State of Washington Pension Funding Council LEOFF 2 Board

Actuarial Audit of June 30, 2017 Actuarial Valuation

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August 8, 2018

Mr. Shawn Merchant
Legislative & Stakeholder Relations Director
Department of Retirement Services

Mr. Steve Nelsen
Executive Director
LEOFF Plan 2 Retirement Board

Re: Actuarial Audit Report

Dear Shawn and Steve,

The enclosed report presents the findings and comments resulting from a detailed review of the June 30, 2017 actuarial valuation performed by the Office of the State Actuary (OSA) for the Pension Funding Council (PFC) and the LEOFF 2 Board. An overview of our findings is included in the Executive Summary section of the report. More detailed commentary on our review process is included in the latter sections.

All calculations for the actuarial valuation are based on the Revised Code of Washington (RCW) and the actuarial assumptions proposed by the OSA based on its 2007-2012 experience study for use in the June 30, 2017 actuarial valuation. Note that economic assumptions for inflation, wage growth, and investment rate of return were updated for the June 30, 2017 actuarial valuation.

As discussed in our report, we believe the package of actuarial assumptions and methods is reasonable (taking into account the experience of Washington State Public Retirement Systems and reasonable expectations). Nevertheless, the emerging costs will vary from those presented in this report to the extent that actual experience differs from that projected by the actuarial assumptions. Future actuarial measurements may differ significantly from the current measurements presented in this report due to factors such as the following:

- Plan experience differing from the actuarial assumptions,
- Future changes in the actuarial assumptions,
- Increases or decreases expected as part of the natural operation of the methodology used for these measurements (such as potential additional contribution requirements due to changes in the plan's funded status), and
- Changes in the plan provisions or accounting standards.

Due to the scope of this assignment, we did not perform an analysis of the potential range of such measurements.

In preparing this report, we relied, without audit, on information (some oral and some in writing) supplied by the OSA's staff. This information includes information supplied to the OSA by the Department of Retirement Systems (DRS) and the Washington State Investment Board (WSIB). This information includes, but is not limited to, statutory provisions, employee data, and financial information. In our examination of these data, we have found them to be reasonably consistent and comparable with data used for other purposes. Since the audit 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 Actuarial Standards of Practice promulgated by the Actuarial Standards Board and the applicable Guides to Professional Conduct, amplifying Opinions, and supporting Recommendations of the American Academy of Actuaries.

Milliman's work product was prepared exclusively for the Pension Funding Council and the LEOFF 2 Board for a specific and limited purpose. It is a complex, technical analysis that assumes a high level of knowledge concerning the operations of the Washington State Public Retirement Systems, and uses DRS's census data, which Milliman has not audited. It is not for the use or benefit of any third party for any purpose. Any third party recipient of Milliman's work product who desires professional guidance should not rely upon Milliman's work product, but should engage qualified professionals for advice appropriate to its own specific needs.

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

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

We would like to express our appreciation to the OSA's staff for their assistance in supplying the data and information on which this report is based.

We are members of the American Academy of Actuaries and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein.

We respectfully submit the following report, and we look forward to discussing it with you.

Sincerely,

Mark C. Olleman, FSA, EA, MAAA
Consulting Actuary

Nick J. Collier, ASA, EA, MAAA
Consulting Actuary

Daniel R. Wade, FSA, EA, MAAA
Consulting Actuary

MCO/NJC/DRW/nlo

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Section 1 Summary of the Findings

Purpose and Scope of the Actuarial Audit

This actuarial audit reviews the June 30, 2017 actuarial valuation performed by the Office of the State Actuary (OSA). The purpose of this audit is to verify that the results of the valuation are accurate and that the assumptions the valuation is based upon are reasonable. The following tasks were performed in this audit:

- Evaluation of the data used in the valuation
- Full independent replication of the key valuation results
- Evaluation of the reasonableness of the assumptions used in the valuation
- Analysis of valuation results and reconciliation of material differences (if any)
- Analysis of the written work product

Audit Conclusion

Overall

The results of this audit are very positive. Specifically, we want to highlight the following:

- **Reasonable Assumptions:** We believe that all of the recommended assumptions used to value liabilities are reasonable. The inflation, wage growth, and investment rate of return assumptions were decreased for the June 30, 2017 actuarial valuation. We believe that the updated assumptions better reflect current expectations based on capital market assumptions.
- **Contributions toward Funding:** Washington State has funding that is superior to that of most statewide systems. The use of the aggregate actuarial cost method, along with relatively short amortization periods for PERS and TRS Plans 1, limits the contributions deferred to future generations in comparison to what is done in most other states.
- **Accurate Calculations:** Our independent calculations matched OSA's closely in all material aspects of the valuation.

Actuarial Valuation

Based upon our review of the June 30, 2017 actuarial valuation, we found the actuarial work performed by OSA was reasonable, appropriate, and accurate. We closely matched the assets, liabilities, and contribution rates calculated by OSA.

Statement of Key Findings

Membership Data

We performed tests on both the raw data supplied by the Department of Retirement Systems (DRS) and the processed data used by the OSA in the June 30, 2017 actuarial valuation. We feel that there is an excellent match between the data supplied by DRS and the data used by OSA. Based on this review, we feel the individual member data used is complete. A summary is shown in the table below:

All Plans	OSA	Milliman	Ratio OSA/Milliman
Active Members			
Total Number	317,677	317,677	100.0%
Total Salaries (millions)	$ 20,031	$ 20,033	100.0%
Average Age	46.8	46.8	100.0%
Average Service	11.5	11.5	100.0%
Average Salary	$ 63,054	$ 63,062	100.0%
Retirees and Survivors			
Total Number	177,685	177,685	100.0%
Average Monthly Pension	$ 1,897	$ 1,895	100.1%
Terminated Members			
Total Number Vested	61,519	61,519	100.0%
Total Number Non-Vested	135,108	135,109	100.0%

Actuarial Value of Assets

We have reviewed the calculations for the actuarial value of assets used for each plan in the June 30, 2017 valuation. We found the calculations to be reasonable and the methodology to be appropriate and in compliance with Actuarial Standards of Practice. The actuarial value of assets is discussed in more detail in Section 3 of this report.

Actuarial Liabilities

We independently calculated the Present Value of Benefits, Normal Cost, and Actuarial Accrued Liability under the Entry Age Normal actuarial cost method for all systems. We found that all significant benefit provisions were accounted for in an accurate manner, the actuarial assumptions and methods are being applied as reported, and that our total liabilities matched those calculated by OSA closely. This was true both in aggregate and by individual plan.

A summary of the results for each system is shown in the table below. Further breakdowns are shown in Section 4.

	OSA	Milliman	Ratio OSA/Milliman
Present Value All Future Benefits (in $Millions)			
PERS 1	$ 12,307.0	$ 12,304.4	100.0%
PERS 2/3	45,200.0	45,000.8	100.4%
TRS 1	8,841.7	8,889.8	99.5%
TRS 2/3	17,513.6	17,404.5	100.6%
SERS 2/3	6,485.8	6,439.0	100.7%
PSERS 2	995.7	982.9	101.3%
LEOFF 1	4,123.5	4,137.3	99.7%
LEOFF 2	13,672.1	13,689.2	99.9%
WSPRS	1,448.1	1,449.8	99.9%
Total PVB	**$ 110,587.3**	**$ 110,297.7**	**100.3%**

In the process of comparing liability calculations with OSA, we noted a minor difference (less than $1 million) in the determination of the benefit for deferred Washington State Patrol (WSP) members with portability. OSA provided us with updated numbers to reflect this small change, and we have reflected that change in the OSA numbers shown in this report. It is our understanding that the OSA will reflect this change in the final 2017 valuation.

Funding

We reviewed the funding methods and their application. We find them reasonable and consistent with the Actuarial Standards of Practice and the objectives stated in RCW 41.45.010. Based on the Systems' funding methods and assumptions, we believe the employer contribution rates for each membership class are appropriately calculated.

When we used the liabilities, present value of future salaries, and actuarial assets calculated by OSA, we matched OSA's contribution rates.

When we used the liabilities, present value of future salaries, and actuarial assets calculated by Milliman, the results were close to OSA's calculated contribution rates, as shown below.

Employer Contribution Rates

	OSA	Milliman	Difference OSA - Milliman
Employer Contribution Rates (Percent of Member Pay)			
PERS 1/2/3	12.68%	12.67%	0.01%
TRS 2/3	15.33%	15.20%	0.13%
SERS 2/3	13.01%	12.91%	0.10%
PSERS 2	11.96%	11.85%	0.11%
WSPRS	22.13%	22.38%	-0.25%
LEOFF 1	0.00%	0.00%	0.00%
LEOFF 2*	4.64%	4.63%	0.01%

Member Contribution Rates

	OSA	Milliman	Difference OSA - Milliman
Member Contribution Rates (Percent of Member Pay)			
PERS 1	6.00%	6.00%	0.00%
PERS 2	7.90%	7.99%	-0.09%
TRS 1	6.00%	6.00%	0.00%
TRS 2	7.77%	7.75%	0.02%
SERS 2	8.25%	8.25%	0.00%
PSERS 2	7.20%	7.19%	0.01%
WSPRS	8.45%	8.45%	0.00%
LEOFF 1	0.00%	0.00%	0.00%
LEOFF 2*	7.74%	7.71%	0.03%

** Based on a LEOFF 2 contribution rate structure of 90% of Entry Age Normal Cost rate with a 50%/30%/20% share for the member, employer and the state, respectively.*

Funding is discussed in more detail in Section 5.

Actuarial Assumptions

We reviewed the assumptions used in the valuation and found them to be reasonable. A complete analysis of the demographic assumptions was done with the 2014 actuarial audit, which also included an audit of the 2007-2012 Demographic Experience Study. For this audit, we did a brief review of the assumption for future mortality improvement, as the Retirement Plans Experience Committee (RPEC) of the Society of Actuaries (SoA) has issued two more recent tables, which feature two-dimensional assumption to allow for disparate improvements by age and calendar year. We continue to believe that 100% of Scale BB is a reasonable assumption to use. We do not believe that the additional complexity of the new tables leads to a materially better prediction of life expectancies in the context of pension funding.

The economic assumptions used were based on the OSA's 2017 Report on Financial Condition and Economic Experience Study completed in August 2017. While a full audit of that report is beyond the scope of our assignment, we feel an actuarial audit would be incomplete without a review of the important economic assumptions used in the actuarial valuation.

We have the following comments regarding the economic assumptions:

- The expected return assumption of 7.40% recommended by the OSA is reasonable based on the future expectations of WSIB and reflecting the 2.75% inflation assumption. Although we also consider the 7.50% assumption used for non-LEOFF 2 plans to be reasonable, we believe that 7.40% is a slightly more realistic assumption and recommend that the investment return assumption continue to decrease. It should be noted that Milliman is generally recommending return assumptions of less than 7.40% to our retained clients.
- The inflation assumption of 2.75% is reasonable, as is the real wage growth assumption of 0.75% for productivity. The general salary increase assumption of 3.50% is the sum of these two assumptions.
- As prescribed, OSA assumes annual growth in active membership varying by plan from 0.95% to 1.25%. Most public sector pension plans assume no future growth in system membership. Please note that this assumption only impacts the amortization of the Plan 1 Unfunded Actuarial Accrued Liability (UAAL) over 10 years. The small membership growth assumption over the 10-year amortization period has a modest impact on the calculated contribution rates.

Review of Preliminary Report

Because the final 2017 Actuarial Valuation reports have not been completed at this time, we base the comments on the preliminary report. Overall, we found OSA's report to be very thorough. We have made two comments for consideration for the upcoming reports that may enhance an outside reader's understanding. These comments are related to additional disclosure and do not impact any of the actuarial calculations. Please see Section 6 of this report for more information about our comments.

Recommendations from Prior Audit

We have also reviewed the comments from our prior actuarial audit and reported on the incorporation of those comments. Our one recommendation pertaining to the valuation calculations was implemented.

Recommendations and Other Considerations

We are recommending one change to the preliminary actuarial valuation. We have also provided a few recommendations for OSA, PFC, and the LEOFF 2 Board to consider in the future, as listed below and discussed in further detail in the body of this report.

Recommended Changes to the 2017 Valuation

We recommend one change to the preliminary 2017 valuation, Our understanding is that this recommendation will be reflected in the final 2017 valuation. This will result in a small (less than $1 million) reduction in the calculated liabilities for WSP compared to the preliminary 2017 valuation. OSA provided us with updated numbers to reflect this small change, and we have reflected that change in the OSA numbers shown in this report.

- **Assumed salary increases for WSP deferred members with portability** – It is assumed that there will be a one-time increase in salaries for active WSP members, in addition to the assumed annual increase, to reflect the expanded definition of pensionable overtime that was recently enacted. In its preliminary valuation, OSA assumed this increase applied to WSP deferred members with portability. OSA reviewed this assumption and decided not to apply it to deferred members in their final 2017 valuation.

Recommended Changes for Future Valuations with a Material Financial Impact

None

Recommended Changes for Future Valuations and Experience Studies with a Non-Material Financial Impact

We recommend that the following changes be considered.

- **Member contribution rate for savings fund accrual assumption** – We recommend this assumption be reviewed in light of the greater weight this assumption has in the short term.
- **Treatment of WSP deferred members with portability** – For valuation purposes, a vested member who has left active WSP service and is now working with another employer and eligible for portability is treated as an active member with no additional service accrual. This results in a later assumed retirement than if the member did not have portability. This may be a reasonable assumption, but given the member's benefit is more valuable if the member retires at earliest eligibility, we believe this approach should be reviewed with the experience study.
- **Recommendations from Prior Audit (see end of Section 6):** The one prior recommendation pertaining to the valuation calculations was implemented. There are recommendations from the 2014 audit for the next experience study which should be considered at that time.

Recommended Changes for Future Valuations and Experience Studies with No Financial Impact

We recommend that OSA consider the following actions for future valuations and the experience studies they are based on:

- **Information in Report (see Comments Regarding OSA's Reports in Section 6).** We have suggested additional disclosure of two items, as described in Section 6.

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Section 2 Membership Data

Audit Conclusion

We performed tests on both the raw data supplied by DRS and the processed data used by OSA in the June 30, 2017 actuarial valuation. We found that the data used by OSA was consistent with the data supplied by DRS.

Based on this review, we feel the individual member data used is appropriate and complete.

Comments

Overall, the data process appears to be thorough and accurate. We would add the following comments:

- Raw Data: OSA provided us with the same files that were given to them by DRS for use in the actuarial valuation.

  Completeness: The data contained all the necessary fields to perform the actuarial valuation.

  Quality: Although we did not audit the data at the source, we performed some independent checks to confirm the overall reasonableness of the data. We compared the total retiree and beneficiary benefit amounts with the actual benefit payments made, as reported in the asset statements.

  We also compared the total active member compensation on the DRS data with the estimated active payroll for 2016-2017. The actual member contribution amounts in the asset statements provided by DRS were divided by the applicable contribution rates for the prior year for each plan. This results in an estimated payroll for each plan. Based on this analysis, we found the compensation data to be reasonable.

- Parallel Data Processing: We performed independent edits on the raw data provided by DRS and then compared our results with the valuation data used by OSA, as summarized in the preliminary participant data summary on the OSA's website. We found our results to be consistent.

  Our results do not match exactly. This is understandable, as some adjustments were made to annualize salary for those with less than one year of service during the valuation period and other adjustments were made for a few data elements outside of the expected range. Overall, each key data component matched well within an acceptable level and we believe the individual member data used by the OSA was appropriate for valuation purposes.

Comments (continued)

A summary of the data for each plan is shown in Exhibit 2-1. In all cases, the summarized totals for our edited data matched those for OSA's valuation data closely. The "Milliman" column reflects the DRS data after adjustments by Milliman. The "OSA" column reflects the actual data used in the OSA's valuation as summarized in the preliminary participant data summary on the OSA's website.

Exhibit 2-1
Member Statistics as of June 30, 2017

All Plans

	OSA	Milliman	Ratio OSA/Milliman
Active Members			
Total Number	317,677	317,677	100.0%
Total Salaries (millions)	$ 20,031	$ 20,033	100.0%
Average Age	46.8	46.8	100.0%
Average Service	11.5	11.5	100.0%
Average Salary	$ 63,054	$ 63,062	100.0%
Retirees and Survivors			
Total Number	177,685	177,685	100.0%
Average Monthly Pension	$ 1,897	$ 1,895	100.1%
Terminated Members			
Total Number Vested	61,519	61,519	100.0%
Total Number Non-Vested	135,108	135,109	100.0%

Comments
(continued)

Exhibit 2-1 (continued)
Member Statistics as of June 30, 2017

PERS 1	OSA	Milliman	Ratio OSA/Milliman
Active Members			
Total Number	2,597	2,597	100.0%
Total Salaries (millions)	$ 163	$ 163	100.2%
Average Age	65.1	65.1	100.0%
Average Service	25.7	25.7	100.0%
Average Salary	$ 62,610	$ 62,613	100.0%
Retirees and Survivors			
Total Number	48,111	48,111	100.0%
Average Monthly Pension	$ 2,048	$ 2,044	100.2%
Terminated Members			
Total Number Vested	660	660	100.0%
Total Number Non-Vested	3,018	3,018	100.0%

PERS 2	OSA	Milliman	Ratio OSA/Milliman
Active Members			
Total Number	121,934	121,934	100.0%
Total Salaries (millions)	$ 7,926	$ 7,927	100.0%
Average Age	47.9	47.9	100.0%
Average Service	12.1	12.1	100.0%
Average Salary	$ 65,002	$ 65,011	100.0%
Retirees and Survivors			
Total Number	46,537	46,537	100.0%
Average Monthly Pension	$ 1,592	$ 1,591	100.1%
Terminated Members			
Total Number Vested	27,796	27,796	100.0%
Total Number Non-Vested	107,483	107,483	100.0%

Comments
(continued)

Exhibit 2-1 (continued)
Member Statistics as of June 30, 2017

PERS 3		OSA		Milliman	Ratio OSA/Milliman
Active Members					
Total Number		34,943		34,943	100.0%
Total Salaries (millions)	$	2,090	$	2,090	100.0%
Average Age		43.3		43.3	100.0%
Average Service		8.4		8.4	100.0%
Average Salary	$	59,809	$	59,821	100.0%
Retirees and Survivors					
Total Number		4,262		4,262	100.0%
Average Monthly Pension	$	890	$	889	100.1%
Terminated Members					
Total Number Vested		5,598		5,598	100.0%
Total Number Non-Vested		N/A		N/A	100.0%

TRS 1		OSA		Milliman	Ratio OSA/Milliman
Active Members					
Total Number		698		698	100.0%
Total Salaries (millions)	$	61	$	61	100.0%
Average Age		66.1		66.1	100.0%
Average Service		32.3		32.3	100.0%
Average Salary	$	87,446	$	87,423	100.0%
Retirees and Survivors					
Total Number		34,151		34,151	100.0%
Average Monthly Pension	$	2,178	$	2,175	100.1%
Terminated Members					
Total Number Vested		187		187	100.0%
Total Number Non-Vested		311		311	100.0%

Comments
(continued)

Exhibit 2-1 (continued)
Member Statistics as of June 30, 2017

TRS 2	OSA	Milliman	Ratio OSA/Milliman
Active Members			
Total Number	18,747	18,747	100.0%
Total Salaries (millions)	$ 1,244	$ 1,244	100.0%
Average Age	41.7	41.7	100.0%
Average Service	7.7	7.7	100.0%
Average Salary	$ 66,374	$ 66,383	100.0%
Retirees and Survivors			
Total Number	5,060	5,060	100.0%
Average Monthly Pension	$ 1,924	$ 1,923	100.1%
Terminated Members			
Total Number Vested	2,612	2,612	100.0%
Total Number Non-Vested	6,300	6,301	100.0%

TRS 3	OSA	Milliman	Ratio OSA/Milliman
Active Members			
Total Number	53,780	53,780	100.0%
Total Salaries (millions)	$ 4,196	$ 4,196	100.0%
Average Age	46.2	46.2	100.0%
Average Service	14.1	14.1	100.0%
Average Salary	$ 78,023	$ 78,013	100.0%
Retirees and Survivors			
Total Number	10,264	10,264	100.0%
Average Monthly Pension	$ 1,139	$ 1,138	100.1%
Terminated Members			
Total Number Vested	8,914	8,914	100.0%
Total Number Non-Vested	N/A	N/A	100.0%

Comments
(continued)

Exhibit 2-1 (continued)
Member Statistics as of June 30, 2017

SERS 2	OSA	Milliman	Ratio OSA/Milliman
Active Members			
Total Number	26,697	26,697	100.0%
Total Salaries (millions)	$ 885	$ 886	99.9%
Average Age	49.8	49.8	100.0%
Average Service	9.1	9.1	100.0%
Average Salary	$ 33,153	$ 33,181	99.9%
Retirees and Survivors			
Total Number	8,216	8,216	100.0%
Average Monthly Pension	$ 879	$ 879	100.0%
Terminated Members			
Total Number Vested	5,914	5,914	100.0%
Total Number Non-Vested	13,740	13,740	100.0%

SERS 3	OSA	Milliman	Ratio OSA/Milliman
Active Members			
Total Number	33,715	33,715	100.0%
Total Salaries (millions)	$ 1,127	$ 1,128	99.9%
Average Age	49.5	49.5	100.0%
Average Service	9.9	9.9	100.0%
Average Salary	$ 33,436	$ 33,454	99.9%
Retirees and Survivors			
Total Number	7,725	7,725	100.0%
Average Monthly Pension	$ 480	$ 480	100.0%
Terminated Members			
Total Number Vested	8,403	8,403	100.0%
Total Number Non-Vested	N/A	N/A	100.0%

Comments
(continued)

Exhibit 2-1 (continued)
Member Statistics as of June 30, 2017

PSERS 2	OSA	Milliman	Ratio OSA/Milliman
Active Members			
Total Number	5,822	5,822	100.0%
Total Salaries (millions)	$ 362	$ 362	99.9%
Average Age	40.1	40.1	100.0%
Average Service	6.0	6.0	100.0%
Average Salary	$ 62,247	$ 62,255	100.0%
Retirees and Survivors			
Total Number	167	167	100.0%
Average Monthly Pension	$ 745	$ 745	100.0%
Terminated Members			
Total Number Vested	468	468	100.0%
Total Number Non-Vested	2,240	2,240	100.0%

LEOFF 1	OSA	Milliman	Ratio OSA/Milliman
Active Members			
Total Number	40	40	100.0%
Total Salaries (millions)	$ 5	$ 5	100.0%
Average Age	65.8	65.8	100.0%
Average Service	41.1	41.1	100.0%
Average Salary	$ 114,135	$ 114,135	100.0%
Retirees and Survivors			
Total Number	7,228	7,228	100.0%
Average Monthly Pension	$ 4,181	$ 4,181	100.0%
Terminated Members			
Total Number Vested	-	-	-
Total Number Non-Vested	29	29	100.0%

Comments
(continued)

Exhibit 2-1 (continued)
Member Statistics as of June 30, 2017

LEOFF 2	OSA	Milliman	Ratio OSA/Milliman
Active Members			
Total Number	17,694	17,694	100.0%
Total Salaries (millions)	$ 1,879	$ 1,879	100.0%
Average Age	43.2	43.2	100.0%
Average Service	14.2	14.2	100.0%
Average Salary	$ 106,169	$ 106,184	100.0%
Retirees and Survivors			
Total Number	4,851	4,851	100.0%
Average Monthly Pension	$ 3,894	$ 3,894	100.0%
Terminated Members			
Total Number Vested	863	863	100.0%
Total Number Non-Vested	1,917	1,917	100.0%

WSPRS 1	OSA	Milliman	Ratio OSA/Milliman
Active Members			
Total Number	464	464	100.0%
Total Salaries (millions)	$ 48	$ 48	100.8%
Average Age	48.2	48.2	100.0%
Average Service	21.4	21.4	100.0%
Average Salary	$ 102,624	$ 102,624	100.0%
Retirees and Survivors			
Total Number	1,113	1,113	100.0%
Average Monthly Pension	$ 4,287	$ 4,287	100.0%
Terminated Members			
Total Number Vested	73	73	100.0%
Total Number Non-Vested	17	17	100.0%

Comments
(continued)

Exhibit 2-1 (continued)
Member Statistics as of June 30, 2017

WSPRS 2	OSA	Milliman	Ratio OSA/Milliman
Active Members			
Total Number	546	546	100.0%
Total Salaries (millions)	$ 45	$ 45	99.5%
Average Age	33.7	33.7	100.0%
Average Service	7.3	7.3	100.0%
Average Salary	$ 82,863	$ 82,863	100.0%
Retirees and Survivors			
Total Number	-	-	100.0%
Average Monthly Pension	$ -	$ -	100.0%
Terminated Members			
Total Number Vested	31	31	100.0%
Total Number Non-Vested	53	53	100.0%

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Section 3 Actuarial Value of Assets

Audit Conclusion

We have reviewed the calculations for the actuarial value of assets used for each plan in the June 30, 2017 valuation. We found the calculations to be reasonable and the methodology to be appropriate and in compliance with Actuarial Standards of Practice.

Comments

The method used to determine the actuarial value of assets smooths investment gains and losses by reflecting a portion of the difference between the actual market value of assets and the expected market value for every fiscal year. For each year and each plan, a base for smoothed recognition over time is established equal to that difference.

The larger the deviation from expectation, the longer the recognition period for that base, with a level dollar amount recognized for each year of that period. For the largest deviations (more than 7% above or below the assumption), the gains or losses are recognized over eight years, whereas when the actual return is within 1% of the assumption, the gain or loss is recognized immediately. Additionally, a “corridor” is applied to make sure that the smoothed actuarial value of assets stays within 30% of the market value of assets.

Although it is unusual to recognize investment gains and losses over different periods, we believe it is a reasonable approach since the maximum smoothing period is reasonable and the method allows the actuarial value of assets to converge to market more rapidly if gains and losses are small.

We independently calculated the actuarial value of assets for each plan based on financial information provided by DRS and the Washington State Investment Board (WSIB). DRS and WSIB both provide market values of assets by plan. Note that there are small differences between the values provided by DRS and WSIB. Per prior conversations with OSA, the DRS values are used for the market value of assets. The WSIB data is only used to determine the monthly cash flows (contributions minus benefit payments) needed to calculate the expected value of assets.

Comments (continued)

We used the information from DRS, WSIB, along with the outstanding gain/loss bases as published in the 2016 Actuarial Valuation Report. With this information and the asset methodology, our independent calculations were within less than 0.05% of the OSA's calculation for every plan.

See the following exhibit for a comparison.

Exhibit 3-1
Comparison of Actuarial Value of Assets by Plan

AVA (millions)	OSA	Milliman	Ratio OSA/Milliman
PERS			
Plan 1	$ 7,042	$ 7,040	100.0%
Plan 2/3 (DB)	$ 33,191	$ 33,184	100.0%
TRS			
Plan 1	$ 5,371	$ 5,369	100.0%
Plan 2/3 (DB)	$ 11,885	$ 11,882	100.0%
SERS			
Plan 2/3 (DB)	$ 4,613	$ 4,612	100.0%
PSERS			
Plan 2	$ 480	$ 480	100.0%
LEOFF			
Plan 1	$ 5,403	$ 5,402	100.0%
Plan 2	$ 11,037	$ 11,035	100.0%
WSPRS			
Plan 1 & 2	$ 1,144	$ 1,144	100.0%

As discussed above, OSA uses an asset smoothing method to reduce volatility. A five-year smoothing method is the most commonly used method among large public retirement systems. OSA uses a variable length of smoothing period, with eight years as the longest possible period. We believe the use of an asset smoothing method is appropriate, and we generally recommend this to our clients, particularly in systems where contribution rates change annually or biennially.

When a smoothing method is used, the actuarial value of assets will deviate from the market value of assets. Many public retirement systems apply a corridor so that the actuarial value of assets is not allowed to deviate from the market value by more than a certain percentage. The potential downside of using a corridor is that it can cause significant contribution rate volatility when the assets are outside the corridor. OSA applies a corridor of 30% (if applicable).

Comments (continued)

Typically, the longer the recognition period, the more important it is to have a corridor. We believe that the eight-year smoothing period, coupled with the application of the corridor, is in compliance with ASOP No. 44, the actuarial standard of practice for the selection and use of asset valuation methods for pension valuations.

In October 2014, the Conference of Consulting Actuaries (CCA) issued a white paper entitled *Actuarial Funding Policies and Practices for Public Pension Plans* which includes guidelines for asset smoothing methodologies. This paper was drafted in part as a response to the void left by the fact that the new applicable statements of the Governmental Accounting Standards Board (GASB) no longer specify the parameters for an Annual Required Contribution (ARC). The CCA was comprised of a group of public plan actuaries from the major firms in public plan practice who met more than 24 times over two years.

OSA's method of smoothing with recognition periods eight years or less, along with a 30% corridor, falls in the "Acceptable Practices" category under these guidelines (categories described below for reference). OSA's method is almost inside of the CCA "Model Practices" category. That could be achieved with a smoothing period of five years or fewer with a 50% corridor or a smoothing period of seven years or fewer with a 40% corridor. Note that the "Model Practices" are not intended to be "best practices," but are the ones considered to be most consistent with the Level Cost Allocation Model. Therefore, this is not a recommendation to change, just an observation.

OSA's method is consistent with all of the CCA specific policy objectives and considerations for an asset smoothing method. Its consistency with the primary objectives is shown by the following:

- All components of the asset method are specified: return subject to smoothing, smoothing period, corridor, and method of recognizing deferred amounts.
- It is unbiased compared to market value.
- It does not selectively reset to market when market value is greater than actuarial value.
- Realized and unrealized gains and losses are treated the same.
- It is consistent with the Actuarial Standard of Practice No. 44 concept of being likely to return to market in a reasonable period and likely to stay within a reasonable range of market value.

We feel that the OSA's method is reasonable and consistent with the policy objectives of the State which are described in RCW 41.45.010 as being "to provide a dependable and systematic process for funding the benefits provided to members and retirees" of the Washington State Retirement Systems.

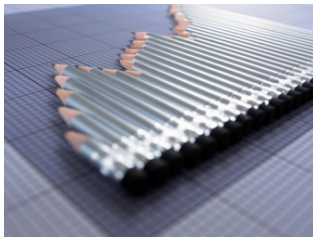
Comments (continued)

For reference, the categories in the CCA guidelines are shown below.

Categories Under CCA Guidelines	
Model Practices	Those practices most consistent with the Level Cost Allocation Model (LCAM).
Acceptable Practices	Generally those which, while not consistent with the LCAM, are well established in practice and typically do not require additional analysis.
Acceptable Practices with Conditions	May be acceptable in some circumstances either to reflect different policy objectives or on the basis of additional analysis.
Non-Recommended Practices	Systems using these practices should acknowledge the policy concerns identified in the CCA Guidelines or acknowledge they reflect different policy objectives.
Unacceptable Practices	No description provided by CCA, but implication is that these should not be used.

Section 4 Actuarial Liabilities

Audit Conclusion



We independently calculated the present value of future benefits and future salaries and the Entry Age Normal Cost rates for the Washington State Public Retirement Systems. We found that all significant benefit provisions were accounted for in an accurate manner and the actuarial assumptions and methods are being applied correctly. Our total liabilities closely matched those calculated by OSA. This was true both in aggregate and by System.

Note that there will always be differences in the calculated liabilities when different software is used by different actuaries; however, the results should not deviate significantly. The level of consistency we found in this audit provides a high level of assurance that the results of the valuation accurately reflect the liabilities of the Washington State Public Retirement Systems based on the plan provisions, assumptions, methods, and census and financial data.

Comments

We incorporated the following information into our valuation system:

- **Data** – We used the same valuation data used by OSA. As discussed in Section 2, we confirmed that this data was consistent with the data provided by DRS.
- **Assumptions and Methods** – We used the assumptions and methods used by OSA for the June 30, 2017 actuarial valuation. This was supplemented by discussions between OSA and Milliman on the technical application of these methods.
- **Benefit Provisions** – We obtained this information from the Revised Code of Washington and various member handbooks.

We then performed an independent parallel valuation as of June 30, 2017. Based on this valuation, we completed a detailed comparison of the Present Value of Future Benefits (PVFB) computed in our independent valuation and the amounts calculated by OSA. Exhibit 4-1 shows a summary of this analysis broken down by benefit type. Exhibit 4-2 shows a summary of this analysis broken down by System. The results were reasonable, and our calculated PVFB values match closely with those calculated by OSA.

Comments
(continued)

Exhibit 4-1
Present Value of Future Benefits by Benefit Type

(in $Millions)	All Systems in Aggregate OSA	Milliman	O / M Ratio
Present Value All Future Benefits			
Retirement	56,017.1	55,608.4	100.7%
Termination	$2,475.8	2,464.5	100.5%
Death	$1,078.8	1,091.3	98.9%
Disability	$610.5	599.9	101.8%
Total Actives	**$60,182.2**	**$59,764.1**	**100.7%**
Terminated Vested	$4,962.9	$4,906.3	101.2%
Terminated Not Vested	369.7	369.5	100.1%
Total Inactive, not in Payment	**$5,332.6**	**$5,275.8**	**101.1%**
Retired	$40,337.0	$40,472.9	99.7%
Disabled	$2,159.3	2,159.9	100.0%
Survivor	$2,437.7	2,486.3	98.0%
LOP Liability	$138.4	138.8	99.7%
Total Annuitants	**$45,072.4**	**$45,257.9**	**99.6%**
Total Members	**$110,587.2**	**$110,297.8**	**100.3%**

Comments
(continued)

Exhibit 4-2
Present Value of Future Benefits by System

	OSA	Milliman	Ratio OSA/Milliman
Present Value All Future Benefits (in $Millions)			
PERS 1			
Active Members	$ 860.8	$ 830.1	103.7%
Inactive Members	11,446.2	11,474.3	99.8%
Total	$ 12,307.0	$ 12,304.4	100.0%
PERS 2/3			
Active Members	$ 30,342.7	$ 30,081.4	100.9%
Inactive Members	14,857.4	14,919.3	99.6%
Total	$ 45,200.0	$ 45,000.8	100.4%
TRS 1			
Active Members	$ 327.8	$ 332.0	98.8%
Inactive Members	8,513.9	8,557.8	99.5%
Total	$ 8,841.7	$ 8,889.8	99.5%
TRS 2/3			
Active Members	$ 12,968.0	$ 12,875.2	100.7%
Inactive Members	4,545.5	4,529.3	100.4%
Total	$ 17,513.6	$ 17,404.5	100.6%

Comments
(continued)

Exhibit 4-2 (continued)
Present Value of Future Benefits by System

	OSA	Milliman	Ratio OSA/Milliman
Present Value All Future Benefits (in $Millions)			
SERS 2/3			
Active Members	$ 4,213.6	$ 4,163.8	101.2%
Inactive Members	2,272.2	2,275.2	99.9%
Total	$ 6,485.8	$ 6,439.0	100.7%
PSERS 2			
Active Members	$ 932.2	$ 920.2	101.3%
Inactive Members	63.5	62.8	101.1%
Total	$ 995.7	$ 982.9	101.3%
LEOFF 1			
Active Members	$ 53.0	$ 52.2	101.5%
Inactive Members	4,070.6	4,085.2	99.6%
Total	$ 4,123.5	$ 4,137.3	99.7%
LEOFF 2			
Active Members	$ 9,873.2	$ 9,891.9	99.8%
Inactive Members	3,798.9	3,797.3	100.0%
Total	$ 13,672.1	$ 13,689.2	99.9%
WSPRS			
Active Members	$ 611.1	$ 617.3	99.0%
Inactive Members	837.1	832.5	100.5%
Total	$ 1,448.1	$ 1,449.8	99.9%

Comments (continued)

We also looked at the Entry Age Normal Accrued Liability (EAN AL). EAN AL is used by OSA to measure the funded ratios and is described in Section 5 of this report. Exhibit 4.3 shows the audit had a good match of EAN AL. The EAN AL is consistent with the requirements of GASB No. 67 and GASB No. 68.

Exhibit 4-3
Comparison of Entry Age Normal Accrued Liability

	OSA	Milliman	Ratio OSA/Milliman
Entry Age Normal Accrued Liability (EAN AL) (in $Millions)			
PERS 1	$ 12,235.9	$ 12,243.1	99.9%
PERS 2/3	37,192.8	36,817.8	101.0%
TRS 1	8,821.2	8,870.8	99.4%
TRS 2/3	13,094.9	13,000.3	100.7%
SERS 2/3	5,241.6	5,236.8	100.1%
PSERS 2	505.5	492.9	102.6%
LEOFF 1	4,121.0	4,137.0	99.6%
LEOFF 2	10,159.5	10,200.3	99.6%
WSPRS	1,243.7	1,258.0	98.9%
Total EAN AL	**$ 92,616.2**	**$ 92,257.0**	**100.4%**

Lastly, we looked at both the present value of future salaries and the Entry Age Normal Cost (EANC) rates, which are used in the determination of the minimum contribution rates.

Exhibit 4-4
Present Value of Future Salaries and EANC Rate

(in $Millions)	All Systems in Aggregate		
	OSA	Milliman	O / M Ratio
Present Value of Future Salaries	$183,845.9	$182,591.7	100.7%
Entry Age Normal Cost Rate	9.95%	9.99%	99.6%

Recommendations

We made one suggested change to the preliminary 2017 actuarial valuation that OSA will be including in its final valuation.

- **Assumed salary increases for WSP deferred members with portability** – It is assumed that there will be a one-time increase in salaries for active WSP members, in addition to the assumed annual increase, in order to reflect the expanded definition of pensionable overtime that was recently enacted. In its preliminary valuation, OSA assumed this increase applied to WSP deferred members with portability. After reviewing this, OSA decided to remove this adjustment. This resulted in a small (less than $1 million) reduction in the calculated liabilities for WSP.

No other changes are recommended to the calculations of the liabilities and normal cost rate in the 2017 valuation. In the process of comparing liability calculations with the OSA, we noted two nuances to the calculations that may be worth OSA reviewing in the future. We do not view either of these as material.

- **Member contribution rate for savings fund accrual assumption** – This assumption is used to project the value of the member accounts that may be refunded upon termination. For most systems, the current member contribution rate is projected to decline in the future. OSA has reflected this by assuming a lower member contribution rate, for purposes of the savings fund accrual, than the rate the member is currently paying. We believe this approach is reasonable. It does appear to us that the method used is producing an assumption that is focusing on the long term; however, it may be appropriate to give greater weight to the short term since most refunds of contributions occur within the first 10 years of employment.
- **Treatment of WSP deferred members with portability** – For valuation purposes, a vested member who has left active WSP service and is now working with another employer and eligible for portability is treated as an active member with no additional service accrual. This results in a later assumed retirement than if the member did not have portability. This may be a reasonable assumption, but given the member's benefit is more valuable if the member retires at earliest eligibility, we believe this approach should be reviewed with the experience study.

Section 5 Funding

Audit Conclusion

Comments

We reviewed the funding methods and their application. We find them reasonable and consistent with the Actuarial Standards of Practice and the objectives stated in RCW 41.45.010. Based on the Systems' funding methods and assumptions, we believe the employer contribution rates for each membership class are appropriately calculated.

When we used the liabilities, present value of future salaries, and actuarial assets calculated by OSA, we matched OSA's contribution rate calculations. When we used the liabilities, present value of future salaries, and actuarial assets calculated by Milliman, the results were close to OSA's calculated contribution rates, as shown below.

Employer Contribution Rates

	OSA	Milliman	Difference OSA - Milliman
Employer Contribution Rates (Percent of Member Pay)			
PERS 1/2/3	12.68%	12.67%	0.01%
TRS 2/3	15.33%	15.20%	0.13%
SERS 2/3	13.01%	12.91%	0.10%
PSERS 2	11.96%	11.85%	0.11%
WSPRS	22.13%	22.38%	-0.25%
LEOFF 1	0.00%	0.00%	0.00%
LEOFF 2*	4.64%	4.63%	0.01%

Member Contribution Rates

	OSA	Milliman	Difference OSA - Milliman
Member Contribution Rates (Percent of Member Pay)			
PERS 1	6.00%	6.00%	0.00%
PERS 2	7.90%	7.99%	-0.09%
TRS 1	6.00%	6.00%	0.00%
TRS 2	7.77%	7.75%	0.02%
SERS 2	8.25%	8.25%	0.00%
PSERS 2	7.20%	7.19%	0.01%
WSPRS	8.45%	8.45%	0.00%
LEOFF 1	0.00%	0.00%	0.00%
LEOFF 2*	7.74%	7.71%	0.03%

** Based on a LEOFF 2 contribution rate structure of 90% of Entry Age Normal Cost rate with a 50%/30%/20% share for the member, employer and the state, respectively.*

The remainder of this section describes in detail why we believe the funding policies used to calculate contribution rates are reasonable and consistent with the objectives described in the RCW.

Policy Objectives

The contribution rate calculations for the Washington State Retirement Systems are complex. Much of this complexity is due to efforts to conform to articulated policy objectives. RCW 41.45.010 states that it is the intent of the legislature to provide a dependable and systematic process for funding the benefits provided to members and retirees of the State's retirement systems and sets out five specific goals:

1. To fully fund the Plans 2 and 3 as provided by law;
2. To fully amortize LEOFF Plan 1 costs not later than June 30, 2024;
3. To fully amortize the unfunded actuarial accrued liability for PERS and TRS Plans 1 within a rolling 10-year period, using methods and assumptions that balance needs for increased benefit security, decreased contribution rate volatility, and affordability of pension contribution rates;
4. To establish long-term employer contribution rates which will remain a relatively predictable proportion of the future state budgets; and
5. To fund, to the extent feasible, all benefits for Plans 2 and 3 members over the working lives of those members so that the cost of those benefits are paid by the taxpayers who receive the benefit of those members' service.

Although not specifically stated in RCW 41.45.010, the funding policies also achieve the following goals:

1. The same employer contribution rate is maintained for all members in the same class regardless of Plan. For example: employers make the same contribution for all TRS members regardless of whether the individual members are in Plans 1, 2, or 3.
2. Funding risk is shared by both employers and members. In Plan 2, both employer and member contribution rates vary based on plan experience. In Plan 3, members take the risk associated with their contributions since they are deposited in the defined contribution plan.

Actuarial Cost Methods

The funding policies of the Washington State Retirement Systems are based on two actuarial cost methods: the Aggregate cost method and the Entry Age cost method. The Funded Ratios are measured based on the Entry Age cost method. The following text describes these methods.

Purpose of a Cost Method and Normal Cost

The purpose of any actuarial cost method is to allocate the cost of future benefits to specific time periods, typically during a member's projected working career. This is clearly stated in *Pension Mathematics for Actuaries*, A.W. Anderson, second edition, 1990, p. 5.

> *"The painful lesson which has been learned over and over again in the last century by various types of employers – first private employers, and later public employers – is that the cost of a pension plan must be recognized during the working lifetimes of the employees who are ultimately going to receive pensions, preferably by actually funding amounts sufficient to provide completely for each employee's life annuity at the time of retirement." The text goes on to state on p. 6: "This is where actuaries come into the picture, … The actuary can … assign to each fiscal year a portion of the present value of future benefit payments in such a way as generally to accrue costs over the working lifetimes of employees. Any scheme for making such an assignment of costs is called an actuarial cost method – which we shall henceforth refer to simply as a "cost method."*

The cost assigned to a specific year is called the Normal Cost.

Aggregate Cost Method

Under the Aggregate cost method, the Normal Cost rate is equal to the level percentage of pay necessary to fund the difference between the present value of all future benefits for current members (PVFB) and the actuarial value of assets (AVA). The difference between PVFB and AVA is funded by future contributions. Each year, the Normal Cost spreads all required future contributions evenly over the present value of future salaries for current members. When actual experience is better or worse than expected experience, the Normal Cost in subsequent years will go down or up, respectively. The contribution calculated by the Aggregate cost method is therefore equal to the Aggregate Normal Cost.

Note that while appropriate for funding, this method does not result in a calculation of the liability independent of assets and therefore does not provide a meaningful "Funded Ratio." OSA currently addresses this by use of the Entry Age actuarial cost method. That method is used to calculate the Funded Ratio and is used for GASB accounting and financial reporting.

Plans 2 and 3 employer and member contribution rates are primarily set using the Aggregate cost method.

Entry Age Actuarial Cost Method

The Entry Age cost method is the most common method used by public plans. The goal of the Entry Age method is the theoretical allocation of projected benefit costs as a level percent of pay over the members' entire working lifetimes. The Entry Age Normal Cost (EANC) is the theoretical level percent of pay which, if contributed from the members' dates of hire to their dates of projected retirement, would exactly fund their benefits if all experience exactly matched the actuarial assumptions. Actual experience better or worse than expected will not change the EANC. The EANC as a percentage of pay is not anticipated to increase or decrease from year to year. Experience better or worse than expected creates a positive or negative Unfunded Actuarial Accrued Liability (UAAL), which is funded separately from the EANC.

Therefore, systems using the Entry Age cost method have two components to their calculated costs: (1) the EANC, which is meant to be a level % of pay, and (2) the UAAL amortization contribution, which is the balancing item that makes sure all future benefits are financed if future experience follows the assumptions, and contributions are made according to schedule.

For the purposes of the Washington State plans, the Entry Age method is only used to set minimum contribution rates based on the EANC. This is a logical use of EANC and should increase contribution stability since it represents the theoretical level percentage of pay contribution required to fund benefits if future experience follows the actuarial assumptions. Specifically, RCW sets minimum contribution rates as follows:

- PERS, TRS, SERS and PSERS Plans 2 and 3 employers and Plan 2 members have a minimum contribution rate based on sharing 80% of EANC. [RCW 41.45.155 and RCW 41.45.158]
- WSPRS employers and members have a minimum contribution rate based on sharing 70% of EANC [RCW 41.45.0631].
- The LEOFF Plan 2 Board has established a policy that considers contribution rates equal to both 90% and 100% of the EANC. The current member contribution rate adopted by the LEOFF 2 Board is 50% of 17.50%, which exceeds 100% of EANC.

Plans 2 and 3 Funding Policy

In general, the Plans 2 and 3 funding policies for PERS, TRS, SERS, PSERS, and WSPRS are based on the Aggregate Cost method and work as described below. Note that where the following text makes references to "Plans 2 and 3" the references should be substituted with "Plans 1 and 2" for WSPRS. Also, please note that PSERS has no Plan 3. RCW 41.45 describes the actuarial funding of state retirement systems. The primary references for Plans 1, 2, and 3 funding are [RCW 41.45.060 Basic State and Employer Contribution Rates], [RCW 41.45.061 Required Contribution Rates for Plan 2 Members] and [RCW 41.45.0631 Washington State Patrol Retirement System].

1. First, the remaining Plans 2 and 3 "past liability balances," which are financed entirely by employer contributions, are determined. For PERS, TRS and SERS, these are due to gain sharing, and for WSPRS these are due to distributions under RCW 43.43.270(2) for survivors of members who became disabled under RCW 43.43.040(2) prior to July 1, 2006.

   The remaining past liability balances are determined by taking the prior year's balance, adding interest, and subtracting employer contributions based on the corresponding supplemental employer percent of pay contribution rates. The SERS balance will be depleted during the 2017-2019 biennium, so there will no longer be a payment for SERS in the 2019-2021 biennium. The PERS and TRS balances are scheduled to be depleted during the 2019-2021 biennium. Those rates have been reduced such that the projected balance will be zero at the end of the 2019-2021 biennium. For that biennium, the rates are 0.02% for PERS and 0.38% for TRS. WSPRS will continue with the rate of 1.32% for the survivors of members who became disabled prior to July 1, 2006.

2. The Plans 2 and 3 Present Value of Future Contributions shared by employers and members is calculated as:

	Present Value All Future Benefits
minus	Actuarial Value of Assets
minus	Past Liability Balance
	Present Value of Future Contributions

3. The Plans 2 and 3 Aggregate Normal Cost Rate is determined by spreading the present value of future contributions shared by employers and members over the present value of future Plans 2 and 3 member salaries. The calculation takes into account that Plan 3 members do not contribute to the defined benefit plans.

4. Plans 2 and 3 minimum employer and member contribution rates are applied based on the EANC. The minimum rate for PERS, TRS, SERS, and PSERS is 80% of EANC. The minimum rate for WSPRS is 70% of EANC. LEOFF 2 contributions for the 2017-2019 biennium are currently equal to 8.75%, which is greater than both the Aggregate Normal Cost Rate and 100% of EANC.

5. Plans 2 maximum member contribution rates are applied to TRS [RCW 41.45.061] and WSPRS [RCW 41.45.0631]. This results in the Plan 2 member contribution rates.

6. The Plans 2 and 3 employer rates are increased by the supplemental contributions rates used to finance past liability balances. As described above, these are: PERS 0.02%, TRS 0.38%, and WSPRS 1.32%.

Plans 2 and 3 Funding Policy (continued)

7. Plans 2 and 3 employer rates are also increased to account for any maximums applied to member contribution rates resulting in the final Plans 2 and 3 employer contribution rates.

LEOFF 2 Funding Policy

The LEOFF 2 funding policy follows the same general pattern as the other Plans 2 and 3 with fewer details. LEOFF 2 contributions are currently based on a flat 17.50% rate, which works like a minimum since it is currently larger than the Aggregate Normal Cost Rate. The total contribution is paid 50% by employees, 30% by employers, and 20% by the State [RCW 41.26.725]. Note that that the 17.50% flat rate is approximately equal to, but slightly greater than, 100% of EANC.

The current LEOFF 2 funding policy might be interpreted as: paying the greater of 100% of EANC or the Aggregate Normal Cost. This works well to establish a stable contribution rate (100% EANC, or the greater flat contribution rate) while ensuring liabilities are financed over a responsible period (Aggregate Normal Cost). However, the current funding policy does not address how stable contribution rates will be maintained if the Plan's funding ratio continues to increase. Specifically, the Board may wish to proactively consider: (a) If the funding ratio continues to increase, at what point action should be taken (b) What that action would be. For instance, two potential actions consistent with stable contribution rates would be to de-risk retiree liability, or to adopt more conservative assumptions.

Plans 1 Funding Policy (PERS, TRS, SERS and PSERS)

PERS and TRS Plans 1 are both closed to new members. The PERS and TRS Plans 1 funding policies have been designed to produce equal total contribution rates for PERS and TRS employers regardless of whether their employees are in Plans 1, 2, or 3, and to share the responsibility of PERS Plan 1 benefits with SERS and PSERS employers. It works as follows:

1. All PERS and TRS Plans 1 members have fixed contribution rates equal to 6.00% of pay.
2. The remaining balances for any liability from Plan 1 benefit improvements effective after June 30, 2009 are determined. These liabilities are financed based on rates that were calculated to amortize them over a fixed 10-year period using combined Plans 1, 2, and 3 salaries. The remaining balances are determined by taking the prior year's balance, adding interest, and subtracting employer contributions based on the corresponding employer percent of pay contribution rates: PERS 0.14% and TRS 0.15%.
3. The Present Value of Future Normal Costs (PVFNC) is determined. The Plan 1 funding policy defines this to be the present value of future contributions made by Plan 1 employees plus the present value of future employer contributions made as a percent of Plan 1 member pay based on the Plans 2 and 3 employer contribution rates calculated above. This must be taken into account to keep the contribution rates equal for Plans 1, 2, and 3.

Plans 1 Funding Policy (PERS, TRS, SERS and PSERS) (continued)

4. The Plan 1 UAAL is calculated as:

	Present Value All Future Benefits
minus	PVFNC
minus	Actuarial Value of Assets
minus	Balance Post 2009 Improvements
	Unfunded Actuarial Accrued Liability

5. The UAAL Rate is calculated as the percent of Plans 1, 2, and 3 member pay to amortize the Plan 1 UAAL over 10 years as a level percentage of projected payroll. This is based on a rolling 10-year period which means every year the UAAL is amortized over a new 10-year period. This helps to keep rates stable while amortizing a material portion of the remaining UAAL each year.

6. Minimum contribution rates of 3.50% of pay for PERS 1 UAAL and 5.75% of pay for TRS 1 UAAL are applied. When combined with the rolling 10-year period, these will help to get the UAAL for the Plans 1 completely financed over a reasonable period instead of indefinitely re-amortizing it over 10 years.

Conference of Consulting Actuaries White Paper

As mentioned in Section 3, in October 2014, the Conference of Consulting Actuaries (CCA) issued a white paper titled *Actuarial Funding Policies and Practices for Public Pension Plans*. The white paper was composed by a group of public plan actuaries from the major consulting firms that work with public plans and was the result of an extensive series of meetings which lasted for over two years. The white paper focuses on a Level Cost Allocation Model (LCAM) and provides detailed analysis for classifying each of the three major components of LCAM funding policies: (a) cost methods, (b) asset methods and (c) amortization methods. The classification system uses the following terms:

Categories Under CCA Guidelines	
Model Practices	Those practices most consistent with the Level Cost Allocation Model (LCAM).
Acceptable Practices	Generally those which, while not consistent with the LCAM, are well established in practice and typically do not require additional analysis.
Acceptable Practices with Conditions	May be acceptable in some circumstances either to reflect different policy objectives or on the basis of additional analysis.
Non-Recommended Practices	Systems using these practices should acknowledge the policy concerns identified in the CCA Guidelines or acknowledge they reflect different policy objectives.
Unacceptable Practices	No description provided by CCA, but implication is that these should not be used.

We will make reference to the CCA white paper in our discussion below.

Evaluation of Funding Policy

As stated earlier, we believe the funding policies are consistent with Actuarial Standards of Practice and with the intended policy objectives. Additional specific comments follow below.

The Aggregate cost method is used as the foundation for the funding policies. The Aggregate cost method is classified as “Acceptable” by the CCA white paper, is well established in practice, and is consistent with the objectives in that document.

The Aggregate cost method is specifically designed to fully fund all future benefits for current members (that are not financed by accumulated assets) over the remaining projected working lifetimes of those members. This represents excellent “demographic matching,” which is to say benefits are funded over the working lifetimes of the members receiving them. It is also excellent at avoiding “agency risk” issues, which means use of the Aggregate method makes it very difficult to push the cost of benefits for current members onto future generations.

The Aggregate method is also consistent with the policy objectives identified in RCW 41.45.010, which is particularly evidenced by how well the fifth policy objective is satisfied: to fund, to the extent feasible, all benefits for Plans 2 and 3 members over the working lives of those members so that the cost of those benefits are paid by the taxpayers who receive the benefit of those members' service.

The Aggregate method’s primary shortcoming is that it passes all gains and losses through to the Normal Cost, which pays for them over the comparatively short period of the active members’ projected remaining working lifetimes. The downside of this is that it can decrease the stability of short-term costs.

This shortcoming is addressed in the funding policy by smoothing asset gains and losses over as much as eight years, as well as by applying the minimum contribution rates. Eight-year asset smoothing is longer than five years, which is the most common length of asset smoothing. The comparatively longer asset smoothing period helps partially offset the comparatively shorter financing period for gains and losses under the Aggregate cost method. The minimum contribution rates equal to 70% or 80% of the EANC help avoid temporary large decreases in contributions due to good investment experience at the peak of a market cycle.

The Plans 1 policy of contributing at a level which finances the UAAL over a rolling 10-year period based on the pay of Plans 1, 2, and 3 is a rough equivalent of the Aggregate Cost Method. The 10-year rolling period bears a very general similarity to financing UAAL over the members’ projected remaining working lifetimes. When the minimum contribution rates of 3.50% for PERS 1 and 5.75% for TRS are added, the policy also has an element that will help to get the UAAL for the Plans 1 completely financed over a reasonable period instead of indefinitely re-amortizing it over a rolling 10-year period. The funding policy is very consistent with the third policy objective listed in RCW 41.45.010, which is to fully amortize the UAAL for PERS and TRS Plans 1 within a rolling 10-year period, using methods and assumptions that balance needs for increased benefit security, decreased contribution rate volatility, and affordability of pension contribution rates.

Evaluation of Funding Policy (continued)

Paying 100% of EANC (or slightly greater) avoids making contributions which are less than the expected long-term cost of benefits. Short-term rate stability is increased since rates will not fluctuate every year due to gains and losses, particularly investment gains and losses, being reflected in the Aggregate Normal Cost. Some margin is provided for adverse experience since the rates are higher than the Aggregate Normal Cost.

Section 6 Review of Preliminary Report and Recommendations from Prior Audit

Audit Conclusion

Because the final 2017 Actuarial Valuation report has not been completed at this time, we base the comments in this section on the preliminary report. We have made a few comments for consideration for the upcoming reports that may enhance an outside reader's understanding. All of these comments are related to additional disclosure, and, if implemented, none would have an impact on the contribution rates.

We have also reviewed the comments from our prior actuarial audit and reported on the incorporation of those comments. All of the recommendations pertaining to the valuation calculations were implemented.

Comments Regarding OSA's Reports

- The valuation assumption is that mortality for beneficiaries is equal to the mortality for a member of the opposite sex in the same system. We recommend this be explicitly disclosed in the OSA report.
- Adjustments to the calculated contribution rates for several systems are included in the OSA valuation to reflect 2018 legislation that has recently been enacted. We agree this is appropriate. OSA provides a good summary of the changes ("Material Plan Provision Changes Since Last Valuation) reflected due to the 2018 laws in its Summary of Plan Provisions section of the report. Our only recommendation is to provide a better link between the two so it is clearer that the changes since the last valuation are the changes due to the 2018 laws.

Recommendations from Prior Audit

We have also reviewed the comments from our prior actuarial audit and reported on the incorporation of those comments. All of the recommendations pertaining to the valuation calculations were implemented.

Recommendations Addressed

- **Calculation of Death Benefits for Future Inactive Members.** OSA is applying the probability of survivor assumption based on future age.
- **Report Comments.** Our comments on the report were either addressed or are no longer applicable to the 2017 valuation.
- **Considerations for Next Experience Study.** The 2014 actuarial audit had some suggestions for changes to be implemented with the experience study. It is our understanding that OSA will consider implementing those suggestions with the next experience study. Those suggestions include mortality analysis by benefit amount, immediate commencement for members with 30 years of service, exclusion of people eligible for early retirement from the termination analysis, consideration of adding a portability assumption, and reflecting increases in medical costs that can occur after retirement.