension liability, beginning	101,747	89,183	81,095	76,679	0	0	0	0	0	0
Total pension liability, ending (a)	90,726	101,747	89,183	81,095	0	0	0	0	0	0
Fiduciary Net Position										
Employer contributions	\$1,127	\$800	\$541	\$428	\$0	\$0	\$0	\$0	\$0	\$0
Member contributions	791	762	740	716	0	0	0	0	0	0
Investment income net of investment expenses	2,737	(294)	1,040	4,078	0	0	0	0	0	0
Benefit payments	(4,306)	(4,169)	(4,015)	(3,838)	0	0	0	0	0	0
Administrative expenses	(12)	(14)	(14)	(12)	0	0	0	0	0	0
Transfers from other Systems + misc items	2	2								
Net change in plan fiduciary net position	338	(2,913)	(1,704)	1,372	0	0	0	0	0	0
Fiduciary net position, beginning	22,718	25,605	27,282	25,888	0	0	0	0	0	0
Fiduciary net position, ending (b)	23,056	22,718	25,605	27,282	0	0	0	0	0	0
Net pension liability, ending = (a) - (b)	\$67,670	\$79,029	\$63,578	\$53,813	\$0	\$0	\$0	\$0	\$0	\$0
Fiduciary net position as a % of total pension liability	25.41%	22.33%	28.71%	33.64%	N/A	N/A	N/A	N/A	N/A	N/A
Covered payroll	\$10,436	\$10,305	\$10,162	\$10,039	\$9,779	\$9,682	\$10,025	\$9,747	\$9,419	\$9,078
Net pension liability as a % of covered payroll	648.42%	766.86%	625.63%	536.05%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

This schedule is presented to illustrate the requirement to show information for 10 years. However, recalculations of prior years are not required, and if prior years are not reported in accordance with the current GASB standards, they should not be reported.

Schedule of Employer Pension Contributions ¹

Fiscal Year Ending June 30	Actuarially Determined Contribution	Actual Employer Contribution	Contribution Deficiency (Excess)	Covered Payroll	Contribution as a % of Covered Payroll
2008	1,286,147,106	663,791,615	\$622,355,491	9,077,628,813	7.31%
2009	1,348,105,853	64,376,207	1,283,729,646	9,419,083,203	0.68%
2010	1,526,168,830	0	1,526,168,830	9,747,020,060	0.00%
2011	1,826,722,370	0	1,826,722,370	10,025,401,658	0.00%
2012	2,009,810,329	287,115,915	1,722,694,414	9,682,318,739	2.97%
2013	2,148,185,001	613,766,799	1,534,418,202	9,779,212,916	6.28%
2014	2,158,287,358	392,035,985	1,766,251,373	10,038,792,896	3.91%
2015	2,306,611,715	504,320,000	1,802,291,715	10,162,263,470	4.96%
2016	2,544,811,534	764,489,000	1,780,322,534	10,305,472,484	7.42%
2017	2,737,175,151	1,087,919,000	1,649,256,151	10,436,205,103	10.42%

¹ Only reflects State contributions towards the Actuarially Determined Contribution. Excludes other employer contributions such as NCGI premium reimbursement, delayed enrollments, delayed appropriations and other miscellaneous items.

Depletion Date Projection

In order to determine if the plan's fiduciary net position is projected to be sufficient to make projected benefit payments, we have prepared a depletion date projection using the following techniques and assumptions:

- Current active members (non-contributory members are not considered active) contribute the required employee contribution amounts.
- Employer contributions are assumed to equal 40% of the State's gross statutory contribution reduced by any Lottery offset as specified in Chapter 98, P.L. 2017. The actuarial liabilities and statutory gross contribution are determined at each projected valuation date using the statutory investment return assumption of 7.5% for July 1, 2017 and 2018 valuations, 7.3% for July 1, 2019 and 2020 valuations, and 7% for July 1, 2021 and later valuations, as specified by the State Treasurer.
- Benefit payments are projected based on the actuarial assumptions and the current plan provisions.
- Members are assumed to receive pay increases, terminate, retire, become disabled, die, and so forth according to the actuarial assumptions adopted in the 2015 Experience Study dated January 16, 2017.
- Terminating and retiring members will not be replaced with new employees.
- Current administrative expenses are assumed to be equal to 0.33% of the expected benefit payments for the fiscal year.
- Cash flows, including Lottery revenue, are assumed to occur on average halfway through the year. State contributions assumed to be paid on a quarterly basis.
- The long-term expected rate of return on pension plan investments to each projected valuation date is 7.00% for GASB 67 purposes.
- The actuarial assumptions do not change.
- The plan provisions do not change.
- Excludes any liabilities associated with the contributory group life insurance benefits, but includes pay-as-you-go payments for the non-contributory insurance benefits.

Actual results at each point in time will yield different values, reflecting the actual experience of the plan membership and assets.

Actuarial Methods and Assumptions Used for Funding Policy

The following actuarial methods and assumptions were used in the July 1, 2016 funding valuation which reflect the 2015 Experience Study. Please see the valuation report and experience study dated February 3, 2017 and January 16, 2017, respectively for further details.

Valuation Timing	Actuarially determined contributions are calculated as of June 30, two years prior to the end of the fiscal year in which the contributions are reported (i.e. June 30, 2016 valuation determines June 30, 2018 fiscal year end contributions).
Actuarial Cost Method	Projected Unit Credit, per NJ Statute for pension benefits; Actual claims for noncontributory group insurance benefits are reimbursed monthly.
Amortization Method	Level Dollar Amortization: Per NJ Statute, the amortization period is 30 years until the June 30, 2019 valuation at which time the period declines by 1 each year until 20 years. The amortization amount in any future year cannot be lower than the amount from the prior year until the plan is fully funded on an actuarial value of assets basis.
Asset Valuation Method	Per NJ Statute, 20% of the difference between the expected Actuarial Value and market value is recognized each year in determining the Actuarial Value of Assets.
Inflation/ SSTWB Inflation	2.3%/ 3.3% until June 30, 2026; 2.6%/ 3.6% thereafter
Salary Increases	Varies by years of employment and valuation year
Investment Rate of Return	7.65% as of July 1, 2016; 7.50% for July 1, 2017 and July 1, 2018; 7.30% for July 1, 2019 and July 1, 2020; 7.00% for July 1, 2021 and later
Cost of Living Adjustments	None
Mortality	Based on experience of TPAF members reflecting mortality improvement on a generational basis based on a 60-year average of Social Security data from 1953 to 2013.
Other Assumptions	See June 30, 2015 Experience Study
<u>Changes Subsequent to the July 1, 2016 Actuarial Valuation</u>	
Lottery Enterprise Offset Method	Projected lottery revenues and lottery appraisal values provided by State Treasurer and reflected in depletion date projections in accordance with Chapter 98, P.L. 2017.
Contribution Timing	In accordance with Chapter 83, P.L. 2016. Contributions are expected to be made on a quarterly basis.

**Projection of Contributions
(\$ in Millions)**

Fiscal Year End	Projected Payroll Current Employees	Projected Payroll Future Employees	Total Employee Payroll	Contributions from Current Employees	Employer Contributions for Current Employees *	Projected Lottery Revenue	Total Contributions
2018	\$9,860	\$0	\$9,860	\$749	\$461	\$779	\$1,988
2019	9,691	0	9,691	\$752	\$521	\$807	\$2,080
2020	9,525	0	9,525	\$739	\$568	\$833	\$2,140
2021	9,355	0	9,355	\$726	\$676	\$845	\$2,247
2022	9,210	0	9,210	\$714	\$761	\$855	\$2,331
2023	9,048	0	9,048	\$702	\$1,095	\$865	\$2,661
2024	8,850	0	8,850	\$686	\$1,249	\$875	\$2,811
2025	8,669	0	8,669	\$672	\$1,408	\$886	\$2,966
2026	8,478	0	8,478	\$658	\$1,570	\$897	\$3,124
2027	8,218	0	8,218	\$637	\$1,728	\$908	\$3,273
2028	8,009	0	8,009	\$621	\$1,887	\$918	\$3,426
2029	7,796	0	7,796	\$605	\$2,059	\$925	\$3,589
2030	7,518	0	7,518	\$583	\$2,229	\$935	\$3,747
2031	7,227	0	7,227	\$560	\$2,336	\$944	\$3,841
2032	6,929	0	6,929	\$537	\$2,451	\$954	\$3,942
2033	6,582	0	6,582	\$511	\$2,573	\$963	\$4,047
2034	6,237	0	6,237	\$484	\$2,682	\$973	\$4,139
2035	5,895	0	5,895	\$457	\$2,799	\$983	\$4,239
2036	5,532	0	5,532	\$429	\$2,874	\$993	\$4,296
2037	5,182	0	5,182	\$0	\$0	\$0	\$0
2038	4,847	0	4,847	\$0	\$0	\$0	\$0
2039	4,510	0	4,510	\$0	\$0	\$0	\$0
2040	4,192	0	4,192	\$0	\$0	\$0	\$0
2041	3,894	0	3,894	\$0	\$0	\$0	\$0
2042	3,577	0	3,577	\$0	\$0	\$0	\$0
2043	3,275	0	3,275	\$0	\$0	\$0	\$0
2044	2,961	0	2,961	\$0	\$0	\$0	\$0
2045	2,598	0	2,598	\$0	\$0	\$0	\$0
2046	2,257	0	2,257	\$0	\$0	\$0	\$0
2047	1,960	0	1,960	\$0	\$0	\$0	\$0

* No contributions from future employees are included in the above analysis.

Projection of Fiduciary Net Position
(\$ in Millions)

Fiscal Year End	Projected Beginning Fiduciary Net Position	Projected Total Contributions & Lottery Revenue	Projected Benefit Payments	Projected Administrative Expenses	Projected Investment Earnings	Projected Ending Fiduciary Net Position
2018	\$23,056	\$1,988	\$4,390	\$14	\$1,527	\$22,167
2019	22,167	\$2,080	4,492	15	1,464	21,205
2020	21,205	\$2,140	4,591	15	1,395	20,133
2021	20,133	\$2,247	4,692	15	1,319	18,992
2022	18,992	\$2,331	4,772	16	1,239	17,774
2023	17,774	\$2,661	4,856	16	1,159	16,722
2024	16,722	\$2,811	4,944	16	1,086	15,659
2025	15,659	\$2,966	5,027	17	1,013	14,594
2026	14,594	\$3,124	5,106	17	940	13,535
2027	13,535	\$3,273	5,215	17	866	12,442
2028	12,442	\$3,426	5,316	18	789	11,324
2029	11,324	\$3,589	5,407	18	712	10,200
2030	10,200	\$3,747	5,519	18	634	9,043
2031	9,043	\$3,841	5,634	19	551	7,782
2032	7,782	\$3,942	5,738	19	462	6,428
2033	6,428	\$4,047	5,856	19	365	4,964
2034	4,964	\$4,139	5,966	20	261	3,379
2035	3,379	\$4,239	6,061	20	149	1,687
2036	1,687	\$4,296	6,159	20	29	0
2037	0	\$0	6,242	0	0	0
2038	0	\$0	6,304	0	0	0
2039	0	\$0	6,366	0	0	0
2040	0	\$0	6,409	0	0	0
2041	0	\$0	6,425	0	0	0
2042	0	\$0	6,459	0	0	0
2043	0	\$0	6,469	0	0	0
2044	0	\$0	6,467	0	0	0
2045	0	\$0	6,508	0	0	0
2046	0	\$0	6,507	0	0	0
2047	0	\$0	6,482	0	0	0
2048	0	\$0	6,476	0	0	0
2049	0	\$0	6,440	0	0	0
2050	0	\$0	6,392	0	0	0

Teachers' Pension and Annuity Fund of New Jersey

This work product was prepared solely for the State of NJ for the purposes described herein and may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work. Milliman recommends that third parties be aided by their own actuary or other qualified professional when reviewing the Milliman work product.

Actuarial Present Value of Projected Benefit Payments (\$ in Millions)

Fiscal Year End	Projected	Projected Benefit Payments****	"Funded"	"Unfunded"	Present	Present	Present
	Beginning Fiduciary Net Position		Portion of Benefit Payments	Portion of Benefit Payments	Value of "Funded" Benefit Payments*	Value of "Unfunded" Benefit Payments**	Value of Total Benefit Payments***
Total					50,589	66,215	116,803
					* Discounted at the long-term expected rate of return, 7.00%		
					** Discounted at the municipal bond rate, 3.58%		
					*** Discounted at the single interest rate that produces a total actuarial present value equal to the sum of the actuarial present values of "funded" and "unfunded" benefit payments, 4.25%		
					**** Projected Benefit Payments reflect statutory interest rate of 7.5% effective June 30, 2017		
2018	23,056	4,390	4,390	0	4,102	0	4,210
2019	22,167	4,492	4,492	0	3,923	0	4,133
2020	21,205	4,591	4,591	0	3,748	0	4,052
2021	20,133	4,692	4,692	0	3,579	0	3,971
2022	18,992	4,772	4,772	0	3,403	0	3,875
2023	17,774	4,857	4,857	0	3,236	0	3,783
2024	16,722	4,945	4,945	0	3,079	0	3,694
2025	15,659	5,029	5,029	0	2,927	0	3,603
2026	14,594	5,108	5,108	0	2,778	0	3,511
2027	13,535	5,217	5,217	0	2,652	0	3,439
2028	12,442	5,319	5,319	0	2,527	0	3,363
2029	11,324	5,410	5,410	0	2,402	0	3,281
2030	10,200	5,523	5,523	0	2,292	0	3,213
2031	9,043	5,638	5,638	0	2,187	0	3,146
2032	7,782	5,743	5,743	0	2,081	0	3,074
2033	6,428	5,862	5,862	0	1,986	0	3,009
2034	4,964	5,972	5,972	0	1,891	0	2,941
2035	3,379	6,068	6,068	0	1,795	0	2,866
2036	1,687	6,167	0	6,167	0	3,161	2,794
2037	0	6,252	0	6,252	0	3,094	2,717
2038	0	6,315	0	6,315	0	3,017	2,632
2039	0	6,380	0	6,380	0	2,943	2,551
2040	0	6,425	0	6,425	0	2,861	2,464
2041	0	6,443	0	6,443	0	2,770	2,370
2042	0	6,482	0	6,482	0	2,690	2,287
2043	0	6,496	0	6,496	0	2,603	2,199

Actuarial Present Value of Projected Benefit Payments
(\$ in Millions)

Fiscal Year End	Projected Beginning Fiduciary Net Position	Projected Benefit Payments	"Funded" Portion of Benefit Payments	"Unfunded" Portion of Benefit Payments	Present Value of "Funded" Benefit Payments*	Present Value of "Unfunded" Benefit Payments**	Present Value of Total Benefit Payments***
2044	0	6,498	0	6,498	0	2,514	2,109
2045	0	6,546	0	6,546	0	2,445	2,038
2046	0	6,549	0	6,549	0	2,362	1,956
2047	0	6,531	0	6,531	0	2,273	1,871
2048	0	6,535	0	6,535	0	2,196	1,796
2049	0	6,509	0	6,509	0	2,112	1,716
2050	0	6,474	0	6,474	0	2,028	1,637
2051	0	6,460	0	6,460	0	1,954	1,567
2052	0	6,408	0	6,408	0	1,871	1,491
2053	0	6,355	0	6,355	0	1,791	1,418
2054	0	6,321	0	6,321	0	1,720	1,353
2055	0	6,220	0	6,220	0	1,634	1,277
2056	0	6,139	0	6,139	0	1,557	1,209
2057	0	6,010	0	6,010	0	1,472	1,135
2058	0	5,854	0	5,854	0	1,384	1,061
2059	0	5,697	0	5,697	0	1,300	990
2060	0	5,510	0	5,510	0	1,214	918
2061	0	5,324	0	5,324	0	1,133	851
2062	0	5,122	0	5,122	0	1,052	785
2063	0	4,910	0	4,910	0	974	722
2064	0	4,693	0	4,693	0	898	662
2065	0	4,470	0	4,470	0	826	605
2066	0	4,242	0	4,242	0	757	551
2067	0	4,010	0	4,010	0	691	499
2068	0	3,775	0	3,775	0	628	451
2069	0	3,539	0	3,539	0	568	405
2070	0	3,301	0	3,301	0	512	363
2071	0	3,064	0	3,064	0	459	323
2072	0	2,828	0	2,828	0	409	286
2073	0	2,594	0	2,594	0	362	252
2074	0	2,365	0	2,365	0	318	220
2075	0	2,141	0	2,141	0	278	191

**Actuarial Present Value of Projected Benefit Payments
(\$ in Millions)**

Fiscal Year End	Projected Beginning Fiduciary Net Position	Projected Benefit Payments	"Funded" Portion of Benefit Payments	"Unfunded" Portion of Benefit Payments	Present Value of "Funded" Benefit Payments*	Present Value of "Unfunded" Benefit Payments**	Present Value of Total Benefit Payments***
2076	0	1,924	0	1,924	0	242	165
2077	0	1,716	0	1,716	0	208	141
2078	0	1,517	0	1,517	0	177	119
2079	0	1,329	0	1,329	0	150	100
2080	0	1,152	0	1,152	0	126	83
2081	0	989	0	989	0	104	69
2082	0	838	0	838	0	85	56
2083	0	702	0	702	0	69	45
2084	0	580	0	580	0	55	36
2085	0	472	0	472	0	43	28
2086	0	378	0	378	0	33	21
2087	0	298	0	298	0	25	16
2088	0	231	0	231	0	19	12
2089	0	176	0	176	0	14	9
2090	0	132	0	132	0	10	6
2091	0	97	0	97	0	7	4
2092	0	70	0	70	0	5	3
2093	0	49	0	49	0	3	2
2094	0	34	0	34	0	2	1
2095	0	23	0	23	0	1	1
2096	0	15	0	15	0	1	1
2097	0	10	0	10	0	1	0
2098	0	6	0	6	0	0	0
2099	0	4	0	4	0	0	0
2100	0	2	0	2	0	0	0
2101	0	1	0	1	0	0	0
2102	0	1	0	1	0	0	0
2103	0	0	0	0	0	0	0
2104	0	0	0	0	0	0	0
2105	0	0	0	0	0	0	0
2106	0	0	0	0	0	0	0
2107	0	0	0	0	0	0	0

**Actuarial Present Value of Projected Benefit Payments
(\$ in Millions)**

Fiscal Year End	Projected Beginning Fiduciary Net Position	Projected Benefit Payments	"Funded" Portion of Benefit Payments	"Unfunded" Portion of Benefit Payments	Present Value of "Funded" Benefit Payments*	Present Value of "Unfunded" Benefit Payments**	Present Value of Total Benefit Payments***
2108	0	0	0	0	0	0	0
2109	0	0	0	0	0	0	0
2110	0	0	0	0	0	0	0
2111	0	0	0	0	0	0	0
2112	0	0	0	0	0	0	0
2113	0	0	0	0	0	0	0
2114	0	0	0	0	0	0	0
2115	0	0	0	0	0	0	0
2116	0	0	0	0	0	0	0

Glossary

Actuarially Determined Contribution	A target or recommended contribution to a defined benefit pension plan for the reporting period, determined based on the funding policy and most recent measurement available when the contribution for the reporting period was adopted.
Deferred Inflows/Outflows of Resources	Portion of changes in net pension liability that is not immediately recognized in Pension Expense. These changes include differences between expected and actual experience, changes in assumptions, and differences between expected and actual earnings on plan investments.
Discount Rate	Single rate of return that, when applied to all projected benefit payments, results in an actuarial present value of projected benefit payments equal to the sum of: <ol style="list-style-type: none">1) The actuarial present value of benefit payments projected to be made in future periods where the plan assets are projected to be sufficient to meet benefit payments, calculated using the Long-Term Expected Rate of Return.2) The actuarial present value of projected benefit payments not included in (1), calculated using the Municipal Bond Rate.
Fiduciary Net Position	Equal to market value of assets.
Long-Term Expected Rate of Return	Long-term expected rate of return on pension plan investments expected to be used to finance the payment of benefits, net of investment expenses.
Money-Weighted Rate of Return	The internal rate of return on pension plan investments, net of investment expenses.
Municipal Bond Rate	Yield or index rate for 20-year, tax-exempt general obligation municipal bonds with an average rating of AA/Aa or higher.
Net Pension Liability	Total Pension Liability minus the Plan's Fiduciary Net Position (unfunded accrued liability).
Projected Benefit Payments	All benefits estimated to be payable through the pension plan to current active and inactive employees as a result of their past service and expected future service.
Service Cost	The portion of the actuarial present value of projected benefit payments that is attributed to a valuation year.
Total Pension Liability	The portion of actuarial present value of projected benefit payments that is attributable to past periods of member service using the Entry Age Normal cost method based on the requirements of GASB 67 and 68.