



500 North Broadway
Suite 1750
St. Louis, MO 63102
USA

Main +1 314 231 3031
Fax +1 314 231 0249

milliman.com

RECEIVED
APR 11 2017

BY: *ing*

April 10, 2017

Jeffery St. Omer
Mickes O'Toole, LLC
555 Maryville University Dr., Suite 240
St. Louis, MO 63141

***RE: Public School Retirement System of the City of St. Louis –
Section 105.665 Cost Statement***

Dear Mr. St. Omer:

The purpose of this letter is to provide the Special Administrative Board of the Transitional School District of the City of St. Louis with a cost statement that may be required under the Missouri Revised Statute Section 105.665 in connection with the proposed changes contained in HCS HB 619, SCS HCS HB 304 or other legislation containing the same provisions.

A summary of the proposed “changes in plan benefits” contained in HCS HB 619 that are subject to this statement are as follows:

1. Reduce the “Rule of 85” unreduced retirement from age plus service equal to 85 to 80 (i.e. change it to a “Rule of 80”).
2. Change the percent of pay benefit multiplier from 2.0% of Average Final Compensation to 1.75% of Average Final Compensation for members hired on or after January 1, 2018.
3. Change employee contribution requirement from a flat 5.0% of compensation to 9.0% in 0.5 % annual increments (new employees hired on or after January 1, 2018 will contribute at 9.0% immediately on entering the system).
4. The employer contribution rate will be 16.0% of covered payroll for 2018, 15% of covered payroll for 2019, 14% of covered payroll for 2020, 13% of covered payroll for 2021, 12% of covered payroll for 2022, 11% of covered payroll for 2023, 10% of covered payroll for 2024, and 9% for 2025 and thereafter.

The most recent periodic actuarial valuation of the plan was prepared as of January 1, 2016, by Buck Consultants LLC. This cost statement is based upon Milliman’s replication of the January 1, 2016 valuation results using the actuarial methods and assumptions employed in that report as required by 105.665.2. The census data we received, in our opinion, is sufficient to compare the



relative changes in liabilities and costs for the purposes of this cost statement, but it is not as complete a data set that the System's actuary has available. We have made reasonable assumptions and approximations to fill in any gaps in the data available to us. For the purpose of this cost statement, we have assumed that the benefit provision changes and the cap on employer contributions were effective as of the 1/1/2016 valuation date and that the employee contribution rate increases would start phasing in during 2017.

Our cost statement, numbered to correspond with Section 105.665, follows below:

1. The level normal cost of plan benefits currently in effect is \$25,251,260 or 10.74% of expected mid-year covered payroll, as calculated in our replication of the January 1, 2016 actuarial valuation.
2. Amortization of Unfunded Actuarial Accrued Liability is \$16,530,824 or 7.03% of expected mid-year covered payroll.
3. The total employer contribution rate from items one and two above is \$41,782,084 or 17.78% of expected mid-year covered payroll.
4. St. Louis Schools are currently paying the total contribution rate under the current plan provisions.
5. The plan's actuarial value of assets is \$915,391,079 market value of assets is \$868,679,049, actuarial accrued liability is \$1,206,970,668, and the funded ratio under the Entry Age Normal cost method is 75.8%, based on the replication of the January 1, 2016 actuarial valuation.
6. The estimated actuarially determined employer post-change contribution rate is \$40,424,413, or 17.2% of expected mid-year covered payroll.
7. A twelve-year projection of annual plan costs and funded ratios for both: i) the current plan and ii) the current plan as modified by HCS HB 619 is presented in Exhibit II. The funded ratios under the proposed plan decrease temporarily during the projection period due to the lost revenue from the statutory contribution rate being lower than the actuarially determined contribution rate. The funded percentage is increasing each year by the end of the projection period.
8. HCS HB 619 does not mandate employer contributions in excess of 16% in the first year of implementation, 15% in the second year, 14% in the third year, 13% in the fourth, 12% in the fifth year, 11% in the sixth year, 10% in the seventh year or 9% in the eighth year or any year thereafter.
9. The proposed change will impair the ability of the plan to meet the obligations due to the employer contribution being lower than the actuarially determined contribution in years



when the contribution statutory employer contribution rate is lower than the actuarially determined contribution rate.

10. The actuarial assumptions used in the January 1, 2016 actuarial valuation are contained in the attached pages from the System's 2016 financial report.

11. Section 105.665 requires that:

- a. all assumptions used in this cost study be those used in the most recent actuarial valuation, and
- b. the actuary certify that the assumptions used in the cost study produce results which in aggregate, are reasonable

Milliman is not the System's retained actuary and had no part in selecting the assumptions used in the most recent periodic actuarial valuation.

The selection of actuarial assumptions involves professional judgement and different actuaries may differ in their selection. It was beyond the scope of our assignment to perform a rigorous assumption analysis. However, we would consider an investment return assumption in the 7.0% - 7.5% range to be more reasonable in the current economic environment. A lower investment return assumption generally results in higher overall plan costs.

12. The actuarial funding method used in preparing the valuation is described in the attached pages from the System's 2016 financial report.

In preparing this report, we relied, without audit, on information (some oral and some in writing) supplied by the Special Administrative Board of the Transitional School District of the City of St. Louis, through its attorney. This information includes, but is not limited to, Plan documents and provisions, employee data, and financial information. Although the data appears generally reasonable, we had only limited, indirect access to the System and none to the System's actuary so a thorough analysis of the source data was not possible. Since the results are dependent on the integrity of the data supplied, the results can be expected to differ if the underlying data is incomplete or missing. It should be noted that if any data or other information is inaccurate or incomplete, our calculations may need to be revised.

Since the valuation results are dependent on the integrity of the data supplied, the results can be expected to differ if the underlying data is incomplete or missing. It should be noted that if any data or other information is inaccurate or incomplete, our calculations may need to be revised.

On the basis of the foregoing, we hereby certify that, to the best of our knowledge and belief, this report is complete and accurate and has been prepared in accordance with generally recognized and accepted actuarial principles and practices which are consistent with the principles prescribed by the Actuarial Standards Board and the Code of Professional Conduct



April 10, 2017
Jeffery St. Omer
Page 4

and Qualification Standards for Public Statements of Actuarial Opinion of the American Academy of Actuaries. We are members of the American Academy of Actuaries and meet the Qualification Standards to render the actuarial opinion contained herein.

Actuarial computations included in this report are for the exclusive purposes cited in this report. Determinations for purposes other than those specifically referenced in this report may be significantly different. Accordingly, additional determinations may be needed for other purposes, such as judging benefit security on a settlement basis.

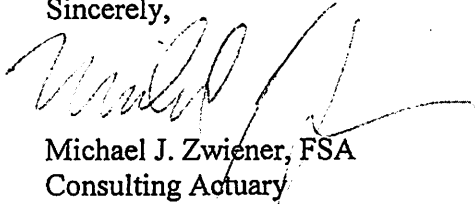
These cost estimates are subject to the uncertainties of a regular actuarial valuation; the costs are inexact because they are based on assumptions that are themselves necessarily inexact, even though we consider them reasonable. Thus, the emerging costs may vary from those presented in this letter to the extent actual experience differs from that projected by the actuarial assumptions.

We have not explored any legal issues with respect to the proposed plan changes. We are not attorneys and cannot give legal advice on such issues. We suggest that you review this proposal with counsel.

This report has been prepared for the internal use of and is only to be relied upon by the Special Administrative Board of the Transitional School District of the City of St. Louis; it is not for the use or benefit of any third party for any purpose. No portion of this report may be disclosed to any other party (other than Missouri State legislative and regulatory personnel) without Milliman's prior written consent. In the event such consent is given, the report must be provided in its entirety, unless prior written consent is obtained from Milliman. We recommend that any such party have its own actuary or other qualified professional review this report to ensure that the party understands the assumptions and uncertainties inherent in our estimates. We respectfully submit the following exhibits, and we look forward to discussing them with you.

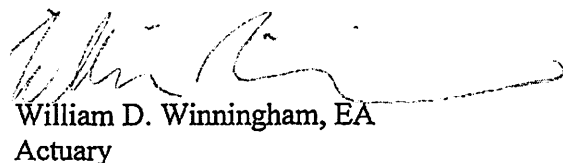
We are available to address any questions that you may have.

Sincerely,



Michael J. Zwiener, FSA
Consulting Actuary

MJZ/WDW



William D. Winningham, EA
Actuary

Enclosures: Exhibit I
Exhibit II
Basis of the Valuation

**Public School Retirement System
of the City of St. Louis**

January 1, 2016 Actuarial Valuation (Based on Milliman Replication)

Development of Recommended Employer Contribution - Plan and Assumption Changes

	<u>Curent Plan</u>	<u>Proposed Plan</u>
1. Present Value of Future Benefits		
a. Active Members		
Withdrawal	38,684,730	47,382,816
Early Retirement	57,870,054	31,823,996
Unreduced Retirement	331,702,492	374,803,833
Death	7,140,165	6,693,554
Disability	9,873,851	9,162,313
Return of Contributions	<u>5,821,566</u>	<u>5,868,108</u>
a. Active Members	\$451,092,858	\$475,734,620
b. Terminated Vested Members	20,893,626	20,893,626
c. Nonvested Former Members	6,329,561	6,329,561
d. Retired Members and Beneficiaries	<u>865,039,616</u>	<u>865,039,616</u>
e. Total	1,343,355,661	1,367,997,423
2. Actuarial Value of Assets	915,391,079	915,391,079
3. Unfunded Frozen Actuarial Accrued Liability	162,302,064	178,006,438
4. Present Value of Future Member Contributions	86,648,374	121,267,383
5. Present Value of Future Normal Costs (1e) - (2) - (3) - (4), not less than zero	179,014,144	153,332,523
6. Present Value of Future Earnings	1,732,967,994	1,677,129,961
7. Normal Cost Rate: (5) / (6)	10.3300%	9.1400%
8. Expected Mid-Year Payroll of Members under Normal Retirement Age	235,044,123	234,536,102
9. Normal Cost: (7) x (8)	24,280,058	21,436,600
	1.04	1.04
10 Normal Cost at End of Year (9 x 1.04)	25,251,260	22,294,064
	0	
11 Amortization of the Unfunded Frozen Actuarial Accrued Liability	16,530,824	18,130,349
12 Recommend Employer Contribution Payable at 12/31/2016	41,782,084	40,424,413
Recommended Contribution by Employer Type		
Board of Education	32,090,877	31,048,113
Retirement System	78,642	76,086
Charter Schools	<u>9,612,566</u>	<u>9,300,214</u>
	41,782,084	40,424,413
Key Assumptions		
Assumed Asset Return	8.00%	8.00%
Salary Increases	4.50%	4.50%

This work product was prepared solely for the Special Administrative Board of the Transitional School District of the City of St. Louis 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.

Public School Retirement System of the City of St. Louis
January 1, 2016 Valuation Projections
Cuurrent Employees Retain 2.0% Accrual Rate, 9.0% Ultimate Contribution Rate
(numbers in thousands)

	<u>2016</u>	<u>2017</u>	<u>2018</u>	<u>2019</u>	<u>2020</u>	<u>2021</u>	<u>2022</u>	<u>2023</u>	<u>2024</u>	<u>2025</u>	<u>2026</u>	<u>2027</u>	<u>2028</u>
Baseline (Current Plan Provisions)													
Employee Contributions	\$11,800	\$11,900	\$12,200	\$12,400	\$12,700	\$13,100	\$13,500	\$13,900	\$14,300	\$14,700	\$15,200	\$15,800	\$16,300
Employer Contributions	\$41,800	\$43,000	\$43,800	\$44,200	\$44,400	\$44,400	\$44,200	\$43,800	\$43,300	\$42,700	\$42,000	\$41,300	\$40,600
Employer Contributions % of Payroll	17.8%	18.0%	18.0%	17.9%	17.5%	17.0%	16.5%	15.9%	15.2%	14.5%	13.9%	13.2%	12.5%
Accrued Liability	\$1,207,000	\$1,210,700	\$1,214,700	\$1,219,200	\$1,224,400	\$1,230,400	\$1,237,100	\$1,245,100	\$1,254,400	\$1,265,400	\$1,278,200	\$1,293,000	\$1,310,000
Actuarial Value of Assets	\$915,400	\$913,500	\$915,500	\$921,100	\$930,000	\$942,200	\$957,100	\$975,000	\$995,700	\$1,019,400	\$1,046,100	\$1,075,900	\$1,108,800
Unfunded Accrued Liability (Entry Age Basis)	\$291,600	\$297,200	\$299,300	\$298,100	\$294,300	\$288,200	\$280,000	\$270,100	\$258,700	\$246,000	\$232,100	\$217,100	\$201,300
Funded Percentage	75.8%	75.5%	75.4%	75.5%	76.0%	76.6%	77.4%	78.3%	79.4%	80.6%	81.8%	83.2%	84.6%
Assumed Asset Return	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%
Proposed Plan													
Employee Contributions	\$11,700	\$13,900	\$15,900	\$17,600	\$19,300	\$20,900	\$22,500	\$24,000	\$25,600	\$26,400	\$27,200	\$28,100	\$29,100
Employer Contributions (Actuarially Determined)*	\$40,400	\$41,300	\$42,300	\$43,300	\$44,400	\$45,600	\$46,900	\$48,500	\$50,300	\$52,100	\$53,800	\$55,400	\$56,900
Employer Contributions % of Expected Payroll	17.2%	17.4%	17.5%	17.6%	17.6%	17.6%	17.6%	17.7%	17.8%	17.9%	17.9%	17.8%	17.7%
Employer Contributions (Statutory)	\$37,500	\$35,600	\$33,800	\$32,000	\$30,200	\$28,400	\$26,600	\$24,600	\$25,400	\$26,200	\$27,000	\$27,900	\$28,900
Employer Contributions % of Expected Payroll	16.0%	15.0%	14.0%	13.0%	12.0%	11.0%	10.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%
Accrued Liability	\$1,223,100	\$1,228,500	\$1,233,700	\$1,238,800	\$1,244,300	\$1,250,400	\$1,256,900	\$1,264,900	\$1,274,400	\$1,285,800	\$1,299,100	\$1,314,600	\$1,332,400
Actuarial Value of Assets	\$915,400	\$908,900	\$904,200	\$900,900	\$899,000	\$898,500	\$898,800	\$900,300	\$902,700	\$908,900	\$918,200	\$930,900	\$947,100
Unfunded Accrued Liability (Entry Age Basis)	\$307,700	\$319,600	\$329,500	\$337,900	\$345,200	\$351,900	\$358,100	\$364,600	\$371,600	\$376,900	\$381,000	\$383,800	\$385,300
Funded Percentage	74.8%	74.0%	73.3%	72.7%	72.2%	71.9%	71.5%	71.2%	70.8%	70.7%	70.7%	70.8%	71.1%
Assumed Asset Return	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%

* Reflects impact of employer contribution limit for prior years.

This work product was prepared solely for the Special Administrative Board of the Transitional School District of the City of St. Louis 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.

Basis of the Valuation

Plan Provisions and Members Census

The plan provisions of the System and the census of members are the foundation of the valuation, since these are the present facts upon which benefit payments will depend.

Summary of Plan Provisions

Participants

All persons regularly employed by the board of education, charter schools, and employees of the board of trustees are in the System.

Retirement age

Normal

Age 65 or any age if age plus the years of credited service equals or exceeds 85 (Rule of 85)

Early

Age 60 with 5 years of service

Service retirement allowance

- a. 2% (1-1/4% if terminated prior to July 1, 1999) times years of credited service, subject to a maximum of 60%
- b. Times average final compensation (AFC)
- c. Subject to a maximum of 60% of AFC.
 - i. AFC is the highest average compensation for any three consecutive years of the last 10 years of service.
 - ii. Compensation is the regular wages plus what your employer pays towards your health and welfare benefits.
 - iii. Minimum monthly benefit is \$10.00 for each year of credited service, up to 15 years, retirement age 65 and over.
 - iv. Unused sick leave is added to a participant's credited service and age.

Early retirement benefit

Service retirement allowance reduced five-ninths of one percent for each month of commencement prior to age 65 or the age at which the Rule of 85 would have been satisfied had the employee continued working until that age, if earlier.

Disability benefit

Service retirement allowance using actual service, or 25% of AFC if larger, provided that in no case will the benefit exceed that payable if service had continued to age 65.

- a. Disability must be incurred while an employee as determined by the medical board and approved by the board of trustees.
- b. The participant must have a minimum of five years of credited service and not be eligible for normal retirement.

Continued disability is subject to routine verification.

Withdrawal benefit

Accumulated contributions of participant with interest credited to the participant's account.

Basis of the Valuation

Summary of Plan Provisions (continued)

Vested benefit

Full vesting on termination of employment after at least five years of service is provided if contributions are left with the System. The full accrued benefit is payable at age 65 or a reduced early retirement benefit prior to age 65.

Retirement options

In lieu of the benefit paid only over the lifetime of the participant, a reduced benefit payable for life of participant with:

- Option 1 Same retirement allowance continued after death to the beneficiary.
- Option 2 One-half of the retirement allowance continued after death to the beneficiary.
- Option 3 Same retirement allowance continued after death to the beneficiary. If the beneficiary predeceases the participant, the retirement allowance is adjusted back to the unreduced allowance.
- Option 4 One-half of retirement allowance continued after death to the beneficiary. If the beneficiary predeceases the participant, the retirement allowance is adjusted back to the unreduced allowance.
- Option 5 Increased retirement allowance is provided up to age 62, such that benefit provided prior to age 62 is approximately equal to the sum of the reduced retirement allowance paid after age 62 and Social Security.
- Option 6 Options 1 and 5 combined.
- Option 7 Options 2 and 5 combined.

Survivor benefits

If an active participant dies after completing 18 months of service, leaving a surviving spouse or other dependent beneficiaries, survivor benefits are payable. The widow or dependent beneficiary may elect to receive either a refund of accumulated contributions, or:

- a. A survivor who is the widow at least age 62 and married to a participant for at least one year receives \$60 a month.
- b. A widow with dependent, unmarried children under age 22 receives \$60 a month plus \$60 per dependent child, not to exceed \$180 per month. The benefit ceases when youngest child is age 22 and resumes again under (a) at age 62.
- c. If no benefits are payable under (a) or (b), minor children may receive a benefit of \$60 per child or \$180 divided among them if more than three children.
- d. If no benefits are payable under (a), (b) or (c), a dependent parent or parents may receive or share \$60 per month upon attaining age 62.

If an active participant dies after completing 5 years of service, the widow or dependent beneficiary may elect to receive either a refund of accumulated contributions or:

- a. If the survivor is the widow, a survivor benefit calculated as if the participant had been age 60 at death and elected Option 1, plus \$60 per dependent child not to exceed \$180 per month.
- b. If there is no widow, a survivor benefit calculated as if the participant had been age 60 at death and elected Option 1.

Basis of the Valuation

Summary of Plan Provisions (continued)

Return of contributions upon death

If after the death of a participant, no further monthly benefits are payable to a beneficiary under an optional form of payment, or under the survivor benefit provisions, the participant's beneficiary shall be paid the excess, if any, of the participant's accumulated contributions over all payments made to or on behalf of the deceased participant.

DROP

Effective July 1, 2001, active participants may elect to enter the deferred retirement option plan (DROP) for up to four years. Upon entering the DROP, the participant's retirement benefit is frozen and credited to the participant's DROP account. At the end of the DROP, or upon earlier termination of employment, the DROP account is paid in a lump sum or installments, at the participant's option. During the DROP, the participant continues as an active participant, but does not pay contributions. To enter the DROP the participant must be age 65 or meet the Rule of 85. The DROP program is no longer available, ending June 30, 2008.

Contributions by participants

Participants contribute 5% of compensation. Accumulated contributions are credited at the rate of interest established by the board of trustees. The current crediting rate is 5%.

Contributions by employers

As needed to keep the System actuarially sound.

Expenses

Administrative expenses paid out of investment income.

Basis of the Valuation

Member Census (Last Two Years)

As of January 1	2014	2015
Active Members		
Number	4,880	5,011
Average Age	43.65	43.77
Average Service	8.08	7.94
Average Annual Base Pay	\$ 49,852	\$ 49,032
Vested Terminated Members		
Number	462	473
Average Account Balance	\$ 27,314	\$ 28,080
Non-vested Terminated Members		
Number	1,336	1,539
Average Account Balance	\$ 3,525	\$ 3,485
Benefit Recipients		
Number	4,689	4,624
Average Age	73.15	73.35
Average Monthly Benefit	\$ 1,867	\$ 1,894

Note: Please see the Statistical Section for a ten year history of the System's membership census.

Schedule of Active Member Valuation Data (Last Six Years)

<u>Plan Year</u>	<u>Number of Active Members</u>	<u>Annual Payroll</u>	<u>Average Annual Pay</u>	<u>% Increase in Average Pay</u>
2010	4,825	241,959,275	50,147	8.70%
2011	4,336	218,308,928	50,348	0.40%
2012	4,784	234,703,040	49,060	-2.56%
2013	4,786	225,894,414	47,199	-3.79%
2014	4,880	243,277,760	49,852	5.62%
2015	5,011	245,699,352	49,032	-1.64%

Schedule of Retirees & Beneficiaries Added or Removed from Rolls (Last Six Years)

<u>Plan Year</u>	<u>Added to Rolls</u>		<u>Removed from Rolls</u>		<u>Rolls – End of Year</u>		<u>% Increase in Annual Allowances</u>	<u>Average Annual Allowance</u>
	<u>No.</u>	<u>Annual Allowances</u>	<u>No.</u>	<u>Annual Allowances</u>	<u>No.</u>	<u>Annual Allowances</u>		
2010	N/A		N/A		4,370		N/A	N/A
2011	373		156		4,587	\$98,927,501	N/A	\$21,567
2012	135	\$2,606,505	182	\$2,793,752	4,540	98,768,933	-0.16%	21,755
2013	164	3,544,756	188	2,699,920	4,516	99,629,314	0.87%	22,061
2014	313	7,711,256	140	2,288,004	4,689	105,061,832	5.45%	22,406
2015	163	3,774,578	228	3,783,237	4,624	105,066,268	0.02%	22,722

Note: The retirement system began tracking changes to Retiree Payroll in Fiscal Year 2013. The changes will appear in the schedule above as they occur with each new fiscal year.

Basis of the Valuation

Summary of Methods and Assumptions

The valuation is based upon the premise that the System will continue in existence, so that future events must also be considered. These future events are assumed to occur in accordance with the actuarial assumptions and concern such events as the earnings of the fund; the number of members who will retire, die or terminate their services; their ages at such termination and their expected benefits.

The following actuarial assumptions and the actuarial cost or funding method have been adopted by the board of trustees to serve as guide in funding the System in a reasonable and acceptable manner.

Interest

8.0% per annum.

Participant account interest crediting rate

5.0% per annum.

Expenses

The rate of interest assumed is net of expenses.

Mortality

Mortality tables mandated by the Pension Protection Act as specified in IRS Regulation 1.430(h) (3)-1, applied on a static basis, projected 7 years from the valuation date for annuitants and 15 years for non-annuitants.

Disability Mortality

The RP-2000 Disability Mortality Table is used for disabled participants.

Withdrawal

Withdrawals are assumed to occur at rates based on actual experience of the retirement system. During the first five years of membership, withdrawals are assumed to occur at the following rates:

Year of Membership	Non-charter school employees	Charter school employees
1 st	25.0%	30.0%
2 nd	20.0%	25.0%
3 rd	15.0%	20.0%
4 th	12.5%	15.0%
5 th	10.0%	10.0%

Salary scale

Salaries are assumed to increase at the rate of 4.5% per year.

Disability

Disabilities are assumed to occur at rates based on the actual experience of the retirement system.

Retirement

Retirements occur at rates based on the actual experience of the retirement system. Unless the age-related rate is greater, for those eligible to retire under the Rule of 85, it is assumed that 25% will retire when first eligible for unreduced benefits with at least 30 years of credited service.

Basis of the Valuation

Summary of Methods and Assumptions (continued)

Family Structure

The probability of a participant being married and the probable number of children are based on a table constructed by the Social Security Administration, modified to reflect the experience of the retirement system. For married participants, husbands are assumed to be 3 years older than their wives.

Usage of Cash-out Option

Participants terminating in vested status are given the option of taking a refund of their accumulated participant contributions instead of a deferred retirement benefit. Active members who terminate in the future with a vested benefit are assumed to take a deferred vested annuity, unless a refund of contributions and interest is greater than the actuarial present value of their vested deferred benefit.

Future Benefit Increases or Additional Benefits

When funding is adequate, the Board may authorize cost of living adjustments (COLAs) or an additional monthly payment to retirees (13th check.) This valuation assumes that no future COLAs and no future 13th checks will be awarded.

Actuarial Method – Frozen Entry Age

The actuarial cost method used by the System is the "frozen entry age actuarial cost method." Under this method, on the initial actuarial valuation date for which the cost method is used, the annual cost accruals (individual normal costs for each participant) are determined as a level percentage of pay for each year from entry age until retirement or termination. The UFAAL was originally determined as of January 1, 1981. Entry age is determined at the date each participant would have entered the System. The sum of these individual normal costs for all active participants whose attained ages are under the assumed retirement age is the normal cost for the initial plan year. The excess of all normal costs falling due prior to the initial actuarial valuation date, accumulated with interest, over the plan assets establishes the initial Unfunded Frozen Actuarial Accrued Liability (UFAAL).

The UFAAL is only frozen in that it is not adjusted due to experience gains and losses. Instead, gains and losses are reflected through changes in the normal cost accrual rate. The UFAAL does change, increasing due to interest and additional normal costs, and decreasing due to contributions. Any changes to plan provisions or actuarial assumptions result in a change to the UFAAL. The amount of the change is determined by computing the impact in the actuarial accrued liability as of the valuation date coincident with or next following the change.

Normal costs are calculated as the level percentage of pay required to fund the excess of the actuarial present value of future benefits over the sum of the actuarial value of current assets and the remaining UFAAL.

Effective January 1, 2006, UFAAL was reestablished to better reflect an appropriate relationship between the normal cost and the actuarial accrued liability.

The funding requirement for each plan year is the sum of the "normal cost contribution" (equal to the normal cost for that year), plus the "actuarial accrued liability contribution." The "actuarial accrued liability contribution" is the payment required to amortize the UFAAL over 30 years, from January 1, 2006, the date that it was reestablished.

Basis of the Valuation

Summary of Methods and Assumptions (continued)

Valuation of Assets

The actuarial value of assets is determined using the assumed yield method of valuing assets. Under the assumed yield asset valuation method, the prior year's actuarial value is increased at the assumed rate of return with appropriate adjustments for contributions and disbursements to produce an expected actuarial value of assets at the end of the year. The expected actuarial value is compared to the market value of assets less the expense and contingency reserve, and 20% of the difference is added to the expected actuarial value. The actuarial value of assets was "fresh-started" as of January 1, 2006 and set equal to the market value of assets as of that date.

Changes from the Prior Valuation

The mortality tables for non-disabled members were updated to the IRS Static Mortality Tables mandated for use by private pension plans for the 2015 plan year.

Non-Annuitant Rates of Withdrawal, Disability and Retirement

Attained Age	<u>Withdrawal Rates</u>		<u>Disability Rates</u>		Retirement Rate*
	<u>Males</u>	<u>Females</u>	<u>Males</u>	<u>Females</u>	
20	18.50%	18.50%	.000%	.000%	0.00%
25	15.50%	15.50%	.000%	.000%	0.00%
30	11.00%	11.00%	.040%	.040%	0.00%
35	9.00%	9.00%	.040%	.040%	0.00%
40	7.50%	7.50%	.080%	.075%	0.00%
45	4.00%	4.00%	.150%	.100%	0.00%
50	2.50%	2.50%	.200%	.150%	0.00%
55	2.00%	2.00%	.450%	.250%	0.00%
60	1.50%	1.50%	.550%	.325%	20.00%
65	0.00%	0.00%	.000%	.000%	35.00%
70	0.00%	0.00%	.000%	.000%	30.00%
72	0.00%	0.00%	.000%	.000%	100.00%

*The retirement rate for all members less than 60 years old is 20% under the "Rule of 85."

Basis of the Valuation

Summary of Methods and Assumptions (continued)

Non-Annuitant Mortality Rates

Death Rates			Death Rates		
Male	Age	Female	Male	Age	Female
.000382	30	.000195	.018659	75	.015484
.000665	35	.000341	.051599	80	.039309
.000848	40	.000449	.094897	85	.067842
.001018	45	.000693	.167928	90	.123259
.001240	50	.001002	.255965	95	.186128
.001704	55	.001985	.271672	96	.196530
.003007	60	.003382	.286932	97	.210554
.004961	65	.005008	.308432	98	.219072
.006305	70	.006550	.323018	99	.226350

Annuitant Mortality Rates

Death Rates			Death Rates		
Male	Age	Female	Male	Age	Female
.000382	30	.000195	.027744	75	.023554
.000665	35	.000341	.051599	80	.039309
.000848	40	.000449	.094897	85	.067842
.001595	45	.000699	.167928	90	.123259
.003586	50	.001607	.255965	95	.186128
.003872	55	.002959	.271672	96	.196530
.005748	60	.005553	.286932	97	.210554
.009840	65	.009282	.308432	98	.219072
.015925	70	.014994	.323018	99	.226350

Disability Mortality Rates

Death Rates			Death Rates		
Male	Age	Female	Male	Age	Female
.022571	30	.007450	.082067	75	.052230
.022571	35	.007450	.109372	80	.072312
.022571	40	.007450	.141603	85	.100203
.022571	45	.007450	.183408	90	.140049
.028975	50	.011535	.267491	95	.194509
.035442	55	.016544	.283905	96	.205379
.042042	60	.021839	.299852	97	.215240
.050174	65	.028026	.315296	98	.223941
.062583	70	.037635	.330207	99	.231387