

**Report 15-17
December 2015**

Wisconsin Retirement System Actuarial Audit

STATE OF WISCONSIN



Legislative Audit Bureau ■

**Report 15-17
December 2015**

Wisconsin Retirement System Actuarial Audit

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STATE OF WISCONSIN

Legislative Audit Bureau

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Joe Chrisman
State Auditor

December 11, 2015

Senator Robert Cowles and
Representative Samantha Kerkman, Co-Chairpersons
Joint Legislative Audit Committee
State Capitol
Madison, Wisconsin 53702

Dear Senator Cowles and Representative Kerkman:

The Legislative Audit Bureau is required by s. 13.94 (1) (dc), Wis. Stats., to contract for the performance of an actuarial audit of the Wisconsin Retirement System (WRS) at least once every five years. After a formal request-for-proposal process, a contract was awarded to the Segal Company (Segal) for an independent audit of the actuarial valuation as of December 31, 2013, and the 2009-2011 experience study. The services provided under this contract primarily focused on verification and analysis of actuarial assumptions and valuation methods used for the WRS by the Department of Employee Trust Funds (ETF) and its consulting actuary, Gabriel Roeder Smith & Company.

This report includes the results of the actuarial audit performed by Segal, a response from ETF, and a response from its consulting actuary. Audit Bureau staff managed the audit contract but were not involved in the fieldwork, analysis, or writing of the actuarial audit report.

Segal concluded that the audit validated the 2013 WRS actuarial valuation and generally agreed with the results of the 2009-2011 experience study, which is statutorily required to be completed every three years. An experience study assesses whether actual experience of the WRS, such as the rate at which participants leave WRS-covered employment, indicates that the actuarial assumptions used in valuing the actuarial liability of the WRS should be updated. The experience study reviewed by the actuarial audit was for the period from December 31, 2009, through December 31, 2011.

In addition, Segal noted that the actuarial cost method and asset valuation method conformed with Actuarial Standards of Practice, and the five-year smoothing mechanism used for the WRS was reasonable. Segal identified some differences in calculating the actuarially accrued liability for WRS members, particularly for those members with less than one year of service. Segal's projection of the liability for these members varied from that determined by the consulting actuary's calculations. The consulting actuary has agreed to review the calculations and make any needed changes.

The State of Wisconsin Investment Board invests the assets of the WRS to achieve a long-term expected rate of return of 7.2 percent, which is the investment return assumption used in the

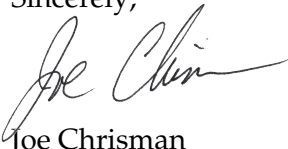
Senator Robert Cowles and
Representative Samantha Kerkman, Co-Chairpersons
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actuarial calculations. As we noted in report 14-9, pension plans have over time been reducing the investment return assumption to ensure it supports the actual returns of the plan. Segal noted that the investment return assumption of 7.2 percent was in the lower range for the WRS peer group. Based on an evaluation of the investment return assumption using proprietary software, Segal also concluded that the 7.2 percent assumption is reasonable.

To improve the consulting actuary's annual actuarial valuations, Segal made several recommendations, including clarifying how the different asset values are used, setting a specific price inflation assumption, and reviewing mortality experience separately for each job classification. To improve the overall evaluation of the WRS experience, Segal recommended that ETF consider whether using five years of data in each experience study would provide for an improved assessment of the actuarial assumptions used.

We acknowledge the professional manner in which staff of Segal performed this independent actuarial audit and appreciate the cooperation provided by staff of ETF and its consulting actuary.

Sincerely,

A handwritten signature in black ink, appearing to read "Joe Chrisman". The signature is fluid and cursive, with a long horizontal stroke extending to the right.

Joe Chrisman
State Auditor

JC/CS/ss



Wisconsin Retirement System

**INDEPENDENT ACTUARIAL AUDIT OF THE
DECEMBER 31, 2013, ACTUARIAL VALUATIONS AND THE
2009-2011 EXPERIENCE STUDY**



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December 4, 2015

Ms. Carolyn Stittleburg
Director, Financial Audit Division
Legislative Audit Bureau
22 E. Mifflin Street, Suite 500
Madison, WI 53703

Re: **Independent Actuarial Audit of the December 31, 2013, Actuarial Valuations
and the 2009-2011 Experience Study**

Dear Ms. Stittleburg:

We are pleased to present the results of Segal's actuarial audit of the December 31, 2013, actuarial valuations and review of the 2009-2011 Experience Study Report. The purpose of this audit is to conduct a review of the actuarial methods, assumptions, and procedures employed by the Wisconsin Retirement System (WRS) and the System's actuary Gabriel Roeder Smith & Company (GRS). This audit includes the following:

1. **Report review** – a review of the valuation results and reports for the retired members and non-retired members of the Wisconsin Retirement System. The results were reviewed to determine if they comply with actuarial standards and whether such valuation reports reflect appropriate disclosure information under any required reporting.
2. **Validation of benefits valued through test lives and data review** – discussion of the procedures used to validate the participant data and the test lives selected, with a detailed review of the findings.
3. **Methods and assumptions review** – an analysis and benchmarking of the actuarial assumptions and a review of the actuarial methods utilized in determining the funded status and accrued liability as of December 31, 2013, for compliance with generally accepted actuarial principles, as well as a review of the Experience Study Report for the three-year period ending December 31, 2011.

This review was conducted under the supervision of Kim Nicholl, a Fellow of the Society of Actuaries, a member of the American Academy of Actuaries, and an Enrolled Actuary under ERISA, and Matthew Strom, a Fellow of the Society of Actuaries, a member of the American Academy of Actuaries, and an Enrolled Actuary under ERISA. This review was conducted in accordance with the standards of practice prescribed by the Actuarial Standards Board.

The assistance of the Department of Employee Trust Funds (ETF) staff and GRS is gratefully acknowledged.

We appreciate the opportunity to serve as an independent actuarial advisor for the Legislative Audit Bureau and we are available to answer any questions you may have on this report.

Sincerely,

A handwritten signature in black ink that reads "Kim Nicholl".

Kim Nicholl, FSA, MAAA, EA
Senior Vice President and Actuary

A handwritten signature in black ink that reads "Matthew A. Strom".

Matthew A. Strom, FSA, MAAA, EA
Vice President and Actuary

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Wisconsin Retirement System

Executive Summary

The State of Wisconsin Legislative Audit Bureau (Audit Bureau) retained Segal Consulting (Segal) to conduct an independent actuarial audit of the Wisconsin Retirement System's (WRS) December 31, 2013, actuarial valuations and the 2009-2011 Experience Study, as performed by the WRS consulting actuary, Gabriel Roeder Smith & Company (GRS). The main objective is to provide an opinion on the reasonableness, consistency, and accuracy of the following:

- Demographic and financial data used in the actuarial valuations;
- Methods, procedures, and assumptions used in the actuarial valuations;
- Format of the actuarial valuation reports;
- Conclusions of the actuarial valuations; and
- Results and the actuarial assumptions generated from the Experience Study.

The objective of a **limited scope audit** (actuarial review) of any system is to provide validation that the liabilities and costs of the system are reasonable and being calculated as intended. This audit is not a full replication of the actuarial valuation results, but rather is a review of the key components in the valuation process that encompass the derivation of the liabilities and costs for the System. These key components are the data, the benefits valued, the actuarial assumptions and funding method used, and the asset valuation method employed. The valuation reports and the valuation output for a select group of test lives provide the detail necessary to validate each of these key components.

We reviewed all information supplied to us. We also requested and reviewed additional information provided by GRS. Finally, we considered the reasonableness of the actuarial assumptions and methods in the context of our own experience, and those of other state and local pension systems.

Summary of Findings

In summary, we found the following:

1. GRS is processing the data files in a reasonable and accurate manner and participants are being removed from the active lives valuation and added to the retired lives valuation at the appropriate time;
2. The economic assumptions are within norms for the peer group, with the investment return assumption towards the lower end of the peer group range;
3. The asset valuation method is being applied correctly and in our opinion, the five-year smoothing method is reasonable and meets actuarial standards;
4. Most test life detail was matched to within a reasonable range, with the exception of active members with less than one year of service.
5. There is an inconsistency in the annual actuarial valuation and gain/loss analysis report related to the Executive and Elected Officials group that should be reviewed.
6. We recommend clarifying the use of each asset value and removing asset values that are not used.

Wisconsin Retirement System

Executive Summary

7. We recommend adding a funded ratio that uses an immediate gain cost method, such as entry age.
8. We recommend fully disclosing all actuarial assumptions.
9. We recommend changes to how some actuarial assumptions are reviewed. Most notably, we recommend that salary increases be analyzed net of actual inflation, mortality be analyzed using the liability-weighted methodology, and mortality be analyzed separately for each job classification.

These items and recommendations are described in more detail throughout this report.

Conclusions

This audit validates the findings of the December 31, 2013, actuarial valuations and 2009-2011 Experience Study. We have found a few inconsistencies in the valuation reports and test lives, which are described in detail in Section II of this report. We generally agree with the results of the Experience Study, with a few recommendations for improvement, as described in Section III. We found the actuarial cost method and asset valuation method conform to the Actuarial Standards of Practice.

The data appears complete and with a cursory analysis of the information supplied, we were able to closely match the participant counts reported by GRS.

Wisconsin Retirement System

Section I: Purpose, Scope and Methodology of the Audit

Purpose of the Audit

The Audit Bureau retained Segal to conduct an independent review of the System's current actuarial calculations, assumptions and methods. The Audit Bureau requested an assessment of the validity of the data used in the valuations, a review of the appropriateness of the current funding method and procedures, an evaluation of both economic and non-economic assumptions, a comprehensive review of sample test lives, and a review of the actuarial reports to determine if there is consistency in the presentation of the actuarial results and whether they are consistent with professional standards.

Scope of the Audit

This actuarial audit has a specified, limited scope in its review. A full scope audit would include performing the December 31, 2013, actuarial valuations from start to finish; in essence, a parallel valuation for the retired members and non-retired members. This limited scope audit reviews the valuations already performed, through reviewing the benefits, assumptions, and methods, without a full replication of the actuarial valuation results. This review is conducted by analyzing detailed output of certain selected test lives from each membership group.

By not performing a full parallel valuation, the following assumptions are made:

1. The current actuary's valuation system is accurately applying each assumption consistent with the test life review; and
2. The valuation system is adding together liabilities appropriately for each decrement (retirement, turnover, disability, and death), for each member, and over the entire population (meaning no participant group is being "dropped off" and no particular liabilities are being omitted).

What a limited scope audit can provide is:

1. Assurance that appropriate benefits are being valued;
2. Confirmation that the valuation system is accurately applying decrements to the test lives;
3. Confirmation that the program is valuing benefits as described in the valuation reports and consistent with applicable statutes;
4. A measurement of economic actuarial assumptions against a peer group and hence an assessment of their reasonableness;
5. A review of the reasonableness of actuarial funding and asset valuation methods;
6. An indication as to whether the liabilities and contribution rates shown are not reasonable or are incorrectly calculated; and
7. An assessment of whether the valuation appropriately reflects information required to be disclosed under required reporting standards (GASB, etc.).

Wisconsin Retirement System

Section I: Purpose, Scope and Methodology of the Audit

Methodology of the Audit

The purpose of this audit is to express an opinion regarding the reasonableness and accuracy of the actuarial assumptions, methods, valuation results, and contribution rates. The limited scope review is not the same as an actuarial valuation, but represents a “second opinion” of the findings and processes included in the valuation.

The measurement of the reasonableness of the funding levels encompasses three key analyses:

1. A verification of the benefits being projected for future payment;
2. A verification of the appropriateness of the actuarial assumptions that are used in calculating the liability; and
3. A verification of the appropriateness of the funding and asset valuation methods.

Benefits Analysis

Critical to projecting future benefits is receiving complete and accurate data. We reviewed the process by which data is prepared for the actuarial valuation, including:

1. An assessment of the completeness of the data;
2. A review of the data screening process employed; and
3. An examination of individual test life calculations.

We developed computer models that generated test life output, which enabled us to compare our test life results with GRS’s results. These models also allowed us to confirm that the GRS valuations project benefits in a manner consistent with the Summary of Plan Provisions in the valuation reports. For purposes of this study, we regard differences of less than 3% to be acceptable for the Total Present Value of Benefits (PVB) and 5% to be acceptable for the review of census data.

Assumptions Analysis

The second critical component in assessing the reasonableness of the funding levels is in the selection and the application of the actuarial assumptions. With respect to the assumptions, we:

1. Reviewed the 2009-2011 Experience Study Report;
2. Independently determined the reasonability of the investment return assumption by using Segal Rogerscasey’s capital market assumptions; and
3. Benchmarked the economic assumptions against a survey of state and local employee retirement systems.

Wisconsin Retirement System

Section I: Purpose, Scope and Methodology of the Audit

Methods and Procedures Analysis

The third component in assessing funding levels is the selection and application of the actuarial cost method (including the method for amortizing the unfunded actuarial accrued liability) and the asset valuation method (including smoothing techniques). This includes items unique to a particular system, such as the method used to calculate the annual annuity adjustment for the Core Trust Fund and reviewing the plan changes that became effective as part of 2011 Wisconsin Act 10 and 2011 Wisconsin Act 32.

Wisconsin Retirement System

Section II: Review of Reports and Validation of Benefits Valued

Data Used in the Valuations

We independently obtained data files directly from ETF and GRS. With minimal data scrubbing, we found that the counts for the active and retired files were relatively close, and well within the 5% threshold we established for determining materiality of differences. All data for actives, inactives, annuitants and beneficiaries was provided as of the valuation date (December 31, 2013).

An additional part of our data validity review was addressing the transition of participants from active to annuitant status and whether participants are being removed from the active lives valuation and added to the retired lives valuation at the appropriate time. We isolated approximately 22,400 records from the active lives file that were reported with an end of year status of “closed.” Of these 22,400 records, we were able to match nearly 9,600 of them to new records in the retired lives data. The remaining 12,800 “non-matched” records were coded as either having withdrawn their employee contribution balance from the System, or receiving a lump sum benefit. We feel confident that GRS is transferring members from the active lives valuation to the retired lives valuation at the appropriate time.

Wisconsin Retirement System

Section II: Review of Reports and Validation of Benefits Valued

The tables that follow summarize our determination of key data elements as compared to those shown in the valuation reports.

December 31, 2013 Analysis of Participant Data						
	Active			Inactive		
	GRS	Segal	Ratio of Segal/GRS	GRS	Segal	Ratio of Segal/GRS
General Members:						
Number	231,973	232,083	1.00	145,854	145,759	1.00
Total Payroll	11,270.1 M	11,306.9 M	1.00	N/A	N/A	N/A
Average Salary	48,584	48,719	1.00	N/A	N/A	N/A
Average Age	46.0	46.0	1.00	47.2	47.2	1.00
Average Service	11.6	11.6	1.00	3.0	3.0	1.00
Executive & Elected:						
Number	1,397	1,404	1.01	640	638	1.00
Total Payroll	106.3 M	106.8 M	1.01	N/A	N/A	N/A
Average Salary	76,125	76,095	1.00	N/A	N/A	N/A
Average Age	54.8	54.9	1.00	54.0	54.0	1.00
Average Service	13.4	13.4	1.00	4.2	4.3	1.02
Protective With SS:						
Number	19,290	19,292	1.00	4,949	4,941	1.00
Total Payroll	1,121.3 M	1,122.6 M	1.00	N/A	N/A	N/A
Average Salary	58,127	58,191	1.00	N/A	N/A	N/A
Average Age	40.7	40.7	1.00	41.8	41.8	1.00
Average Service	12.9	12.9	1.00	4.0	4.0	1.00
Protective Without SS:						
Number	2,736	2,736	1.00	205	205	1.00
Total Payroll	196.9 M	197.0 M	1.00	N/A	N/A	N/A
Average Salary	71,960	71,986	1.00	N/A	N/A	N/A
Average Age	41.3	41.3	1.00	42.8	42.8	1.00
Average Service	14.3	14.3	1.00	6.8	6.8	1.00

Wisconsin Retirement System

Section II: Review of Reports and Validation of Benefits Valued

December 31, 2013						
Analysis of Retired Members Data						
	Core			Variable		
	GRS	Segal	Ratio of Segal/GRS	GRS	Segal	Ratio of Segal/GRS
Regular:						
Number	172,430	171,237	0.99	38,672	38,812	1.00
Total Benefits	3,661.1 M	3,667.5 M	1.00	317.2 M	317.7 M	1.00
Average Age	69.7	70.0	1.02	69.0	69.4	1.01
Disability:						
Number	6,393	6,420	1.00	1,292	1,296	1.00
Total Benefits	123.4 M	123.4 M	1.00	5.7 M	5.7 M	1.00
Average Age	66.6	67.6	1.01	65.8	66.6	1.01
Death-in-Service:						
Number	1,233	1,238	1.01	353	351	0.99
Total Benefits	16.2 M	16.3 M	1.00	1.6 M	1.6 M	1.00
Average Age	67.2	67.9	0.98	67.6	67.2	0.99

As previously mentioned, we were able to match most information reported by GRS to within 1% with minimal data scrubbing.

Wisconsin Retirement System

Section II: Review of Report and Validation of Benefits Valued

Valuation Reports

While the accuracy of the actuarial valuations is the primary focus of an actuarial review, the content and presentation of the actuarial valuation results to a layperson and professional are also important. Our recommendations are to provide clarity to the existing reports. Based on our review of the actuarial valuation reports, we offer the following comments:

1. There is inconsistency within the annual actuarial valuation and gain/loss analysis report related to the Executive and Elected Officials group. The present value of future benefits and present value of future normal costs shown on page B-1 are both \$8 million lower than the amounts shown on pages B-3 and B-4. If the present value of future normal costs shown on page B-1 is supposed to be \$8 million higher, the resulting total contribution rate for the Executive and Elected Officials group would be 16.4% rather than 15.4%. Discussions with GRS on this subject revealed that the information contained on page B-1, including the total contribution rate, represents the final calculations; pages B-3 and B-4 were not updated in the final version of the report.
2. There are four different asset values shown in the annual actuarial valuation and gain/loss analysis report and it is unclear how each asset value is used. We recommend adding a description of how each asset value is used and removing asset values that are not used.
3. The Frozen Initial Liability cost method is difficult for a non-actuary to understand. In order to help the stakeholders better understand the funded status of the System, we suggest including a funded ratio using an immediate gain cost method, such as entry age.

Projected Benefits in the Valuations

We requested test lives in order to compare the benefit amounts projected in the valuations against our understanding of the WRS benefits summarized in the valuation reports. We did not run “parallel” valuations, which is beyond the scope of this audit. We reproduced the present value of future salary, present value of future benefits, and actuarial accrued liability for the test lives received to determine whether GRS correctly projected plan benefits and whether the costs and liabilities were determined in accordance with the actuary’s stated methods and assumptions.

Based on our review of the individual test life calculations, we have the following observations and/or recommendations:

1. We could not match the actuarial accrued liability for members with less than one year of service. For these members, we were able to match the present value of future salary and benefits; therefore, we suspect there is a difference in software methodology for allocating benefits to past and future service. For example, active test life “Protective w/out SS - 1” is age 33 with 0.84 years of service and GRS calculated this member’s present value of benefits to be \$40,869 and actuarial accrued liability to be \$18,641, or 45.6% of the present value of benefits. For a young member with low service, the actuarial accrued liability should be a low percentage of the present value of benefits. For comparison, the Segal software calculates this member’s present value of benefits to be \$42,124 and actuarial accrued liability to be \$2,304, or 5.5% of present value of benefits. GRS’s actuarial accrued liability is higher than Segal’s liability for some test lives and

Wisconsin Retirement System

Section II: Review of Report and Validation of Benefits Valued

lower for others. This discrepancy does not exist for test lives with more than one year of service.

2. There are two actuarial assumptions that are not fully disclosed in the annual actuarial valuation and gain/loss report. For example, protective members are not assumed to retire early with a reduced benefit until they have at least 20 years of service. However, the report only states that protective members are eligible to retire early with a reduced benefit at age 50. In addition, termination rates stop at retirement eligibility, but the report states that termination rates operate during the retirement pattern.
3. We specifically reviewed the plan changes that became effective as part of 2011 Wisconsin Act 10 and 2011 Wisconsin Act 32. These include, but are not limited to, changing member contribution rates to half of the actuarially determined contribution, changing the multiplier for executive and elected members from 2% to 1.6%, and adding a five-year vesting period for members hired on or after July 1, 2011. Based on our analysis, we have confirmed that the changes included in the recent legislation are being valued properly.
4. We recommend GRS review the test lives where our differences are more than 3%. For instance, we were able to match the accrued benefit for “deferred vested General – 1”, so we would not expect our present value of benefits to be 7% higher.

Recommendations

The following summarizes our actionable comments and suggestions relative to the valuation reports documents and calculation of projected benefits within the valuations:

1. Review the inconsistency in the annual actuarial valuation and gain/loss analysis report related to the Executive and Elected Official group.
2. Clarify the use of each asset value and remove asset values that are not being used.
3. Add a funded ratio using an immediate gain cost method, such as entry age.
4. Fully disclose all of the actuarial assumptions.
5. Review test lives where our differences are more than 3%.

The individual test life comparison exhibits on the following pages summarize the calculations performed by Segal and GRS and show the differences by each liability category, as well as the ratio of Segal’s results to GRS’s results.

Wisconsin Retirement System

Section II: Review of Report and Validation of Benefits Valued

December 31, 2013 Valuations of the Wisconsin Retirement System Retired Lives Test Life Comparison

Counter	Test Life Description	Present Value of Benefits			Counter	Test Life Description	Present Value of Benefits		
		GRS	Segal	Ratio of Segal/GRS			GRS	Segal	Ratio of Segal/GRS
1	Disabled 40.63 - Participant	329,673	326,201	0.99	15	Disabled 40.63 (4) - Participant	448,059	457,705	1.02
2	Retired - Participant	329,341	331,152	1.01	16	Retired - Named Survivor	293,625	301,627	1.03
3	Disabled 40.63 - Named Survivor	481,622	484,077	1.01	17	Retired - Participant	92,413	92,172	1.00
4	Retired - Participant	229,663	227,646	0.99	18	Disabled 40.63 - Participant	683,308	683,705	1.00
5	Retired - Participant	175,768	174,225	0.99	19	Retired - Participant	164,723	168,190	1.02
6	Disabled 40.63 - Participant	789,943	799,898	1.01	20	Retired - Participant	192,564	196,616	1.02
7	Retired - Participant	3,892	4,082	1.05	21	Retired - Participant	383,464	383,579	1.00
8	Retired - Participant	3,822	4,009	1.05	22	Retired - Participant	346,965	347,069	1.00
9	Retired - Participant	44,658	44,978	1.01	23	Retired - Participant	105,769	106,548	1.01
10	Retired - Participant	33,371	33,611	1.01	24	Retired - Participant	102,420	103,175	1.01
11	Retired - Named Survivor	25,037	25,688	1.03	25	Retired - Participant	119,409	119,382	1.00
12	Retired - Named Survivor	25,126	25,780	1.03	26	Retired - Participant	1,156	1,159	1.00
13	Disabled 40.63 - Participant	573,306	575,183	1.00	27	Retired - Participant	124,586	124,908	1.00
14	Retired - Named Survivor	50,355	51,678	1.03					

Wisconsin Retirement System

Section II: Review of Report and Validation of Benefits Valued

December 31, 2013 Valuations of the Wisconsin Retirement System Non-Retired Lives Test Life Comparison

Test Life Description	Present Value of Future Salary			Present Value of Benefits			Accrued Liability		
	GRS	Segal	Ratio of Segal/GRS	GRS	Segal	Ratio of Segal/GRS	GRS	Segal	Ratio of Segal/GRS
Deferred Vested Elected & Executive - 1				20,367	20,561	1.01			
Deferred Vested University - 1				7,909	8,204	1.04			
Deferred Vested Protective w/SS - 1				26,407	26,795	1.01			
Deferred Vested Protective w/out SS - 1				72,353	74,438	1.03			
Deferred Vested Protective w/out SS - 2				234,891	235,208	1.00			
Deferred Vested Teacher - 1				37,280	37,280	1.00			
Deferred Vested General - 1				23,210	24,872	1.07			
Deferred Vested Teacher - 2				38,935	40,352	1.04			
Active Protective w/SS - 1	513,837	532,759	1.04	484,174	489,984	1.01	402,741	400,471	0.99
Active Protective w/SS - 2	677,834	657,491	0.97	187,764	180,256	0.96	44,026	43,897	1.00
Active Protective w/SS - 3	206,014	207,113	1.01	58,594	58,274	0.99	16,857	16,178	0.96
Active Protective w/SS - 4	466,436	460,894	0.99	83,165	84,078	1.01	691	3,525	5.10*
Active Protective w/out SS - 1	98,289	97,223	0.99	40,869	42,124	1.03	18,641	2,304	0.12*
Active Protective w/out SS - 2	1,013,005	1,011,688	1.00	315,959	316,368	1.00	109,522	108,331	0.99
Active Protective w/out SS - 3	443,670	441,341	0.99	552,327	551,191	1.00	435,591	433,114	0.99
Active Protective w/out SS - 4	295,412	292,982	0.99	119,712	114,732	0.96	28,392	11,846	0.42*
Active University - 1	147,852	149,881	1.01	21,197	21,332	1.01	1,264	1,686	1.33*
Active University - 2	862,400	863,542	1.00	208,951	210,257	1.01	95,577	97,430	1.02
Active University - 3	189,473	191,460	1.01	78,677	77,863	0.99	48,246	48,570	1.01

Note: Items above that are blank are not applicable to that test life.

* Active member with less than one year of service.

Wisconsin Retirement System

Section II: Review of Report and Validation of Benefits Valued

December 31, 2013 Valuations of the Wisconsin Retirement System Non-Retired Lives Test Life Comparison

Test Life Description	Present Value of Future Salary			Present Value of Benefits			Accrued Liability		
	GRS	Segal	Ratio of Segal/GRS	GRS	Segal	Ratio of Segal/GRS	GRS	Segal	Ratio of Segal/GRS
Active Teacher - 1	554,652	565,732	1.02	82,764	83,799	1.01	1,042	3,060	2.94*
Active Teacher - 2	1,441,406	1,432,105	0.99	243,373	242,685	1.00	56,143	58,195	1.04
Active Teacher - 3	194,466	197,899	1.02	286,852	290,962	1.01	260,110	258,059	0.99
Active Teacher - 4	361,459	365,746	1.01	200,153	197,838	0.99	145,594	142,136	0.98
Active General - 1	165,051	162,046	0.98	31,326	30,120	0.96	5,860	5,616	0.96
Active General - 2	269,806	269,448	1.00	245,612	247,334	1.01	212,335	209,231	0.99
Active General - 3	315,844	322,802	1.02	83,706	83,792	1.00	42,873	42,752	1.00
Active General - 4	186,421	185,032	0.99	137,190	139,031	1.01	106,310	103,376	0.97
Active Elected and Executive - 1	168,811	167,284	0.99	33,983	33,397	0.98	8,523	8,874	1.04
Active Elected and Executive - 2	58,941	58,589	0.99	15,815	15,830	1.00	8,029	1,715	0.21*
Active Elected and Executive - 3	641,818	641,347	1.00	641,150	641,739	1.00	556,121	532,192	0.96
Active Elected and Executive - 4	216,125	216,851	1.00	721,625	732,924	1.02	695,656	694,122	1.00
Active Elected and Executive - 5	537,071	531,776	0.99	86,089	86,667	1.01	18,379	18,690	1.02

Note: Items above that are blank are not applicable to that test life.

* Active member with less than one year of service.

Wisconsin Retirement System

Section III: Analysis of Actuarial Assumptions Employed

As part of our analysis, we have reviewed the principal assumptions used in the actuarial valuation reports for the valuation as of December 31, 2013, for consistency, reasonableness and compatibility. In addition, we have reviewed the 2012 Experience Study Report (that covered experience for the three-year period ending December 31, 2011), and have also compared the current set of economic assumptions to those used by a peer group of 126 systems covering state and local employees, the Public Fund Survey published by the National Association of State Retirement Administrators.

Economic Assumptions

Inflation

Since benefits are not linked to price increases, there is no specific price inflation assumption. However, other economic assumptions imply a price inflation assumption of 2.00% to 2.70%. This price inflation range is at the low end of the Public Fund Survey range of 2.75% to 3.50% (based on valuations primarily covering fiscal years ending in 2013). The Experience Study recommended no change, which is reasonable considering the 2015 OASDI Trustees' intermediate inflation assumption is 2.7%. In addition, the U.S. Federal Reserve formally targets long-term inflation of 2%. However, we recommend selecting a specific price inflation assumption so that all of the economic assumptions are internally consistent.

Investment Return

The 7.20% assumption, when compared to the peer group, is towards the lower end of the range of 7.00% to 8.00%. The Experience Study Report recommended no change.

In testing the real rate of return assumption for reasonableness, we used Segal Rogerscasey's capital market assumptions and WRS's current target asset allocations. The Segal Rogerscasey assumptions are based on a 20-year horizon. Based on the current capital market assumptions, we calculated the median real rate of return to be 4.90%. The Segal Rogerscasey assumptions are not net of fees, so the adjusted median real rate of return is 4.50%. Including the inflation assumption of 2.00% - 2.70%, the median net investment return is 6.50% - 7.20%. On this basis, we believe the 7.20% assumption is reasonable.

The data presented in the Experience Study Report is based on capital market expectations of eight different investment consultant firms. We support this approach because it provides a broader view of the universe of expectations than relying on the assumptions of a single firm.

Payroll Growth

The wage inflation assumption is used as the payroll growth assumption, which determines the unfunded liability amortization as a level percentage of payroll. An assumption of 3.20% was used in the December 31, 2013, actuarial valuations and the Experience Study Report recommended no change to this assumption. The Experience Study Report illustrates that national historical wage increases have been higher than inflation by 0.70% - 1.00%. Including the inflation assumption of 2.00% - 2.70%, an acceptable wage inflation range is 2.70% - 3.70%. In addition, the 3.20% assumption is supported by WRS's actual experience.

Wisconsin Retirement System

Section III: Analysis of Actuarial Assumptions Employed

Salary Scale

For all active members, the salary scale assumption is comprised of a merit and seniority component and a real wage inflation rate of 3.2%. In the Experience Study Report, the merit and seniority component was analyzed by comparing year-over-year salary increases, net of the assumed wage inflation of 3.2%. A better approach is to look at year-over-year salary increases, net of the actual wage inflation experienced in each year of the study period. We note that actual wage inflation during this period was 2.1% and believe that, as a result, the merit and seniority component was greater than that determined by GRS. Reflecting this difference would have likely resulted in a recommendation to increase, rather than decrease, the merit and seniority salary assumption.

Mortality

The rates of mortality for the period after retirement were set to match the plan's experience and then projected 5 years using Scale BB to account for future mortality improvement. The rates of mortality prior to retirement were set to 55% of the post-retirement rates. The rates of mortality for disabled annuitants were updated in the Experience Study Report. However, there is no description of how the mortality rates were determined.

The actuary's guide for determining the reasonableness of demographic assumptions is Actuarial Standard of Practice (ASOP) No. 35. The following is an excerpt from this ASOP that provides guidance on setting the mortality assumptions. Note that the ASOP quoted below was modified in September 2010 and is applicable for actuarial valuations with measurement dates on or after June 30, 2011.

Excerpt from ASOP 35, Section 3.5.3 – Mortality and Mortality Improvement Assumptions:

The actuary should consider the effect of mortality improvement both prior to and subsequent to the measurement date. With regard to mortality improvement, the actuary should do the following:

- i. adjust mortality rates to reflect mortality improvement prior to the measurement date. For example, if the actuary starts with a published mortality table, the mortality rates may need to be adjusted to reflect mortality improvement from the effective date of the table to the measurement date. Such an adjustment is not necessary if, in the actuary's professional judgment, the published mortality table reflects expected mortality rates as of the measurement date.*
- ii. include an assumption as to expected mortality improvement after the measurement date. This assumption should be disclosed in accordance with section 4.1.1, even if the actuary concludes that an assumption of zero future improvement is reasonable as described in section 3.1. Note that the existence of uncertainty about the occurrence or magnitude of future mortality improvement does not by itself mean that an assumption of zero future improvement is a reasonable assumption.*

The valuation reports note that "...rates in this table were based on actual WRS experience projected to 2017 with scale BB to allow for future improvements (margin) in mortality...", however, no indication is given as to the magnitude of the margin. The Experience Study Report indicates that there is an 8% margin for males and a 7% margin for females. In general, we believe that the margin for future mortality

Wisconsin Retirement System

Section III: Analysis of Actuarial Assumptions Employed

improvements should be at least 10%. Alternatively, mortality tables with no margin in the valuation year, but with generational improvement applied in the future also satisfy the ASOP requirement.

We do wish to point out an alternative (and probable improvement in methodology) that could be considered in the future. Rather than perform the actual versus expected analysis using headcounts (i.e., the number of retirees that died), another approach is to perform the analysis on a benefits-weighted basis. This methodology takes into account the correlation, if any, between the health of the annuitants and their benefit size. GRS used a similar methodology, liability-weighted, when analyzing the retirement and turnover experience.

Each job classification (General, Public School, Protective, etc.) has separate demographic assumptions, except for mortality rates. While it is probable that upon achieving retirement age, all retirees would exhibit the same mortality experience, it would be worth studying the information separately and have the conclusion drawn from the data.

Retirement Rates

The valuation uses separate age-based retirement rates for each job classification. The 100% retirement age of 75 for the age-based rates appears reasonable based on the data and information provided in the Experience Study Report.

We have the following observations and comments concerning the retirement rate evaluation and recommendations contained in the Experience Study:

1. Actual experience during 2011 was excluded from the study because there were an unusually large number of retirements that was perceived to be a one-time event. Excluding an entire year's worth of experience, or 1/3rd of the plan's experience during the study, may have been extreme and including this experience with a smaller weighting relative to the other years would have been a reasonable alternative approach.
2. The Experience Study Report summary of the retirement experience states that there were many more normal retirements than expected before removing the 2011 experience. However, the proposed normal retirement rates are lower than the current rates for every group except General female members and Executive & Elected members. This may be a sign that the 2011 experience should not have been ignored entirely.
3. The historical information shown near the bottom of all pages in Section D is using population-weighted rates. Since the analysis used the liability-weighted methodology, we recommend showing liability-weighted historical information going forward.
4. For General, Public School, and University members, the male and female experience was analyzed separately. For Protective and Executive and Elected members, the male and female experience was analyzed together. It may be worth reviewing male and female experience separately for all job classifications.

Wisconsin Retirement System

Section III: Analysis of Actuarial Assumptions Employed

5. There are a number of instances throughout the report where the current and proposed rates are the same at certain ages, but the expected retirements under the current and proposed rates are different. As an example, on page D-2, the current and proposed retirement rate for age 59 is 0.0550, yet the expected retirements under the current and proposed rates are 166 and 171, respectively. We believe those should be the same. Other examples can be found throughout the Experience Study Report.

Turnover Rates

Separate service-based tables for separation from active service apply to each job classification during the first ten years of service. After ten years, rates are age-based. In addition, it is assumed that a percentage of members who are terminating employment will take their contributions in lieu of a future annuity benefit.

We have the following observations and comments concerning the turnover rate evaluation and recommendations contained in the Experience Study Report:

1. The Experience Study Report does not analyze the percentage of terminations that elected to take their contributions in lieu of a future annuity benefit. Currently, 25% of terminating members age 35 are assumed to take their contributions and that percentage grades down to zero at retirement eligibility. We recommend that this experience be reviewed to support this assumption.
2. Members with ten years of service seem to be included in the experience for both the service-based rates and the age-based rates. The annual actuarial valuation and gain/loss analysis report states that members with ten or more years of service use age-based rates, so the Experience Study Report should more clearly show this.
3. All of the service-based total liability-weighted rates appear low relative to the data shown. For instance, on page A-1, the total liability-weighted rate shown is 0.0427, compared to our estimate of 0.075 using the surrounding data. However, the proposed service-based rates were set using the liability-weighted rates for each service index, so this does not affect the proposed rates.
4. The historical information shown near the bottom of all pages in Section A is using population-weighted rates. Since the analysis used the liability-weighted methodology, we recommend showing liability-weighted historical information going forward.
5. For General, Public School, and University members, the male and female experience was analyzed separately. For Protective and Executive and Elected members, the male and female experience was analyzed together. It may be worth reviewing male and female experience separately for all job classifications.

Wisconsin Retirement System

Section III: Analysis of Actuarial Assumptions Employed

Disability Rates

Age-based disability rates are specific for each job classification. In addition, there are separate rates for male and female General, Public School, and University members. Based on the analysis in the Experience Study Report, we believe the current and proposed disability rates are reasonable. However, we recommend that the experience for Public School, University, and Executive and Elected members be analyzed together in order to increase the credibility of the experience. These job classifications do not have considerably different exposure to becoming disabled.

Other Comments

Overall, the economic and demographic actuarial assumptions adopted by the System are reasonable and consistent with generally accepted actuarial standards and practices contained in Actuarial Standard of Practice No. 27 covering economic assumptions and Actuarial Standard of Practice No. 35 covering demographic and non-economic assumptions. In order to increase the credibility of the System's experience, consider using the most recent five years of experience for the next three-year Experience Study Report.

Funding Method for Liabilities

The funding method prescribed by statute for WRS is the frozen initial liability (FIL) actuarial cost method. We find the current method to be reasonable, though only seven of the 126 plans in the peer group use this cost method (most use entry age).

Core Trust Fund Annual Annuity Adjustment

The Core Trust Fund Annual Annuity Adjustment allows retirees to receive core annuity increases, referred to as dividends, when the investment return experience of the Fund is favorable. Simply stated, the dividend adjustment to core annuities in force as of any December 31 is the amount necessary to align the present value of core annuity payments with the Core Annuity Reserve. For example, if the present value of core annuities was \$100 and the Core Annuity Reserve was \$110, then the dividend would be equal to 10% of each core annuity in force so that the new present value of core annuity payments would match the current value of Core Annuity Reserves. If in the subsequent year, the Core Annuity Reserve decreased to \$105, core annuities would be decreased by 4.5% (i.e., 100% minus 105 divided by 110). However, core annuities can only be decreased to the extent that there are prior dividends to reduce. Core annuities cannot be reduced below the original benefit at retirement. Therefore, in our example, some core annuities may need to be decreased by more than 4.5% so that, on average, total core annuities decrease by 4.5%. If the ratio of Core Annuity Reserves to the present value of core annuities in force would result in a change to core annuities of less than 0.5%, no change is made for that year and the investment gain/loss is carried forward to the next year.

Given the purpose of the Core Annuity Fund, we find that the methodology for determining the change in core annuities to be reasonable and appropriate.

Wisconsin Retirement System

Section III: Analysis of Actuarial Assumptions Employed

Asset Valuation Method

In compliance with Section 40.04(3) of the Wisconsin Statutes, assets in the Core Investment Trust are valued using the Market Recognition Account (MRA). This method smoothes investment gains and losses for each fiscal year by recognizing these gains and losses evenly over a five-year period. The MRA method does not impose a corridor that places limits on the spread between actuarial value of assets (AVA) and market value of assets (MVA).

An essential part of the public sector budgeting process is that material budget items, including pension contributions, should have a level cost pattern from year to year to the extent possible. Segal recognizes the importance of this requirement and assists clients in establishing reasonable methodologies for recognizing investment gains and losses and limiting the potential volatility that may result in increased contributions due to investment results.

The actuary's guide for determining the reasonableness of an asset smoothing method is ASOP No. 44. The following is an excerpt from this ASOP that establishes the qualities a reasonable asset smoothing method must exhibit.

From the Actuarial Standard of Practice No. 44:

3.3 Selecting Methods Other Than Market Value -- If the considerations in section 3.2 have led the actuary to conclude that an asset valuation method other than market value may be appropriate, the actuary should select an asset valuation method that is designed to produce actuarial values of assets that bear a reasonable relationship to the corresponding market values. The qualities of such an asset valuation method include the following:

- a. The asset valuation method is likely to produce actuarial values of assets that are sometimes greater than and sometimes less than the corresponding market values.*
- b. The asset valuation method is likely to produce actuarial values of assets that, in the actuary's professional judgment, satisfy both of the following:*
 - 1. The asset values fall within a reasonable range around the corresponding market values. For example, there might be a corridor centered at market value, outside of which the actuarial value of assets may not fall, in order to assure that the difference from market value is not greater than the actuary deems reasonable.*
 - 2. Any differences between the actuarial value of assets and the market value are recognized within a reasonable period of time. For example, the actuary might use a method where the actuarial value of assets converges toward market value at a pace that the actuary deems reasonable, if the investment return assumption is realized in future periods.*

In lieu of satisfying both (1) and (2) above, an asset valuation method could satisfy section 3.3(b) if, in the actuary's professional judgment, the asset valuation method either (i) produces values within a sufficiently narrow range around market value or (ii) recognizes differences from market value in a sufficiently short period.

Wisconsin Retirement System

Section III: Analysis of Actuarial Assumptions Employed

Two key principles arise from ASOP 44. These are that acceptable asset smoothing must create asset values that fall within a reasonable range around market value and are recognized in a reasonable period of time. In lieu of satisfying both of these principles, a smoothing method could satisfy the requirements if, in the actuary's professional judgment, the range around market value is sufficiently narrow or the differences are recognized in a sufficiently short period.

Segal has established an internal policy, which is consistent with others in the actuarial community, that five years is a sufficiently short period to constitute a reasonable asset smoothing method even if no corridor is used. Therefore, it is our opinion that the method utilized by WRS is reasonable.

Recommendations

The following summarizes our actionable comments and suggestions relative to the actuarial assumptions and methods used in the valuations:

1. Select a specific price inflation assumption.
2. Review salary increases net of actual inflation.
3. Explicitly state the margin for future mortality improvement in the valuation reports and consider using a margin of at least 10% or generational mortality.
4. Review mortality experience separately for each job classification and use the liability-weighted methodology.
5. Show liability-weighted historical information in future Experience Study Reports.
6. Review sex-distinct retirement and turnover experience for all job classifications.
7. Review the percentage of members who terminate employment and take their contributions in lieu of a future annuity.
8. Consider using the most recent five years of experience for the next three-year Experience Study Report.

Wisconsin Retirement System

Section IV: Conclusions and Recommendations

This limited scope audit reviewed the data used, the benefits valued, the valuation results, and the actuarial methods and assumptions employed in the December 31, 2013, actuarial valuations. We found some inconsistencies in the valuation reports and test lives, and we generally agree with the results of the Experience Study Report, with a few recommendations for improvement. We found the actuarial cost method and asset valuation method conform with the Actuarial Standards of Practice. The data appears complete and with a cursory analysis of the information supplied, we were able to closely match the participant counts reported by GRS.

Below we summarize our comments and recommendations for your consideration:

A. Valuation Reports

1. Review the inconsistency in the annual actuarial valuation and gain/loss analysis report related to the Executive and Elected Official group.
2. Clarify the use of each asset value and remove asset values that are not being used.
3. Add a funded ratio using an immediate gain cost method, such as entry age.

B. Projected Benefits

1. Fully disclose all of the actuarial assumptions.
2. Review test lives where our differences are more than 3%.

C. Assumptions and Methods

1. Select a specific price inflation assumption.
2. Review salary increases net of actual inflation.
3. Explicitly state the margin for future mortality improvement in the valuation reports and consider using a margin of at least 10% or generational mortality.
4. Review mortality experience separately for each job classification and use the liability-weighted methodology.
5. Show liability-weighted historical information in future Experience Study Reports.
6. Review sex-distinct retirement and turnover experience for all job classifications.
7. Review the percentage of members who terminate employment and take their contributions in lieu of a future annuity
8. Consider using the most recent five years of experience for the next three-year Experience Study Report.

In this report, we have noted areas that we believe will improve the usefulness and clarity of the WRS annual actuarial valuations and Experience Study, and improve the valuation results. We are available to discuss any aspect of our review with the Legislative Audit Bureau, the WRS Board of Trustees, WRS staff, or the System's actuary. Segal Consulting is independent of Gabriel Roeder Smith & Company, and we are not aware of any conflict of interest that would impair the objectivity of our actuarial audit of their work.

Responses ■



STATE OF WISCONSIN
Department of Employee Trust Funds
Robert J. Conlin
SECRETARY

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December 8, 2015

JOE CHRISMAN, STATE AUDITOR
LEGISLATIVE AUDIT BUREAU
22 E MIFFLIN ST SUITE 500
MADISON WI 53703

Dear Mr. Chrisman:

Thank you for the opportunity to address the conclusions and recommendations provided by The Segal Company (Segal) in their review of actuarial services provided by Gabriel Roeder Smith and Company (GRS) to the Wisconsin Retirement System (WRS) and the Employee Trust Funds (ETF) Board. We support this type of review process as we believe it helps further strengthen the WRS. We are pleased with Segal's conclusion that GRS's valuation practices, methods and assumptions are sound and in accordance with generally accepted actuarial standards.

In their report, Segal made a number of observations and recommendations intended to improve the clarity of the various reports they reviewed. Overall, we believe the recommendations are helpful and will improve the reports. While GRS will be responding to all of Segal's recommendations, I would also like to address a few of them. One recommendation Segal made is to clarify the use of each asset value used in the valuations and remove asset values that are not used. We believe it's helpful to the reader to show a full reconciliation of our reserve accounts in order to understand the significance of the valuation methods to our system. We believe it would be better to provide clearer explanations of how and to what extent each asset value is used and we will work with GRS to make sure such explanations are included in the future.

Segal also recommended GRS add a funded ratio using an immediate gain cost method, such as entry age, to assist readers in understanding the funded status of the WRS. GRS currently presents funded ratios based on both the funding methodology used by the WRS and the required GASB 67 valuation method. While we believe that adding yet another funding ratio is unlikely to make these reports easier to understand, we will work with GRS to provide appropriate explanations of these funding ratios.

Finally, Segal recommended using five years' worth of data in the next experience study. Although current law requires experience studies to be completed no less than every three years, we believe that using data covering longer time periods in these experience studies makes sense. We will work with GRS to find ways to formally implement this change for the next experience study.

We appreciate the work of Segal and the assistance of the Legislative Audit Bureau in facilitating this audit.

Sincerely,

Robert J. Conlin
Secretary

December 8, 2015

Mr. Joe Chrisman
Wisconsin Legislative Audit Bureau
22 E. Mifflin Street, Suite 500
Madison, Wisconsin 53703

Re: Actuarial Review of GRS Work for WRS

Dear Mr. Chrisman:

Earlier this year, you retained the Segal Group, Inc. to review our December 31, 2013 Actuarial Valuations and the 2009-2011 Experience Study. GRS is very supportive of the actuarial review process. We have reviewed the work of other firms, and similarly, our work has been reviewed many times. A common purpose of an actuarial review is to double check the retained actuary's technical work, and to ensure that mathematical processes are being carried out correctly and appropriately. The actuarial review process also provides a means for Boards to receive a different perspective on their particular situation from another experienced consulting firm. In virtually every actuarial review that GRS has been involved in, the end result is an improved product for the client.

Ms. Nicholl and Mr. Strom, the Segal actuaries assigned to the audit, have now completed the review and have provided their report dated December 4, 2015. The main conclusions reached in their audit regarding the December 31, 2013 valuations were stated on page 2 of their report as follows:

- "The audit validates the findings of the December 31, 2013 actuarial valuations and 2009-2011 Experience Study."
- "We have found a few inconsistencies in the valuation reports and test lives, we generally agree with the results of the Experience Study Report."
- "We found the actuarial cost method and asset valuation method conform to the Actuarial Standards of Practice."
- "The data appears complete and with a cursory analysis of the information supplied, we were able to closely match the participant counts reported by GRS."

We direct your attention in particular to the first bullet point above. We are certainly pleased that the auditor was able to validate our work. The auditor has, in addition made a number of helpful suggestions and recommendations, which is customary and expected as part of the audit process. The recommendations are, for the most part, designed to help improve a process that has already been validated. They are not indicative of any type of substantive error or omission in the work product. We will consider those suggestions very carefully during the coming actuarial work cycle. There follows below a brief commentary on the summary recommendations that the reviewers made on page 21 of their report.

A. Valuation Reports

- 1. Review the inconsistency in the annual actuarial valuation and gain/loss analysis report related to the Executive and Elected Official group.** There was a clerical oversight in the production of report page B-3 related to Executives and Elected Officials, and the provisions of Act 10 of 2011. Contribution rates are developed based upon the figures on page B-1 and we have confirmed that those are correct. We will ensure that the figures on pages B-1 and B-3 agree going forward, but contribution rates will not be affected.
- 2. Clarify the use of each asset value and remove asset values that are not being used.** We will review pages C-1 through C-4 of the report and add an additional description of how the asset values are used in the report. Although certain values are not used (e.g. Milwaukee Retirement Assets), we think it is important to show a reconciliation of the MRA. Therefore, we do not expect to actually remove any asset values from the report.
- 3. Add a funded ratio using an immediate gain cost method, such as entry age.** Funded ratios using entry age are currently reported in the GASB Statement Nos. 67 and 68 reports. We agree that it should be added to the funding actuarial valuation report.

B. Projected Benefits

- 1. Fully disclose all of the actuarial assumptions.** The valuations used the assumptions that were intended and that were adopted by the Board. Consequently, the valuations are correct, and contribution rates are not impacted. We will ensure that, going forward, we accurately describe the assumptions that are used.
- 2. Review test lives where our differences are more than 3%.** We have not yet had time to do a thorough review of these cases. We did a preliminary review and noted that the reasons for differences tend to be highly technical and/or relate to rounding of ages or service, projections of the money purchase minimum effect, and the treatment of people with small amounts of service. We plan to do a thorough review of the cases as time permits and make technical adjustments to the extent such are warranted. Based on our preliminary analysis, we do not expect to find anything material, but these types of cases do tend to be instructive.

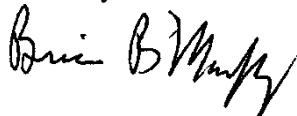
C. Assumptions and Methods

- 1. Select a specific price inflation assumption.** The price inflation assumption is not explicitly used in the calculation of liabilities. Rather, it is a building block that is used to derive the wage inflation assumption and investment return assumption. The current experience study report recommends a specific price inflation assumption of 2.7%.
- 2. Review salary increases net of actual inflation.** The presentation of the salary increase assumption in the Experience report is based upon actual inflation, but does not make that clear. We will make a note to clarify this matter.
- 3. Explicitly state the margin for future mortality improvement in the valuation reports and consider using a margin of at least 10% or generational mortality.** The current Experience Study report (a draft report was released prior to this audit finding) has recommended the use of generational mortality.

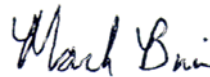
4. **Review mortality experience separately for each job classification and use the liability-weighted methodology.** We do not think there is sufficient credible data to review the mortality experience by job classification. We are also concerned that the use of different mortality assumptions for different occupations could have an unintended effect on the dividend process. This is a matter that would require considerable thought. The Society of Actuaries (SOA) is currently undertaking a mortality study of public sector data that may study different occupations. We can reconsider this matter and the liability weighting issue after seeing the results of the SOA study.
5. **Show liability-weighted historical information in future Experience Study Reports.** We think this is a good recommendation and will start to build the history of liability-weighted information in future valuation reports.
6. **Review sex-distinct retirement and turnover experience for all job classifications.** We have developed separate sex-distinct retirement and turnover rates for General, Public Schools and University employment groups. We do not think there is sufficient data to develop separate rates for Executive and Elected and Protective occupations.
7. **Review the percentage of members who terminate employment and take their contributions in lieu of a future annuity.** We agree with this suggestion and will attempt to study this in future experience studies if data is available.
8. **Consider using the most recent five years of experience for the next three-year Experience Study Report.** We agree with the auditing actuary that each study can and should consider more than three years of data. As part of each study, we consider experience from prior periods, and tabulate summaries of prior studies within the reports. Effectively, we are usually viewing at least 6 years of data when we make recommendations. We will give consideration to whether or not this should be done in a more formal manner when the next study is done.

We are very pleased with the results of the audit, and, in particular, we are pleased that the auditor has successfully validated both our 2013 valuation and the 2009-2011 experience study. We certainly appreciate the thorough work, professional demeanor, and helpful suggestions and recommendations that the auditors have made. We will continue to review them throughout the next work cycle and will implement those that seem to be in the best interest of the WRS.

Sincerely



Brian B. Murphy, FSA, EA, MAAA, FCA



Mark Buis, FSA, EA, MAAA

BBM/MB:sc

cc: Jim Anderson
Kim Nicholl
Matthew Strom
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