

West Virginia  
Teachers' Retirement System

Actuarial Valuation As of July 1, 2016

April 2017

April 25, 2017

West Virginia Consolidated Public Retirement Board  
West Virginia Teachers' Retirement System  
4101 MacCorkle Avenue, SE  
Charleston, WV 25304

Dear Board Members:

We respectfully present our report on the actuarial valuation of the West Virginia Teachers' Retirement System (TRS) as of July 1, 2016. This valuation presents the liabilities of the plan as of the valuation date and the projected Employer contribution for fiscal year 2018.

The valuation assumptions for mortality, withdrawal rates, disability rates, retirement rates, salary scale, and non-contributory service loads were changed to reflect the most recent experience study.

This report reflects the Board's adoption of a change in the asset valuation method used for TRS from market value to a four-year smoothed actuarial value effective July 1, 2016.

The valuation reflects the Tier 2 benefit structure, which was established during the 2015 legislative session under SB 529. The Tier 2 benefits apply to TRS participants who were hired for the first time on or after July 1, 2015. The legislation made the following changes to the benefits of such members:

- Increased the normal retirement eligibility to age 62 after 10 years of service;
- Removed eligibility for unreduced early retirement benefit at age 55 after 30 years of service, and at any age after 35 years of service,
- Increased the reduced early retirement eligibility requirements to the earliest i) attainment of age 60 with 10 years of service, ii) attainment of age 57 with 20 years of service, and iii) attainment of age 55 with 30 years of service;
- Increased the deferred retirement eligibility requirements to the earlier of i) attainment of age 64 with 10 years of service and ii) attainment of age 63 with 20 years of service;
- Removed the use of unused sick or annual leave towards extra credited service; and
- Permitted the purchase of up to five years of military service.

The valuation results indicate:

- The State contribution to TRS for fiscal year 2018 is \$443,800,000. The State appropriation needed for fiscal year 2018 for the Teachers' Retirement Plans (TRS and TDC) under the School Aid Formula is \$416,088,000.
- The funded percentage of plan assets to the actuarial accrued liability at the valuation date is 62%, compared to 66% for the prior year.

This report contains supporting data and background information pertaining to the development of costs and related liabilities of the plan. The valuation is based on membership data as of June 30,

2016 maintained by the West Virginia Consolidated Public Retirement Board and financial information received from the West Virginia Investment Management Board.

This report presents fairly the actuarial position of the West Virginia Teachers' Retirement System (TRS) as of July 1, 2016 in accordance with generally accepted actuarial principles applied on a basis consistent with that of the preceding valuation. In our opinion, the assumptions used in preparing the liabilities and costs are individually reasonable in respect to TRS experience and represent our best estimate of anticipated experience under TRS. The assumptions were developed in accordance with the guidance set forth in the various Actuarial Standards of Practice, including ASOPs 27 and 35. In particular, the mortality assumptions were developed in accordance with the recommendation that an appropriate margin for future improvement in mortality beyond the measurement date be included.

Future actuarial measurements may differ significantly from current measurements due to plan experience differing from that anticipated by the economic and demographic assumptions, changes expected as part of the natural operation of the methodology used for these measurements, and changes in plan provisions, or applicable law or regulations. An analysis of the potential range of such future differences is beyond the scope of this report.

Where presented, references to "funded ratio" and "unfunded accrued liability" typically are measured on an actuarial value of assets basis. It should be noted that the same measurements using market value of assets would result in different funded ratios and unfunded accrued liabilities. Moreover, the funded ratio presented is appropriate for evaluating the need and level of future contributions but makes no assessment regarding the funded status of the plan if the plan were to settle (i.e., purchase annuities to cover) a portion or all of its liabilities.

The valuation results are based on liabilities used for funding purposes only. Measurements made for financial reporting purposes under GASB Statements Nos. 67 and 68 are reported separately.

Use of this report for any other purpose may not be appropriate and may result in mistaken conclusions due to failure to understand applicable assumptions, methodologies, or inapplicability of the report for that purpose. Because of the risk of misinterpretation of actuarial results, Conduent should be asked to review any statement to be made on the basis of results contained in this report. Conduent will accept no liability for any such statement made without such prior review.

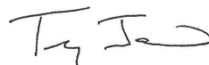
We are Fellows of the Society of Actuaries and Members of the American Academy of Actuaries. We meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained in this report. This report has been prepared in accordance with all applicable Actuarial Standards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

Conduent HR Services



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# 1. Summary of Valuation

This report presents the results of the July 1, 2016 actuarial valuation of the West Virginia Teachers' Retirement System and includes the projected employer contribution requirement for FY 2018. A summary of the plan features, a summary of the method, factors and assumptions, and supplementary membership tables used in the valuation are also included.

## Valuation Results

The West Virginia Teachers' Retirement System (TRS) is a defined benefit plan covering education employees hired prior to July 1, 1991, or hired on and after July 1, 2005, and prior Teachers' Defined Contribution Plan (TDC) members who elected to transfer from TDC to TRS effective July 1, 2008 or August 1, 2008. The plan provides unreduced monthly benefits to Tier 1 members upon retirement after 35 years of service, or at age 60 after completing 5 years of service. Tier 2 members are eligible for unreduced monthly benefits upon retirement at age 62 after completing 10 years of service. The plan also provides reduced early retirement benefits, benefits in the event of disability or death while active, and deferred benefits to members who terminate prior to retirement, providing plan eligibility conditions are met.

The plan is funded through member contributions of 6% of payroll and employer contributions sufficient to provide for any remaining normal cost (after member contributions are accounted for) and to amortize the unfunded liability as a level-dollar amount starting from FY 2009.

The major purpose of this valuation is to determine the amount of appropriation needed for FY 2018 for West Virginia's Teachers Retirement Plans under the School Aid Formula (SAF), which is determined to be \$416,088,000. Two components of the SAF determination are calculated in the valuation process: the contributions required from the State for TRS, and a projection of the State's contributions to TDC, both for FY 2018.

The State's contribution to TRS is based on an actuarial valuation of the provisions of the State code and the participant data, in consideration of the assets held in trust for TRS. The details of the TRS contribution for FY 2018 are shown in Table 1.

The State's TRS contribution for FY 2018, assuming a mid-year payment, consists of three separate components:

- The State share of the normal cost,
- The amount needed to fund the unfunded actuarial accrued liability, net of the liability for recent benefit changes, over a 40-year period which began in 1994 (as required by Section 18-9A-6a of the State code), and
- The amount required to separately amortize the liability for recent benefit changes. For FY 2018, there are no separate amortizations.

The total State TRS contribution on this basis is \$443,800,000.

Starting with FY 2009, the annual amortization payment toward the unfunded liability is determined as a level-dollar amount that is amortized over a 40-year period from July 1, 1994. In prior years, the amortization was determined as a level percentage of the projected total education payroll. The total amount contributed to the plan from FY 2009 forward will fund the normal cost plus interest and principal on the unfunded liability, fully amortizing the unfunded liability by the end of FY 2034.

Table 2 presents the development of the School Aid Formula, separately identifying the TRS contribution based on the original 40-year amortization period, any special payments toward the additional unfunded due to recent plan improvements, and other specific components. Detailed projections of the balance of the 40-year funding program under the level-dollar amortization schedule, net of any separately funded improvements, are shown in Tables 3 and 4.

# 1. Summary of Valuation

The projected TDC contribution for FY 2018 for the School Aid Formula is based on projected payroll for that participant population. The split of both the TRS and the TDC contributions is based on information provided by the state Education Department. The projected fire insurance premium tax shown in Table 2 was provided by the Department of Administration.

## Comments on Valuation Results

Table 1 presents the development of the valuation results as of July 1, 2016 and, for comparison purposes, July 1, 2015. Based on the prior year's projections, the expected unfunded actuarial accrued liability as of July 1, 2016 was \$3.442 billion. The actual unfunded liability at the valuation date is \$3.668 billion, an increase of \$0.226 billion.

The increase in the unfunded liability was primarily due to the following:

- The return on assets for the year ending June 30, 2016 was approximately (0.3)%. This return was well below the prior year's valuation assumption of 7.50% and increased the unfunded liability by approximately \$524 million.
- The change in asset method decreased the unfunded liability by approximately \$393 million.
- Assumption changes effective July 1, 2016 for mortality, withdrawal rates, disability rates, retirement rates, salary scale, and non-contributory service loads increased the unfunded liability by approximately \$196 million
- Contributions greater than expected decreased the unfunded liability by approximately \$42 million.
- The combined impact of turnover, mortality, and retirement experience decreased the unfunded liability by approximately \$59 million.

Tables 3 and 4 present projections of the unfunded accrued liability, net of any separately funded liability, to June 30, 2034. Table 3 illustrates the expected pattern of change in the unfunded liability over the remaining 18-year period. The unfunded liability is expected to decrease steadily to zero at the end of the period. Table 4 presents the expected funding progress toward the unfunded actuarial accrued liability based on the funding policy. This table illustrates the expected dollar amount of change in this component of the unfunded liability from year to year.

Table 5 presents a cash flow projection of expected asset balances, contributions, disbursements, and earnings over the period to FY 2034.

The valuation results were determined using an interest rate of 7.5% with an underlying inflation assumption of 3.0%.

## Plan Membership

A summary of plan membership, with a comparison to the prior year, follows:

Group	July 1, 2016	July 1, 2015
Actives	35,811	35,788
Retirees & Beneficiaries	35,440	34,738
Terminated Vested	1,867	1,707
Terminated Non-Vested	<u>3,258</u>	<u>2,891</u>
Total	76,376	75,124

Table 8 presents a reconciliation of plan membership during the year. Table 9 presents detailed information on the categories of plan membership.

# 1. Summary of Valuation

Tables 10(a) and 10(b) present the number and total annual compensation of actives, separately for Teachers and Non-Teachers (including State), by 5-year age and service groups as of July 1, 2016.

Table 11 presents the number and average monthly benefits of retirees and beneficiaries included in the valuation distributed by 5-year age groups. Table 12 shows a similar distribution for terminated vested participants entitled to deferred benefits.

# 1. Summary of Valuation

**Table 1**  
**Development of Valuation Results (000's omitted)**

Valuation Date	July 1, 2016	July 1, 2015
1. Present Value of Future Benefits		
a. Active	\$ 4,761,421	\$ 4,743,343
b. Inactive - Retirees	6,780,193	6,448,659
- Disabled Retirees	210,255	214,159
- Beneficiaries	241,501	224,200
- Vested Terminated	88,544	77,730
- Non-Vested Terminated	13,072	11,597
c. Total	\$ 12,094,986	\$ 11,719,688
2. Actuarial Accrued Liability	\$ 10,604,279	\$ 10,310,652
3. Actuarial Value of Assets	6,936,281	6,803,089
4. Unfunded Actuarial Accrued Liability (UAL)	\$ 3,667,998	\$ 3,507,563
5. Annual Normal Cost Rate: <b>Type 1 (Pre 7/1/1991 Group)</b>		
a. Present Value of Future Normal Costs	\$ 81,637	\$ 102,562
b. Present Value of Future Pay	\$ 778,581	\$ 1,011,244
c. Normal Cost Rate as a % of Payroll	10.49%	10.14%
d. Employee share	6.00%	6.00%
e. Employer share	4.49%	4.14%
f. TRS FY 2017 (2016) Normal Cost Payroll	\$ 217,525	\$ 265,213
g. Employer FY 2017 (2016) Normal Cost (BOY)	\$ 9,767	\$ 10,980
h. TRS FY 2018 (2017) Normal Cost Payroll	\$ 182,703	\$ 227,432
i. Employer FY 2018 (2017) Normal Cost (BOY)	\$ 8,203	\$ 9,416
6. Annual Normal Cost Rate: <b>Type 3 (Post 6/30/2005 Group)</b>		
a. Present Value of Future Normal Costs	\$ 1,409,070	\$ 1,306,474
b. Present Value of Future Pay	\$ 13,060,478	\$ 12,471,568
c. Normal Cost Rate as a % of Payroll	10.79%	10.48%
d. Employee share	6.00%	6.00%
e. Employer share	4.79%	4.48%
f. TRS FY 2017 (2016) Normal Cost Payroll	\$ 1,287,555	\$ 1,246,058
g. Employer FY 2017 (2016) Normal Cost (BOY)	\$ 61,674	\$ 55,823
h. TRS FY 2018 (2017) Normal Cost Payroll	\$ 1,377,736	\$ 1,339,070
i. Employer FY 2018 (2017) Normal Cost (BOY)	\$ 65,994	\$ 59,990



# 1. Summary of Valuation

**Table 1 (continued)**  
**Development of Valuation Results (000's omitted)**

Valuation Date	July 1, 2016	July 1, 2015
7. Employer Contribution for FY 2017 and FY 2018, (FY 2016 and FY 2017), assumes mid-year contribution:		
a. FY 2017 (2016)	FY 2017	FY 2016
i. TRS and TDC Payroll	\$ 1,638,863	\$ 1,649,307
ii. FY 2017 (2016) TRS Contribution		
A. Normal Cost	74,072	69,263
B. Amortization components:		
- Original UAL over 40 years as a level-dollar amount	364,489	339,689
C. Total	\$ 438,561	\$ 408,952
iii. FY 2017 (2016) Contribution as a % of Payroll	26.76%	24.80%
b. FY 2018 (2017)	FY 2018	FY 2017
i. TRS and TDC Payroll	\$ 1,691,306	\$ 1,702,084
ii. FY 2018 (2017) TRS Contribution		
A. Normal Cost	76,929	71,962
B. Amortization components:		
- Original UAL over 40 years as a level-dollar amount	366,871	342,014
C. Total	\$ 443,800	\$ 413,976
iii. FY 2018 (2017) Contribution as a % of Payroll	26.24%	24.32%
iv. FY 2018 (2017) SAF appropriation <sup>1</sup>	\$ 416,088	\$ 388,098
v. FY 2018 (2017) SAF appropriation as a % of Payroll	24.60%	22.80%

<sup>1</sup> The School Aid Formula retirement allocation includes the amount that the State appropriates for the Teachers Defined Contribution Plan and required payments toward the TRS Unfunded Actuarial Accrued Liabilities. It does NOT include amounts contributed to TRS by nonstate groups or the fire premium tax.

# 1. Summary of Valuation

**Table 2**  
**Development of School Aid Formula Appropriation for Fiscal Year 2018 (000's omitted)**

TRs Contribution for FY 2018	\$ 443,800
+ 7.50% x School Aid Formula (TDC only) <sup>1</sup>	7,375
- 15.0% x County Portion of the Old Group TRS payroll <sup>2</sup>	(6,978)
- 7.5% x County Portion of the New Group TRS payroll <sup>3</sup>	(26,259)
- Fire Tax Per Code Section 33-3-14(d)	(3,440)
+ State payment equal to TDC forfeitures <sup>4</sup>	<u>1,590</u>
Subtotal of Standard SAF Appropriation	\$ 416,088
Special Payments for Benefit Improvements under H.B. 3145	<u>-</u>
Total FY 2018 SAF Appropriation	\$ 416,088

<sup>1</sup> School Aid Formula for TDC only is 74.11% of FY 2018 TDC pay for County employees plus FY 2018 TDC pay for State employees = 74.11% x \$125,665 + \$5,203 = 98,333.

<sup>2</sup> County portion of the Old Group TRS payroll is 25.89% of FY 2018 TRS pay for County employees = 25.89% x \$179,681 = \$46,519.

<sup>3</sup> County portion of the New Group TRS payroll is 25.89% of FY 2018 TRS pay for County employees = 25.89% x \$1,352,345 = \$350,122.

<sup>4</sup> Actual amount to be released from the TDC suspense account at 6/30/2016 per Code Section 18-7A-18a(b).

# 1. Summary of Valuation

**Table 3**  
**Projection of Unfunded Accrued Liability and Annual Contributions (000's omitted)**

FY Ending 6/30	Unfunded AAL BOY <sup>1</sup>	Employer Normal Cost (MOY) <sup>2</sup>		Projected Payroll			Total Type 1 Employer Contribution (MOY) <sup>3</sup>		Total Type 3 Employer Contribution (MOY)	
		Type 1	Type 3	Type 1 TRS	Type 3 TRS	TRS+TDC	% of Payroll	Amount	% of Payroll	Amount
2017	\$ 3,667,998	\$ 9,763	\$ 62,199	\$ 217,525	\$ 1,287,555	\$ 1,638,863	21.46%	\$ 351,777	3.80%	\$ 62,199
2018	3,588,490	8,505	68,424	182,703	1,377,736	1,691,306	22.19%	375,376	4.05%	68,424
2019	3,477,247	7,198	72,672	154,607	1,463,275	1,745,428	21.43%	374,069	4.16%	72,672
2020	3,357,661	5,986	76,912	128,580	1,548,672	1,801,282	20.70%	372,857	4.27%	76,912
2021	3,229,106	4,892	81,152	105,081	1,634,038	1,858,923	20.00%	371,763	4.37%	81,152
2022	3,090,909	3,955	85,329	84,971	1,718,148	1,918,408	19.33%	370,826	4.45%	85,329
2023	2,942,347	3,146	89,489	67,564	1,801,891	1,979,797	18.69%	370,017	4.52%	89,489
2024	2,782,643	2,467	93,618	52,979	1,885,024	2,043,151	18.08%	369,338	4.58%	93,618
2025	2,610,961	1,911	97,736	41,045	1,967,956	2,108,532	17.49%	368,782	4.64%	97,736
2026	2,426,403	1,464	101,854	31,438	2,050,886	2,176,005	16.93%	368,335	4.68%	101,854
2027	2,228,003	1,098	106,009	23,592	2,134,538	2,245,637	16.39%	367,969	4.72%	106,009
2028	2,014,723	808	110,184	17,343	2,218,595	2,317,497	15.87%	367,679	4.75%	110,184
2029	1,785,447	582	114,417	12,504	2,303,833	2,391,657	15.36%	367,453	4.78%	114,417
2030	1,538,976	414	118,711	8,881	2,390,302	2,468,190	14.88%	367,285	4.81%	118,711
2031	1,274,019	286	123,099	6,154	2,478,638	2,547,172	14.41%	367,157	4.83%	123,099
2032	989,190	197	127,566	4,228	2,568,608	2,628,682	13.96%	367,068	4.85%	127,566
2033	682,999	131	132,147	2,805	2,660,831	2,712,800	13.53%	367,002	4.87%	132,147
2034	353,844	83	136,839	1,791	2,755,297	2,799,609	13.11%	366,954	4.89%	136,839

<sup>1</sup> Net of any separately funded liability for benefit increases.

<sup>2</sup> Net of member contributions.

<sup>3</sup> Net of any amortization amounts for separately funded benefit increases.

# 1. Summary of Valuation

**Table 4**  
**Funding Progress of Unfunded Actuarial Accrued Liability Under Current Funding Policy (000's omitted)**

<b>FY Ending 6/30</b>	<b>Unfunded AAL BOY <sup>1</sup></b>	<b>Interest on Unfunded at 7.50%</b>	<b>MOY Contribution Toward Unfunded <sup>2</sup></b>	<b>Unfunded Funding Progress <sup>3</sup></b>
2017	\$ 3,667,998	\$ 275,100	\$ 342,014	\$ 79,508
2018	3,588,490	269,137	366,871	111,243
2019	3,477,247	260,794	366,871	119,586
2020	3,357,661	251,825	366,871	128,555
2021	3,229,106	242,183	366,871	138,197
2022	3,090,909	231,818	366,871	148,562
2023	2,942,347	220,676	366,871	159,704
2024	2,782,643	208,698	366,871	171,682
2025	2,610,961	195,822	366,871	184,558
2026	2,426,403	181,980	366,871	198,400
2027	2,228,003	167,100	366,871	213,280
2028	2,014,723	151,104	366,871	229,276
2029	1,785,447	133,909	366,871	246,471
2030	1,538,976	115,423	366,871	264,957
2031	1,274,019	95,551	366,871	284,829
2032	989,190	74,189	366,871	306,191
2033	682,999	51,225	366,871	329,155
2034	353,844	26,538	366,871	353,842

<sup>1</sup> Net of any separately funded liability for benefit increases.

<sup>2</sup> Net of employer contribution toward normal cost and any separately funded benefit increases.

<sup>3</sup> Equals (MOY Contribution) x 1.03682 - (Interest on Unfunded)

# 1. Summary of Valuation

**Table 5**  
**Cash Flow Projection FY 2017 Through FY 2034 (000's omitted)**

<b>FY Ending 6/30</b>	<b>MV Assets Beg. of Year</b>	<b>Expected</b>			<b>Net Income</b>		<b>MV Assets End of Year</b>
		<b>Contributions</b>	<b>Benefits</b>	<b>Earnings</b>			
2017	\$ 6,543,087	\$ 504,281	\$ 814,013	\$ 479,327	\$ 169,595	\$ 6,712,682	
2018	6,712,682	537,426	821,131	493,005	209,300	6,921,982	
2019	6,921,982	543,814	839,950	508,244	212,108	7,134,090	
2020	7,134,090	550,404	857,020	523,767	217,151	7,351,241	
2021	7,351,241	557,262	872,430	539,738	224,570	7,575,811	
2022	7,575,811	564,342	885,682	556,353	235,013	7,810,824	
2023	7,810,824	571,673	896,544	573,849	248,978	8,059,802	
2024	8,059,802	579,236	905,144	592,485	266,577	8,326,379	
2025	8,326,379	587,058	911,591	612,528	287,995	8,614,374	
2026	8,614,374	595,128	916,030	634,262	313,360	8,927,734	
2027	8,927,734	603,466	920,094	657,921	341,293	9,269,027	
2028	9,269,027	612,019	923,172	683,720	372,567	9,641,594	
2029	9,641,594	620,850	925,584	711,899	407,165	10,048,759	
2030	10,048,759	629,947	927,135	742,714	445,526	10,494,285	
2031	10,494,285	639,344	928,528	776,423	487,239	10,981,524	
2032	10,981,524	649,004	929,842	813,273	532,435	11,513,959	
2033	11,513,959	658,967	930,939	853,532	581,560	12,095,519	
2034	12,095,519	669,218	931,200	897,517	635,535	12,731,054	

# 1. Summary of Valuation

**Table 6a**  
Valuation Assets as of June 30, 2016 (000's omitted)

	June 30, 2016	June 30, 2015
<b>Assets</b>		
Cash with State Treasurer	\$ 116	\$ 20,329
Investments at Fair Value	6,513,313	6,753,118
Contributions Receivable	26,213	25,119
Participant Loans Receivable	2,705	3,389
Miscellaneous Revenue Receivable	740	1,134
Total Assets	<u>\$ 6,543,087</u>	<u>\$ 6,803,089</u>
<b>Liabilities</b>		
Accrued Expenses and Other Payables	<u>-</u>	<u>-</u>
Market Value of Assets	\$ 6,543,087	\$ 6,803,089
Adjustment for Deferred Gains / (Losses)	<u>(393,194)</u>	<u>-</u>
Actuarial Value of Assets	\$ 6,936,281	\$ 6,803,089

**Table 6b**  
Four-Year Asset Smoothing as of June 30, 2016 (000's omitted)

FY Ending 6/30	Gain/(Loss) on Actuarial Value of Assets	Percent Deferred	Gain/(Loss) Deferred as of June 30, 2016	Gain/(Loss) Recognized for FY ending June 30, 2016
2016	\$ (524,259)	75%	\$ (393,194)	\$ (131,065)
2015	-	50%	-	-
2014	-	25%	-	-
2013	-	0%	-	-
			<u>\$ (393,194)</u>	<u>\$ (131,065)</u>

# 1. Summary of Valuation

**Table 7**

**Statement of Changes in Market Value of Assets for Year ended June 30, 2016 (000's omitted)**

Market Value of Assets - Beginning of Year	\$	6,803,089
Post Valuation Adjustment		253
Market Value of Assets - After Adjustment	\$	6,803,342
Additions:		
Contributions:		
Member Type 1	\$	16,626
Member Type 3		76,689
Employer Type 1		9,323
Employer Type 3		20,894
School Aid Formula		358,506
Make Up Contributions		-
Special Appropriations		34,472
Voluntary Special Contribution Members		1,861
Special Contribution Required Employers		-
Contribution Delinquency Fees		43
§33-3-14(d) Fees		3,440
Subtotal	\$	521,854
Investment Income:		
Net Appreciation in Fair Value <sup>1</sup>		(18,714)
Interest		312
Subtotal	\$	(18,402)
Other Income		436
Total	\$	503,888
Deductions and Transfers:		
Benefit Expense	\$	749,139
Refunds of Contributions		10,364
Administrative Expenses		4,507
TDC to TRS Accounts for Transfers		10
Transfers to/(from) other plans		123
Total	\$	764,143
Net Increase	\$	(260,255)
Market Value of Assets - End of Year	\$	6,543,087
Investment Return for Year:		
Valuation purposes (assumes mid-year transactions and offsets investment income by investment and administrative expenses)		-0.34%
Per Investment Management Board (time-weighted, excluding administrative expense)		-0.10%

<sup>1</sup> Net of Investment Expense

# 1. Summary of Valuation

**Table 8**  
**Reconciliation of Plan Participants**

	Active	Non-Vested Terms	Vested Terms	Service Retirees	Disabled Retirees	Beneficiaries	Total
Census as of July 1, 2015	35,788	2,891	1,707	30,007	2,203	2,528	75,124
New Entrants	2,728	89	-	-	-	227	3,044
Returned to Active Status	223	(187)	(36)	-	-	-	-
Terminated Non-Vested	(628)	628	-	-	-	-	-
Terminated Vested	(357)	-	357	-	-	-	-
Withdrew Contributions	(424)	(118)	(54)	-	-	-	(596)
Retired	(1,403)	-	(90)	1,493	-	-	-
Disabled	(67)	-	(9)	-	76	-	-
Deceased	(41)	(3)	(9)	(882)	(86)	(125)	(1,146)
Certain Period Expired	-	-	-	-	-	(5)	(5)
Adjustments	(8)	(42)	1	5	-	(1)	(45)
Census as of July 1, 2016	35,811	3,258	1,867	30,623	2,193	2,624	76,376



# 1. Summary of Valuation

**Table 9**  
**Summary of Membership**

	July 1, 2016 Valuation	July 1, 2015 Valuation
<b>Active Members:</b>		
Teachers	21,445	21,474
Non-Teachers (including State)	14,366	14,314
Total	<u>35,811</u>	<u>35,788</u>
<b>Inactive Members:</b>		
Service Retirees	30,623	30,007
Disabled Retirees	2,193	2,203
Beneficiaries	2,624	2,528
Vested Terminated	1,867	1,707
Non-Vested Terminated	3,258	2,891
Total	<u>40,565</u>	<u>39,336</u>
<b>Total Members</b>	76,376	75,124

# 1. Summary of Valuation

**Table 10(a)**  
**Distribution of the Number and Total Annual Compensation of Active Teachers as of July 1, 2016**

Attained Age	Years of Credited Service													Total Count / Total Comp						
	0 - 4		5 - 9		10 - 14		15 - 19		20 - 24		25 - 29		30 - 34		35 - 39		40 & over			
	Count / Total Comp	Count / Total Comp	Count / Total Comp	Count / Total Comp	Count / Total Comp	Count / Total Comp	Count / Total Comp	Count / Total Comp	Count / Total Comp	Count / Total Comp	Count / Total Comp	Count / Total Comp	Count / Total Comp		Count / Total Comp	Count / Total Comp	Count / Total Comp	Count / Total Comp	Count / Total Comp	
Under 25	482	17,300,376																482	17,300,376	
25 - 29	2,048	79,537,239	492	21,168,951														2,540	100,706,190	
30 - 34	1,086	43,609,594	1,745	78,347,847	322	15,867,768												3,153	137,825,210	
35 - 39	1,023	41,003,925	1,046	48,212,218	1,135	57,803,846	51	3,019,180										3,255	150,039,167	
40 - 44	579	24,526,491	700	32,651,420	851	44,342,274	406	22,560,313	22	1,310,496								2,558	125,390,993	
45 - 49	433	18,630,498	603	29,135,752	654	34,185,437	551	31,748,359	252	15,260,626	84	5,026,079						2,577	133,986,750	
50 - 54	297	13,232,888	397	19,121,855	441	23,306,224	313	18,105,127	288	17,458,081	569	36,003,927	326	21,187,590				2,631	148,415,692	
55 - 59	190	8,902,665	278	13,896,792	328	17,403,149	282	15,983,808	218	13,111,478	377	23,777,465	500	33,991,887	237	16,844,227		2,410	143,911,469	
60 - 64	102	5,202,079	153	7,796,979	219	11,680,188	186	10,719,021	132	7,928,145	147	9,225,606	150	9,959,203	256	17,992,474	92	1,437	87,613,184	
65 - 69	34	1,759,372	32	1,722,715	61	3,255,249	38	2,309,322	22	1,402,424	34	2,216,880	27	1,934,905	26	1,692,757	64	338	20,938,080	
70 & over	6	277,057	8	434,304	10	548,896	3	213,038	5	308,441	9	594,130	5	318,743	4	295,695	14	64	4,059,836	
Total	6,280	253,982,184	5,454	252,488,832	4,021	208,393,030	1,830	104,658,166	939	56,779,691	1,220	76,844,087	1,008	67,392,327	523	36,825,153	170	12,823,478	21,445	1,070,186,947

# 1. Summary of Valuation

**Table 10(b)**  
**Distribution of the Number and Total Annual Compensation of Active Non-Teachers (including State Employees) as of July 1, 2016**

Attained Age	Years of Credited Service										Total Count / Total Comp
	0 - 4	5 - 9	10 - 14	15 - 19	20 - 24	25 - 29	30 - 34	35 - 39	40 & over		
Under 25	Count / Total Comp 119 2,901,606	Count / Total Comp 1 27,551	Count / Total Comp 32 1,124,440	Count / Total Comp 13 563,773	Count / Total Comp 4 135,222	Count / Total Comp 45,857	Count / Total Comp 3 139,764	Count / Total Comp 18 883,946	Count / Total Comp 5 237,621	Count / Total Comp 120 2,929,157	
25 - 29	Count / Total Comp 311 7,790,330	Count / Total Comp 50 1,635,522	Count / Total Comp 163 5,673,542	Count / Total Comp 72 2,781,540	Count / Total Comp 43 1,937,908	Count / Total Comp 49	Count / Total Comp 3	Count / Total Comp 135 6,998,865	Count / Total Comp 41 1,838	Count / Total Comp 361 9,425,852	
30 - 34	Count / Total Comp 376 9,564,236	Count / Total Comp 165 5,489,759	Count / Total Comp 304 9,948,733	Count / Total Comp 179	Count / Total Comp 6,523,441	Count / Total Comp 159	Count / Total Comp 18	Count / Total Comp 18 883,946	Count / Total Comp 25 535	Count / Total Comp 573 16,178,435	
35 - 39	Count / Total Comp 831 19,493,247	Count / Total Comp 339 10,130,549	Count / Total Comp 610 18,145,241	Count / Total Comp 468 15,422,969	Count / Total Comp 161 6,043,333	Count / Total Comp 245 10,215,182	Count / Total Comp 159	Count / Total Comp 135 6,998,865	Count / Total Comp 5 2,847	Count / Total Comp 1,346 35,861,111	
40 - 44	Count / Total Comp 679 16,254,954	Count / Total Comp 534 15,129,792	Count / Total Comp 385 11,574,744	Count / Total Comp 345 11,504,073	Count / Total Comp 129 4,911,390	Count / Total Comp 158 6,549,214	Count / Total Comp 94	Count / Total Comp 88 4,759,436	Count / Total Comp 41 1,838	Count / Total Comp 1,594 44,296,097	
45 - 49	Count / Total Comp 712 17,364,797	Count / Total Comp 701 19,297,774	Count / Total Comp 506 15,717,597	Count / Total Comp 179	Count / Total Comp 1,937,908	Count / Total Comp 2,346,866	Count / Total Comp 132	Count / Total Comp 18 883,946	Count / Total Comp 25 535	Count / Total Comp 2,193 63,328,147	
50 - 54	Count / Total Comp 621 14,885,467	Count / Total Comp 691 18,702,250	Count / Total Comp 703 21,066,698	Count / Total Comp 332 11,576,392	Count / Total Comp 95 3,783,385	Count / Total Comp 6,944,072	Count / Total Comp 132	Count / Total Comp 18 883,946	Count / Total Comp 5 2,847	Count / Total Comp 2,751 84,667,508	
55 - 59	Count / Total Comp 477 11,398,898	Count / Total Comp 587 15,727,564	Count / Total Comp 610 18,145,241	Count / Total Comp 468 15,422,969	Count / Total Comp 161 6,043,333	Count / Total Comp 245 10,215,182	Count / Total Comp 159	Count / Total Comp 135 6,998,865	Count / Total Comp 5 2,847	Count / Total Comp 2,847 92,356,562	
60 - 64	Count / Total Comp 290 6,969,991	Count / Total Comp 308 8,378,567	Count / Total Comp 385 11,574,744	Count / Total Comp 345 11,504,073	Count / Total Comp 129 4,911,390	Count / Total Comp 158 6,549,214	Count / Total Comp 94	Count / Total Comp 88 4,759,436	Count / Total Comp 41 1,838	Count / Total Comp 1,838 61,473,604	
65 - 69	Count / Total Comp 88 2,042,641	Count / Total Comp 109 2,850,157	Count / Total Comp 113 3,278,883	Count / Total Comp 84 2,734,935	Count / Total Comp 23 781,733	Count / Total Comp 48 1,860,403	Count / Total Comp 27	Count / Total Comp 18 921,711	Count / Total Comp 25 535	Count / Total Comp 17,197,317	
70 & over	Count / Total Comp 30 795,202	Count / Total Comp 41 1,195,637	Count / Total Comp 36 987,267	Count / Total Comp 22 623,593	Count / Total Comp 9 288,926	Count / Total Comp 20 816,642	Count / Total Comp 10	Count / Total Comp 21 911,530	Count / Total Comp 19 1,145,948	Count / Total Comp 208 7,179,555	
Total	Count / Total Comp 4,534 109,461,369	Count / Total Comp 3,526 98,565,121	Count / Total Comp 2,852 87,517,145	Count / Total Comp 1,515 51,730,716	Count / Total Comp 464 17,881,897	Count / Total Comp 28,778,235	Count / Total Comp 21,431,776	Count / Total Comp 14,475,487	Count / Total Comp 5,051,598	Count / Total Comp 434,893,345	

# 1. Summary of Valuation

**Table 11**  
**Distribution of the Number and Average Monthly Benefits of Retired Participants as of July 1, 2016**

Current Age	Service Retirees			Disabled Retirees			Beneficiaries			Total		
	Count	Avg. Age	Avg. Mo. Benefit	Count	Avg. Age	Avg. Mo. Benefit	Count	Avg. Age	Avg. Mo. Benefit	Count	Avg. Age	Avg. Mo. Benefit
under 35	-	-	-	-	-	-	20	29	974	20	29	974
35 - 39	-	-	-	4	37	815	16	38	1,369	20	37	1,258
40 - 44	-	-	-	6	43	635	18	43	690	24	43	676
45 - 49	-	-	-	28	47	754	38	47	733	66	47	742
50 - 54	33	54	2,223	105	53	973	70	52	958	208	53	1,166
55 - 59	1,364	58	3,040	312	57	1,062	115	57	976	1,791	58	2,563
60 - 64	5,733	62	2,626	481	62	1,073	239	62	1,313	6,453	62	2,461
65 - 69	8,635	67	2,270	574	67	959	388	67	1,236	9,597	67	2,150
70 - 74	5,174	72	1,836	392	72	829	352	72	1,106	5,918	72	1,726
75 - 79	3,795	77	1,435	194	76	641	390	77	918	4,379	77	1,354
80 - 84	2,857	82	1,170	52	81	507	389	82	860	3,298	82	1,123
85 - 89	1,943	87	1,006	28	87	451	342	87	789	2,313	87	968
90 - 94	813	92	880	13	91	372	193	92	686	1,019	92	837
95 & over	276	97	726	4	96	297	54	97	522	334	97	688
<b>Total</b>	<b>30,623</b>	<b>71</b>	<b>1,960</b>	<b>2,193</b>	<b>66</b>	<b>922</b>	<b>2,624</b>	<b>74</b>	<b>978</b>	<b>35,440</b>	<b>71</b>	<b>1,823</b>
<b>Total Annual Benefits</b>			<b>720,408,164</b>			<b>24,273,138</b>			<b>30,800,559</b>			<b>775,481,861</b>

# 1. Summary of Valuation

**Table 12**  
**Distribution of the Number and Average Monthly Benefits**  
**of Participants Entitled to Deferred Benefits as of July 1, 2016**

Current Age	Count	Deferred Vested	
		Avg. Age	Avg. Mo. Benefit
under 35	163	32	404
35 - 39	178	37	462
40 - 44	141	42	562
45 - 49	194	47	586
50 - 54	365	52	602
55 - 59	498	57	752
60 - 64	256	61	655
65 - 69	66	66	475
70 - 74	4	71	1,014
75 - 79	-	-	-
80 & over	2	86	1,480
<b>Total</b>	<b>1,867</b>	<b>51</b>	<b>611</b>
Total Annual Benefits			13,691,425

## 2. Summary of Plan Provisions

### System Name

The State Teachers' Retirement System (TRS)

### Effective Date

Originally enacted effective July 1, 1941.

### Member

Membership includes any employee hired before July 1991, or on or after July 1, 2005, in the public schools, state institutions of higher education, certain state departments, and the Board of Regents, and members of the Teachers' Defined Contribution Plan (TDC) who elected to transfer at July 1 or August 1, 2008. Other members of TDC or TIAA-CREF are not eligible for TRS.

Tier 2 provisions apply for employees who are hired for the first time on or after July 1, 2015.

### Final Average Salary

Final Average Salary is the average of the member's 5 highest fiscal years of total earnings from covered employment during the member's last 15 years of service.

### Contributions

#### Member Contributions

Members contribute 6.0% of their pay to the retirement system.

#### Employer Contributions – State

- 15.0% of the payroll of State-employed members,
- 15.0% of School Aid Formula (SAF) covered payroll of county-employed members,
- 7.5% of SAF-covered payroll of members of the TDC Plan,
- a certain percentage of fire insurance premiums paid by state residents, and
- under Code Section 18-9-A-6a, beginning in fiscal year 1996, an amount determined by the State Actuary as being needed to eliminate the TRS Unfunded Liability within 40 years of June 30, 1994.

#### Employer Contributions – County

15.0% of the payroll of TRS members hired before July 1, 1991 and 7.5% of the payroll for TRS members hired on or after July 1, 2005, and prior TDC members who transferred into TRS at July 1, 2008 or August 1, 2008, who are employed by county boards of education, which is not covered under the School Aid Formula.

### Service

#### Credited Service

Credited Service is granted for each day the member performs work and contributes to the System. At most one year of Credited Service may be earned in any one school year. Credited Service may be granted under certain guidelines for other State employment, for military service, and for out-of-state teaching service.

#### Contributory Service

Service credited for years in which a member contributes to the retirement system. Contributory service is counted for both eligibility and benefit determination.

#### Military Service

For Tier 1 members, in a period when a federal Selective Service Act was in effect, Active service in the U.S. military up to 25% of the amount of a member's Contributory Service (but not more than 10 years) will be counted for both eligibility and benefit determination under the retirement system.

## 2. Summary of Plan Provisions

Tier 2 members may purchase up to 5 years of active military service with the Armed Forces or National Guard.

### Purchased Service

Service in parochial school or with other states' teacher retirement systems may count for benefits (but not eligibility), provided that the member pays TRS double the amount contributed during the first year of employment times the number of years credited plus interest, and cashes out his rights to any future benefits under his prior retirement system.

### Unused Leave

A Tier 1 retiring member may choose to receive pension credited service for days of sick or annual leave unused at the time of retirement. Credited Service is granted at the rate of twice the actual number of unused days.

Tier 2 members are not eligible to apply unused sick or annual leave for additional credited service.

## Service Retirement

### Eligibility

A Tier 1 member may retire with an unreduced pension (1) at any age with 35 years of Credited Service, or (2) at age 60 with 5 years of Credited Service. A Tier 1 member may retire with 30 years of Credited Service at any age, with the pension reduced actuarially if retiring before age 55.

A Tier 2 member may retire with an unreduced pension at age 62 with 10 years of Credited Service. A Tier 2 member may retire (1) at age 60 with 10 years of Credited Service, (2) at age 57 with 20 years of Credited Service, or (3) at age 55 with 30 years of Credited Service, with the pension reduced actuarially if retiring before age 62.

### Amount

The normal form of benefit is a single life annuity paid monthly, in an amount equal to 2.0% of Final Average Salary times years of Credited Service. Other forms of benefit may be elected, subject to actuarial reduction, including a cash refund annuity, 50% or 100% joint and survivor annuities, and a 10-year certain and life annuity.

## Disability Retirement

### Eligibility

A member may be eligible to receive a disability retirement benefit after completing 10 years of Credited Service, if the member is disabled for 6 months, unable to perform his regular occupation and the Retirement Board expects the disability to be permanent.

### Amount

An annual disability benefit amount, payable monthly as a cash refund annuity, is equal to 2.0% of the member's Final Average Salary times the total years of Credited Service to date of disability.

## Deferred Vested Benefit

### Eligibility

A Tier 1 member leaving employment with 5 years of Contributory Service may elect to receive either a refund of contributions or a deferred pension commencing at age 62. If a member has 20 years of Contributory Service, the deferral age is age 60.

A Tier 2 member leaving employment with 10 years of Contributory Service may elect to receive either a refund of contributions or a deferred pension commencing at age 64. If a member has 20 years of Contributory Service, the deferral age is age 63.

## 2. Summary of Plan Provisions

### Amount

An annuity defined as described under “Service Retirement.”

### Pre-Retirement Death Benefits

#### Eligibility

The surviving spouse of a deceased member who had attained age 50 and completed 25 years of Credited Service is eligible for the Surviving Spouse Benefit. If a member dies prior to attaining age 50 or completing 25 years of Credited Service a Lump Sum Death Benefit is payable to the beneficiary.

#### Amount

##### To the Surviving Spouse

The surviving spouse receives an annuity payable as if the member had retired on the date of death with a 100% joint and survivor pension.

##### Lump Sum Death Benefit

The sum of the accumulated member contributions with interest and accumulated member contributions without interest is paid to the member’s beneficiary or estate.

### Refund of Contributions

#### Eligibility

A member who leaves employment and is not eligible for any other benefit will receive a refund of his contributions to the retirement system.

#### Amount

A lump sum of the member’s accumulated contributions, with compound interest computed on any contributed amount from the end of the fiscal year in which contributed to the date of distribution of the lump sum (but in no case beyond 5 years after the end of the fiscal year during which the member left service). For purposes of this benefit, interest is computed at a 4.0% annual rate.

### Post-Retirement Cost-of-Living Adjustments

*Ad hoc* cost-of-living increases in pensions are periodically granted by the State Legislature. However, the retirement system makes no automatic provision for such increases.

- Effective July 1, 2001 retirees age 65 and over who were retired for at least 5 years received a percentage increase in benefits as follows:
  - Eligible retirees age 65 to age 70 received a 5% increase, and
  - Eligible retirees over age 70 received a 10% increase.

However, if the retiree originally retired under an early retirement window the percentage increase was limited to 3%.

- Effective July 1, 2006, retirees age 70 and over who were retired for at least 5 years received a 3% increase in retirement benefits.
- Effective July 1, 2008, all retirees and applicable beneficiaries thereof who retired with 20 or more years of service and are receiving a primary retiree pension of \$600 or less per month received a thirteenth check single payment of \$600.
- Effective July 1, 2011, a select group of retirees received a thirteenth check single payment of \$1,200.



## 3. Actuarial Assumptions and Methods

### Valuation Date

July 1, 2016

### Funding Method

The valuation is prepared under the Entry Age Normal Cost Method with individually computed accrued liabilities. The Normal Cost is computed in aggregate. Entry is based on adjusted date of hire (i.e. valuation date minus known past service).

### Basis for Assumptions

Experience studies are performed at least once in every 5-year period. This valuation was prepared on the basis of assumptions that were recommended to and adopted by the Board based on the experience study covering the period from July 1, 2010, to June 30, 2015. These assumptions will remain in effect for valuation purposes until such time as the Board adopts revised assumptions.

### Interest Rate and Expenses

The valuation interest assumption is 7.5 % per annum, with no loading for system expenses.

### Salary Scales

The salary scales are shown in the Appendix. Salary scales include an assumed underlying inflation rate of 3.00%. The ranges of projected salary increases are as follows:

- Teachers 3.00% to 6.00% per year
- Non-Teachers 3.00% to 6.50% per year

### Pre-Retirement Mortality

RP-2000 Non-Annuitant table, projected with Scale AA on a fully generational basis

### Post-Retirement Mortality

- Healthy males 97% of RP-2000 Healthy Annuitant table, projected with Scale AA on a fully generational basis
- Healthy females 94% of RP-2000 Healthy Annuitant table, projected with Scale AA on a fully generational basis
- Disabled males 96% of RP-2000 Disabled Annuitant table, projected with Scale AA on a fully generational basis
- Disabled females 101% of RP-2000 Disabled Annuitant table, projected with Scale AA on a fully generational basis

### Withdrawal from Service

Withdrawal rates are shown in the Appendix. Withdrawal rates are assumed to cease upon eligibility for retirement. All withdrawal is assumed to result in refund of contributions if non-vested or a deferred annuity if vested.

### Disablement Rates

Disablement rates are shown in the Appendix.

### Retirement Rates

Retirement rates are shown in the Appendix.

### 3. Actuarial Assumptions and Methods

#### Family Composition

It is assumed that 85% of males and 80% of females are married, with husbands 3 years older than wives. Remarriage rates are not used.

#### Accrual of Future Service

It is assumed that all active members will accrue 1 year of service for each future year of employment.

#### Noncontributory Service Loadings

The load factor assumptions for non-contributory service (military, parochial or out-of-state teaching, transferred PERS service, and unused sick leave) are as follows:

	<u>Tier 1</u>	<u>Tier 2</u>
• Male – Teachers	7.75%	0.50%
• Male – Non-Teachers	4.50%	0.50%
• Female – Teachers	4.50%	0.00%
• Female – Non-Teachers	3.25%	0.00%

#### Asset Valuation Method

4-year 25% level smoothing of actuarial gain or (loss) on trust fund return:

- Implemented over 4 years, prospectively commencing July 1, 2016 for the experience for the trust year ending June 30, 2016.
- Actuarial gain or (loss) on assets is calculated as the difference between the expected return under valuation assumptions based on the smoothed Actuarial Value of Assets and the actual trust fund return.
- Actuarial gain or (loss) is recognized at 25% of the original amount each year until fully recognized in the fourth year.
- Total accumulated deferred gain or (loss) amounts are used to adjust the reported Market Value of Assets to determine the Actuarial Value of Assets.

#### System Contributions

Both employee and employer contributions to the System are assumed to be paid in the middle of the year.

# Appendix – Detailed Assumptions

## Salary Scales

Age	Teachers	Non-Teachers and State	Age	Teachers	Non-Teachers and State
19	6.000%	6.500%	45	4.286%	4.474%
20	6.000	6.500	46	4.200	4.400
21	6.000	6.500	47	4.114	4.326
22	6.000	6.375	48	4.029	4.253
23	6.000	6.250	49	3.943	4.179
24	6.000	6.125	50	3.857	4.105
25	6.000	6.000	51	3.771	4.032
26	5.914	5.900	52	3.686	3.958
27	5.829	5.800	53	3.600	3.884
28	5.743	5.726	54	3.565	3.811
29	5.657	5.653	55	3.529	3.737
30	5.571	5.579	56	3.494	3.663
31	5.486	5.505	57	3.459	3.589
32	5.400	5.432	58	3.424	3.516
33	5.314	5.358	59	3.388	3.442
34	5.229	5.284	60	3.353	3.368
35	5.143	5.211	61	3.318	3.295
36	5.057	5.137	62	3.282	3.221
37	4.971	5.063	63	3.247	3.147
38	4.886	4.989	64	3.212	3.074
39	4.800	4.916	65	3.176	3.000
40	4.714	4.842	66	3.141	3.000
41	4.629	4.768	67	3.106	3.000
42	4.543	4.695	68	3.071	3.000
43	4.457	4.621	69	3.035	3.000
44	4.371	4.547	70	3.000	3.000

## Appendix – Detailed Assumptions

### Withdrawal Rates for Teachers (less than 1 year)

Age	Male	Female	Age	Male	Female	Age	Male	Female
19	0.15000	0.15000	36	0.23000	0.23000	53	0.32714	0.32714
20	0.15000	0.15000	37	0.23571	0.23571	54	0.33286	0.33286
21	0.15000	0.15000	38	0.24143	0.24143	55	0.33857	0.33857
22	0.15000	0.15000	39	0.24714	0.24714	56	0.34429	0.34429
23	0.15571	0.15571	40	0.25286	0.25286	57	0.35000	0.35000
24	0.16143	0.16143	41	0.25857	0.25857	58	0.35000	0.35000
25	0.16714	0.16714	42	0.26429	0.26429	59	0.35000	0.35000
26	0.17286	0.17286	43	0.27000	0.27000	60	0.35000	0.35000
27	0.17857	0.17857	44	0.27571	0.27571	61	0.35000	0.35000
28	0.18429	0.18429	45	0.28143	0.28143	62	0.35000	0.35000
29	0.19000	0.19000	46	0.28714	0.28714	63	0.35000	0.35000
30	0.19571	0.19571	47	0.29286	0.29286	64	0.35000	0.35000
31	0.20143	0.20143	48	0.29857	0.29857	65	0.35000	0.35000
32	0.20714	0.20714	49	0.30429	0.30429	66	0.35000	0.35000
33	0.21286	0.21286	50	0.31000	0.31000	67	0.35000	0.35000
34	0.21857	0.21857	51	0.31571	0.31571	68	0.35000	0.35000
35	0.22429	0.22429	52	0.32143	0.32143	69	0.35000	0.35000

### Withdrawal Rates for Teachers (1 to 2 years)

Age	Male	Female	Age	Male	Female	Age	Male	Female
19	0.13860	0.11000	36	0.12316	0.09800	53	0.10441	0.08343
20	0.13860	0.11000	37	0.12206	0.09714	54	0.10331	0.08257
21	0.13860	0.11000	38	0.12095	0.09629	55	0.10221	0.08171
22	0.13860	0.11000	39	0.11985	0.09543	56	0.10110	0.08086
23	0.13750	0.10914	40	0.11875	0.09457	57	0.10000	0.08000
24	0.13639	0.10829	41	0.11765	0.09371	58	0.10000	0.08000
25	0.13529	0.10743	42	0.11654	0.09286	59	0.10000	0.08000
26	0.13419	0.10657	43	0.11544	0.09200	60	0.10000	0.08000
27	0.13309	0.10571	44	0.11434	0.09114	61	0.10000	0.08000
28	0.13198	0.10486	45	0.11323	0.09029	62	0.10000	0.08000
29	0.13088	0.10400	46	0.11213	0.08943	63	0.10000	0.08000
30	0.12978	0.10314	47	0.11103	0.08857	64	0.10000	0.08000
31	0.12867	0.10229	48	0.10993	0.08771	65	0.10000	0.08000
32	0.12757	0.10143	49	0.10882	0.08686	66	0.10000	0.08000
33	0.12647	0.10057	50	0.10772	0.08600	67	0.10000	0.08000
34	0.12537	0.09971	51	0.10662	0.08514	68	0.10000	0.08000
35	0.12426	0.09886	52	0.10551	0.08429	69	0.10000	0.08000

## Appendix – Detailed Assumptions

### Withdrawal Rates for Teachers (2 to 3 years)

Age	Male	Female	Age	Male	Female	Age	Male	Female
19	0.10000	0.10000	36	0.06550	0.06200	53	0.06500	0.05000
20	0.10000	0.10000	37	0.06500	0.06000	54	0.06500	0.05000
21	0.10000	0.10000	38	0.06500	0.05800	55	0.06500	0.05000
22	0.10000	0.10000	39	0.06500	0.05600	56	0.06500	0.05000
23	0.09400	0.09600	40	0.06500	0.05400	57	0.06500	0.05000
24	0.08800	0.09200	41	0.06500	0.05200	58	0.06500	0.05000
25	0.08200	0.08800	42	0.06500	0.05000	59	0.06500	0.05000
26	0.07600	0.08400	43	0.06500	0.05000	60	0.06500	0.05000
27	0.07000	0.08000	44	0.06500	0.05000	61	0.06500	0.05000
28	0.06950	0.07800	45	0.06500	0.05000	62	0.06500	0.05000
29	0.06900	0.07600	46	0.06500	0.05000	63	0.06500	0.05000
30	0.06850	0.07400	47	0.06500	0.05000	64	0.06500	0.05000
31	0.06800	0.07200	48	0.06500	0.05000	65	0.06500	0.05000
32	0.06750	0.07000	49	0.06500	0.05000	66	0.06500	0.05000
33	0.06700	0.06800	50	0.06500	0.05000	67	0.06500	0.05000
34	0.06650	0.06600	51	0.06500	0.05000	68	0.06500	0.05000
35	0.06600	0.06400	52	0.06500	0.05000	69	0.06500	0.05000

### Withdrawal Rates for Teachers (3 to 4 years)

Age	Male	Female	Age	Male	Female	Age	Male	Female
19	0.08000	0.08000	36	0.05200	0.05000	53	0.03000	0.05000
20	0.08000	0.08000	37	0.04900	0.05000	54	0.03000	0.05000
21	0.08000	0.08000	38	0.04600	0.05000	55	0.03000	0.05000
22	0.08000	0.08000	39	0.04300	0.05000	56	0.03000	0.05000
23	0.08000	0.07600	40	0.04000	0.05000	57	0.03000	0.05000
24	0.08000	0.07200	41	0.03800	0.05000	58	0.03000	0.05000
25	0.08000	0.06800	42	0.03600	0.05000	59	0.03000	0.05000
26	0.07600	0.06400	43	0.03400	0.05000	60	0.03000	0.05000
27	0.07200	0.06000	44	0.03200	0.05000	61	0.03000	0.05000
28	0.06800	0.05600	45	0.03000	0.05000	62	0.03000	0.05000
29	0.06400	0.05200	46	0.03000	0.05000	63	0.03000	0.05000
30	0.06000	0.05133	47	0.03000	0.05000	64	0.03000	0.05000
31	0.05900	0.05067	48	0.03000	0.05000	65	0.03000	0.05000
32	0.05800	0.05000	49	0.03000	0.05000	66	0.03000	0.05000
33	0.05700	0.05000	50	0.03000	0.05000	67	0.03000	0.05000
34	0.05600	0.05000	51	0.03000	0.05000	68	0.03000	0.05000
35	0.05500	0.05000	52	0.03000	0.05000	69	0.03000	0.05000

## Appendix – Detailed Assumptions

### Withdrawal Rates for Teachers (4 to 5 years)

Age	Male	Female	Age	Male	Female	Age	Male	Female
19	0.06000	0.06000	36	0.04390	0.04200	53	0.02860	0.02250
20	0.06000	0.06000	37	0.04300	0.04001	54	0.02770	0.02250
21	0.06000	0.06000	38	0.04210	0.03800	55	0.02680	0.02250
22	0.06000	0.06000	39	0.04120	0.03600	56	0.02590	0.02250
23	0.06000	0.06000	40	0.04030	0.03401	57	0.02500	0.02250
24	0.06000	0.06000	41	0.03940	0.03200	58	0.02500	0.02250
25	0.06000	0.06000	42	0.03850	0.03000	59	0.02500	0.02250
26	0.05600	0.06000	43	0.03760	0.03000	60	0.02500	0.02250
27	0.05200	0.06000	44	0.03670	0.03000	61	0.02500	0.02250
28	0.05110	0.05801	45	0.03580	0.03000	62	0.02500	0.02250
29	0.05020	0.05600	46	0.03490	0.02850	63	0.02500	0.02250
30	0.04930	0.05400	47	0.03400	0.02700	64	0.02500	0.02250
31	0.04840	0.05201	48	0.03310	0.02550	65	0.02500	0.02250
32	0.04750	0.05000	49	0.03220	0.02400	66	0.02500	0.02250
33	0.04660	0.04800	50	0.03130	0.02250	67	0.02500	0.02250
34	0.04570	0.04601	51	0.03040	0.02250	68	0.02500	0.02250
35	0.04480	0.04400	52	0.02950	0.02250	69	0.02500	0.02250

### Withdrawal Rates for Teachers (greater than 5 years)

Age	Male	Female	Age	Male	Female	Age	Male	Female
19	0.03200	0.03200	36	0.02141	0.01920	53	0.01440	0.01040
20	0.03200	0.03200	37	0.02082	0.01840	54	0.01520	0.01120
21	0.03120	0.03120	38	0.02022	0.01760	55	0.01600	0.01200
22	0.03040	0.03040	39	0.01963	0.01680	56	0.01600	0.01200
23	0.02960	0.02960	40	0.01904	0.01600	57	0.01600	0.01200
24	0.02880	0.02880	41	0.01843	0.01520	58	0.01600	0.01200
25	0.02800	0.02800	42	0.01782	0.01440	59	0.01600	0.01200
26	0.02720	0.02720	43	0.01722	0.01360	60	0.01600	0.01200
27	0.02640	0.02640	44	0.01661	0.01280	61	0.01600	0.01200
28	0.02560	0.02560	45	0.01600	0.01200	62	0.01600	0.01200
29	0.02480	0.02480	46	0.01520	0.01120	63	0.01600	0.01200
30	0.02400	0.02400	47	0.01440	0.01040	64	0.01600	0.01200
31	0.02360	0.02320	48	0.01360	0.00960	65	0.01600	0.01200
32	0.02320	0.02240	49	0.01280	0.00880	66	0.01600	0.01200
33	0.02280	0.02160	50	0.01200	0.00800	67	0.01600	0.01200
34	0.02240	0.02080	51	0.01280	0.00880	68	0.01600	0.01200
35	0.02200	0.02000	52	0.01360	0.00960	69	0.01600	0.01200

## Appendix – Detailed Assumptions

### Withdrawal Rates for Non-Teachers and State (less than 1 year)

Age	Male	Female	Age	Male	Female	Age	Male	Female
19	0.18000	0.24750	36	0.14160	0.19470	53	0.10080	0.13860
20	0.18000	0.24750	37	0.13920	0.19140	54	0.09840	0.13530
21	0.17760	0.24420	38	0.13680	0.18810	55	0.09600	0.13200
22	0.17520	0.24090	39	0.13440	0.18480	56	0.09360	0.12870
23	0.17280	0.23760	40	0.13200	0.18150	57	0.09120	0.12540
24	0.17040	0.23430	41	0.12960	0.17820	58	0.08880	0.12210
25	0.16800	0.23100	42	0.12720	0.17490	59	0.08640	0.11880
26	0.16560	0.22770	43	0.12480	0.17160	60	0.08400	0.11550
27	0.16320	0.22440	44	0.12240	0.16830	61	0.08400	0.11550
28	0.16080	0.22110	45	0.12000	0.16500	62	0.08400	0.11550
29	0.15840	0.21780	46	0.11760	0.16170	63	0.08400	0.11550
30	0.15600	0.21450	47	0.11520	0.15840	64	0.08400	0.11550
31	0.15360	0.21120	48	0.11280	0.15510	65	0.08400	0.11550
32	0.15120	0.20790	49	0.11040	0.15180	66	0.08400	0.11550
33	0.14880	0.20460	50	0.10800	0.14850	67	0.08400	0.11550
34	0.14640	0.20130	51	0.10560	0.14520	68	0.08400	0.11550
35	0.14400	0.19800	52	0.10320	0.14190	69	0.08400	0.11550

### Withdrawal Rates for Non-Teachers and State (1 to 2 years)

Age	Male	Female	Age	Male	Female	Age	Male	Female
19	0.13000	0.17550	36	0.09600	0.08640	53	0.06000	0.05400
20	0.13000	0.17550	37	0.09200	0.08280	54	0.06000	0.05400
21	0.12800	0.17280	38	0.08800	0.07920	55	0.06000	0.05400
22	0.12600	0.17010	39	0.08400	0.07560	56	0.05800	0.05220
23	0.12400	0.16740	40	0.08000	0.07200	57	0.05600	0.05040
24	0.12200	0.16470	41	0.07800	0.07020	58	0.05400	0.04860
25	0.12000	0.16200	42	0.07600	0.06840	59	0.05200	0.04680
26	0.11800	0.15930	43	0.07400	0.06660	60	0.05000	0.04500
27	0.11600	0.15660	44	0.07200	0.06480	61	0.05000	0.04500
28	0.11400	0.14436	45	0.07000	0.06300	62	0.05000	0.04500
29	0.11200	0.13212	46	0.06800	0.06120	63	0.05000	0.04500
30	0.11000	0.11988	47	0.06600	0.05940	64	0.05000	0.04500
31	0.10800	0.10764	48	0.06400	0.05760	65	0.05000	0.04500
32	0.10600	0.09540	49	0.06200	0.05580	66	0.05000	0.04500
33	0.10400	0.09360	50	0.06000	0.05400	67	0.05000	0.04500
34	0.10200	0.09180	51	0.06000	0.05400	68	0.05000	0.04500
35	0.10000	0.09000	52	0.06000	0.05400	69	0.05000	0.04500

## Appendix – Detailed Assumptions

### Withdrawal Rates for Non-Teachers and State (2 to 3 years)

Age	Male	Female	Age	Male	Female	Age	Male	Female
19	0.12000	0.11200	36	0.07520	0.07504	53	0.04000	0.04480
20	0.12000	0.11200	37	0.07200	0.07168	54	0.04000	0.04480
21	0.12000	0.11200	38	0.06880	0.06832	55	0.04000	0.04480
22	0.12000	0.11200	39	0.06560	0.06496	56	0.04000	0.04480
23	0.11680	0.11200	40	0.06240	0.06160	57	0.04000	0.04480
24	0.11360	0.11200	41	0.05920	0.05824	58	0.04000	0.04480
25	0.11040	0.11200	42	0.05600	0.05488	59	0.04000	0.04480
26	0.10720	0.10864	43	0.05280	0.05152	60	0.04000	0.04480
27	0.10400	0.10528	44	0.04960	0.04816	61	0.04000	0.04480
28	0.10080	0.10192	45	0.04640	0.04480	62	0.04000	0.04480
29	0.09760	0.09856	46	0.04320	0.04480	63	0.04000	0.04480
30	0.09440	0.09520	47	0.04000	0.04480	64	0.04000	0.04480
31	0.09120	0.09184	48	0.04000	0.04480	65	0.04000	0.04480
32	0.08800	0.08848	49	0.04000	0.04480	66	0.04000	0.04480
33	0.08480	0.08512	50	0.04000	0.04480	67	0.04000	0.04480
34	0.08160	0.08176	51	0.04000	0.04480	68	0.04000	0.04480
35	0.07840	0.07840	52	0.04000	0.04480	69	0.04000	0.04480

### Withdrawal Rates for Non-Teachers and State (3 to 4 years)

Age	Male	Female	Age	Male	Female	Age	Male	Female
19	0.08000	0.09000	36	0.05200	0.04680	53	0.05000	0.04050
20	0.08000	0.09000	37	0.05000	0.04410	54	0.05000	0.04050
21	0.08000	0.09000	38	0.05000	0.04140	55	0.05000	0.04050
22	0.08000	0.09000	39	0.05000	0.03870	56	0.05000	0.04050
23	0.08000	0.09000	40	0.05000	0.03600	57	0.05000	0.04050
24	0.08000	0.09000	41	0.05000	0.03420	58	0.05000	0.04050
25	0.08000	0.09000	42	0.05000	0.03240	59	0.05000	0.04050
26	0.07600	0.09000	43	0.05000	0.03060	60	0.05000	0.04050
27	0.07200	0.09000	44	0.05000	0.02880	61	0.05000	0.04050
28	0.06800	0.08244	45	0.05000	0.02700	62	0.05000	0.04050
29	0.06400	0.07488	46	0.05000	0.02700	63	0.05000	0.04050
30	0.06000	0.06732	47	0.05000	0.02700	64	0.05000	0.04050
31	0.05900	0.05976	48	0.05000	0.02970	65	0.05000	0.04050
32	0.05800	0.05220	49	0.05000	0.03240	66	0.05000	0.04050
33	0.05700	0.05130	50	0.05000	0.03510	67	0.05000	0.04050
34	0.05600	0.05040	51	0.05000	0.03780	68	0.05000	0.04050
35	0.05500	0.04950	52	0.05000	0.04050	69	0.05000	0.04050



## Appendix – Detailed Assumptions

### Withdrawal Rates for Non-Teachers and State (4 to 5 years)

Age	Male	Female	Age	Male	Female	Age	Male	Female
19	0.04500	0.06750	36	0.03450	0.04275	53	0.03450	0.02250
20	0.04500	0.06750	37	0.03450	0.04050	54	0.03450	0.02250
21	0.04350	0.06525	38	0.03450	0.03825	55	0.03450	0.02250
22	0.04200	0.06300	39	0.03450	0.03600	56	0.03450	0.02138
23	0.04050	0.06075	40	0.03450	0.03375	57	0.03450	0.02025
24	0.03900	0.05850	41	0.03450	0.03263	58	0.03450	0.01913
25	0.03750	0.05625	42	0.03450	0.03150	59	0.03450	0.01800
26	0.03750	0.05625	43	0.03450	0.03038	60	0.03450	0.01688
27	0.03750	0.05625	44	0.03450	0.02925	61	0.03450	0.01688
28	0.03750	0.05625	45	0.03450	0.02813	62	0.03450	0.01688
29	0.03750	0.05625	46	0.03450	0.02700	63	0.03450	0.01688
30	0.03750	0.05625	47	0.03450	0.02588	64	0.03450	0.01688
31	0.03600	0.05400	48	0.03450	0.02475	65	0.03450	0.01688
32	0.03450	0.05175	49	0.03450	0.02363	66	0.03450	0.01688
33	0.03450	0.04950	50	0.03450	0.02250	67	0.03450	0.01688
34	0.03450	0.04725	51	0.03450	0.02250	68	0.03450	0.01688
35	0.03450	0.04500	52	0.03450	0.02250	69	0.03450	0.01688

### Withdrawal Rates for Non-Teachers and State (greater than 5 years)

Age	Male	Female	Age	Male	Female	Age	Male	Female
19	0.04000	0.02800	36	0.02903	0.02352	53	0.01758	0.01366
20	0.04000	0.02800	37	0.02768	0.02065	54	0.01694	0.01383
21	0.03900	0.02765	38	0.02633	0.01960	55	0.01629	0.01400
22	0.03800	0.02730	39	0.02498	0.01855	56	0.01565	0.01400
23	0.03700	0.02695	40	0.02363	0.01750	57	0.01500	0.01400
24	0.03600	0.02660	41	0.02295	0.01680	58	0.01500	0.01400
25	0.03500	0.02625	42	0.02228	0.01610	59	0.01500	0.01400
26	0.03400	0.02590	43	0.02160	0.01540	60	0.01500	0.01400
27	0.03300	0.02555	44	0.02093	0.01470	61	0.01500	0.01400
28	0.03369	0.02744	45	0.02025	0.01400	62	0.01500	0.01400
29	0.03438	0.02933	46	0.01958	0.01383	63	0.01500	0.01400
30	0.03507	0.03122	47	0.01890	0.01366	64	0.01500	0.01400
31	0.03576	0.03311	48	0.01823	0.01350	65	0.01500	0.01400
32	0.03645	0.03500	49	0.01755	0.01333	66	0.01500	0.01400
33	0.03443	0.03213	50	0.01688	0.01316	67	0.01500	0.01400
34	0.03240	0.02926	51	0.01755	0.01333	68	0.01500	0.01400
35	0.03038	0.02639	52	0.01823	0.01350	69	0.01500	0.01400

## Appendix – Detailed Assumptions

### Disability Rates

Age	Male	Female	Age	Male	Female	Age	Male	Female
19	0.00000	0.00000	33	0.00128	0.00102	47	0.00298	0.00236
20	0.00008	0.00006	34	0.00144	0.00115	48	0.00334	0.00257
21	0.00014	0.00012	35	0.00160	0.00128	49	0.00371	0.00279
22	0.00021	0.00017	36	0.00168	0.00134	50	0.00407	0.00301
23	0.00027	0.00022	37	0.00176	0.00141	51	0.00444	0.00330
24	0.00034	0.00027	38	0.00184	0.00147	52	0.00480	0.00360
25	0.00040	0.00032	39	0.00192	0.00154	53	0.00496	0.00389
26	0.00048	0.00038	40	0.00200	0.00160	54	0.00512	0.00419
27	0.00056	0.00045	41	0.00208	0.00166	55	0.00528	0.00448
28	0.00064	0.00051	42	0.00216	0.00173	56	0.00544	0.00499
29	0.00072	0.00058	43	0.00224	0.00179	57	0.00560	0.00550
30	0.00080	0.00064	44	0.00232	0.00186	58	0.00560	0.00602
31	0.00096	0.00077	45	0.00240	0.00192	59	0.00560	0.00653
32	0.00112	0.00090	46	0.00269	0.00214	60	0.00560	0.00704
						61+	0.00000	0.00000

### Retirement Rates

Age	Teachers		Non-Teachers and State	
	Male	Female	Male	Female
54	0.000	0.000	0.000	0.000
55	0.250	0.275	0.300	0.200
56	0.175	0.175	0.200	0.175
57	0.175	0.200	0.175	0.150
58	0.200	0.200	0.150	0.150
59	0.200	0.200	0.150	0.175
60	0.200	0.250	0.150	0.175
61	0.250	0.200	0.150	0.175
62	0.350	0.275	0.350	0.250
63	0.250	0.250	0.250	0.200
64	0.250	0.250	0.175	0.200
65	0.400	0.300	0.300	0.300
66	0.300	0.350	0.225	0.250
67	0.250	0.300	0.225	0.225
68	0.250	0.300	0.225	0.225
69	0.250	0.300	0.225	0.225
70+	1.000	1.000	1.000	1.000