



OREGON PUBLIC EMPLOYEES RETIREMENT SYSTEM

TIER 1/TIER 2 AND OPSRP PENSION BENEFITS RHIA/RHIPA RETIREE MEDICAL BENEFITS

December 31, 2018 Actuarial Valuation

Prepared by:

Matt Larrabee, FSA, EA, MAAA

Principal and Consulting Actuary

Scott Preppernau, FSA, EA, MAAA

Principal and Consulting Actuary

1455 SW Broadway, Suite 1600
Portland OR 97201

Tel +1 503 227 0634

Fax +1 503 227 7956

milliman.com



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1455 SW Broadway
Suite 1600
Portland, OR 97201
USA

Tel +1 503 227 0634
Fax +1 503 227 7956

milliman.com

December 12, 2019

Retirement Board
Oregon Public Employees Retirement System

Dear Members of the Board,

As part of our engagement with the Board, we performed an actuarial valuation of the Oregon Public Employees Retirement System (“PERS” or “the System”) as of December 31, 2018. Our findings are set forth in this actuarial valuation report. This report reflects the benefit provisions in effect as of December 31, 2018, as modified by Senate Bill 1049 from the 2019 legislative session, as described in the report.

In preparing this report, we relied, without audit, on information (some oral and some in writing) supplied by the System’s staff. This information includes, but is not limited to, System benefit provisions as defined by statute, member census data, and financial information. We found this information to be reasonably consistent and comparable with information used for other purposes. The valuation results depend on the integrity of this information. If any of this information is inaccurate or incomplete our results may be different and our calculations may need to be revised.

All costs, liabilities, rates of interest, and other factors for the System have been determined on the basis of actuarial assumptions and methods which are individually reasonable (taking into account the experience of the System and reasonable expectations); and which, in combination, offer a reasonable estimate of anticipated experience affecting the System.

This valuation report is only an estimate of the System’s financial condition as of a single date. It can neither predict the System’s future condition nor guarantee future financial soundness. Actuarial valuations do not affect the ultimate cost of System benefits, only the timing of System contributions. While the valuation is based on an array of individually reasonable assumptions, other assumption sets may also be reasonable and valuation results based on those assumptions would be different. No one set of assumptions is uniquely correct.

Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the following: System experience differing from that anticipated by the economic or demographic assumptions; changes in economic or demographic assumptions; increases or decreases expected as part of the natural operation of the methodology used for these measurements (such as the end of an amortization period or additional cost or contribution requirements based on the System’s funded status); and changes in System benefit provisions or applicable law. Due to the limited scope of this assignment, we did not perform an analysis of the potential range of future measurements. The Board has the final decision regarding the appropriateness of the assumptions and adopted them as indicated herein in October 2019.



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Some of the actuarial computations presented in this report are for purposes of determining the advisory July 2021 to June 2023 contribution rates for System employers. Other actuarial computations presented in this report are for purposes of assisting the System and participating employers in fulfilling their financial reporting requirements. The computations prepared for these two purposes may differ as disclosed in our report. The calculations in the enclosed report have been made on a basis consistent with our understanding of the System's funding requirements and goals. The calculations in this report have been made on a basis consistent with our understanding of the System benefit provisions as summarized in this report. This report does not include results determined under GASB Statements Nos. 67 and 68, or under GASB Statements Nos. 74 and 75, which will be provided separately. Determinations for purposes other than meeting these requirements may be significantly different from the results contained in this report. Accordingly, additional determinations may be needed for other purposes.

Milliman's work is prepared solely for the use and benefit of the Oregon Public Employees Retirement System.

Milliman does not intend to benefit or create a legal duty to any third party recipient of this report. No third party recipient of Milliman's work product should rely upon this report. Such recipients should engage qualified professionals for advice appropriate to their own specific needs.

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

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

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

Sincerely,



Matt Larrabee, FSA, EA, MAAA
Principal and Consulting Actuary



Scott Preppernau, FSA, EA, MAAA
Principal and Consulting Actuary



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Table of Contents

	<u>Page</u>
Executive Summary	1
System-Wide Assets	19
Pension Plan Valuation	23
Tier 1/Tier 2	24
OPSRP	44
Retiree Healthcare Valuation	54
Accounting / CAFR Exhibits	65
Data Exhibits	77
Actuarial Methods and Assumptions.....	96
Tier 1/Tier 2	97
OPSRP	107
Summary of Plan Provisions	111
Risk Disclosure	122
Glossary	127

Executive Summary

Executive Summary

Milliman prepared this report for the Oregon Public Employees Retirement System to:

- Present Milliman’s actuarial estimates of the system-wide liabilities and expenses of the Oregon Public Employees Retirement System (PERS), including pension benefits provided through Tier 1/Tier 2 and the Oregon Public Service Retirement Plan (OPSRP), and retiree medical benefits provided through the Retiree Health Insurance Account (RHIA) and the Retiree Health Insurance Premium Account (RHIPA), as of December 31, 2018 for PERS to incorporate, as PERS deems appropriate, in its financial statements; and
- Provide information on advisory system-wide average employer contribution rates and employer contribution rates for the School District rate pool and the State and Local Government Rate Pool (SLGRP) calculated as of December 31, 2018.

This valuation does not cover the defined contribution Individual Account Program (IAP). Except where otherwise explicitly noted, contribution rates in this valuation do not include contributions to the IAP. In addition, the valuation does not include an allowance for employer debt service payments on pension obligation bonds.

Summarizing a key result of this report, this advisory valuation indicates that the system-average collared “net” employer contribution rate for the 2021-2023 biennium is projected to increase compared to the rate currently in effect for the 2019-2021 biennium. However, this increase is smaller than projected in the prior valuation, primarily due to changes made by Senate Bill 1049 (discussed below), which was passed in June 2019. Further discussion and explanation of the change in collared rates can be found in our October 2019 presentation materials to the PERS Board. Actual contribution rates for the 2021-2023 biennium will be determined by the December 31, 2019 valuation, and will reflect plan experience through that date.

For more information on projections of future rate increases, we encourage readers of this report to review our financial modeling presentations to the PERS Board. The most recent such presentation was given at the December 2019 PERS Board meeting.

Projected Benefit Payments and the Fundamental Cost Equation

The actuarial liabilities contained in this report are calculated from a projection of benefit payments. This projection reflects the current plan provisions, assumptions, and demographic information documented herein. The stream of projected future benefit payments is converted to a net present value as of the valuation date based on the valuation’s investment return assumption, which currently is 7.20%. The total net present value is then assigned to past, present, and future service according to the actuarial cost method. The portion assigned to the past is called the **actuarial accrued liability**¹, while the portion assigned to the current year is referred to as the **normal cost**.

Actuarial valuations provide a tool for measuring a System’s progress towards funding its benefit obligations and adjusting budgeted contributions as appropriate to reflect changing circumstances. Even though they affect actuarial funded status and contribution rate calculations, assumptions regarding plan investment returns and participant experience do not affect the ultimate long-term cost of the program, which is governed by the **fundamental cost equation**:

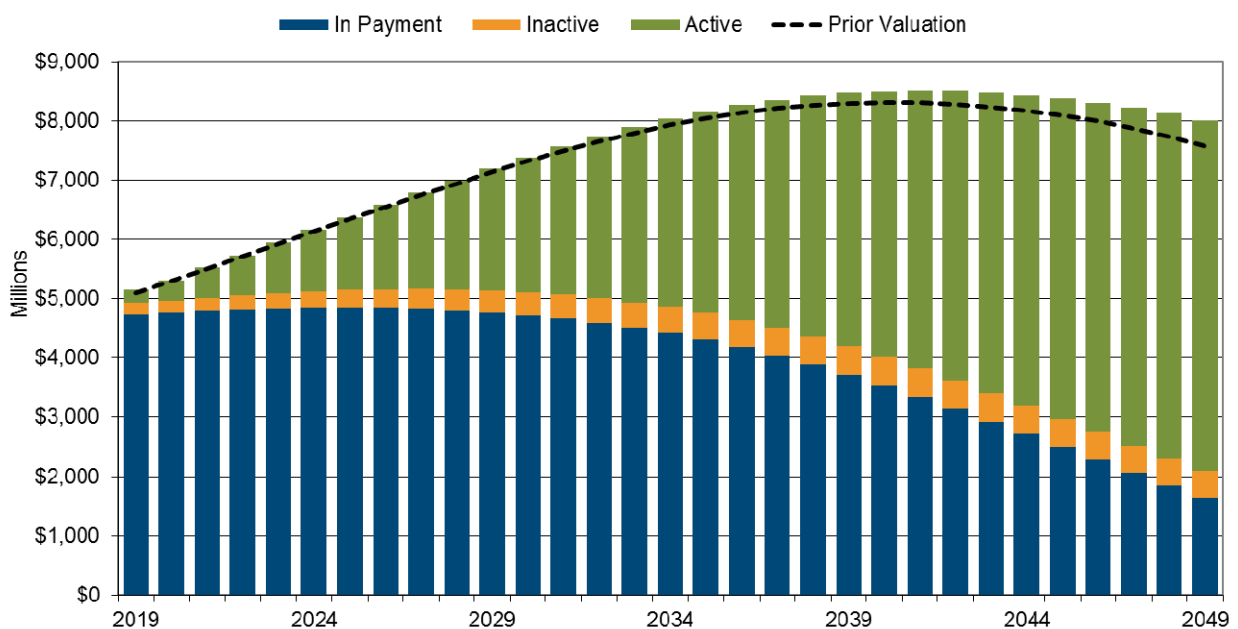
$$\text{Benefits} + \text{Expenses} = \text{Contributions} + \text{Investment Earnings}$$

¹ *Bolded terms from the Executive Summary are defined in the report glossary.*

From a plan funding perspective, contributions are the balancing item in the equation. To the extent actual plan investment earnings underperform compared to assumption, contributions must increase to fund the defined level of benefits; if investments outperform the assumption, contributions can decrease.

The graph below illustrates projected benefit payments from the System calculated in both the current valuation and the prior valuation, organized by member status as of the actuarial valuation date. The graph includes the estimated effects on projected benefits of anticipated future service by current active members, including the assumed effects of future salary increases. The graph does not include expected benefit payments for members hired after the valuation date. The dotted line illustrates the shape of the graph from the prior valuation, which was performed as of December 31, 2017. As shown in the graph, there was little change in the projected benefits calculated in the current valuation.

Tier 1/Tier 2 & OPSRP Expected Benefit Payments
by status as of 12/31/2018



Retirement System Risks

Oregon PERS, like all defined benefit plans, is subject to various risks that will affect the future plan liabilities and contribution requirements, including investment risk, demographic risk, and contribution risk. While the results of an actuarial valuation are based on one set of reasonable assumptions, it is almost certain that future experience will not exactly match the assumptions. The section of this report titled *Risk Disclosures* discusses the System's risks in more detail. In addition, our annual financial modeling work provides analysis of the effect of different possible future experience with a key source of risk: future investment performance.

Employer Contribution Rates

Pension Contribution Rates

This report presents system average employer contribution rates calculated as of December 31, 2018. These rates are advisory only. The December 31, 2019 valuation will determine employer contribution rates that will be presented for PERS Board adoption to be first effective July 1, 2021. The December 31, 2017 valuation presented the employer contribution rates that were adopted by the PERS Board for July 1, 2019 through June 30, 2021.

Employer pension contribution rates consist of a normal cost rate and a rate to amortize the Unfunded Accrued Liability (UAL). Normal cost rates are calculated and charged separately to the Tier 1/Tier 2, OPSRP general service and OPSRP police and fire payrolls. UAL rates are calculated separately for Tier 1/Tier 2 and OPSRP, but each UAL rate so developed is then charged across all payrolls. Rates for individual employers are adjusted if the employer maintains a side account or has a **pre-SLGRP liability or surplus**. The table below compares the average employer contribution rates for each type of payroll calculated for this valuation to the rates in effect from July 1, 2019 through June 30, 2021. In the table below, redirected member contributions under Senate Bill 1049 are assumed to fund a portion of the normal cost rate effective July 1, 2021, and serve as a partial offset to the employer contribution rate otherwise payable absent that redirection.

Collared Pension Contribution Rates (Excludes IAP)						
Payroll	Advisory July 1, 2021			Effective July 1, 2019		
	Tier 1/Tier 2	OPSRP General Service	OPSRP Police & Fire	Tier 1/Tier 2	OPSRP General Service	OPSRP Police & Fire
Normal Cost Rate	15.19%	8.70%	13.07%	15.27%	8.40%	13.03%
Tier 1/Tier 2 UAL Rate ¹	15.17%	15.17%	15.17%	12.19%	12.19%	12.19%
OPSRP UAL Rate	1.76%	1.76%	1.76%	1.45%	1.45%	1.45%
Total Pension Rate	32.12%	25.63%	30.00%	28.91%	22.04%	26.67%
Average Adjustment ²	(6.39%)	(6.39%)	(6.39%)	(6.91%)	(6.91%)	(6.91%)
Member Redirect Offset ³	(2.45%)	(0.70%)	(0.70%)	N/A	N/A	N/A
Net Employer Pension Rate	23.28%	18.54%	22.91%	22.00%	15.13%	19.76%

¹ Includes Multnomah Fire District #10

² Adjustments shown are for side accounts and pre-SLGRP liabilities and are shown on system-wide average basis. For this purpose, adjustments are not assumed to be limited when an individual employer reaches a 0% contribution rate.

³ Redirected member contributions under Senate Bill 1049 (2.50% of payroll for Tier 1/Tier 2 and 0.75% of payroll for OPSRP) are anticipated to offset employer contribution rates. Redirect does not apply to members with monthly pay below a threshold. The values shown in the table incorporate an estimate of the effect of this limitation.

Average collared UAL rates calculated in this valuation increased compared to the contribution rates calculated in the December 31, 2017 valuation, which produced rates effective July 1, 2019. This is primarily due to continued systematic UAL rate increases via the rate collar methodology, the mechanics of which are detailed later in this report. The introduction of redirected member contributions partially offset the increase in the system-average employer contribution rate because a portion of the increase in the Total Pension Rate will be paid by the redirected contributions.

Pension contribution rates differ for each Tier 1/Tier 2 rate pool. This report calculates the specific rates for each rate pool. Tier 1/Tier 2 rates for independent employers (employers that do not participate in a Tier 1/Tier 2 rate pool) are calculated in separate reports for each employer. Changes from biennium to biennium in pension contribution rates for each rate pool (or independent employer) are confined to a **rate collar** depending on **funded status**. The table below shows the employer pension contribution rates for each Tier 1/Tier 2 rate pool calculated in this valuation compared to the rates in effect as of July 1, 2019, along with the average adjustment to those rates for side account rate offsets and for pre-SLGRP and Transition Liability/(Surplus) charges and credits and the effect of the offset for redirected member contributions.

Tier 1/Tier 2 Collared Pension Contribution Rates (Excludes IAP)				
	Advisory July 1, 2021		Effective July 1, 2019	
	SLGRP	School Districts	SLGRP	School Districts
Normal Cost Rate	15.78%	13.63%	15.83%	13.79%
Tier 1/Tier 2 UAL Rate ¹	14.57%	17.05%	10.43%	16.73%
Total Pension Rate	30.35%	30.68%	26.26%	30.52%
Average Adjustment ²	(5.38%)	(9.67%)	(5.68%)	(10.66%)
Member Redirect Offset ³	(2.45%)	(2.45%)	N/A	N/A
Net Employer Pension Rate	22.52%	18.56%	20.58%	19.86%

¹ Includes Multnomah Fire District #10

² Adjustments shown are for side accounts and pre-SLGRP liabilities and are shown on a rate pool average basis. For this purpose, adjustments are not assumed to be limited when an individual employer reaches a 0% contribution rate.

³ Redirected member contributions under Senate Bill 1049 (2.50% of payroll for Tier 1/Tier 2) are anticipated to offset employer contribution rates. Redirect does not apply to members with monthly pay below a threshold. The values shown in the table incorporate an estimate of the effect of this limitation.

The Tier 1/Tier 2 contribution rates shown here are after reflecting the effects of the rate collar. In recent rate-setting valuations, due to the impact of the *Moro* decision and assumption changes (primarily lower investment return), both the SLGRP and the School District rate pool had “before collar” (or “uncollared”) contribution rates that exceeded the maximum single biennium rate increase allowed by the collar. In the December 31, 2018 valuation, the contribution rate increases calculated for both the SLGRP and the School District rate pool are no longer limited by the collar, as shown below. In general, any contribution rate increases deferred by the rate collar will be reflected in future rate-setting periods. For both the SLGRP and School District pools, since the rate collar is not limiting the contribution rate calculated in this valuation, there currently are not any deferred increases beyond the advisory July 1, 2021 contribution rates shown in this valuation. As noted in the table above, the “average adjustment” in the table below quantifies the effects of side accounts and pre-SLGRP liabilities on a rate pool average basis.

Collar Impact on Tier 1/Tier 2 Pension Contribution Rates		
	Advisory July 1, 2021	
	SLGRP	School Districts
Total Pension Rate Before Collar	30.35%	30.68%
Collar Adjustment	0.00%	0.00%
Total Pension Rate After Collar	30.35%	30.68%
Average Adjustment	(5.38%)	(9.67%)
Member Redirect Offset	(2.45%)	(2.45%)
Net Employer Pension Rate	22.52%	18.56%

Retiree Healthcare Contribution Rates

In addition to the pension contribution rates, all employers contribute to the Retirement Health Insurance Account (RHIA). Further, State Agencies and State Judiciary also contribute to the Retiree Health Insurance Premium Account (RHIPA). Only Tier 1 and Tier 2 members are eligible for these benefits, so the normal cost rates are only charged to Tier 1/Tier 2 payroll, but the UAL rates are charged to all payrolls. For each type of payroll used in this valuation the table below compares the employer contribution rates calculated in this valuation to the rates in effect from July 1, 2019 through June 30, 2021. The funded status for both retiree healthcare programs has historically lagged those of the defined benefit pension programs. In response to this, the UAL on the retiree healthcare programs is amortized over a ten-year period, which is shorter than the pension program amortization periods, in an effort to more rapidly improve funded status. Funded status for both programs have materially improved since the amortization change was implemented, with the funded status for the larger RHIA program now above 100%. With its funded status over 100%, the RHIA UAL contribution rate was set to 0.00% of payroll for 2019-2021.

Retiree Healthcare Contribution Rates						
Payroll	Advisory July 1, 2021			Effective July 1, 2019		
	Tier 1/Tier 2	OPSRP General Service	OPSRP Police & Fire	Tier 1/Tier 2	OPSRP General Service	OPSRP Police & Fire
RHIA Normal Cost Rate	0.05%	0.00%	0.00%	0.06%	0.00%	0.00%
RHIA UAL Rate	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Total RHIA rate	0.05%	0.00%	0.00%	0.06%	0.00%	0.00%
RHIPA Normal Cost Rate	0.11%	0.00%	0.00%	0.12%	0.00%	0.00%
RHIPA UAL Rate	0.22%	0.22%	0.22%	0.27%	0.27%	0.27%
Total RHIPA rate	0.33%	0.22%	0.22%	0.39%	0.27%	0.27%

System-Average Total Pension Contribution Rates

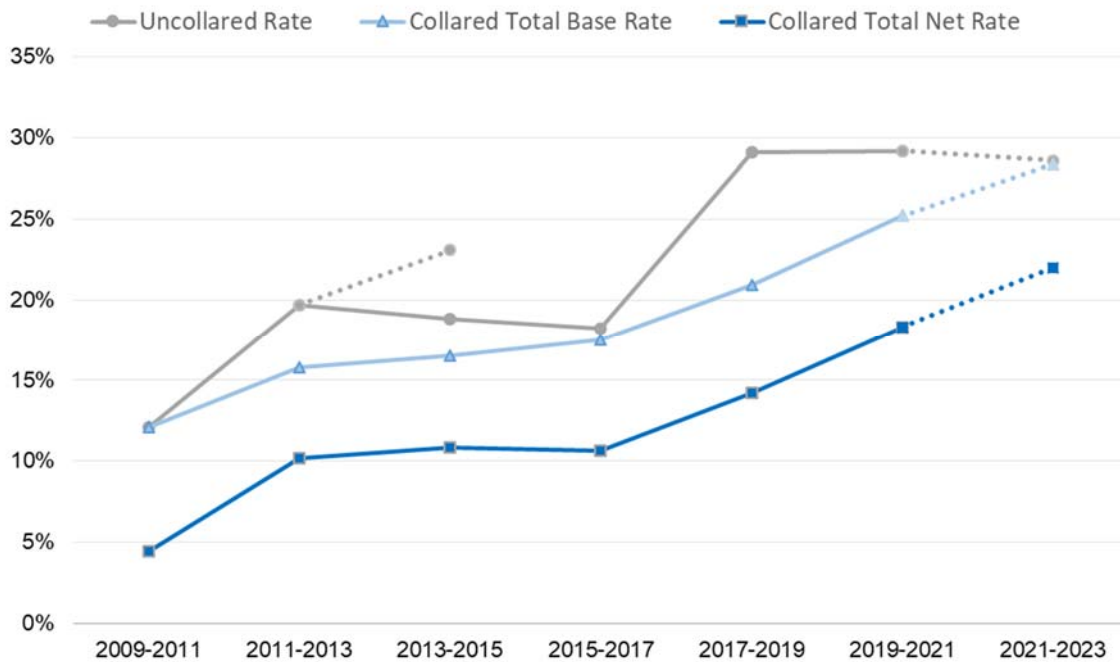
The system-wide weighted average pension contribution rates are shown below for each period since the July 1, 2009 to June 30, 2011 biennium, the rates for which were based on the December 31, 2007 rate-setting valuation. The rates shown reflect a blend of Tier 1/Tier 2 and OPSRP normal costs based on the relative proportions of system-wide payroll between those categories at the relevant rate-setting valuation. Rates shown are for illustration only, as no employer pays the system-wide average contribution rate, but instead each employer pays a rate determined based on its own experience or that of its rate pool.

The graph shows the average level of uncollared rates, collared base rates, and collared net rates over the depicted period. All rates are “Total Pension Rates”, and do not reflect the offset to employer contribution rates expected beginning with the July 1, 2021 to June 30, 2023 biennium due to redirected member contributions.

The uncollared rate is calculated based on the normal cost and UAL rates initially calculated in a valuation and is the starting point of the rate-setting process. If the uncollared rate is well above (or below) the current (collared) rate being paid, the contribution rate stabilization method (the “rate collar”) limits the increase (or decrease) in the rate paid in the next biennium. As a result, the collared rate may temporarily be below (or above) the uncollared rate, as the rate collar methodology systematically spreads large adjustments over multiple periods.

For an individual employer, collared base pension rates are adjusted for side account rate offsets to develop collared net pension rates paid by the employer. Side accounts are the result of employer supplemental deposits, often financed through a pension obligation bond. When a supplemental deposit is made, a side account is established (after any Transition Liabilities related to joining the SLGRP have been paid) and used to offset the otherwise required contribution rate. This occurs by having the employer pay part of its collared contribution rate via a transfer from its side account. As of December 31, 2018, the system has approximately \$5.2 billion in unamortized side accounts, slightly less than last year. At a system-average level, side accounts now offset employer contribution rates by 5.97% of payroll, but there is wide variation between employers.

For individual employers in the SLGRP, collared base pension rates are also adjusted for amortization charges (or credits) on pre-SLGRP liabilities (or assets). The average adjustment to individual employer rates due to side accounts and pre-SLGRP charges or credits is shown on a combined basis in the table on page 4.



The system-average total pension contribution rates shown above reflect significant recent events affecting the System:

- The 2009-2011 contribution rates were set before the financial crisis (based on the December 31, 2007 rate-setting valuation). Rates increased in 2011-2013, reflecting the asset losses during 2008 and 2009.
- The dotted line shown for the uncollared rate in 2013-2015 illustrates the initially adopted contribution rates for that biennium. However, legislative changes to the system made in 2013 (most notably to the COLA) reduced projected future benefits. At legislative direction, contribution rates were reduced to reflect the legislated changes, and these rates are shown in the solid lines for 2013-2015.
- The 2015 Oregon Supreme Court ruling in *Moro v. State of Oregon* reversed the majority of the effect of the 2013 legislation. The decision first affected contribution rates for the 2017-2019 biennium, leading to a significant increase in the uncollared rate and the first of multiple scheduled increases in the collared rate to reflect the change.
- The valuation assumed return was 8.00% for contribution rates effective through the 2013-2015 biennium. The rate was lowered to 7.75% for the 2015-2017 biennium, to 7.50% for the 2017-2019 biennium, and then to 7.20% for the 2019-2021 and 2021-2023 biennia. A lower assumed return increases the estimated present value of liabilities and increases near-term calculated contribution rates.
- The contribution rates based on this advisory valuation are shown as the dotted lines for the 2021-23 biennium. Based on this valuation at a system-average level, the advisory increase in the collared total base rate is projected to result in a rate very close to the uncollared rate. Actual contribution rates for the 2021-23 biennium will be based on the December 31, 2019 rate-setting valuation.

As noted above, rates shown in the graph do not reflect the offset to employer contribution rates expected beginning with the July 1, 2021 to June 30, 2023 biennium due to redirected member contributions.

Limits on Future Pension Contribution Rates

The minimum and maximum rates that can be effective July 1, 2021 for each Tier 1/Tier 2 rate pool (prior to adjustments) are shown in the table below. The limits are calculated and applied on an individual employer basis for independent employers. The contribution rates for employers in Tier 1/Tier 2 pooling arrangements (i.e., the SLGRP and School Districts rate pool) are adjusted from the rates of the pool to reflect side account rate offsets, charges or credits for pre-SLGRP liabilities, and adjustments to the normal cost rates of SLGRP employers to reflect the employer’s ratio of general service to police and fire payroll. These adjustments are not limited by the rate collar.

The size of the rate collar depends on the funded status of a rate pool or employer. When funded status excluding side accounts is less than 60 percent or above 140 percent, the size of the rate collar is twice the size of the “single collar” that applies when funded status excluding side accounts is between 70 percent and 130 percent. The rate collar provides a graded schedule between the single and double rate collars if the funded status excluding side accounts is between 60% and 70% or 130% and 140%.

	Effective July 1, 2021	
	SLGRP	School Districts
Limits on Future Tier 1/Tier 2 Pension Contribution Rates		
Between 70% and 130% Funded		
Minimum Rate	21.01%	24.42%
Maximum Rate	31.51%	36.62%
Less than 60% or Greater than 140% Funded		
Minimum Rate	15.76%	18.32%
Maximum Rate	36.76%	42.72%

For Rate Pools funded between 60% and 70% or between 130% and 140% the limits vary linearly between the rates shown above.

Funded Status

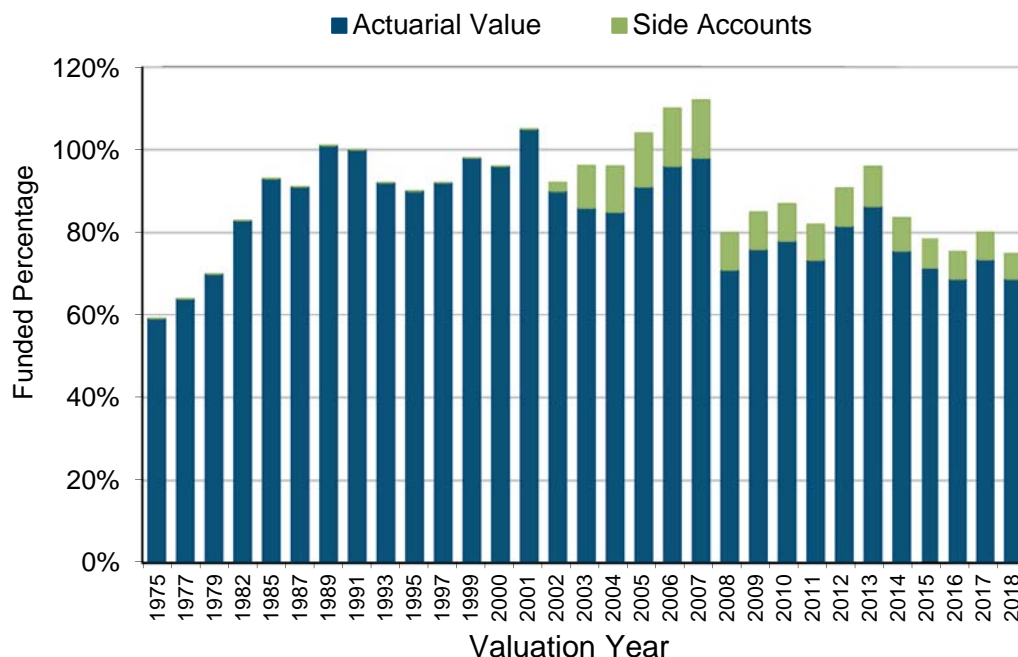
The table below shows the funded status of the various pension rate pools both on the basis used to calculate the contribution rate for each rate pool and after adjustment for side accounts (assuming side accounts offset Tier 1/Tier 2 liabilities). For this exhibit, all independent employers, including State Judiciary, have been grouped together.

	SLGRP	School Districts	Independent Employers	OPSRP	Pension System Totals ¹
December 31, 2018					
Actuarial accrued liability	\$43,149.3	\$29,898.4	\$6,736.3	\$6,738.0	\$86,574.7
Actuarial value of assets	\$29,383.7	\$20,846.8	\$4,673.1	\$4,783.0	\$59,593.0
Funded status	68.1%	69.7%	69.4%	71.0%	68.8%
Side accounts	\$2,415.1	\$2,711.0	\$83.1	\$0.0	\$5,209.3
Funded status reflecting side accounts	73.7%	78.8%	70.6%	71.0%	74.9%
December 31, 2017					
Actuarial accrued liability	\$42,150.7	\$29,677.4	\$6,536.3	\$5,634.7	\$84,056.1
Actuarial value of assets	\$30,899.7	\$21,924.7	\$4,932.9	\$4,116.5	\$61,764.9
Funded status	73.3%	73.9%	75.5%	73.1%	73.5%
Side accounts	\$2,466.3	\$3,009.7	\$85.3	\$0.0	\$5,561.2
Funded status reflecting side accounts	79.2%	84.0%	76.8%	73.1%	80.1%

Amounts in millions

¹ Includes Multnomah Fire District #10

As shown in the graph below, the funded status of the system generally improved until the market decline of 2000-2002. After the decline, funded status generally improved for several years due to better than expected investment returns until 2008, when it decreased significantly due to investment losses. Funded status then improved through the December 31, 2013 valuation due to legislative changes in plan provisions and investment gains during 2012 and 2013. Funded status declined in the December 31, 2014 valuation due to the combined effects of the *Moro* decision and assumption changes. It continued decreasing in subsequent years due to the combined effects of investment losses and adoption of a lower assumed rate of return, then improved in the December 31, 2017 valuation due to 2017 investment gains, but decreased in the current valuation due to lower than expected investment returns in 2018.



The retiree medical benefits are funded using a 401(h) account within the pension trust. The table below shows the funded status of the retiree medical programs. The funded status of the RHIA and RHIPA programs improved since the prior valuation due the effects of employer contributions and actual member plan coverage election experience.

	December 31, 2018			December 31, 2017		
	RHIA	RHIPA	Total	RHIA	RHIPA	Total
Actuarial accrued liability	\$411.7	\$62.7	\$474.4	\$437.6	\$69.4	\$506.9
Actuarial value of assets	\$570.7	\$38.5	\$609.2	\$553.3	\$29.8	\$583.1
Funded status	138.6%	61.3%	128.4%	126.4%	43.0%	115.0%

Amounts in millions

Asset Changes

Since December 31, 2017, contributions (including supplemental deposits but excluding side account rate offset transfers) for pension benefits have increased assets by 2.6% while benefit payments decreased assets by about 6.9%. On the whole, assets decreased by 4.0%, since the investment returns of approximately 0.3% were not enough to offset the system's negative cash flow position.

	Amount	Percentage of Beginning Market Value
Market Value of Assets, December 31, 2017	\$69,316.4	
Contributions	1,818.9	2.6%
Investment Income (less administrative expenses)	190.1	0.3%
Benefit Payments	(4,788.3)	(6.9%)
Market Value of Assets, December 31, 2018	\$66,537.1	96.0%

Amounts in millions

The Tier 1 Rate Guarantee Reserve that is used to pay for the interest crediting rate guarantee on active Tier 1 member accounts when actual investment earnings are below the assumed rate has decreased from a reserve of \$511 million as of December 31, 2017 to a reserve of \$258 million as of December 31, 2018 due to investment performance and Tier 1 retirement patterns in 2018. Tier 1 non-retired member accounts that are linked to the Rate Guarantee Reserve decreased from \$4.1 billion on December 31, 2017 to \$3.8 billion on December 31, 2018 due to retirements during the year of Tier 1 active members.

Market values of assets are reported to Milliman by PERS. It is our understanding that the December 31 market values of select real estate and private equity investments are reported on a three-month lag basis. This valuation report does not attempt to quantify the impact of any such lag effects.

Liability Changes

Since December 31, 2017, the system-wide actuarial accrued liability has increased primarily due to interest on the liability as current active members get closer to retirement. The normal cost for 2018, or the present value of projected future benefits for active members allocated to that year of service, was about one-quarter of the value of benefits paid out during the year. The remaining increase in the actuarial accrued liability was attributable to demographic experience, which includes actual experience differing from assumption, data corrections, and the effect of new members joining the system during the year. The largest demographic experience effects in descending order of magnitude resulted from pay increases differing from assumption, interest crediting on member account balances differing from assumption, new members entering the system, and active retirement levels differing from assumption.

	Amount	Percentage of Beginning AAL
Actuarial Accrued Liability, December 31, 2017	\$84,563.0	
Normal Cost	1,130.8	1.3%
Benefit Payments	(4,788.3)	(5.7%)
Interest	5,956.9	7.0%
Assumption & Method Changes	(67.3)	(0.1%)
Plan Changes	(52.1)	(0.1%)
Demographic Experience	306.1	0.4%
Actuarial Accrued Liability, December 31, 2018	\$87,049.1	102.9%

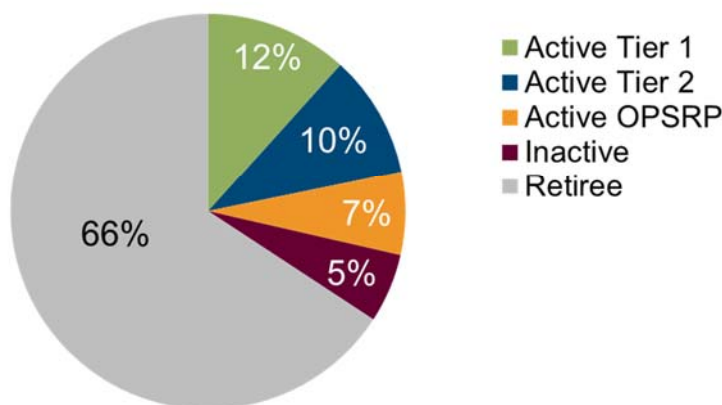
Amounts in millions

The Oregon Public Employees Retirement System is a mature system. There are currently 1.19 active members in the system for every annuitant (including retired members and beneficiaries). By comparison, the average ratio in NASRA’s November 2018 Public Fund Survey is 1.38. Since contributions to the system are based on active payroll, a lower active-to-annuitant ratio generally means there will be a larger change in contribution rates for any given level of actuarial gain or loss, such as for investment experience varying from assumption by a certain percentage, compared to peer systems. The ratio of active members to annuitants may decline further as a significant portion of active members are currently eligible to retire.

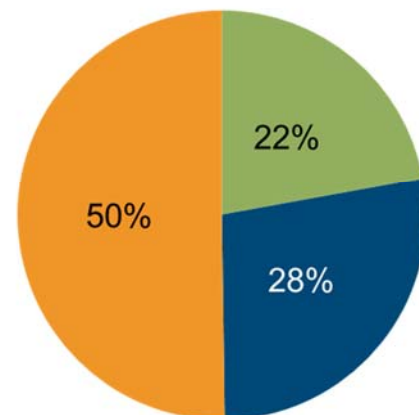
The left-hand chart below illustrates the distribution of the system’s actuarial accrued liability by member pension tier and status. While the majority of active liability is attributable to Tier 1 members, 72% of the system’s total actuarial accrued liability is due to members who are no longer actively working in covered employment. Only 17% of the liability is attributable to active Tier 2 and OPSRP members. Of the actuarial accrued liability that is attributable to actives, a large portion is located at or near prime retirement ages.

The right-hand chart below illustrates the distribution of the system’s normal cost. Tier 2 members account for 28% of the system’s normal cost compared to about 10% of the system’s actuarial accrued liability. OPSRP members account for 50% of the normal cost compared to just 7% of the actuarial accrued liability.

Actuarial Accrued Liability by Member Category



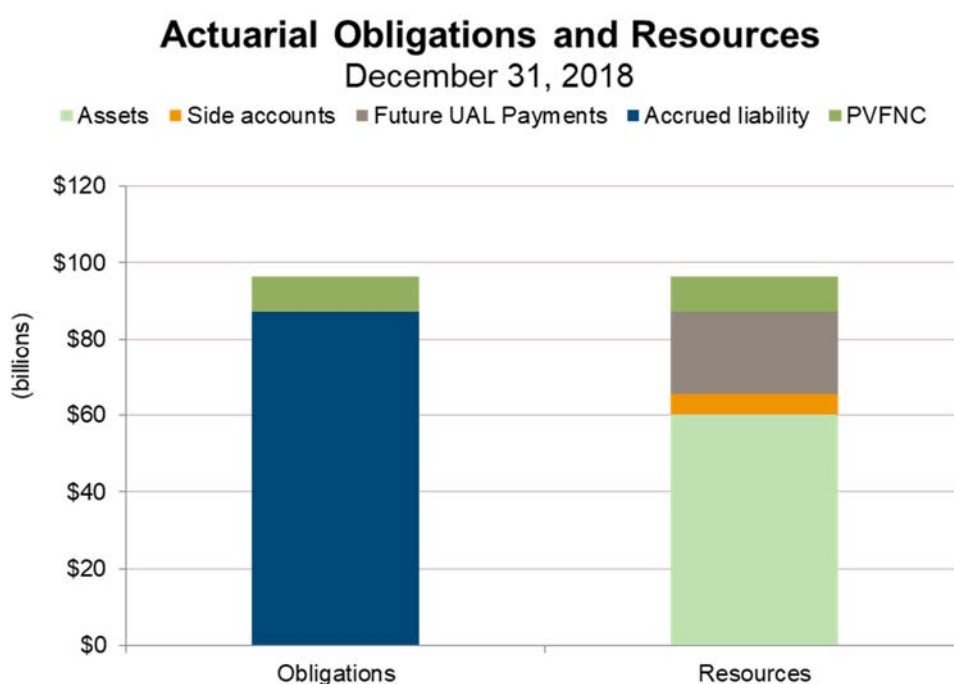
Normal Cost by Member Category



Actuarial Obligations and Resources

The actuarial accrued liability discussed above is the present value of benefits allocated to past service by the actuarial cost allocation method. The **total actuarial present value of benefits** (also referred to as “total liability”) is a broader measure that reflects both the actuarial accrued liability and the **present value of future normal cost** (PVFNC) for current members. Conceptually, the total actuarial present value of benefits can be thought of as the total expected benefit obligation, in today’s dollars, associated with members as of the valuation date for service throughout their working careers, including assumed service subsequent to the valuation date. As of December 31, 2018, the total actuarial present value of benefits for the system was \$96.2 billion.

The resources to fund this expected obligation include assets the system has set aside as of the valuation date, plus the present value of expected future contributions to normal cost and UAL payments. By definition, the resources and obligations are equal in this “actuarial balance sheet”, as shown in the graph below.



Contributions to future normal costs and UAL payments are made as a percent of subject member salary, known as valuation payroll. The table below shows the amount of projected salary in the year following the valuation date as well as the present value of all future projected salary amounts for members included in the valuation.

	Projected Valuation Payroll for Year Subsequent to Valuation Date	Present Value of Future Valuation Payroll ¹
Tier 1/Tier 2	\$4,076.1	\$24,161.2
OPSRP General Service	5,973.4	58,509.4
OPSRP Police & Fire	802.5	9,707.2
Total	\$10,852.0	\$92,377.8

Amounts in millions

¹ For members as of the valuation date.

Principal Valuation Results

A summary of principal valuation results from the current valuation and the prior valuation follows. Any changes in actuarial assumptions, methods or plan provisions between the two valuations are described after the summary. **Combined valuation payroll** is the projected Tier 1/Tier 2 payroll plus OPSRP payroll for the calendar year subsequent to the actuarial valuation date.

	Actuarial Valuation as of		
	December 31, 2018	December 31, 2017	Percent Change
Tier 1/Tier 2 Pension			
Actuarial accrued liability	\$79,836.8	\$78,421.4	2%
Actuarial value of assets	\$54,810.0	\$57,648.4	(5%)
Unfunded actuarial accrued liability	\$25,026.7	\$20,773.0	20%
Funded status	69%	74%	
UAL as a percentage of payroll	231%	206%	
Normal cost	\$619.3	\$648.7	(5%)
Tier 1/Tier 2 valuation payroll	\$4,076.1	\$4,246.9	(4%)
Normal cost rate	15.19%	15.27%	
OPSRP Pension			
Actuarial accrued liability	\$6,738.0	\$5,634.7	20%
Actuarial value of assets	\$4,783.0	\$4,116.5	16%
Unfunded actuarial accrued liability	\$1,955.0	\$1,518.2	29%
Funded status	71%	73%	
UAL as a percentage of payroll	18%	15%	
Normal cost	\$624.8	\$522.2	20%
OPSRP valuation payroll	\$6,775.9	\$5,852.0	16%
Normal cost rate	9.22%	8.92%	
Combined Pension			
Actuarial accrued liability	\$86,574.7	\$84,056.1	3%
Actuarial value of assets	\$59,593.0	\$61,764.9	(4%)
Unfunded actuarial accrued liability	\$26,981.7	\$22,291.2	21%
Funded status	69%	73%	
Combined valuation payroll	\$10,852.0	\$10,098.9	7%
UAL as a percentage of payroll	249%	221%	
Normal cost	\$1,244.1	\$1,170.9	6%
Combined valuation payroll	\$10,852.0	\$10,098.9	7%
Normal cost rate	11.46%	11.59%	

Amounts in millions

	Actuarial Valuation as of		
	December 31, 2018	December 31, 2017	Percent Change
RHIA			
Actuarial accrued liability	\$411.7	\$437.6	(6%)
Actuarial asset value	\$570.7	\$553.3	3%
Unfunded actuarial accrued liability	(\$159.1)	(\$115.7)	37%
Funded status	139%	126%	
Combined valuation payroll	\$10,852.0	\$10,098.9	7%
UAL as a percentage of payroll	(1%)	(1%)	
Normal cost	\$2.2	\$2.5	(14%)
Tier 1/Tier 2 valuation payroll	\$4,076.1	\$4,246.9	(4%)
Normal cost rate	0.05%	0.06%	
RHIPA			
Actuarial accrued liability	\$62.7	\$69.4	(10%)
Actuarial asset value	\$38.5	\$29.8	29%
Unfunded actuarial accrued liability	\$24.3	\$39.5	(39%)
Funded status	61%	43%	
Combined valuation payroll	\$3,211.6	\$2,984.5	8%
UAL as a percentage of payroll	1%	1%	
Normal cost	\$1.3	\$1.4	(9%)
Tier 1/Tier 2 valuation payroll	\$1,159.5	\$1,212.2	(4%)
Normal cost rate	0.11%	0.12%	

Amounts in millions

Data Summary

A brief summary of the data underlying the current and prior valuations follows. As shown below, the active member count increased about 2.2%, while the system's total member population also increased by about 2.2%. The data section of this report provides additional detail. State Judiciary is included in the Tier 1 counts.

	December 31, 2018				December 31, 2017
	Tier 1	Tier 2	OPSRP	Total	Total
Active Members					
Count	20,058	34,088	122,617	176,763	173,002
Average age	56.5	51.7	42.9	46.1	46.2
Average total service	25.9	17.8	6.5	10.9	10.9
Average prior year covered salary	\$81,481	\$73,656	\$52,159	\$59,632	\$56,939
Inactive Members¹					
Count	12,226	14,789	18,930	45,945	45,703
Average age	60.2	54.2	47.7	53.1	53.0
Average monthly deferred benefit	\$2,116	\$774	\$416	\$983	\$1,007
Retired Members and Beneficiaries¹					
Count	128,742	14,892	5,259	148,893	144,982
Average age	72.7	67.8	67.1	72.0	71.7
Average monthly benefit ²	\$2,902	\$1,066	\$511	\$2,634	\$2,586
Total Members	161,026	63,769	146,806	371,601	363,687

¹ Inactive and Retiree counts are shown by lives within the system. In other words, a member is counted once for purposes of this exhibit, regardless of their service history for different rate pools. This contrasts with the method used to count inactive participants in some of the later exhibits of this report.

² The average monthly benefit reflects an estimated adjustment for the effect of the Supreme Court decision in *Moro v. State of Oregon* for records that were not already adjusted in the data provided.

Effects of Changes

Effective with the December 31, 2018 actuarial valuation the following changes were made:

Assumption Changes

- Assumed administrative expenses were updated for both Tier 1/Tier 2 and OPSRP.
- Mortality assumptions were changed to reflect recently published base mortality tables and mortality improvement projection scales for all groups.
- Termination, disability and retirement rates were updated for some groups to more closely match observed experience.
- Assumptions for merit increases, unused sick leave, and vacation pay were updated.
- The assumed healthcare cost trend rates for the RHIPA program as well as the participation assumptions for both RHIA and RHIPA were updated.

Method Changes

- Senate Bill 1049 was signed into law in June 2019 and requires a one-time re-amortization of Tier 1/ Tier 2 UAL over a closed 22 year period at the December 31, 2019 rate-setting actuarial valuation, which will set actuarially determined contribution rates for the 2021-2023 biennium.
- The percentages used for allocating accrued liability for Tier 1/Tier 2 active members who have earned service with multiple PERS employers were updated.

Plan Changes

Senate Bill 1049, signed into law in June 2019, made a number of changes to the PERS system, including:

- Effective with calendar year 2020, annual salary included in the calculation of Final Average Salary will be limited to \$195,000 (as indexed for inflation in future years).
- The PERS Board was required to implement a one-time re-amortization of Tier 1/Tier 2 UAL over a closed 22 year period at the December 31, 2019 rate-setting actuarial valuation, which will set actuarially determined contribution rates for the 2021-2023 biennium.
- For years 2020 through 2024, the limitation on the hours that can be worked by a rehired retiree is eliminated. Effective January 1, 2020, contributions will also be charged on the payroll of rehired retirees.
- Effective July 1, 2020, a portion of the 6% of salary member contribution to the Individual Account Program (IAP) will be redirected to Employee Pension Stability Accounts, which will help fund the defined benefits provided under Tier 1/Tier 2 and OPSRP. For Tier 1/Tier 2 members, the prospectively redirected amount will be 2.50% of salary, and for OPSRP members the amount will be 0.75% of salary. The redirection will only apply to members earning \$2,500 per month or more (indexed for inflation).

The projected benefits in this valuation reflect the limit on annual salary starting in 2020, which reduced the actuarial accrued liability. The re-amortization of Tier 1/Tier 2 UAL is incorporated in the calculation of the advisory Tier 1/Tier 2 UAL rate. The changes related to the work after retirement provisions are not explicitly reflected in the determination of liabilities or contribution rates shown in this valuation. Our understanding is that redirected member contributions are expected to help pay the total collared contribution rates for the 2021-2023 biennium and will serve as an offset to employer contribution rates, and we have illustrated that offset for advisory 2021-23 employer rates shown in this report.

System-Wide Assets

System-Wide Assets

The table below reconciles the market value of assets, as provided by PERS, to the asset values used in this valuation.

	Tier 1/Tier 2	OPSRP	Side Accounts	Contingency and Capital Preservation Reserve	Rate Guarantee Reserve	RHIA and RHIPA	System Totals
Amount reported by PERS December 31, 2018	\$55,628.1	\$4,783.0	\$5,209.3	\$50.0	\$257.6	\$609.2	\$66,537.2
Adjustment for Recognized Transition Liability Receivable	(472.4)	0.0	0.0	0.0	0.0	0.0	(472.4)
Adjustment for Negative Rate Guarantee Reserve	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Net Pre-SLGRP Liabilities	(345.7)	0.0	0.0	0.0	0.0	0.0	(345.7)
December 31, 2018 Actuarial Value of Assets	\$54,810.0	\$4,783.0	\$5,209.3	\$50.0	\$257.6	\$609.2	\$65,719.1

Amounts in millions

PERS calculates the amount that should be transferred from side accounts to employer reserves in Tier 1/ Tier 2 and OPSRP for rate relief on a monthly basis. PERS does not track net Pre-SLGRP liabilities.

Employer supplemental deposits establish individual side accounts within the pension trust. The side accounts are treated as prepaid contributions. Employer contribution rates are first determined excluding side accounts. Then, an amortized portion of the side account is used to offset the contribution otherwise required for the individual employers that have side accounts. While side accounts are excluded from valuation assets in determining contribution rates for each of the rate pools, side accounts are included in valuation assets for financial reporting purposes such as the reporting of funded status.

In addition, pension assets are held in the Contingency Reserve, the Capital Preservation Reserve, and the Tier 1 Rate Guarantee Reserve (RGR). As shown below, at December 31, 2018 the RGR was in surplus status of \$258 million. It is possible for the RGR to be in deficit at its year-end measurement date, which occurred most recently at December 31, 2012. It is our understanding that if a RGR deficit arose and then persisted for five years, employers may be required to restore the Tier 1 Rate Guarantee Reserve.

Tier 1/Tier 2 assets are adjusted by the net outstanding balance of pre-SLGRP liabilities to arrive at the actuarial value of assets. These notional employer-specific balances, created at the formation of the SLGRP and at later dates when additional employers join the pool, are treated akin to receivables to the SLGRP from individual employers (for pre-SLGRP liabilities) or payables – in the form of future rate offsets – from the SLGRP assets to individual employers (for pre-SLGRP surpluses). For accounting purposes, PERS recognizes outstanding pre-SLGRP liabilities as receivables in the system financial statements. However, for funding purposes, future contributions associated with pre-SLGRP liabilities are not current assets of the system. The resulting adjustment for Transition Liability receivables is shown above.

Finally, assets are held in separate accounts established under Internal Revenue Code Section 401(h) (the Retirement Health Insurance Account (RHIA) and the Retiree Health Insurance Premium Account (RHIPA)) to provide retiree medical benefits.

Reconciliation of Pension and Retiree Healthcare Assets

The following table reconciles the changes in the system-wide assets from December 31, 2017 to December 31, 2018. The reconciliation of assets is provided by PERS.

	Tier 1/Tier 2	OPSRP	Side Accounts	Contingency Reserve	Capital Preservation Reserve	Rate Guarantee Reserve	RHIA and RHIPA	System Totals
Additions								
1. Contributions								
a. Employer	\$773.1	\$688.2	\$284.1	-	-	-	\$63.1	\$1,808.5
b. Transfer from side accounts ¹	\$665.3	-	(\$665.3)	-	-	-	-	-
c. Judge member contributions	\$1.9	-	-	-	-	-	-	\$1.9
d. Member service purchases	\$8.6	-	-	-	-	-	-	\$8.6
e. Recognized transition liability receivable	-	-	-	-	-	-	-	-
f. Total	\$1,448.9	\$688.2	(\$381.2)	-	-	-	\$63.1	\$1,818.9
2. Net investment income								
a. Transfers	-	-	-	-	-	-	-	-
b. From investments	\$428.6	\$19.4	\$29.4	-	-	(\$252.9)	\$1.7	\$226.2
c. Total	\$428.6	\$19.4	\$29.4	-	-	(\$252.9)	\$1.7	\$226.2
3. Other ²	\$2.4	\$0.0	-	-	-	-	-	\$2.4
4. Total additions	\$1,879.8	\$707.6	(\$351.9)	-	-	(\$252.9)	\$64.8	\$2,047.5
Deductions								
5. Retirement and survivor benefits	(\$4,699.6)	(\$33.5)	-	-	-	-	(\$37.0)	(\$4,770.1)
6. Death Benefits	(\$4.5)	-	-	-	-	-	-	(\$4.5)
7. Refund of contributions	(\$13.7)	-	-	-	-	-	-	(\$13.7)
9. Administrative expenses	(\$29.1)	(\$7.6)	(\$0.1)	-	-	-	(\$1.7)	(\$38.5)
10. Total deductions	(\$4,746.9)	(\$41.1)	(\$0.1)	-	-	-	(\$38.7)	(\$4,826.8)
11. Net change	(\$2,867.0)	\$666.5	(\$352.0)	-	-	(\$252.9)	\$26.1	(\$2,779.3)
12. Net assets held in trust for pension benefits								
a. Beginning of year	\$58,495.1	\$4,116.5	\$5,561.2	\$50.0	-	\$510.5	\$583.1	\$69,316.4
b. End of year	\$55,628.1	\$4,783.0	\$5,209.3	\$50.0	-	\$257.6	\$609.2	\$66,537.2

Amounts in millions

¹ Side account transfers shown in this exhibit are all credited to Tier 1/Tier 2 assets. We understand the portion to be credited to OPSRP is credited through the employer contribution line of the exhibit.

² Includes TRFA transfer from Metlife and adjustments by PERS.

Reconciliation of Side Accounts

Side accounts are established for employers who make supplemental payments (a lump sum payment in excess of the required employer contribution). For SLGRP employers, this supplemental payment is first applied toward the employer's Transition Liability, if any, and any excess is established in a Side Account. A reconciliation of the side accounts from December 31, 2017 to December 31, 2018, is shown below on a rate pool basis. For this exhibit, all independent employers are grouped together.

	SLGRP	School Districts	Independent Employers	System Totals
Side Accounts, December 31, 2017	\$2,466.3	\$3,009.7	\$85.3	\$5,561.2
Deposits during 2018	235.2	41.1	7.8	284.1
Interest	11.3	17.7	0.3	29.4
Administrative expenses	(0.0)	(0.1)	(0.0)	(0.1)
Transfers to employer reserves	(297.7)	(357.4)	(10.2)	(665.3)
Side Accounts, December 31, 2018	\$2,415.1	\$2,711.0	\$83.1	\$5,209.3

Amounts in millions

Development of Side Account Rate Relief

The rate relief attributable to an employer's side account is determined by amortizing the side account balance on the valuation date over a fixed period and expressing the result as a percentage of combined valuation payroll. For side accounts established on or before December 31, 2009, the fixed period ends December 31, 2027. For side accounts established later, the fixed period ends 18 years after the first rate-setting valuation following its creation. The table below shows the average rate relief attributable to side accounts for each rate pool. While results are shown at a rate pool level, the rate relief provided by side accounts varies from employer to employer.

	December 31, 2018			
	SLGRP	School Districts	Independent Employers	System Totals
1. Side Account	\$2,415.1	\$2,711.0	\$83.1	\$5,209.3
2. Combined valuation payroll	\$6,346.1	\$3,543.5	\$962.4	\$10,852.0
3. Average Amortization Factor ¹	8.170	7.915	8.344	8.040
4. Average Side Account Rate Relief (1. ÷ 2. ÷ 3.)	4.66%	9.67%	1.04%	5.97%

Amounts in millions

¹ Weighted average

Pension Plan Valuation

Tier 1/Tier 2 Pension Assets

Summary of Actuarial Value of Assets

This section summarizes the Tier 1/Tier 2 pension valuation assets as of the current and prior actuarial valuation. For valuation purposes, Tier 1/Tier 2 pension assets are divided among the State & Local Government Rate Pool (SLGRP), the School Districts rate pool, and various independent employers to determine employer contribution rates. For this system-wide report, all independent employers, including State Judiciary, have been grouped together as if they were a rate pool.

	SLGRP	School Districts	Independent Employers	Tier 1/Tier 2 Totals ¹
December 31, 2018				
Member reserves	\$3,065.6	\$1,673.7	\$414.3	\$5,153.6
Employer reserves	15,371.1	10,589.4	2,491.0	28,337.7
Benefit in force reserves	11,292.8	8,583.7	1,767.8	21,664.5
Net outstanding pre-SLGRP liabilities	(345.7)			(345.7)
Total actuarial value of assets	\$29,383.7	\$20,846.8	\$4,673.1	\$54,810.0
December 31, 2017				
Member reserves	\$3,327.3	\$1,808.7	\$449.8	\$5,585.9
Employer reserves	15,393.8	10,337.6	2,534.6	28,132.0
Benefit in force reserves	12,515.2	9,778.4	1,948.5	24,267.2
Net outstanding pre-SLGRP liabilities	(336.6)			(336.6)
Total actuarial value of assets	\$30,899.7	\$21,924.7	\$4,932.9	\$57,648.4

Amounts in millions

¹ Includes Multnomah Fire District #10.

Pre-SLGRP liabilities and surpluses are notional balances specific to individual employers or groups of employers. For contribution rate calculations, pre-SLGRP liabilities are treated akin to receivables to the SLGRP from the individual employers and pre-SLGRP surpluses are treated akin to payables (in the form of future rate offsets) from the SLGRP assets to individual employers. The assets of the SLGRP used to calculate the pooled contribution rate reflect the net outstanding balance of these items.

Side accounts are treated as pre-paid contributions. Consequently, they are not reflected in the actuarial value of assets shown above. The actuarial value of assets for each rate pool is used to develop the contribution rate for that pool. Side accounts are used by employers to pay a portion of the base contribution rate via a side account rate offset and deduction mechanism. The net impact of side accounts is shown in a separate section of this report.

Reconciliation of Actuarial Value of Assets

The table below shows a reconciliation of the actuarial value of assets from the prior valuation to the current valuation for each of the rate pools. Again, independent employers, including State Judiciary, are treated as if they were a single rate pool for purposes of the system-wide report.

	SLGRP	School Districts	Independent Employers	Tier 1/Tier 2 Totals ¹
Actuarial value of assets, December 31, 2017	\$30,899.7	\$21,924.7	\$4,932.9	\$57,648.4
Contributions				
Employer	\$501.6	\$260.5	\$86.2	\$848.3
Side account transfers	297.7	357.4	10.2	665.3
Member	0.0	0.0	1.9	1.9
Total contributions	\$799.3	\$618.0	\$98.2	\$1,515.5
Investment income	197.3	132.9	29.6	359.4
Benefit payments and expenses	(2,474.4)	(1,880.8)	(387.3)	(4,747.0)
Adjustments ²	(38.2)	52.1	(0.3)	33.6
Actuarial value of assets, December 31, 2018	\$29,383.7	\$20,846.8	\$4,673.1	\$54,810.0

Amounts in millions

¹ Includes Multnomah Fire District #10.

² Adjustments include a reallocation of the benefits in force reserve, transfers to Multnomah Fire District #10, member service purchases, and other adjustments made by PERS.

Outstanding Balance of Pre-SLGRP Liabilities

In the valuation, pre-SLGRP liabilities are treated as assets of the SLGRP. That is, a pre-SLGRP liability is treated as a receivable owed to the SLGRP by the employer. Pre-SLGRP surpluses are treated as payables from the SLGRP to employers.

Prior to the formation of the SLGRP, the State and Community Colleges were pooled together and some employers participated in the Local Government Rate Pool (LGRP). The UAL attributable to the State and Community Colleges or the LGRP at the time the SLGRP was formed is maintained separately from the SLGRP, and is reduced by contributions and increased for interest charges at the assumed interest rate.

Similarly, when an independent employer joins the SLGRP, a Transition Liability or Surplus is calculated to ensure that each employer enters the pool on a comparable basis. The Transition Liability for each employer is maintained separately from the SLGRP, and is reduced by contributions and increased for interest charges at the assumed interest rate. The Transition Surplus for each employer is also maintained separately from the SLGRP, and is amortized over time through contribution rate offsets and credited with interest at the assumed interest rate. The table below shows the reconciliation of the pre-SLGRP pooled liability attributable to the State and Community Colleges and the LGRP from the last valuation to the current valuation. It also shows the reconciliation of the total Transition Liability or Surplus from the last valuation to the current valuation.

	State and Community Colleges	Local Government Rate Pool	Transition	Total
Pre-SLGRP liability/(surplus), January 1, 2018	\$482.4	(\$206.0)	(\$613.0)	(\$336.6)
Employer contributions	(63.8)	27.2	82.6	46.0
Supplemental payments	0.0	0.0	(34.2)	(34.2)
Interest	30.1	(12.9)	(38.1)	(20.8)
Employer mergers/adjustments	0.0	0.0	0.0	0.0
Pre-SLGRP liability/(surplus), December 31, 2018	\$448.8	(\$191.8)	(\$602.7)	(\$345.7)

Amounts in millions

Tier 1/Tier 2 Pension Liabilities

Normal Cost

The normal cost represents the present value of benefits allocated to the next year of service by the actuarial cost method. If all current actuarial assumptions are met in both past and future years, the normal cost represents the percent of payroll that would need to be contributed each year to fully fund plan benefits during each member's working career.

A summary of the normal cost by assumed cause of future termination of service is shown below on a system-wide basis for the Tier 1/Tier 2 pension benefits.

	December 31, 2018	December 31, 2017	Percent Change
Normal Cost			
Service Retirement	\$429.0	\$434.1	(1.2%)
Withdrawal	139.3	156.5	(11.0%)
Duty Disability	4.5	2.7	63.5%
Nonduty Disability	10.3	13.3	(22.6%)
Death	3.7	4.6	(18.9%)
Administrative Expenses	32.5	37.5	(13.3%)
Total Normal Cost	\$619.3	\$648.7	(4.5%)

Amounts in millions

Reconciliation of Change in Normal Cost

The decrease in normal cost since the prior valuation is primarily due to the reduction in active Tier 1/Tier 2 members as members retire from the closed Tier 1/Tier 2 group.

The table below reconciles the normal cost from the prior valuation to the current valuation.

	Tier 1/Tier 2 Pension
Normal Cost, December 31, 2017	\$648.7
Expected increase (decrease)	(38.0)
Assumption and method changes	11.9
Plan changes	(0.9)
Deviations from expected experience	
Pay increases	\$1.7
Interest crediting experience	(3.6)
All other sources	(0.4)
Total demographic (gains) and losses	(\$2.4)
Normal Cost, December 31, 2018	\$619.3

Amounts in millions

Summary of Normal Cost by Group and Tier

A summary of the normal cost by tier and employment category for each rate pool is shown below. Again, independent employers, including State Judiciary, are treated as if they were a single rate pool for purposes of the system-wide report.

	December 31, 2018			December 31, 2017		Percent Change
	SLGRP	School Districts	Independent Employers	Tier 1/ Tier 2 Totals	Tier 1/ Tier 2 Totals	
Normal Cost¹						
Tier 1 General Service	\$131.3	\$81.3	\$19.5	\$232.1	\$254.9	(8.9%)
Tier 2 General Service	138.4	109.0	17.1	264.5	265.0	(0.2%)
Tier 1 Police & Fire	32.5	0.3	10.7	43.5	49.5	(12.0%)
Tier 2 Police & Fire	60.8	0.3	18.2	79.3	79.3	(0.1%)
Total Normal Cost	\$362.9	\$190.9	\$65.5	\$619.3	\$648.7	(4.5%)

Amounts in millions

¹ Includes assumed administrative expenses. Assumed expenses allocated pro-rata based on normal cost.

Actuarial Accrued Liability

The actuarial accrued liability represents the present value of benefits allocated to prior years of service by the actuarial cost method. A summary of the actuarial accrued liability is shown below on a system-wide basis for the Tier 1/Tier 2 pension benefits.

	December 31, 2018	December 31, 2017	Percent Change
Active Members	\$18,849.3	\$18,914.1	(0.3%)
Inactive Members	4,452.6	4,539.9	(1.9%)
Retired Members and Beneficiaries	56,534.9	54,967.4	2.9%
Total Actuarial Accrued Liability	\$79,836.8	\$78,421.4	1.8%

Amounts in millions

Actuarial Accrued Liability

A summary of actuarial accrued liabilities based on member status, tier and employment category is shown in the table below. For this exhibit, all independent employers, including State Judiciary, have been grouped together.

	December 31, 2018			December 31, 2017		Percent Change
	SLGRP	School Districts	Independent Employers	Tier 1 / Tier 2 Totals ¹	Tier 1 / Tier 2 Totals ¹	
Active Members						
Tier 1 General Service	\$4,841.2	\$3,258.8	\$573.5	\$8,673.5	\$9,146.2	(5.2%)
Tier 1 Police & Fire	1,064.2	4.9	378.5	1,447.6	1,577.1	(8.2%)
Tier 1 Total	5,905.4	3,263.7	952.0	10,121.1	10,723.3	(5.6%)
Tier 2 General Service	3,577.2	2,855.6	455.7	6,888.5	6,494.3	6.1%
Tier 2 Police & Fire	1,409.0	6.0	424.6	1,839.7	1,696.5	8.4%
Tier 2 Total	4,986.3	2,861.6	880.3	8,728.2	8,190.8	6.6%
Total Active Members	\$10,891.6	\$6,125.3	\$1,832.3	\$18,849.3	\$18,914.1	(0.3%)
Inactive Members	2,788.4	1,373.4	290.9	4,452.6	4,539.9	(1.9%)
Retired Members and Beneficiaries	29,469.3	22,399.7	4,613.1	56,534.9	54,967.4	2.9%
Total Tier 1/ Tier 2 Pension Liability, December 31,	\$43,149.3	\$29,898.4	\$6,736.3	\$79,836.8	\$78,421.4	1.8%

Amounts in millions

¹ Includes Multnomah Fire District #10.

Reconciliation of Change in Actuarial Accrued Liability

The change in actuarial accrued liability since the last valuation reflects the experience of the system. The actuarial accrued liability is expected to increase due to benefits earned during the year and interest, and to decrease due to benefits paid during the year.

The table below reconciles the actuarial accrued liability from the last valuation to this valuation.

	Tier 1/Tier 2 Pension
Actuarial Accrued Liability December 31, 2017	\$78,421.4
Expected change	1,391.9
Assumption and method changes	(60.0)
Plan changes	(41.0)
Deviations from expected experience	
Retirements from active status	\$78.1
Disability retirements	4.1
Active mortality and withdrawal	10.8
Pay increases	74.4
Interest crediting experience	(88.5)
Inactive mortality	50.2
Data corrections	33.3
Other	(39.1)
Total demographic (gains) and losses	\$123.3
New Entrants	1.1
Actuarial Accrued Liability December 31, 2018	\$79,836.8

Amounts in millions

Tier 1/Tier 2 Pension Unfunded Accrued Liability (UAL)

Calculation of UAL

The Unfunded Accrued Liability (UAL) represents the difference between the actuarial accrued liability and the valuation assets. To determine uncollared and collared base employer contribution rates, the UAL is calculated excluding side accounts. The calculated collared base contribution rate is later offset by an amortized portion of the side accounts for individual employers with such accounts. A summary of the UAL by rate pool is shown on the following table. All independent employers, including State Judiciary, have been grouped together.

	SLGRP	School Districts	Independent Employers	Tier 1 / Tier 2 Totals ¹
December 31, 2018				
1. Actuarial accrued liability	\$43,149.3	\$29,898.4	\$6,736.3	\$79,836.8
2. Actuarial value of assets	\$29,383.7	\$20,846.8	\$4,673.1	\$54,810.0
3. Unfunded accrued liability (2. - 1.)	\$13,765.6	\$9,051.6	\$2,063.2	\$25,026.7
4. Funded percentage (2. ÷ 1.)	68.1%	69.7%	69.4%	68.7%
5. Combined valuation payroll	\$6,346.1	\$3,543.5	\$962.4	\$10,852.0
6. Unfunded accrued liability as % of combined valuation payroll (3. ÷ 5.)	216.9%	255.4%	214.4%	230.6%
December 31, 2017				
1. Actuarial accrued liability	\$42,150.7	\$29,677.4	\$6,536.3	\$78,421.4
2. Actuarial value of assets	\$30,899.7	\$21,924.7	\$4,932.9	\$57,648.4
3. Unfunded accrued liability (2. - 1.)	\$11,251.0	\$7,752.7	\$1,603.4	\$20,773.0
4. Funded percentage (2. ÷ 1.)	73.3%	73.9%	75.5%	73.5%
5. Combined valuation payroll	\$5,897.8	\$3,314.2	\$886.9	\$10,098.9
6. Unfunded accrued liability as % of combined valuation payroll (3. ÷ 5.)	190.8%	233.9%	180.8%	205.7%

Amounts in millions

¹ Includes Multnomah Fire District #10.

Reconciliation of UAL Bases

Beginning with the December 31, 2013 actuarial valuation, the PERS Board established a policy to amortize the Tier 1/Tier 2 UAL over a 20-year period, with each subsequent odd-year valuation establishing a new 20-year closed-period amortization schedule for new Tier 1/Tier 2 UAL amounts based on the total Tier 1/Tier 2 UAL as of that valuation date less the remaining unamortized balance of previously established Tier 1/Tier 2 UAL bases. As part of Senate Bill 1049, passed in 2019, the Legislature directed the PERS Board to enact a one-time re-amortization of Tier 1/Tier 2 UAL over 22 years. This means that, effective with the December 31, 2019 rate-setting valuation, the entire unamortized Tier 1/Tier 2 UAL for each rate pool and independent employer will be re-amortized over a 22 year period as a level percentage of projected future payroll. For the December 31, 2021 and subsequent odd-year valuations, the PERS Board will again have authority to set the amortization schedule. It is anticipated that the policy of 20-year closed-period amortization schedules will be reintroduced at that point.

This even-year advisory valuation shows an estimate of the base to be established on December 31, 2019, with the estimate based on experience during 2018.

The UAL amortization schedules are shown for the SLGRP and School District rate pools below. UAL bases for independent employers are developed individually for each employer, and are shown in each employer’s individual valuation report.

SLGRP					
Amortization Base	UAL December 31, 2017	Payment	Interest	UAL December 31, 2018	Next Year's Payment
December 31, 2018	N/A	N/A	N/A	13,765.6	911.3
Total				\$13,765.6	\$911.3

Amounts in millions

School Districts					
Amortization Base	UAL December 31, 2017	Payment	Interest	UAL December 31, 2018	Next Year's Payment
December 31, 2018	N/A	N/A	N/A	9,051.6	599.2
Total				\$9,051.6	\$599.2

Amounts in millions

Actuarial Gain or Loss since Prior Valuation

In every actuarial valuation, assumptions are made as to the future experience of the plan and covered group of participants. Whenever there is a difference between the actual experience and that anticipated by the actuarial assumptions, there is an actuarial gain or loss to the plan. Gains are the result of experience that is more financially favorable to the system than assumed (i.e., serves to reduce the unfunded accrued liability or increase the surplus), while losses are the result of financially unfavorable experience to the system.

The table below shows the development of the actuarial gain (or loss) for the Tier 1/Tier 2 pension benefits for the year ending December 31, 2018. For this exhibit, all independent employers, including State Judiciary, have been grouped together.

	SLGRP	School District	Independent Employers	Tier 1/Tier 2 Totals ¹
1. Expected actuarial accrued liability				
a. Actuarial accrued liability at January 1, 2018	\$42,150.7	\$29,677.4	\$6,536.3	\$78,421.4
b. Normal cost (excluding expenses) at January 1, 2018	359.5	187.5	64.2	611.2
c. Benefit payments (excluding expenses) for year ending December 31, 2018	(2,459.2)	(1,869.2)	(385.0)	(4,717.8)
d. Interest	2,959.3	2,076.2	459.1	5,498.5
e. Expected actuarial accrued liability before changes (a. + b. + c. + d.)	\$43,010.3	\$30,071.9	\$6,674.5	\$79,813.3
f. Change in actuarial accrued liability at December 31, 2018, due to assumption, method, and plan changes	113.3	(227.8)	15.3	(101.0)
g. Expected actuarial accrued liability at December 31, 2018 (e. + f.)	\$43,123.6	\$29,844.2	\$6,689.9	\$79,712.3
2. Actuarial accrued liability at December 31, 2018	\$43,149.3	\$29,898.4	\$6,736.3	\$79,836.8
3. Liability gain/(loss) (1.g. - 2)	(\$25.7)	(\$54.3)	(\$46.4)	(\$124.4)
4. Expected actuarial value of assets				
a. Actuarial value of assets at January 1, 2018	\$30,899.7	\$21,924.7	\$4,932.9	\$57,648.4
b. Actual contributions for 2018	799.3	618.0	98.2	1,515.5
c. Benefit payments and expenses for year ending December 31, 2018	(2,474.4)	(1,880.8)	(387.3)	(4,747.0)
d. Assumed investment return	2,164.5	1,533.1	344.8	4,034.4
e. Expected actuarial value of assets before changes (a. + b. + c. + d.)	\$31,389.1	\$22,195.0	\$4,988.6	\$58,451.3
f. Change in actuarial value of assets at December 31, 2018, due to assumption changes	0.0	0.0	0.0	0.0
g. Expected actuarial value of assets at December 31, 2018 (e. + f.)	\$31,389.1	\$22,195.0	\$4,988.6	\$58,451.3
5. Actuarial value of assets as of December 31, 2018	\$29,383.7	\$20,846.8	\$4,673.1	\$54,810.0
6. Asset gain/(loss) (5. - 4.g.)	(\$2,005.4)	(\$1,348.1)	(\$315.5)	(\$3,641.3)
7. Net actuarial gain/(loss) (3. + 6.)	(\$2,031.1)	(\$1,402.4)	(\$361.9)	(\$3,765.7)

Amounts in millions

¹ Includes Multnomah Fire District #10.

Reconciliation of the UAL

The table below reconciles the UAL from the last valuation to this valuation. For this exhibit, all independent employers, including State Judiciary, have been grouped together.

	SLGRP	School Districts	Independent Employers	Tier 1 / Tier 2 Totals ¹
UAL, December 31, 2017	\$11,251.0	\$7,752.7	\$1,603.4	\$20,773.0
Normal cost	359.5	187.5	64.2	611.2
Administrative expenses	15.2	11.6	2.4	29.2
Contributions	(799.3)	(618.0)	(98.2)	(1,515.5)
Liability (gain) or loss	25.7	54.3	46.4	124.4
Asset (gain) or loss	2,005.4	1,348.1	315.5	3,641.3
Assumption, method, and plan changes	113.3	(227.8)	15.3	(101.0)
Interest at 7.20%	794.8	543.1	114.3	1,464.2
UAL, December 31, 2018	\$13,765.6	\$9,051.6	\$2,063.2	\$25,026.7

Amounts in millions

¹ Includes Multnomah Fire District #10.

Tier 1/Tier 2 Pension Contribution Rate Development

Normal Cost Rates

The table below shows the development of the system-wide weighted average Tier 1/ Tier 2 normal cost rate.

	December 31, 2018	December 31, 2017	Percent Change
Normal Cost			
a. Service Retirement	\$429.0	\$434.1	(1.2%)
b. Withdrawal	139.3	156.5	(11.0%)
c. Duty Disability	4.5	2.7	63.5%
d. Nonduty Disability	10.3	13.3	(22.6%)
e. Death	3.7	4.6	(18.9%)
f. Administrative Expenses	32.5	37.5	(13.3%)
g. Total Normal Cost	\$619.3	\$648.7	(4.5%)
Tier 1/Tier 2 Valuation Payroll	\$4,076.1	\$4,246.9	(4.0%)
Average Normal Cost Rate			
a. Service Retirement	10.53%	10.22%	
b. Withdrawal	3.42%	3.69%	
c. Duty Disability	0.11%	0.06%	
d. Nonduty Disability	0.25%	0.31%	
e. Death	0.09%	0.11%	
f. Administrative Expenses	0.80%	0.88%	
g. Average Normal Cost Rate	15.19%	15.27%	

Amounts in millions

The table below shows the development of the Tier 1/Tier 2 normal cost rate for the various rate pools. For this exhibit, all independent employers, including State Judiciary, have been grouped together.

Normal cost rates shown below are before any offset for redirected member contributions under Senate Bill 1049.

	SLGRP	School Districts	Independent Employers	Tier 1 / Tier 2 Totals
Normal Cost				
Tier 1 General Service	\$131.3	\$81.3	\$19.5	\$232.1
Tier 2 General Service	138.4	109.0	17.1	264.5
Tier 1 Police & Fire	32.5	0.3	10.7	43.5
Tier 2 Police & Fire	60.8	0.3	18.2	79.3
Total Normal Cost	\$362.9	\$190.9	\$65.5	\$619.3
Tier 1/Tier 2 Valuation Payroll				
Tier 1 General Service	\$771.7	\$524.1	\$102.6	\$1,398.4
Tier 2 General Service	1,077.5	874.1	131.9	2,083.5
Tier 1 Police & Fire	146.5	1.4	47.6	195.5
Tier 2 Police & Fire	303.9	1.6	93.2	398.7
Total Valuation Payroll	\$2,299.5	\$1,401.2	\$375.4	\$4,076.1
Average Normal Cost Rates				
Tier 1 General Service	17.01%	15.52%	18.97%	16.59%
Tier 2 General Service	12.84%	12.47%	12.94%	12.69%
Tier 1 Police & Fire	22.20%	20.61%	22.49%	22.26%
Tier 2 Police & Fire	20.00%	19.36%	19.54%	19.89%
Average Rates				
Tier 1 Average	17.84%	15.53%	20.09%	17.29%
Tier 2 Average	14.42%	12.48%	15.67%	13.85%
General Service Average	14.58%	13.61%	15.58%	14.26%
Police & Fire Average	20.71%	19.94%	20.54%	20.67%
System Average	15.78%	13.63%	17.44%	15.19%
Judiciary Member Contributions			0.47%	0.04%
Adjusted System Average	15.78%	13.63%	16.97%	15.15%

Amounts in millions

UAL Rates Prior to Application of the Rate Collar

The Tier 1/Tier 2 UAL rate prior to application of the rate collar is determined by calculating the sum of next year's scheduled amortization payments to the Tier 1/Tier 2 UAL as a percentage of combined (Tier 1/Tier 2 plus OPSRP) valuation payroll.

The following table develops the Tier 1/Tier 2 UAL rate separately for each of the rate pools. For this exhibit, all independent employers, including State Judiciary, have been grouped together.

	SLGRP	School Districts	Independent Employers	Tier 1 / Tier 2 Totals ¹
December 31, 2018				
1. Total UAL	\$13,765.6	\$9,051.6	\$2,063.2	\$25,026.7
2. Next year's UAL payment	\$911.3	\$599.2	\$136.6	\$1,647.1
3. Combined valuation payroll	\$6,346.1	\$3,543.5	\$962.4	\$10,852.0
4. UAL rate (2 ÷ 3)	14.36%	16.91%	14.19%	15.18%
December 31, 2017				
1. Total UAL	\$11,251.0	\$7,752.7	\$1,603.4	\$20,773.0
2. Next year's UAL payment	\$878.2	\$613.4	\$123.6	\$1,615.2
3. Combined valuation payroll	\$5,897.8	\$3,314.2	\$886.9	\$10,098.9
4. UAL rate (2 ÷ 3)	14.89%	18.51%	13.94%	15.99%

Amounts in millions

¹ While the Tier 1/Tier 2 Total UAL amount includes the UAL for Multnomah Fire District #10 (MFD), the UAL rate for MFD is developed separately in this report and is added to the rates shown in this table.

Pre-SLGRP Pooled Rate

Prior to the formation of the SLGRP, the State and Community Colleges were pooled together and some employers participated in the Local Government Rate Pool (LGRP). The Tier 1/Tier 2 UAL attributable to the State and Community Colleges and the LGRP at the time the SLGRP was formed is maintained separately from the Tier 1/Tier 2 UAL for the SLGRP. The balance of the pre-SLGRP pooled liability attributable to the State and Community Colleges or the LGRP on the valuation date is amortized over the period ending December 31, 2027 and expressed as a percentage of the pool's combined (Tier 1/Tier 2 plus OPSRP) valuation payroll.

The following table develops the Pre-SLGRP pooled rate separately for the State and Community College Pool and the LGRP.

	December 31, 2018	December 31, 2017
State and Community College Pool		
1. Total pre-SLGRP pooled liability	\$448.8	\$482.4
2. Combined valuation payroll	\$3,633.6	\$3,388.6
3. Amortization Factor	7.606	8.312
4. Pre-SLGRP pooled rate (1. ÷ 2. ÷ 3.)	1.62%	1.71%
Local Government Rate Pool		
1. Total pre-SLGRP pooled liability	(\$191.8)	(\$206.0)
2. Combined valuation payroll	\$1,614.5	\$1,475.6
3. Amortization Factor	7.606	8.312
4. Pre-SLGRP pooled rate (1. ÷ 2. ÷ 3.)	(1.56%)	(1.68%)

Amounts in millions

Transition Liability or Surplus Rate

When an employer joins the SLGRP, a Transition Liability or Surplus is calculated to ensure that each employer enters the pool on a comparable basis. The Transition Liability or Surplus for each employer is maintained separately from the Tier 1/Tier 2 UAL for the SLGRP. The Transition Liability is amortized over a fixed period, and is expressed as a percentage of the employer’s combined (Tier 1/Tier 2 plus OPSRP) valuation payroll. The Transition Surplus for each employer is also maintained separately from the SLGRP, and is amortized over a fixed period via contribution rate offsets as a percentage of the employer’s combined valuation payroll. For employers joining the SLGRP prior to December 31, 2009, the fixed period ends December 31, 2027. For all others, the fixed period ends 18 years after the date the employer joined the SLGRP.

The following table develops the average rate impact across all employers with outstanding Transition Liabilities or Surpluses as of the valuation date. The amortization factor below reflects the weighted average of the amortization periods for all such employers.

	December 31, 2018	December 31, 2017
1. Total transition liability/(surplus)	(\$602.7)	(\$613.0)
2. Combined valuation payroll	\$2,511.6	\$2,365.0
3. Average Amortization Factor ¹	7.670	8.587
4. Average transition liability/(surplus) rate (1. ÷ 2. ÷ 3.)	(3.13%)	(3.02%)

Amounts in millions

¹ *Weighted average*

Multnomah Fire District #10 UAL Rate

The Multnomah Fire District #10 UAL rate is determined by amortizing Multnomah Fire District #10's unfunded accrued liability over the period ending December 31, 2027, and expressing the result as a percentage of combined valuation payroll.

As part of 2003 legislation, the Multnomah Fire District #10 UAL was allocated to all Tier 1/Tier 2 employers. Multnomah Fire District #10 was allocated \$50,000 of the outstanding UAL, which was fully paid in November, 2003. Of the remaining UAL, City of Portland is allocated 21.8743%, while all Tier 1/Tier 2 employers, including City of Portland, share in the remaining 78.1257%. Four employers (City of Gresham, City of Fairview, City of Wood Village, and City of Troutdale) are required to pay twice the rate that is determined under item 6.b. below. Thus, the combined valuation payroll for all Tier 1/Tier 2 employers, shown below in item 4.b., includes twice the valuation payroll for those four employers.

	December 31, 2018	December 31, 2017
1. Actuarial accrued liability		
a. Active members	\$0.0	\$0.0
b. Inactive members	0.0	0.0
c. Retired members and beneficiaries	52.7	57.0
d. Total actuarial accrued liability	\$52.7	\$57.0
2. Actuarial value of assets		
a. Employer reserve	(\$113.8)	(\$134.1)
b. Members reserve	0.0	0.0
c. Benefits in force reserve	20.2	25.2
d. Total actuarial value of assets	(\$93.6)	(\$108.9)
3. Multnomah FD #10 UAL (1.d. - 2.d.)	\$146.4	\$165.9
a. Portion allocated to City of Portland (21.8743% x 3.)	\$32.0	\$36.3
b. Portion allocated to all T1/T2 employers (78.1257% x 3.)	\$114.3	\$129.6
4. Combined valuation payroll		
a. City of Portland	\$434.2	\$384.4
b. All employers ¹	\$10,909.3	\$10,152.6
5. Amortization factor	7.606	8.312
6. Multnomah FD #10 UAL Rate		
a. City of Portland (3.a. ÷ 4.a. ÷ 5.)	0.97%	1.14%
b. All Tier 1 / Tier 2 employers (3.b. ÷ 4.b. ÷ 5.)	0.14%	0.15%
7. Total Multnomah FD #10 UAL Rate		
a. City of Portland (6.a. + 6.b.)	1.11%	1.29%
b. City of Gresham, City of Fairview, City of Wood Village, City of Troutdale (2 x 6.b.)	0.28%	0.30%
c. All other Tier 1 / Tier 2 employers (6.b.)	0.14%	0.15%

Amounts in millions

¹ For weighting purposes, includes double valuation payroll for each of the four employers listed in 7.b.

Calculated Employer Contribution Rate Summary (Pre-Rate Collar)

The following table summarizes the development of the total Tier 1/Tier 2 contribution rate for each rate pool as of the valuation date. The normal cost rates apply to Tier 1/Tier 2 payroll only, but all other rates are applied to combined (Tier 1/Tier 2 plus OPSRP) valuation payroll. These rates are adjusted on an individual employer basis for side accounts and pre-SLGRP liabilities, if applicable. Weighted average adjustments for side accounts and pre-SLGRP liabilities are shown in the table. For individual employers, these adjustments cannot reduce the pension contribution rate below 0.00%. Note that independent employers, other than the State Judiciary, are subject to a minimum employer contribution rate of 6.00% that is not taken into account in the average rates below.

Advisory July 1, 2021 Rates Calculated as of December 31, 2018				
	SLGRP	School Districts	Independent Employers	Tier 1 / Tier 2 Totals
Tier 1/Tier 2 pension contribution rates				
Normal cost rate	15.78%	13.63%	16.97%	15.15%
Judiciary member contributions			0.47%	0.04%
Uncollared UAL rate	14.36%	16.91%	14.19%	15.18%
Multnomah FD #10 rate	0.21%	0.14%	0.15%	0.18%
Total Tier 1/Tier 2 pension rate	30.35%	30.68%	31.78%	30.55%
Average adjustments				
Pre-SLGRP liability/(surplus) rate	(0.72%)	N/A	N/A	(0.42%)
Side account rate	(4.66%)	(9.67%)	(1.04%)	(5.97%)
Total average adjustment	(5.38%)	(9.67%)	(1.04%)	(6.39%)
Member redirect offset¹	(2.45%)	(2.45%)	(2.45%)	(2.45%)
Uncollared net employer pension rate	22.52%	18.56%	28.29%	21.71%

¹ Redirected member contributions under Senate Bill 1049 (2.50% of payroll for Tier 1/Tier 2) are anticipated to offset employer contribution rates. Redirect does not apply to members with monthly pay below a threshold. The values shown in the table incorporate an estimate of the effect of this limitation.

Calculation of Rate Collar

Due to the rate collar, employer base contribution rates will not generally change by more than the greater of 3 percent of payroll or 20% of the current contribution rate. However, if the funded percentage is below 60% or above 140%, the size of the rate collar is doubled. If the funded percentage is between 60% and 70% or between 130% and 140%, the size of the rate collar is increased on a graded scale. All rate collar calculations are performed excluding amounts and contribution rates attributable to pre-SLGRP liabilities, side accounts and member IAP contributions. Retiree medical rates are also excluded from the rate collar calculation.

The table below develops the impact of the collar for each of the Tier 1/Tier 2 rate pools. Although the calculation is performed individually for independent employers, the table shows the calculation as if independent employers were a single rate pool. Note that independent employers, other than the State Judiciary, are subject to a minimum employer contribution rate of 6.00% that is not taken into account in the calculation below.

Advisory July 1, 2021 Rates Calculated as of December 31, 2018				
Calculation of Collar Adjustments	SLGRP	School Districts	Independent Employers	Tier 1 / Tier 2 Totals ¹
1. Current total Tier 1/Tier 2 pension rate	26.26%	30.52%	23.93%	27.44%
2. Size of rate collar				
a. Preliminary size of rate collar <i>(greater of 3% or 20% x 1.)</i>	5.25%	6.10%	4.79%	5.49%
b. Funded percentage	68%	70%	69%	69%
c. Size of rate collar <i>(If b. < 60% or b. > 140%, 2 x a. If b. is 70%-130%, a. Otherwise, graded rate between a. and 2 x a.)</i>	6.30%	6.10%	5.27%	
3. July 1, 2021 Minimum total contribution rate <i>(1. - 2.c.)</i>	19.96%	24.42%	18.66%	
4. July 1, 2021 Maximum total contribution rate <i>(1. + 2.c.)</i>	32.56%	36.62%	29.20%	
5. Advisory July 1, 2021 total contribution rate before collar	30.35%	30.68%	31.31%	
6. Advisory July 1, 2021 total contribution rate after collar <i>(5., but not less than 3. or more than 4.)</i>	30.35%	30.68%	29.20%	
7. Impact of collar (6. - 5.)²	0.00%	0.00%	(2.11%)	(0.19%)

¹ The average Tier 1/Tier 2 rate has been recalculated based on current valuation payroll.

² The impact of collar shown for the system-wide column is the weighted average of the impact shown for each rate pool.

Calculated Employer Contribution Rate Summary (Post-Rate Collar)

Any needed adjustment to reflect the effects of the rate collar is made to the UAL rate. The table below summarizes the advisory average rates that would be effective July 1, 2021 by pool and component. Although the rate collar is applied individually for independent employers, the table shows the average rates as if independent employers were a single rate pool. Note that independent employers, other than the State Judiciary, are subject to a minimum employer contribution rate of 6.00% that is not taken into account in the average rates below.

Advisory July 1, 2021 Rates Calculated as of December 31, 2018				
	SLGRP	School Districts	Independent Employers	Tier 1 / Tier 2 Totals
Tier 1/Tier 2 pension contribution rates				
Normal cost rate	15.78%	13.63%	16.97%	15.15%
Judiciary member contributions			0.47%	0.04%
Collared UAL rate	14.36%	16.91%	12.08%	14.99%
Multnomah FD #10 rate	0.21%	0.14%	0.15%	0.18%
Total Tier 1/Tier 2 pension rate	30.35%	30.68%	29.67%	30.36%
Average adjustments				
Pre-SLGRP liability/(surplus) rate	(0.72%)	N/A	N/A	(0.42%)
Side account rate	(4.66%)	(9.67%)	(1.04%)	(5.97%)
Total average adjustment	(5.38%)	(9.67%)	(1.04%)	(6.39%)
Member redirect offset¹	(2.45%)	(2.45%)	(2.45%)	(2.45%)
Collared net employer pension rate	22.52%	18.56%	26.18%	21.52%

¹ Redirected member contributions under Senate Bill 1049 (2.50% of payroll for Tier 1/Tier 2) are anticipated to offset employer contribution rates. Redirect does not apply to members with monthly pay below a threshold. The values shown in the table incorporate an estimate of the effect of this limitation.

OPSRP Assets

Information on OPSRP assets is shown in the section of this report covering the system-wide assets. As of December 31, 2018, the actuarial value of assets for OPSRP is \$4,783.0 million.

OPSRP Liabilities

Normal Cost

The normal cost represents the present value of projected future benefits allocated to the next year of service by the actuarial cost method. If all current actuarial assumptions are met in past and future years, the normal cost represents the percent of payroll that would need to be contributed each year to fully fund each member's plan benefits during his or her working career.

A summary of the normal cost by assumed cause of future termination of service is shown below for the current and prior year.

	December 31, 2018			December 31, 2017		
	General Service	Police & Fire	Total	General Service	Police & Fire	Total
Pre-Retirement Disability						
Duty	\$0.6	\$1.3	\$1.9	\$0.6	\$1.0	\$1.6
Non-Duty	8.9	1.0	9.9	8.1	0.9	9.0
Total Pre-Retirement Disability	\$9.5	\$2.3	\$11.8	\$8.7	\$1.9	\$10.6
Other Benefits						
Service Retirement	\$444.9	\$94.2	\$539.1	\$369.5	\$77.7	\$447.2
Withdrawal	47.5	4.9	52.4	41.6	4.0	45.6
Death	4.3	0.6	4.9	4.3	0.7	5.0
Duty Disability Retirement	0.3	1.0	1.4	0.3	0.7	1.1
Non-Duty Disability Retirement	6.2	1.0	7.2	5.6	0.8	6.4
Total Other Benefits	\$503.3	\$101.7	\$605.0	\$421.2	\$83.9	\$505.1
Assumed Administrative Expenses	7.1	0.9	8.0	5.8	0.7	6.5
Total Normal Cost	\$519.9	\$104.9	\$624.8	\$435.7	\$86.6	\$522.2

Amounts in millions

Reconciliation of Change in Normal Cost

The increase in the normal cost since the prior valuation is primarily attributable to the effect of new entrants to the OPSRP program. The table below reconciles the normal cost from the prior valuation to the current valuation.

	OPSRP
Normal Cost, December 31, 2017	\$522.2
Expected increase (decrease)	(11.9)
Assumption and method changes	23.3
Plan changes	(1.2)
New entrants	60.5
Deviations from expected experience	
Pay increases	\$24.9
All other sources	7.0
Total demographic (gains) and losses	\$31.8
Normal Cost, December 31, 2018	\$624.8

Amounts in millions

Actuarial Accrued Liability

The actuarial accrued liability represents the present value of projected future benefits allocated to prior years of service by the actuarial cost method. For active members, a summary of the actuarial accrued liability by assumed cause of future termination of service is shown below for the current and prior year.

	December 31, 2018			December 31, 2017		
	General Service	Police & Fire	Total	General Service	Police & Fire	Total
Active Members						
Pre-retirement Duty Disability	\$1.3	\$2.7	\$4.1	\$1.3	\$2.2	\$3.5
Pre-retirement Non-Duty Disability	77.6	8.0	85.6	74.7	7.3	82.0
Service Retirement	4,546.3	881.5	5,427.8	3,818.7	695.9	4,514.6
Withdrawal	228.9	19.8	248.7	207.8	17.4	225.3
Death	39.8	5.0	44.8	40.3	5.8	46.2
Duty Disability Retirement	2.2	5.8	8.0	2.2	4.1	6.3
Non-Duty Disability Retirement	59.1	8.7	67.8	54.9	6.7	61.6
Total Active Members	\$4,955.3	\$931.4	\$5,886.7	\$4,199.8	\$739.5	\$4,939.3
Inactive Members			432.2			385.2
Retired Members and Beneficiaries			419.0			310.1
Total Actuarial Accrued Liability			\$6,738.0			\$5,634.7

Amounts in millions

Reconciliation of Change in Actuarial Accrued Liability

The change in actuarial accrued liability since the last valuation reflects the experience of the system. The actuarial accrued liability is expected to increase due to benefits earned during the year and interest, and to decrease due to benefits paid during the year. The table below reconciles the actuarial accrued liability from the last valuation to this valuation.

	OPSRP
Actuarial Accrued Liability December 31, 2017	\$5,634.7
Expected change	905.3
Assumption and method changes	13.7
Plan changes	(11.1)
Deviations from expected experience	
Retirements from active status	\$4.1
Disability retirements	1.3
Active mortality and withdrawal	27.2
Pay increases	81.4
Inactive mortality	(4.5)
Data corrections	(4.3)
Other	8.6
Total demographic (gains) and losses	\$113.8
New entrants	81.5
Actuarial Accrued Liability December 31, 2018	\$6,738.0

Amounts in millions

OPSRP Unfunded Accrued Liability (UAL)

Calculation of UAL

The Unfunded Accrued Liability (UAL) represents the difference between the actuarial accrued liability and the valuation assets. The UAL is amortized over combined (Tier 1/Tier 2 and OPSRP) valuation payroll. The table below shows the OPSRP UAL, funded status, and UAL as a percentage of combined valuation payroll.

	December 31, 2018	December 31, 2017
1. Actuarial accrued liability	\$6,738.0	\$5,634.7
2. Actuarial value of assets	\$4,783.0	\$4,116.5
3. Unfunded accrued liability (2. - 1.)	\$1,955.0	\$1,518.2
4. Funded percentage (2. ÷ 1.)	71.0%	73.1%
5. Combined valuation payroll	\$10,852.0	\$10,098.9
6. Unfunded accrued liability as % of combined valuation payroll (3. ÷ 5.)	18.0%	15.0%

Amounts in millions

Reconciliation of UAL Bases

Beginning with the December 31, 2007, actuarial valuation, each odd-year valuation establishes a 16-year closed-period amortization base for outstanding OPSRP UAL amounts. For odd-year valuations subsequent to December 31, 2007, this amortization base is calculated based on the total OPSRP UAL as of that valuation date less the remaining unamortized balance of any OPSRP UAL bases established at previous odd-year valuation dates. In other words, OPSRP experience from December 31, 2015 to December 31, 2017 is amortized based on a 16-year amortization schedule beginning December 31, 2017.

This even-year advisory valuation shows both the progress of the amortization bases established in prior valuations and an estimate of the base to be established on December 31, 2019, with the estimate based on experience during 2018.

Reconciliation of UAL Bases					
Amortization Base	UAL December 31, 2017	Payment	Interest	UAL December 31, 2018	Next Year's Payment
December 31, 2007	(\$46.4)	(\$8.7)	(\$3.0)	(\$40.7)	(\$9.0)
December 31, 2009	123.2	17.9	8.2	113.5	18.5
December 31, 2011	48.6	5.8	3.3	46.0	6.0
December 31, 2013	434.7	45.0	29.6	419.3	46.6
December 31, 2015	736.4	67.5	50.4	719.3	69.9
December 31, 2017	221.7	18.4	15.3	218.6	19.0
December 31, 2018	N/A	N/A	N/A	479.1	39.7
Total				\$1,955.0	\$190.8

Actuarial Gain or Loss since Prior Valuation

In every actuarial valuation, assumptions are made as to the future experience of the plan and covered group of participants. Whenever there is a difference between the actual experience and that anticipated by the actuarial assumptions, there is an actuarial gain or loss to the plan. Gains are the result of experience that is more financially favorable to the system than anticipated (i.e., serves to reduce the unfunded accrued liability or increase the surplus), while losses are the result of experience that is financially unfavorable to the system.

The table below develops the actuarial gain or loss for OPSRP for the year ending December 31, 2018.

	OPSRP
1. Expected actuarial accrued liability	
a. Actuarial accrued liability at January 1, 2018	\$5,634.7
b. Normal cost (excluding expenses) at January 1, 2018	515.7
c. Benefit payments (excluding expenses) for year ending December 31, 2018	(33.5)
d. Interest	423.1
e. Expected actuarial accrued liability before changes (a. + b. + c. + d.)	\$6,540.0
f. Change in actuarial accrued liability at December 31, 2018, due to assumption and method changes	13.7
g. Change in actuarial accrued liability at December 31, 2018, due to plan changes	(11.1)
h. Expected actuarial accrued liability at December 31, 2018 (e. + f. + g.)	\$6,542.6
2. Actuarial accrued liability at December 31, 2018	\$6,738.0
3. Liability gain/(loss) (1.h. - 2)	(\$195.4)
4. Expected actuarial value of assets	
a. Actuarial value of assets at January 1, 2018	\$4,116.5
b. Actual contributions for 2018	688.2
c. Benefit payments and expenses for year ending December 31, 2018	(41.1)
d. Assumed investment return	319.7
e. Expected actuarial value of assets at December 31, 2018 (a. + b. + c. + d.)	\$5,083.2
5. Actuarial value of assets as of December 31, 2018	\$4,783.0
6. Asset gain/(loss) (5. - 4.e.)	(\$300.2)
7. Net actuarial gain/(loss) (3. + 6.)	(\$495.6)

Amounts in millions

Reconciliation of the UAL

The table below summarizes the changes in UAL since the prior valuation.

The 2018 liability loss shown is primarily due to pay increases differing from assumption and the accrued liability associated with new entrants to the OPSRP program. For a full assessment of the new entrant effect on UAL, the accrued liability associated with new entrants would need to be combined with contributions associated with new entrants.

	OPSRP
UAL, December 31, 2017	\$1,518.2
Normal cost (including actual administrative expenses)	523.3
Contributions	(688.2)
Liability (gain) or loss	195.4
Asset (gain) or loss	300.2
Assumption and method changes	13.7
Plan changes	(11.1)
Interest at 7.20%	103.4
UAL, December 31, 2018	\$1,955.0

Amounts in millions

OPSRP Contribution Rate Development

Normal Cost Rates

The table below shows the development of the OPSRP normal cost rates. Total normal cost rates shown below are before any offset for redirected member contributions under Senate Bill 1049.

	December 31, 2018			December 31, 2017		
	General Service	Police & Fire	Total	General Service	Police & Fire	Total
Normal Cost						
Pre-retirement Disability Benefits	\$9.5	\$2.3	\$11.8	\$8.7	\$1.9	\$10.6
All Other Benefits	503.3	101.7	605.0	421.2	83.9	505.1
Assumed Administrative Expenses	7.1	0.9	8.0	5.8	0.7	6.5
Total Normal Cost	\$519.9	\$104.9	\$624.8	\$435.7	\$86.6	\$522.2
OPSRP Valuation Payroll	\$5,973.4	\$802.5	\$6,775.9	\$5,187.5	\$664.5	\$5,852.0
Normal Cost Rate						
Pre-retirement Disability Benefits	0.16%	0.29%	0.17%	0.17%	0.29%	0.18%
All Other Benefits	8.43%	12.67%	8.93%	8.12%	12.63%	8.63%
Assumed Administrative Expenses	0.12%	0.12%	0.12%	0.11%	0.11%	0.11%
Total Normal Cost Rate	8.70%	13.07%	9.22%	8.40%	13.03%	8.92%

Amounts in millions

UAL Rates

The UAL rate is determined by calculating the sum of next year's scheduled amortization payments to the UAL as a percentage of combined (Tier 1/Tier 2 and OPSRP) valuation payroll.

	December 31, 2018	December 31, 2017
1. Total UAL	\$1,955.0	\$1,518.2
2. Next year's UAL payment	\$190.8	\$146.0
3. Combined valuation payroll	\$10,852.0	\$10,098.9
4. UAL rate (2 ÷ 3)	1.76%	1.45%

Amounts in millions

Calculated Employer Contribution Rates (Pre-Rate Collar)

The following table summarizes the OPSRP contribution rate for general service and police & fire members as of the valuation date, prior to application of the rate collar.

The normal cost rates apply to OPSRP payroll only, but the UAL rate is applied to combined (Tier 1/Tier 2 and OPSRP) valuation payroll. These rates, after the application of the rate collar, are combined with each employer's Tier 1/Tier 2 rates (other than Tier 1/Tier 2 normal cost rate) to determine each employer's pension contribution rate on OPSRP payroll.

Advisory July 1, 2021 Rates Calculated as of December 31, 2018			
	General Service	Police & Fire	Average Rate
OPSRP pension contribution rates			
Normal cost rate	8.70%	13.07%	9.22%
Uncollared UAL rate	1.76%	1.76%	1.76%
Uncollared total OPSRP pension rate	10.46%	14.83%	10.98%
Member redirect offset¹	(0.70%)	(0.70%)	(0.70%)
Uncollared net employer OPSRP pension rate	9.76%	14.13%	10.28%

¹ Redirected member contributions under Senate Bill 1049 (0.75% of payroll for OPSRP) are anticipated to offset employer contribution rates. Redirect does not apply to members with monthly pay below a threshold. The values shown in the table incorporate an estimate of the effect of this limitation.

Calculation of Rate Collar

The rate collar restricts the average OPSRP contribution rate so it generally cannot change by more than the greater of 3 percent of payroll or 20% of the current average OPSRP contribution rate. However, if the funded percentage is below 60% or above 140%, the size of the collar is doubled. If the funded percentage is between 60% and 70% or between 130% and 140%, the size of the rate collar is increased on a graded scale. All collar calculations are performed based on the weighted average OPSRP contribution rate, and any adjustment due to the collar is applied to the OPSRP UAL rate.

The table below shows the calculation of and any adjustment for the rate collar.

Advisory July 1, 2021 Rates Calculated as of December 31, 2018			
	General Service	Police & Fire	Average Rate
1. Current total OPSRP pension rate	9.85%	14.48%	10.37%
2. Size of rate collar			
a. Preliminary size of rate collar <i>(greater of 3% or 20% x 1.)</i>			3.00%
b. Funded percentage			71%
c. Size of rate collar <i>(If b. < 60% or b. > 140%, 2 x a. If b. is 70%-130%, a. Otherwise, graded rate between a. and 2 x a.)</i>			3.00%
3. July 1, 2021 Minimum total contribution rate <i>(1. - 2.c.)</i>			7.37%
4. July 1, 2021 Maximum total contribution rate <i>(1. + 2.c.)</i>			13.37%
5. Advisory July 1, 2021 total contribution rate before collar	10.46%	14.83%	10.98%
6. Advisory July 1, 2021 total contribution rate after collar <i>(5., but not less than 3. or more than 4.)</i>	10.46%	14.83%	10.98%
7. Impact of collar (6. - 5.)	0.00%	0.00%	0.00%

Calculated Employer Contribution Rates (Post-Rate Collar)

The table below summarizes the OPSRP contribution rate for general service and police & fire members as of the valuation date, after adjustments for the rate collar.

Advisory July 1, 2021 Rates Calculated as of December 31, 2018			
	General Service	Police & Fire	Average Rate
OPSRP pension contribution rates			
Normal cost rate	8.70%	13.07%	9.22%
Collared UAL rate	1.76%	1.76%	1.76%
Collared total OPSRP pension rate	10.46%	14.83%	10.98%
Member redirect offset¹	(0.70%)	(0.70%)	(0.70%)
Collared net employer OPSRP pension rate	9.76%	14.13%	10.28%

¹ Redirected member contributions under Senate Bill 1049 (0.75% of payroll for OPSRP) are anticipated to offset employer contribution rates. Redirect does not apply to members with monthly pay below a threshold. The values shown in the table incorporate an estimate of the effect of this limitation.

Retiree Healthcare Valuation

Retiree Healthcare Assets

Assets

A reconciliation of retiree healthcare assets is shown below. The reconciliation of assets is provided by PERS.

	RHIA	RHIPA	Retiree Healthcare Totals
Additions			
1. Employer contributions	\$49.5	\$13.6	\$63.1
2. Net investment income	1.8	(0.0)	1.7
3. Other	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>
4. Total additions	\$51.3	\$13.6	\$64.8
Deductions			
4. Healthcare Premium Subsidies	(\$32.4)	(\$4.6)	(\$37.0)
5. Administrative expenses	<u>(1.4)</u>	<u>(0.3)</u>	<u>(1.7)</u>
6. Total deductions	(\$33.8)	(\$4.9)	(\$38.7)
7. Net change	\$17.5	\$8.7	\$26.1
8. Net assets held in trust for benefits			
a. Beginning of year	\$553.3	\$29.8	\$583.1
b. End of year	\$570.7	\$38.5	\$609.2

Amounts in millions

Retiree Healthcare Liabilities

Normal Cost

A summary of the normal cost by assumed cause of future termination of service is shown below for the current and prior year.

	RHIA			RHIPA		
	December 31, 2018	December 31, 2017	Percent Change	December 31, 2018	December 31, 2017	Percent Change
Normal Cost						
Service Retirement	\$1.5	\$1.8		\$1.2	\$1.3	
Withdrawal	0.5	0.6		0.0	0.0	
Disability	0.1	0.1		0.1	0.1	
Death	<u>0.0</u>	<u>0.0</u>		<u>0.0</u>	<u>0.0</u>	
Total Normal Cost	\$2.2	\$2.5	(13.9%)	\$1.3	\$1.4	(9.1%)

Amounts in millions

The table below reconciles the normal cost from the prior valuation to the current valuation.

	RHIA	RHIPA
Normal Cost December 31, 2017	\$2.5	\$1.4
Expected increase (decrease)	(0.1)	(0.1)
Assumption and method changes	(0.1)	(0.1)
Plan changes	0.0	0.0
Deviations from expected experience		
Demographic (gains) or losses	(0.1)	0.0
Normal Cost December 31, 2018	\$2.2	\$1.3

Amounts in millions

Actuarial Accrued Liability

A summary of the actuarial accrued liability by status is shown below for the current and prior year.

	RHIA			RHIPA		
	December 31, 2018	December 31, 2017	Percent Change	December 31, 2018	December 31, 2017	Percent Change
Actives	\$62.2	\$71.7	(13.2%)	\$48.8	\$54.0	(9.7%)
Inactive Members	19.6	22.0	(10.8%)	0.0	0.0	0.0%
Retired Members and Beneficiaries	329.8	343.9	(4.1%)	14.0	15.4	(9.1%)
Total Actuarial Accrued Liability	\$411.7	\$437.6	(5.9%)	\$62.7	\$69.4	(9.5%)

The change in actuarial accrued liability since the last valuation reflects the experience of the system. The actuarial accrued liability is expected to increase due to benefits earned during the year and interest, and to decrease due to benefits paid during the year. The table below reconciles the actuarial accrued liability from the last valuation to this valuation.

	RHIA	RHIPA	Total
Actuarial Accrued Liability December 31, 2017	\$437.6	\$69.4	\$506.9
Expected change	0.5	1.7	2.2
Assumption and method changes	(14.7)	(6.4)	(21.0)
Plan changes	0.0	0.0	0.0
Deviations from expected experience			
Demographic (gains) or losses	(11.7)	(1.9)	(13.7)
Actuarial Accrued Liability December 31, 2018	\$411.7	\$62.7	\$474.4

Amounts in millions

Retiree Healthcare Unfunded Accrued Liability (UAL)

Calculation of UAL

The Unfunded Accrued Liability (UAL) represents the difference between the actuarial accrued liability and the valuation assets. A summary of the UAL by program is shown on the following table.

	RHIA			RHIPA		
	December 31, 2018	December 31, 2017	Percent Change	December 31, 2018	December 31, 2017	Percent Change
1. Actuarial accrued liability	\$411.7	\$437.6	(5.9%)	\$62.7	\$69.4	(9.5%)
2. Actuarial value of assets	\$570.7	\$553.3	3.2%	\$38.5	\$29.8	29.0%
3. Unfunded accrued liability	(\$159.1)	(\$115.7)	37.5%	\$24.3	\$39.5	(38.6%)
4. Funded percentage (2. ÷ 1.)	138.6%	126.4%	9.6%	61.3%	43.0%	42.6%
5. Combined valuation payroll	\$10,852.0	\$10,098.9	7.5%	\$3,211.6	\$2,984.5	7.6%
6. Unfunded accrued liability as % of combined valuation payroll (3. ÷ 5.)	(1.5%)	(1.1%)		0.8%	1.3%	

Amounts in millions

Reconciliation of UAL Bases

Beginning with the December 31, 2007 actuarial valuation, each rate-setting valuation establishes a 10-year amortization base for outstanding RHIA and RHIPA UAL amounts. For odd-year valuations subsequent to December 31, 2007, this amortization base is calculated based on the total UAL as of that valuation date less the remaining unamortized balance of any UAL bases established at previous odd-year valuation dates. In other words, RHIA and RHIPA experience from December 31, 2015 to December 31, 2017 is amortized based on a 10-year amortization schedule beginning December 31, 2017.

This even-year advisory valuation shows both the progress of the amortization bases established in prior valuations and an estimate of the base to be established on December 31, 2019, with the estimate based on experience during 2018. The payment schedules for the unamortized UAL balances as of December 31, 2018, have been modified to reflect the lowering of the investment return assumption first effective with this valuation.

RHIA					
Amortization Base	UAL December 31, 2017	Payment	Interest	UAL December 31, 2018	Next Year's Payment
December 31, 2009	\$19.3	\$10.2	\$1.0	\$10.2	\$10.5
December 31, 2011	(17.2)	(4.7)	(1.1)	(13.6)	(4.8)
December 31, 2013	(33.8)	(6.3)	(2.2)	(29.6)	(6.6)
December 31, 2015	(5.6)	(0.8)	(0.4)	(5.2)	(0.8)
December 31, 2017	(78.5)	(9.4)	(5.3)	(74.3)	(9.8)
December 31, 2018	N/A	N/A	N/A	(46.5)	(5.6)
Total				(\$159.1)	(\$17.1)

Amounts in millions

RHIPA					
Amortization Base	UAL December 31, 2017	Payment	Interest	UAL December 31, 2018	Next Year's Payment
December 31, 2009	\$0.7	\$0.3	\$0.0	\$0.3	\$0.4
December 31, 2011	8.0	2.2	0.5	6.3	2.3
December 31, 2013	23.2	4.4	1.5	20.3	4.5
December 31, 2015	9.9	1.4	0.7	9.1	1.5
December 31, 2017	(2.2)	(0.3)	(0.1)	(2.1)	(0.3)
December 31, 2018	N/A	N/A	N/A	(9.8)	(1.2)
Total				\$24.3	\$7.2

Amounts in millions

Actuarial Gain or Loss since Prior Valuation

In every actuarial valuation, assumptions are made as to the future experience of the plan and covered group of participants. Whenever there is a difference between the actual experience and that anticipated by the actuarial assumptions, there is an actuarial gain or loss to the plan. Gains are the result of experience that is more financially favorable to the system than anticipated (i.e., serves to reduce the unfunded accrued liability or increase the surplus), while losses are the result of experience that is financially unfavorable to the system.

The table below shows the development of the actuarial gain (or loss) for RHIA and RHIPA for the plan year ending December 31, 2018.

	RHIA	RHIPA	Retiree Healthcare Totals
1. Expected actuarial accrued liability			
a. Actuarial accrued liability at January 1, 2018	\$437.6	\$69.4	\$506.9
b. Normal cost at January 1, 2018	2.5	1.4	3.9
c. Benefit payments for fiscal year ending December 31, 2018	(32.4)	(4.6)	(37.0)
d. Interest	30.4	4.9	35.3
e. Expected actuarial accrued liability before changes (a. + b. + c. + d.)	\$438.1	\$71.1	\$509.1
f. Change in actuarial accrued liability at December 31, 2018, due to assumption and method changes	(14.7)	(6.4)	(21.0)
g. Change in actuarial accrued liability at December 31, 2018, due to plan changes	0.0	0.0	0.0
h. Expected actuarial accrued liability at December 31, 2018 (e. + f. + g.)	\$423.4	\$64.7	\$488.1
2. Actuarial accrued liability at December 31, 2018	\$411.7	\$62.7	\$474.4
3. Liability gain/(loss) (1.h. - 2.)	\$11.7	\$1.9	\$13.7
4. Expected actuarial value of assets			
a. Actuarial value of assets at January 1, 2018	\$553.3	\$29.8	\$583.1
b. Actual contributions for 2018	49.5	13.6	63.1
c. Benefit payments and expenses for fiscal year ending December 31, 2018	(33.8)	(4.9)	(38.7)
d. Assumed investment return	40.4	2.5	42.9
e. Expected actuarial value of assets before changes (a. + b. + c. + d.)	\$609.4	\$41.0	\$650.3
f. Change in actuarial value of assets at December 31, 2018, due to assumption changes	0.0	0.0	0.0
g. Change in actuarial value of assets at December 31, 2018, due to plan changes	0.0	0.0	0.0
h. Expected actuarial value of assets at December 31, 2018 (e. + f. + g.)	\$609.4	\$41.0	\$650.3
5. Actuarial value of assets at December 31, 2018	\$570.7	\$38.5	\$609.2
6. Actuarial asset gain/(loss) (5. - 4.h.)	(\$38.6)	(\$2.5)	(\$41.1)
7. Net actuarial gain/(loss) (3. + 6.)	(\$26.9)	(\$0.5)	(\$27.4)

Amounts in millions

Reconciliation of UAL

The table below summarizes the changes in UAL since the prior valuation.

The significant decrease in both the RHIA and RHIPA UAL is primarily due to employer contributions, and lower participation than assumed.

	RHIA	RHIPA
UAL, December 31, 2017	(\$115.7)	\$39.5
Normal Cost (including actual administrative expenses)	3.9	1.7
Contributions	(49.5)	(13.6)
Liability (gain) or loss	(11.7)	(1.9)
Asset (gain) or loss	38.6	2.5
Assumption and method changes	(14.7)	(6.4)
Interest	(10.0)	2.4
UAL, December 31, 2018	(\$159.1)	\$24.3

Amounts in millions

Retiree Healthcare Contribution Rate Development

Normal Cost Rate

The table below shows the development of the retiree healthcare normal cost rates. For RHIA, valuation payroll is shown on a system-wide basis. For RHIPA, valuation payroll is for the State of Oregon and the State Judiciary only.

	RHIA		RHIPA	
	December 31, 2018	December 31, 2017	December 31, 2018	December 31, 2017
Normal Cost	\$2.2	\$2.5	\$1.3	\$1.4
Tier 1/Tier 2 Valuation Payroll	\$4,076.1	\$4,246.9	\$1,159.5	\$1,212.2
Normal Cost Rate	0.05%	0.06%	0.11%	0.12%

Amounts in millions

The table below shows the development of the retiree healthcare normal cost rates for the various rate pools. For RHIA, valuation payroll is shown on a system-wide basis. For RHIPA, valuation payroll is for the State of Oregon and the State Judiciary only. For this exhibit, all independent employers, including State Judiciary, have been grouped together.

	December 31, 2018			
	SLGRP	School Districts	Independent Employers	Retiree Healthcare Total
1. Tier 1/ Tier 2 Valuation Payroll				
a. All Employers' Payroll	\$2,299.5	\$1,401.2	\$375.4	\$4,076.1
b. RHIPA Employers' Payroll	\$1,134.5	\$0.0	\$25.0	\$1,159.5
2. Normal Cost Rate				
a. RHIA	0.05%	0.05%	0.05%	0.05%
b. RHIPA	0.11%	0.00%	0.11%	0.11%
3. Weighted Average Normal Cost Rate [(1.a. x 2.a + 1.b. x 2.b.) / 1.a]	0.10%	0.05%	0.06%	0.08%

UAL Rate

The UAL rate is determined by calculating the sum of next year's scheduled amortization payments to the UAL as a percentage of combined (Tier 1/Tier 2 and OPSRP) valuation payroll. For RHIPA, valuation payroll is for the State of Oregon and the State Judiciary only.

For RHIA, the UAL rate calculated under this method was less than 0.00% in this valuation. As a result, the PERS Board decided to apply a minimum UAL rate of 0.00% for the current valuation.

	RHIA		RHIPA	
	December 31, 2018	December 31, 2017	December 31, 2018	December 31, 2017
1. Total UAL	(\$159.1)	(\$115.7)	\$24.3	\$39.5
2. Next year's UAL payment	(\$17.1)	(\$11.1)	\$7.2	\$8.0
3. Combined valuation payroll	\$10,852.0	\$10,098.9	\$3,211.6	\$2,984.5
4. UAL rate				
a. Preliminary UAL rate (2 ÷ 3)	(0.16%)	(0.11%)	0.22%	0.27%
b. Final UAL rate (greater of a. or 0.00%)	0.00%	0.00%	0.22%	0.27%

Amounts in millions

The table below shows the development of the retiree healthcare UAL rates for the various rate pools. For RHIA, combined valuation payroll is shown on a system-wide basis. For RHIPA, valuation payroll is for the State of Oregon and the State Judiciary only. For this exhibit, all independent employers, including State Judiciary, have been grouped together.

	December 31, 2018			
	SLGRP	School Districts	Independent Employers	Retiree Healthcare Total
1. Combined Valuation Payroll				
a. All Employers' Payroll	\$6,346.1	\$3,543.5	\$962.4	\$10,852.0
b. RHIPA Employers' Payroll	\$3,186.6	\$0.0	\$25.0	\$3,211.6
2. UAL Rate				
a. RHIA	0.00%	0.00%	0.00%	0.00%
b. RHIPA	0.22%	0.00%	0.22%	0.22%
3. Weighted Average UAL Rate [(1.a. x 2.a + 1.b. x 2.b.) / 1.a]	0.11%	0.00%	0.01%	0.07%

Amounts in millions

Calculated Employer Contribution Rate Summary

The following table summarizes the calculated employer contribution rates for the retiree healthcare programs. The normal cost rates are applied against Tier 1/Tier 2 payroll, but the UAL rates are applied against all payroll. For RHIPA, valuation payroll is for the State of Oregon and the State Judiciary only.

Advisory July 1, 2021 Rates Calculated as of December 31, 2018			
	State Agencies and Judiciary	All Other Employers	Retiree Healthcare Total
Normal Cost Rates			
RHIA	0.05%	0.05%	0.05%
RHIPA	0.11%	0.00%	0.03%
Total normal cost rate	0.16%	0.05%	0.08%
UAL Rates			
RHIA	0.00%	0.00%	0.00%
RHIPA	0.22%	0.00%	0.07%
Total UAL rate	0.22%	0.00%	0.07%
Total retiree healthcare rate	0.38%	0.05%	0.15%

Accounting / CAFR Exhibits

Accounting/CAFR Exhibits

The following information as of December 31, 2018 has been prepared and provided to Oregon PERS for inclusion in the Actuarial Section of the 2019 Comprehensive Annual Financial Report (CAFR):

- Schedule of Active Member Valuation Data
- Schedule of Retirees and Beneficiaries Added to and Removed from Rolls
- Schedules of Funding Progress by Rate Pool
- Solvency Test
- Analysis of Financial Experience
- Schedules of Funding Progress

These exhibits do not reflect GASB Statements No. 74 and 75, which were issued by GASB in June 2015 to replace Statements No. 43 and 45, and govern financial reporting for postemployment benefits other than pensions. GASB 74 governs plan reporting effective for fiscal years beginning after June 15, 2016, while GASB 75 governs employer reporting for fiscal years beginning after June 15, 2017. Milliman provided results for Oregon PERS under GASB 74 and 75 determined as of a June 30, 2018 measurement date in letters dated November 28, 2018 and March 4, 2019, respectively. The results for a measurement date of June 30, 2019 will be provided separately.

These exhibits do not reflect GASB Statements No. 67 and 68, issued by GASB in June 2012 to replace Statements No. 25 and 27. GASB 67 governs plan financial reporting effective for fiscal years beginning after June 15, 2013, while GASB 68 governs employer financial reporting for fiscal years beginning after June 15, 2014. Milliman provided results for Oregon PERS under GASB 67 and 68 determined as of a June 30, 2018 measurement date in letters dated November 28, 2018 and March 4, 2019, respectively. The results for a measurement date of June 30, 2019 will be provided separately.

Some employers have made supplemental deposits in addition to their regularly scheduled contributions. These deposits are placed in a side account within the pension trust and used to offset future contribution requirements of that employer. The Schedules of Funding Progress and Solvency Test include side accounts as part of the Plan's assets since those amounts are in a restricted trust available exclusively for the benefit of plan members.

Milliman is not an accounting or audit firm and cannot provide accounting advice. Milliman is not responsible for the interpretation of, or compliance with, accounting standards; citations to, and descriptions of accounting standards provided in this report are for reference purposes only. The information provided in this section is intended to assist Oregon PERS in completing its financial statements, but any accounting determination should be reviewed by your auditor.

The exhibits are provided on the following pages.

Actuarial Schedules

Schedule of Active Member Valuation Data

Valuation Date	Count	Annual Payroll (Thousands)	Average Annual Pay	% Increase in Average Pay	Number of Participating Employers ¹	
12/31/1993	137,513	\$4,466,797	\$32,483		N/A	
12/31/1995	141,471	\$4,848,058	\$34,269	5.5%	N/A	
12/31/1997	143,194	\$5,161,562	\$36,045	5.2%	N/A	
12/31/1999	151,262	\$5,676,606	\$37,528	4.1%	N/A	
12/31/2000	156,869	\$6,195,862	\$39,497	5.2%	N/A	
12/31/2001	160,477	\$6,520,225	\$40,630	2.9%	N/A	Old Basis
12/31/2001	160,477	\$6,253,965	\$38,971	—	N/A	New Basis ²
12/31/2002	159,287	\$6,383,475	\$40,075	2.8%	N/A	
12/31/2003	153,723	\$6,248,550	\$40,648	1.4%	N/A	
12/31/2004	142,635	\$6,306,447	\$44,214	8.8%	806	
12/31/2005 ³	156,501	\$6,791,891	\$43,398	(1.8%)	810	
12/31/2006	163,261	\$7,326,798	\$44,878	3.4%	758	
12/31/2007	167,023	\$7,721,819	\$46,232	3.0%	760	
12/31/2008	170,569	\$8,130,136	\$47,665	3.1%	766	
12/31/2009	178,606	\$8,512,192	\$47,659	(0.0%)	776	
12/31/2010	193,569	\$8,750,064	\$45,204	(5.2%)	787	
12/31/2011	170,972	\$8,550,511	\$50,011	10.6%	791	
12/31/2012	167,103	\$8,590,879	\$51,411	2.8%	798	
12/31/2013	162,185	\$8,671,835	\$53,469	4.0%	799	
12/31/2014	164,859	\$9,115,767	\$55,294	3.4%	802	
12/31/2015	168,177	\$9,544,132	\$56,751	2.6%	804	
12/31/2016	172,483	\$9,872,557	\$57,238	0.9%	805	
12/31/2017	173,002	\$10,098,889	\$58,374	2.0%	802	
12/31/2018	176,763	\$10,851,980	\$61,393	5.2%	798	

¹ Effective in 2006, participating employers are defined for this purpose as any employer with covered payroll during the prior year. In prior years, employers with liabilities but without covered payroll were included as well.

² Effective in 2001, the Annual Payroll excludes the member pick-up, if any.

³ Effective with the 12/31/2005 valuation, OPSRP members and payroll are included.

Actuarial Schedules

Schedule of Retirees and Beneficiaries Added to and Removed from Rolls

Annual Allowances are shown in thousands.

Valuation Date	Added to Rolls		Removed from Rolls		Rolls - End of Year		% Increase in Annual Allowances ²	Average Annual Allowances
	Count	Annual Allowances ¹	Count	Annual Allowances	Count	Annual Allowances		
12/31/1993					60,841	\$564,341	27.6%	\$9,276
12/31/1995					64,796	\$700,171	24.1%	\$10,806
12/31/1997					69,624	\$919,038	31.3%	\$13,200
12/31/1999					82,819	\$1,299,380	41.4%	\$15,689
12/31/2000					82,458	\$1,385,556	6.6%	\$16,803
12/31/2001					85,216	\$1,514,491	9.3%	\$17,772
12/31/2002					89,482	\$1,722,865	13.8%	\$19,254
12/31/2003					97,777	\$2,040,533	8.4%	\$20,869
12/31/2004 ³	6,754	\$149,474	2,863	\$35,151	101,668	\$2,154,856	5.6%	\$21,195
12/31/2005 ³	4,472	\$149,127	3,217	\$36,784	102,923	\$2,267,198	5.2%	\$22,028
12/31/2006 ³	5,060	\$151,240	3,263	\$39,735	104,720	\$2,378,704	4.9%	\$22,715
12/31/2007 ³	5,385	\$183,232	3,304	\$40,590	106,801	\$2,521,345	6.0%	\$23,608
12/31/2008 ³	5,963	\$171,484	3,626	\$47,062	109,138	\$2,645,767	4.9%	\$24,242
12/31/2009 ³	6,377	\$226,713	3,374	\$46,228	112,141	\$2,826,252	6.8%	\$25,203
12/31/2010 ³	6,359	\$217,424	3,512	\$51,627	114,988	\$2,992,048	5.9%	\$26,021
12/31/2011 ³	8,715	\$282,098	3,679	\$55,633	120,024	\$3,218,514	7.6%	\$26,816
12/31/2012 ³	7,023	\$235,917	4,875	\$59,353	122,172	\$3,395,079	5.5%	\$27,789
12/31/2013	9,724	\$307,551	3,644	\$66,607	128,252	\$3,636,023	7.1%	\$28,351
12/31/2014 ⁴	6,910	\$235,250	3,524	\$66,621	131,638	\$3,804,651	4.6%	\$28,902
12/31/2015 ⁴	8,566	\$304,818	3,781	\$73,305	136,423	\$4,036,165	6.1%	\$29,586
12/31/2016 ⁴	6,413	\$242,372	3,931	\$80,903	138,905	\$4,197,633	4.0%	\$30,219
12/31/2017 ⁴	10,075	\$385,197	3,878	\$83,921	145,102	\$4,498,910	7.2%	\$31,005
12/31/2018	7,856	\$297,542	3,933	\$90,107	149,025	\$4,706,345	4.6%	\$31,581

¹ Additions to annual allowances reflect the combined effects of new retirements and COLA increases since the previous valuation date.

² Since last valuation date.

³ Annual allowances reflect estimated adjustments to retiree benefits due to the implementation of the *Strunk v. PERB, et al.* and *City of Eugene v. State of Oregon, PERB, et al.* decisions.

⁴ Annual allowances reflect estimated adjustments to retiree benefits for the *Moro v. State of Oregon* decision for records that were not already adjusted in the data provided.

Actuarial Schedules

Schedule of Funding Progress by Rate Pool

The liabilities and assets resulting from the last six actuarial valuations are as follows (*dollar amounts in millions*)

Actuarial Valuation Date	Actuarial Value of Assets ^{1,2} (a)	Actuarial Accrued Liability (AAL) ² (b)	Unfunded AAL (UAAL) (b-a)	Funded Ratio (a/b)	Covered Payroll ³ (c)	UAAL as a % of Covered Payroll ((b-a)/c)
Tier 1/Tier 2 State & Local Government Rate Pool						
12/31/2013 ⁴	\$30,590.2	\$31,738.8	\$1,148.6	96.4%	\$2,915.9	39.4%
12/31/2014 ⁵	\$31,162.6	\$37,169.9	\$6,007.3	83.8%	\$2,827.9	212.4%
12/31/2015 ⁴	\$30,185.3	\$38,396.8	\$8,211.5	78.6%	\$2,691.8	305.1%
12/31/2016	\$30,417.6	\$40,351.3	\$9,933.7	75.4%	\$2,546.7	390.1%
12/31/2017 ⁴	\$33,366.0	\$42,150.7	\$8,784.7	79.2%	\$2,410.6	364.4%
12/31/2018	\$31,798.9	\$43,149.3	\$11,350.4	73.7%	\$2,299.5	493.6%
Tier 1/Tier 2 School District Rate Pool						
12/31/2013	\$23,063.3	\$23,392.6	\$329.4	98.6%	\$1,663.0	19.8%
12/31/2014 ⁵	\$23,361.2	\$27,059.9	\$3,698.7	86.3%	\$1,626.0	227.5%
12/31/2015	\$22,728.9	\$27,670.7	\$4,941.8	82.1%	\$1,578.8	313.0%
12/31/2016	\$22,870.2	\$29,152.2	\$6,282.0	78.5%	\$1,532.7	409.9%
12/31/2017	\$24,934.4	\$29,677.4	\$4,743.1	84.0%	\$1,443.7	328.5%
12/31/2018	\$23,557.9	\$29,898.4	\$6,340.6	78.8%	\$1,401.2	452.5%
Tier 1/Tier 2 Independent Employers and Judiciary						
12/31/2013 ⁴	\$4,851.0	\$5,164.3	\$313.3	93.9%	\$494.8	63.3%
12/31/2014 ⁵	\$4,967.4	\$6,104.9	\$1,137.4	81.4%	\$479.2	237.4%
12/31/2015 ⁴	\$4,807.6	\$6,327.1	\$1,519.5	76.0%	\$460.3	330.1%
12/31/2016	\$4,856.6	\$6,690.8	\$1,834.3	72.6%	\$437.3	419.5%
12/31/2017 ⁴	\$5,018.2	\$6,536.3	\$1,518.1	76.8%	\$392.6	386.7%
12/31/2018	\$4,756.2	\$6,736.3	\$1,980.1	70.6%	\$375.4	527.5%
OPSRP Rate Pool						
12/31/2013	\$1,630.2	\$2,243.3	\$613.2	72.7%	\$3,598.1	17.0%
12/31/2014 ⁵	\$2,024.6	\$3,064.1	\$1,039.5	66.1%	\$4,182.7	24.9%
12/31/2015	\$2,389.1	\$3,742.5	\$1,353.5	63.8%	\$4,813.3	28.1%
12/31/2016	\$3,021.4	\$4,717.0	\$1,695.6	64.1%	\$5,355.8	31.7%
12/31/2017	\$4,116.5	\$5,634.7	\$1,518.2	73.1%	\$5,852.0	25.9%
12/31/2018	\$4,783.0	\$6,738.0	\$1,955.0	71.0%	\$6,775.9	28.9%
Postemployment Healthcare Benefits - Retirement Health Insurance Account						
12/31/2013	\$353.5	\$473.6	\$120.0	74.7%	\$5,073.7	2.4%
12/31/2014	\$395.9	\$468.4	\$72.5	84.5%	\$4,933.1	1.5%
12/31/2015	\$419.3	\$465.6	\$46.3	90.0%	\$4,730.8	1.0%
12/31/2016	\$465.0	\$463.7	(\$1.3)	100.3%	\$4,516.7	(0.0%)
12/31/2017	\$553.3	\$437.6	(\$115.7)	126.4%	\$4,246.9	(2.7%)
12/31/2018	\$570.7	\$411.7	(\$159.1)	138.6%	\$4,076.1	(3.9%)
Postemployment Healthcare Benefits - Retiree Health Insurance Premium Account						
12/31/2013	\$5.2	\$61.2	\$55.9	8.6%	\$1,434.5	3.9%
12/31/2014	\$7.2	\$70.5	\$63.3	10.2%	\$1,406.3	4.5%
12/31/2015	\$11.2	\$67.8	\$56.6	16.5%	\$1,339.4	4.2%
12/31/2016	\$19.1	\$67.9	\$48.8	28.1%	\$1,276.0	3.8%
12/31/2017	\$29.8	\$69.4	\$39.5	43.0%	\$1,212.2	3.3%
12/31/2018	\$38.5	\$62.7	\$24.3	61.3%	\$1,159.5	2.1%

Notes:

¹ Side account assets are included with Tier 1/Tier 2 assets.

² Excludes effect of Multnomah Fire District (net UAAL of \$146 million as of 12/31/2018).

³ Covered payroll shown is for members of the rate pool benefiting from the specified program. For example, Tier 1/Tier 2 School District payroll is only payroll for Tier 1/Tier 2 members and excludes OPSRP. However, UAL is amortized using combined Tier 1/Tier 2 and OPSRP payroll.

⁴ Reflects the transfer in assets and liabilities for new employers that joined the SLGRP effective January 1 following the valuation date.

⁵ The 12/31/2014 valuation reflects benefit changes from the Oregon Supreme Court's ruling in *Moro v. State of Oregon*, which overturned portions of Senate Bills 822 and 861.

Actuarial Schedules

Solvency Test

Pension and Retiree Healthcare Plans Combined

(dollar amounts in millions)

The schedule below shows results from the defined benefit pension plans and retiree healthcare plans on a consolidated basis. Results are also shown separately for each program: Tier 1/Tier 2, OPSRP, and retiree healthcare. Note that the defined benefit pension plan constitutes over 99% of the consolidated assets and liabilities.

Valuation Date ²	Actuarial Accrued Liability ¹			Valuation Assets ^{1,3}	Portion of Actuarial Accrued Liabilities Covered by Assets		
	Active Member Contributions (1)	Retired Members and Beneficiaries (2)	Other Members (3)		(1)	(2)	(3)
	12/31/2009 ⁴	\$8,392.0	\$32,484.2		\$16,470.1	\$48,949.7	100%
12/31/2010	\$8,407.9	\$34,432.5	\$17,070.2	\$51,821.6	100%	100%	53%
12/31/2011 ⁴	\$7,779.7	\$37,362.4	\$16,551.8	\$50,412.4	100%	100%	32%
12/31/2012 ⁵	\$7,704.9	\$36,759.3	\$16,473.1	\$55,080.1	100%	100%	64%
12/31/2013 ⁴	\$7,120.1	\$39,531.5	\$16,476.8	\$60,372.9	100%	100%	83%
12/31/2014 ⁶	\$6,950.4	\$46,576.7	\$20,470.8	\$61,798.3	100%	100%	40%
12/31/2015 ⁴	\$6,476.8	\$49,158.7	\$21,094.5	\$60,430.6	100%	100%	23%
12/31/2016	\$6,168.1	\$52,232.7	\$23,101.0	\$61,543.2	100%	100%	14%
12/31/2017 ⁴	\$5,585.9	\$55,636.9	\$23,340.3	\$67,909.2	100%	100%	29%
12/31/2018	\$5,153.6	\$57,297.7	\$24,597.8	\$65,411.5	100%	100%	12%

¹ Includes effect of Multnomah Fire District (net UAAL of \$146 million as of 12/31/2018).

² An extensive revision of the actuarial assumptions occurs prior to each even-year valuation; therefore, the figures are not directly comparable.

³ Includes the value of UAL Lump Sum Side Accounts.

⁴ Reflects the transfer in assets and liabilities for new employers that joined the SLGRP effective January 1 following the valuation date.

⁵ The 12/31/2012 valuation reflects the benefit changes enacted by the 2013 Oregon Legislature in Senate Bills 822 and 861, as well as a change in cost method to Entry Age Normal.

⁶ The 12/31/2014 valuation reflects benefit changes from the Oregon Supreme Court's ruling in *Moro v. State of Oregon*, which overturned portions of Senate Bills 822 and 861.

Actuarial Schedules

Solvency Test

Tier 1/Tier 2 Pension

(dollar amounts in millions)

Valuation Date ²	Actuarial Accrued Liability ¹			Valuation Assets ^{1,3}	Portion of Actuarial Accrued Liabilities Covered by Assets		
	Active Member Contributions (1)	Retired Members and Beneficiaries (2)	Other Members (3)		(1)	(2)	(3)
	12/31/2012 ⁴	\$7,704.9	\$36,377.3		\$14,527.4	\$53,594.0	100%
12/31/2013 ⁵	\$7,120.1	\$39,116.2	\$14,114.1	\$58,384.0	100%	100%	86%
12/31/2014 ⁶	\$6,950.4	\$46,113.5	\$17,331.0	\$59,370.6	100%	100%	36%
12/31/2015 ⁵	\$6,476.8	\$48,641.5	\$17,335.7	\$57,611.0	100%	100%	14%
12/31/2016	\$6,168.1	\$51,655.5	\$18,429.6	\$58,037.6	100%	100%	1%
12/31/2017 ⁵	\$5,585.9	\$54,967.4	\$17,868.1	\$63,209.7	100%	100%	15%
12/31/2018	\$5,153.6	\$56,534.9	\$18,148.3	\$60,019.3	100%	97%	0%

¹ Includes effect of Multnomah Fire District (net UAAL of \$146 million as of 12/31/2018).

² An extensive revision of the actuarial assumptions occurs prior to each even-year valuation; therefore, the figures are not directly comparable.

³ Includes the value of UAL Lump Sum Side Accounts.

⁴ The 12/31/2012 valuation reflects the benefit changes enacted by the 2013 Oregon Legislature in Senate Bills 822 and 861, as well as a change in cost method to Entry Age Normal.

⁵ Reflects the transfer in assets and liabilities for new employers that joined the SLGRP effective January 1 following the valuation date.

⁶ The 12/31/2014 valuation reflects benefit changes from the Oregon Supreme Court's ruling in *Moro v. State of Oregon*, which overturned portions of Senate Bills 822 and 861.

OPSRP Pension

(dollar amounts in millions)

Valuation Date ¹	Actuarial Accrued Liability			Valuation Assets	Portion of Actuarial Accrued Liabilities Covered by Assets		
	Active Member Contributions (1)	Retired Members and Beneficiaries (2)	Other Members (3)		(1)	(2)	(3)
	12/31/2012 ²	\$0.0	\$28.6		\$1,766.9	\$1,190.0	100%
12/31/2013	\$0.0	\$51.2	\$2,192.1	\$1,630.2	100%	100%	72%
12/31/2014 ³	\$0.0	\$92.4	\$2,971.6	\$2,024.6	100%	100%	65%
12/31/2015	\$0.0	\$144.6	\$3,597.9	\$2,389.1	100%	100%	62%
12/31/2016	\$0.0	\$201.1	\$4,515.9	\$3,021.4	100%	100%	62%
12/31/2017	\$0.0	\$310.1	\$5,324.5	\$4,116.5	100%	100%	71%
12/31/2018	\$0.0	\$419.0	\$6,318.9	\$4,783.0	100%	100%	69%

¹ An extensive revision of the actuarial assumptions occurs prior to each even-year valuation; therefore, the figures are not directly comparable.

² The 12/31/2012 valuation reflects the benefit changes enacted by the 2013 Oregon Legislature in Senate Bills 822 and 861, as well as a change in cost method to Entry Age Normal.

³ The 12/31/2014 valuation reflects benefit changes from the Oregon Supreme Court's ruling in *Moro v. State of Oregon*, which overturned portions of Senate Bills 822 and 861.

Retiree Healthcare (RHIA and RHIPA)

(dollar amounts in millions)

Retiree Health Insurance Account (RHIA)							
Actuarial Accrued Liability							
Valuation Date ¹	Active Member Contributions (1)	Retired Members and Beneficiaries (2)	Other Members (3)	Valuation Assets	Portion of Actuarial Accrued Liabilities Covered by Assets		
					(1)	(2)	(3)
12/31/2012 ²	\$0.0	\$338.3	\$133.5	\$291.6	100%	86%	0%
12/31/2013	\$0.0	\$348.0	\$125.6	\$353.5	100%	100%	4%
12/31/2014	\$0.0	\$355.1	\$113.3	\$395.9	100%	100%	36%
12/31/2015	\$0.0	\$357.7	\$107.9	\$419.3	100%	100%	57%
12/31/2016	\$0.0	\$361.7	\$102.0	\$465.0	100%	100%	101%
12/31/2017	\$0.0	\$343.9	\$93.7	\$553.3	100%	100%	224%
12/31/2018	\$0.0	\$329.8	\$81.8	\$570.7	100%	100%	294%

¹ An extensive revision of the actuarial assumptions occurs prior to each even-year valuation; therefore, the figures are not directly comparable.

² The 12/31/2012 valuation reflects a change in cost method to Entry Age Normal.

Retiree Health Insurance Premium Account (RHIPA)							
Actuarial Accrued Liability							
Valuation Date ¹	Active Member Contributions (1)	Retired Members and Beneficiaries (2)	Other Members (3)	Valuation Assets	Portion of Actuarial Accrued Liabilities Covered by Assets		
					(1)	(2)	(3)
12/31/2012 ²	\$0.0	\$15.1	\$45.3	\$4.4	100%	29%	0%
12/31/2013	\$0.0	\$16.1	\$45.1	\$5.2	100%	33%	0%
12/31/2014	\$0.0	\$15.7	\$54.9	\$7.2	100%	46%	0%
12/31/2015	\$0.0	\$14.9	\$52.9	\$11.2	100%	75%	0%
12/31/2016	\$0.0	\$14.4	\$53.5	\$19.1	100%	100%	9%
12/31/2017	\$0.0	\$14.4	\$53.5	\$19.1	100%	100%	9%
12/31/2018	\$0.0	\$14.0	\$48.8	\$38.5	100%	100%	50%

¹ An extensive revision of the actuarial assumptions occurs prior to each even-year valuation; therefore, the figures are not directly comparable.

² The 12/31/2012 valuation reflects a change in cost method to Entry Age Normal.

Actuarial Schedules

Analysis of Financial Experience

The schedule below shows results from the defined benefit pension plans and retiree healthcare plans on a consolidated basis. Results are also shown separately for each program on subsequent pages.

Gains and Losses in Unfunded Accrued Liability Resulting from Differences Between Assumed Experience and Actual Experience and Assumption Changes

(dollar amounts in millions)

Pension and Retiree Healthcare Plans	\$ Gain (or Loss) for Year	
	2018	2017
Type of Activity		
Retirements from Active Status	(\$87.6)	(\$143.9)
Active Mortality and Withdrawal	(38.0)	(2.3)
Pay Increases	(155.9)	(168.4)
Contributions	208.3	94.2
Interest Crediting Experience	88.5	(95.7)
Investment Income	(3,982.7)	4,854.2
Retirement, Mortality and Lump Sums from Inactive Status	(4.3)	18.0
Retiree and Beneficiary Mortality	(41.5)	(34.6)
New Entrants ¹	(82.6)	(68.3)
Other	15.2	(225.8)
Gain (or Loss) During Year from Financial Experience	(\$4,080.5)	\$4,227.3
Non-Recurring Items		
Assumption Changes	67.3	0.0
Plan Changes	52.1	0.0
Composite Gain (or Loss) During Year	(\$3,961.1)	\$4,227.3

¹ Accrued liability associated with new entrants is shown. For a full assessment of the new entrant effect on UAL, this would need to be combined with contributions associated with new entrants.

The schedules below show results from the Tier 1/Tier 2 and OPSRP pension programs separately.

Gains and Losses in Unfunded Accrued Liability Resulting from Differences between Assumed Experience and Actual Experience and Assumption Changes

(dollar amounts in millions)

Tier 1/Tier 2 Pension Program	\$ Gain (or Loss) for Year	
	2018	2017
Type of Activity		
Retirements from Active Status	(\$82.2)	(\$145.1)
Active Mortality and Withdrawal	(10.8)	(12.5)
Pay Increases	(74.4)	(70.7)
Contributions	143.1	49.4
Interest Crediting Experience	88.5	(95.7)
Investment Income	(3,641.3)	4,496.6
Retirement, Mortality and Lump Sums from Inactive Status	(8.0)	15.9
Retiree and Beneficiary Mortality	(42.3)	(34.6)
New Entrants	(1.1)	(1.2)
Other	5.8	(297.0)
Gain (or Loss) During Year from Financial Experience	(\$3,622.6)	\$3,905.1
Non-Recurring Items		
Assumption Changes	60.0	0.0
Plan Changes	41.0	0.0
Composite Gain (or Loss) During Year	(\$3,521.6)	\$3,905.1

OPSRP Pension Program	\$ Gain (or Loss) for Year	
	2018	2017
Type of Activity		
Retirements from Active Status	(\$5.4)	\$1.1
Active Mortality and Withdrawal	(\$27.2)	10.2
Pay Increases	(\$81.4)	(97.7)
Contributions	\$61.0	41.6
Investment Income	(\$300.2)	317.5
Retirement, Mortality and Lump Sums from Inactive Status	\$3.7	2.0
Retiree and Beneficiary Mortality	\$0.8	(0.1)
New Entrants ¹	(\$81.5)	(67.1)
Other	(\$4.3)	42.0
Gain (or Loss) During Year from Financial Experience	(\$434.6)	\$249.7
Non-Recurring Items		
Assumption Changes	(\$13.7)	0.0
Plan Changes	\$11.1	0.0
Composite Gain (or Loss) During Year	(\$437.2)	\$249.7

¹ Accrued liability associated with new entrants is shown. For a full assessment of the new entrant effect on UAL, this would need to be combined with contributions associated with new entrants.

The schedule below shows results from the retiree healthcare programs.

Gains and Losses in Unfunded Accrued Liability Resulting from Differences Between Assumed Experience and Actual Experience and Assumption Changes

(dollar amounts in millions)

Retiree Healthcare Programs	\$ Gain (or Loss) for Year			
	RHIA		RHIPA	
	2018	2017	2018	2017
Type of Activity				
Contributions	\$3.2	\$2.4	\$0.9	\$0.9
Investment Income	(38.6)	38.7	(2.5)	1.3
Other	11.7	29.0	1.9	0.2
Gain (or Loss) During Year from Financial Experience	(\$23.7)	\$70.2	\$0.4	\$2.3
Non-Recurring Items				
Assumption Changes	14.7	0.0	6.4	0.0
Plan Changes	0.0	0.0	0.0	0.0
Composite Gain (or Loss) During Year	(\$9.0)	\$70.2	\$6.8	\$2.3

Actuarial Schedules

Schedules of Funding Progress

(dollar amounts in millions)

Actuarial Valuation Date	Actuarial Value of Assets ¹ (a)	Actuarial Accrued Liability (AAL) (b)	Unfunded AAL (UAAL) (b-a)	Funded Ratio (a/b)	Covered Payroll (c)	UAAL as a % of Covered Payroll ((b-a)/c)
Pension Benefits - Tier 1/Tier 2 and OPSRP²						
12/31/2009 ³	\$48,729.2	\$56,810.6	\$8,081.4	85.8%	\$8,512.2	94.9%
12/31/2010	\$51,583.6	\$59,329.5	\$7,746.0	86.9%	\$8,750.1	88.5%
12/31/2011 ³	\$50,168.2	\$61,198.4	\$11,030.2	82.0%	\$8,550.5	129.0%
12/31/2012 ⁴	\$54,784.1	\$60,405.2	\$5,621.1	90.7%	\$8,590.9	65.4%
12/31/2013 ³	\$60,014.1	\$62,593.6	\$2,579.5	95.9%	\$8,671.8	29.7%
12/31/2014 ⁵	\$61,395.2	\$73,458.9	\$12,063.7	83.6%	\$9,115.8	132.3%
12/31/2015 ³	\$60,000.1	\$76,196.6	\$16,196.5	78.7%	\$9,544.1	169.7%
12/31/2016	\$61,059.0	\$80,970.3	\$19,911.2	75.4%	\$9,872.6	201.7%
12/31/2017 ³	\$67,326.1	\$84,056.1	\$16,730.0	80.1%	\$10,098.9	165.7%
12/31/2018	\$64,802.3	\$86,574.7	\$21,772.4	74.9%	\$10,852.0	200.6%
Postemployment Healthcare Benefits - Retirement Health Insurance Account						
12/31/2009	\$214.1	\$511.2	\$297.1	41.9%	\$8,512.2	3.5%
12/31/2010	\$232.3	\$547.1	\$314.8	42.5%	\$8,750.1	3.6%
12/31/2011	\$239.6	\$461.1	\$221.5	52.0%	\$8,550.5	2.6%
12/31/2012	\$291.6	\$471.8	\$180.2	61.8%	\$8,590.9	2.1%
12/31/2013	\$353.5	\$473.6	\$120.0	74.7%	\$8,671.8	1.4%
12/31/2014	\$395.9	\$468.4	\$72.5	84.5%	\$9,115.8	0.8%
12/31/2015	\$419.3	\$465.6	\$46.3	90.0%	\$9,544.1	0.5%
12/31/2016	\$465.0	\$463.7	(\$1.3)	100.3%	\$9,872.6	(0.0%)
12/31/2017	\$553.3	\$437.6	(\$115.7)	126.4%	\$10,098.9	(1.1%)
12/31/2018	\$570.7	\$411.7	(\$159.1)	138.6%	\$10,852.0	(1.5%)
Postemployment Healthcare Benefits - Retiree Health Insurance Premium Account						
12/31/2009	\$6.4	\$24.5	\$18.2	25.9%	\$2,371.8	0.8%
12/31/2010	\$5.7	\$33.9	\$28.2	16.8%	\$2,379.7	1.2%
12/31/2011	\$4.5	\$34.4	\$29.9	13.2%	\$2,376.9	1.3%
12/31/2012	\$4.4	\$60.3	\$55.9	7.4%	\$2,432.4	2.3%
12/31/2013	\$5.2	\$61.2	\$55.9	8.6%	\$2,531.5	2.2%
12/31/2014	\$7.2	\$70.5	\$63.3	10.2%	\$2,718.9	2.3%
12/31/2015	\$11.2	\$67.8	\$56.6	16.5%	\$2,831.8	2.0%
12/31/2016	\$19.1	\$67.9	\$48.8	28.1%	\$2,881.4	1.7%
12/31/2017	\$29.8	\$69.4	\$39.5	43.0%	\$2,984.5	1.3%
12/31/2018	\$38.5	\$62.7	\$24.3	61.3%	\$3,211.6	0.8%

Notes:

¹ Side account assets are included with pension assets.

² Includes UAAL for Multnomah Fire District (\$146 million as of 12/31/2018).

³ Reflects the transfer in assets and liabilities for new employers that joined the SLGRP effective January 1 following the valuation date.

⁴ The 12/31/2012 valuation reflects the benefit changes enacted by the 2013 Oregon Legislature in Senate Bills 822 and 861, as well as a change in cost method to Entry Age Normal.

⁵ The 12/31/2014 valuation reflects benefit changes from the Oregon Supreme Court's ruling in *Moro v. State of Oregon*, which overturned portions of Senate Bills 822 and 861.

Data Exhibits

This valuation is based upon the membership of the System as of December 31, 2018.

System Wide Data Exhibits

Valuation Pay and Census Exhibit

The following tables illustrate the breakdown of member counts and valuation payroll for the SLGRP, School District Pool, and independent employers.

SLGRP

	General Service	Police & Fire	Total
Tier 1	\$771.7	\$146.5	\$918.1
Tier 2	1,077.5	303.9	1,381.4
Tier 1/Tier 2 Valuation Payroll	1,849.2	450.4	2,299.5
OPSRP Valuation Payroll	3,410.3	636.2	4,046.5
Combined Valuation Payroll	\$5,259.5	\$1,086.6	\$6,346.1

Amounts in millions

	December 31				
	2018				2017
	Tier 1	Tier 2	OPSRP	Total	Total
Active Members in the Pool					
General Service	9,231	14,128	55,992	79,351	77,824
Police & Fire	1,441	3,256	8,211	12,908	12,227
Total	10,672	17,384	64,203	92,259	90,051
Average Age	56.8	52.0	42.9	46.2	46.3
Average Service	26.4	18.0	6.4	10.9	11.0
Average prior year Covered Salary	\$88,542	\$80,570	\$59,271	\$66,670	\$63,752
Active Members outside the Pool with previous Segments in the Pool					
General Service	2,205	2,365		4,570	4,888
Police & Fire	215	330		545	569
Total	2,420	2,695		5,115	5,457
Average Age	55.5	49.4		52.3	51.9
Average Service in the Pool	3.2	2.8		3.0	2.9
Inactive Members¹					
General Service	7,770	8,170	9,802	25,742	25,677
Police & Fire	517	693	760	1,970	2,326
Total	8,287	8,863	10,562	27,712	28,003
Average Age	59.7	53.9	47.1	53.1	52.8
Average Monthly Benefit	\$1,970	\$765	\$461	\$1,009	\$1,031
Retired Members and Beneficiaries¹					
General Service	68,325	8,147	3,091	79,563	77,272
Police & Fire	9,918	1,189	295	11,402	10,947
Total	78,243	9,336	3,386	90,965	88,219
Average Age	72.1	68.0	67.1	71.5	71.2
Average Monthly Benefit ²	\$2,460	\$1,079	\$542	\$2,247	\$2,201
Grand Total Number of Members	99,622	38,278	78,151	216,051	211,730

¹ In these exhibits, Inactives and Retirees are counted by members with service in each rate pool. As a result, individual members with service segments in more than one rate pool will be included in more than one exhibit.

² The average monthly benefit reflects an estimated adjustment for the effect of the Supreme Court decision in *Moro v. State of Oregon* for records that were not already adjusted in the data provided.

School District Pool

	General Service	Police & Fire	Total
Tier 1	\$524.1	\$1.4	\$525.5
Tier 2	874.1	1.6	875.7
Tier 1/Tier 2 Valuation Payroll	1,398.3	2.9	1,401.2
OPSRP Valuation Payroll	2,140.5	1.8	2,142.3
Combined Valuation Payroll	\$3,538.8	\$4.8	\$3,543.5

Amounts in millions

	December 31				
	2018				2017
	Tier 1	Tier 2	OPSRP	Total	Total
Active Members					
General Service	7,832	14,040	49,280	71,152	70,070
Police & Fire	19	23	30	72	65
Total	7,851	14,063	49,310	71,224	70,135
Average Age	56.3	51.5	43.1	46.2	46.2
Average Service	25.5	17.6	6.6	10.8	10.8
Average prior year Covered Salary	\$68,054	\$62,650	\$41,344	\$48,495	\$46,255
Active Members outside the Pool with previous Segments in the Pool					
General Service	978	1,240		2,218	2,279
Police & Fire	4	5		9	10
Total	982	1,245		2,227	2,289
Average Age	56.6	50.7		53.3	53
Average Service	5.8	4.5		5.1	4.9
Inactive Members¹					
General Service	4,934	6,560	7,104	18,598	18,235
Police & Fire	10	17	6	33	32
Total	4,944	6,577	7,110	18,631	18,267
Average Age	60.4	53.8	48.5	53.5	53.5
Average Monthly Benefit	\$1,615	\$570	\$339	\$759	\$770
Retired Members and Beneficiaries¹					
General Service	62,926	5,385	1,452	69,763	68,430
Police & Fire	198	38	8	244	237
Total	63,124	5,423	1,460	70,007	68,667
Average Age	73.3	67.3	67.0	72.7	72.3
Average Monthly Benefit ²	\$2,407	\$802	\$420	\$2,241	\$2,206
Grand Total Number of Members	76,901	27,308	57,880	162,089	159,358

¹ In these exhibits, Inactives and Retirees are counted by members with service in each rate pool. As a result, individual members with service segments in more than one rate pool will be included in more than one exhibit.

² The average monthly benefit reflects an estimated adjustment for the effect of the Supreme Court decision in *Moro v. State of Oregon* for records that were not already adjusted in the data provided.

Independents

	General Service	Police & Fire	Total
Tier 1	\$102.6	\$47.6	\$150.3
Tier 2	131.9	93.2	225.1
Tier 1/Tier 2 Valuation Payroll	234.5	140.9	375.4
OPSRP Valuation Payroll	422.6	164.4	587.0
Combined Valuation Payroll	\$657.1	\$305.3	\$962.4

Amounts in millions

	December 31				
	2018				2017
	Tier 1	Tier 2	OPSRP	Total	Total
Active Members					
General Service	1,136	1,783	7,223	10,142	9,780
Police & Fire	399	858	1,881	3,138	3,036
Total	1,535	2,641	9,104	13,280	12,816
Average Age	55.4	50.8	41.5	45.0	45.3
Average Service	24.4	18.0	6.2	10.6	10.8
Average prior year Covered Salary	\$101,062	\$86,743	\$60,582	\$70,464	\$67,529
Active Members outside the Pool with previous Segments in the Pool					
General Service	792	1,099		1,891	1,981
Police & Fire	192	297		489	511
Total	984	1,396		2,380	2,492
Average Age	55.2	49.4		51.8	51.2
Average Service	5.0	4.0		4.4	4.3
Inactive Members¹					
General Service	991	1,268	1,116	3,375	3,419
Police & Fire	168	191	142	501	491
Total	1,159	1,459	1,258	3,876	3,910
Average Age	58.5	53.5	48.3	53.3	53.2
Average Monthly Benefit	\$1,348	\$628	\$462	\$789	\$791
Retired Members and Beneficiaries¹					
General Service	9,384	1,419	374	11,177	10,768
Police & Fire	3,277	189	39	3,505	3,369
Total	12,661	1,608	413	14,682	14,137
Average Age	70.6	67.3	67.0	70.1	69.8
Average Monthly Benefit ²	\$2,308	\$902	\$577	\$2,105	\$2,068
Grand Total Number of Members	16,339	7,104	10,775	34,218	33,355

¹ In these exhibits, Inactives and Retirees are counted by members with service in each rate pool. As a result, individual members with service segments in more than one rate pool will be included in more than one exhibit.

² The average monthly benefit reflects an estimated adjustment for the effect of the Supreme Court decision in *Moro v. State of Oregon* for records that were not already adjusted in the data provided.

Total

	General Service	Police & Fire	Total
Tier 1	\$1,398.4	\$195.5	\$1,593.9
Tier 2	2,083.5	398.7	2,482.3
Tier 1/Tier 2 Valuation Payroll	3,481.9	594.2	4,076.1
OPSRP Valuation Payroll	5,973.4	802.5	6,775.9
Combined Valuation Payroll	\$9,455.3	\$1,396.6	\$10,852.0

Amounts in millions

	December 31				
	2018				2017
	Tier 1	Tier 2	OPSRP	Total	Total
Active Members					
General Service	18,199	29,951	112,495	160,645	157,674
Police & Fire	1,859	4,137	10,122	16,118	15,328
Total	20,058	34,088	122,617	176,763	173,002
Average Age	56.5	51.7	42.9	46.1	46.2
Average Service	25.9	17.8	6.5	10.9	10.9
Average prior year Covered Salary	\$81,481	\$73,656	\$52,159	\$59,632	\$56,939
Inactive Members¹					
General Service	13,695	15,998	18,022	47,715	47,331
Police & Fire	695	901	908	2,504	2,849
Total	14,390	16,899	18,930	50,219	50,180
Average Age	59.8	53.8	47.7	53.3	53.1
Average Monthly Benefit	\$1,798	\$677	\$415	\$900	\$917
Retired Members and Beneficiaries¹					
General Service	140,635	14,951	4,917	160,503	156,470
Police & Fire	13,393	1,416	342	15,151	14,553
Total	154,028	16,367	5,259	175,654	171,023
Average Age	72.5	67.7	67.1	71.8	71.5
Average Monthly Benefit ²	\$2,426	\$970	\$511	\$2,233	\$2,192
Grand Total Number of Members	188,476	67,354	146,806	402,636	394,205

¹ In these exhibits, Inactives and Retirees are counted by members with service in each rate pool. As a result, individual members with service segments in more than one rate pool are counted more than once in this exhibit.

² The average monthly benefit reflects an estimated adjustment for the effect of the Supreme Court decision in *Moro v. State of Oregon* for records that were not already adjusted in the data provided.

Age/Service and Prior Year Covered Payroll by Tier and Job Class

Tier 1 General Service Active Members

	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40+	Total
<20	0	0	0	0	0	0	0	0	0	0
\$	0	0	0	0	0	0	0	0	0	0
20-24	0	0	0	0	0	0	0	0	0	0
\$	0	0	0	0	0	0	0	0	0	0
25-29	0	0	0	0	0	0	0	0	0	0
\$	0	0	0	0	0	0	0	0	0	0
30-34	0	0	0	0	0	0	0	0	0	0
\$	0	0	0	0	0	0	0	0	0	0
35-39	0	0	0	0	0	0	0	0	0	0
\$	0	0	0	0	0	0	0	0	0	0
40-44	11	2	6	15	115	12	0	0	0	161
\$	134,864	86,051	73,972	82,423	71,695	72,755	0	0	0	77,352
45-49	10	32	65	142	1,263	374	5	0	0	1,891
\$	125,254	61,416	54,940	74,422	81,569	80,261	85,613	0	0	79,759
50-54	16	57	100	196	1,683	2,033	300	6	0	4,391
\$	135,491	80,716	61,192	68,249	81,131	83,923	81,428	75,514	0	81,600
55-59	8	59	97	224	1,676	2,311	1,146	148	5	5,674
\$	121,511	75,448	62,301	69,390	74,468	80,080	85,468	81,146	80,194	78,823
60-64	2	26	60	122	1,326	1,653	813	293	45	4,340
\$	148,179	61,202	80,505	64,185	68,106	76,754	85,106	80,319	70,491	75,490
65-69	0	8	36	51	410	544	272	83	41	1,445
\$	0	86,387	79,537	82,652	70,102	75,513	87,890	93,220	79,908	77,861
70-74	0	1	2	6	56	77	53	23	16	234
\$	0	148,179	81,298	84,534	56,786	89,255	88,818	96,064	101,211	82,935
75+	1	0	0	2	13	18	12	6	11	63
\$	844	0	0	39,424	53,624	79,681	65,058	102,542	93,205	73,528
Total	48	185	366	758	6,542	7,022	2,601	559	118	18,199
\$	128,608	73,623	65,666	70,391	75,748	80,153	85,117	83,288	80,457	78,741

Tier 2 General Service Active Members

	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40+	Total
<20	0	0	0	0	0	0	0	0	0	0
\$	0	0	0	0	0	0	0	0	0	0
20-24	0	0	0	0	0	0	0	0	0	0
\$	0	0	0	0	0	0	0	0	0	0
25-29	0	0	0	0	0	0	0	0	0	0
\$	0	0	0	0	0	0	0	0	0	0
30-34	0	1	12	14	0	0	0	0	0	27
\$	0	28,353	66,755	63,603	0	0	0	0	0	63,698
35-39	0	27	347	592	20	0	0	0	0	986
\$	0	53,575	69,307	68,143	60,788	0	0	0	0	68,005
40-44	8	137	822	3,510	428	0	0	0	0	4,905
\$	18,171	43,493	70,133	77,281	77,729	0	0	0	0	75,082
45-49	7	151	660	4,200	1,515	0	0	0	0	6,533
\$	15,045	41,493	68,538	77,971	80,907	0	0	0	0	76,789
50-54	4	72	494	3,657	1,372	0	0	0	0	5,599
\$	29,091	45,814	66,015	71,654	76,897	0	0	0	0	72,078
55-59	1	51	401	3,871	1,418	0	0	0	0	5,742
\$	51,395	45,977	61,790	65,076	70,147	0	0	0	0	65,927
60-64	4	46	260	2,839	1,172	0	0	0	0	4,321
\$	35,997	42,165	56,856	62,265	64,890	0	0	0	0	62,413
65-69	8	22	81	1,013	381	0	0	0	0	1,505
\$	24,936	41,245	61,204	61,784	66,627	0	0	0	0	62,483
70-74	2	11	21	186	60	0	0	0	0	280
\$	26,936	45,854	53,207	61,924	56,571	0	0	0	0	59,242
75+	2	1	6	40	4	0	0	0	0	53
\$	16,157	24,387	28,908	53,750	24,727	0	0	0	0	46,775
Total	36	519	3,104	19,922	6,370	0	0	0	0	29,951
\$	23,559	43,773	66,416	70,622	73,306	0	0	0	0	70,235

Tier 1 Police and Fire Active Members

	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40+	Total
<20	0	0	0	0	0	0	0	0	0	0
\$	0	0	0	0	0	0	0	0	0	0
20-24	0	0	0	0	0	0	0	0	0	0
\$	0	0	0	0	0	0	0	0	0	0
25-29	0	0	0	0	0	0	0	0	0	0
\$	0	0	0	0	0	0	0	0	0	0
30-34	0	0	0	0	0	0	0	0	0	0
\$	0	0	0	0	0	0	0	0	0	0
35-39	0	0	0	0	0	0	0	0	0	0
\$	0	0	0	0	0	0	0	0	0	0
40-44	0	0	0	1	24	0	0	0	0	25
\$	0	0	0	65,739	113,848	0	0	0	0	111,924
45-49	0	0	2	11	428	114	0	0	0	555
\$	0	0	63,333	88,059	114,349	120,903	0	0	0	114,991
50-54	0	3	2	8	353	288	34	0	0	688
\$	0	29,793	55,278	90,778	108,803	112,599	106,234	0	0	109,555
55-59	2	2	2	6	111	169	82	4	0	378
\$	15,629	80,402	58,945	101,481	108,603	106,137	107,182	92,579	0	106,006
60-64	0	0	3	2	56	62	30	16	4	173
\$	0	0	87,204	103,191	83,520	94,655	91,260	121,936	80,241	92,621
65-69	0	0	0	1	7	11	7	3	1	30
\$	0	0	0	51,916	60,418	89,485	85,901	96,339	74,162	80,789
70-74	0	0	0	0	2	3	1	0	2	8
\$	0	0	0	0	65,402	70,410	76,704	0	138,705	87,019
75+	0	0	0	0	1	0	0	1	0	2
\$	0	0	0	0	74,230	0	0	67,556	0	70,893
Total	2	5	9	29	982	647	154	24	7	1,859
\$	15,629	50,036	68,525	90,613	109,411	110,066	102,706	111,578	96,076	108,309

Tier 2 Police and Fire Active Members

	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40+	Total
<20	0	0	0	0	0	0	0	0	0	0
\$	0	0	0	0	0	0	0	0	0	0
20-24	0	0	0	0	0	0	0	0	0	0
\$	0	0	0	0	0	0	0	0	0	0
25-29	0	0	0	0	0	0	0	0	0	0
\$	0	0	0	0	0	0	0	0	0	0
30-34	0	0	0	1	0	0	0	0	0	1
\$	0	0	0	88,236	0	0	0	0	0	88,236
35-39	0	2	28	120	5	0	0	0	0	155
\$	0	57,335	96,087	100,754	106,995	0	0	0	0	99,552
40-44	0	6	67	837	170	0	0	0	0	1,080
\$	0	93,054	94,557	104,416	103,214	0	0	0	0	103,552
45-49	0	2	42	825	505	0	0	0	0	1,374
\$	0	90,718	89,895	100,150	104,049	0	0	0	0	101,256
50-54	0	1	23	485	329	0	0	0	0	838
\$	0	88,945	85,255	96,391	100,799	0	0	0	0	97,807
55-59	0	3	7	252	150	0	0	0	0	412
\$	0	126,710	74,186	85,885	90,994	0	0	0	0	87,843
60-64	0	0	10	128	76	0	0	0	0	214
\$	0	0	66,012	80,561	84,074	0	0	0	0	81,129
65-69	0	0	2	36	18	0	0	0	0	56
\$	0	0	69,032	79,431	84,720	0	0	0	0	80,760
70-74	0	0	1	5	1	0	0	0	0	7
\$	0	0	37,841	104,188	78,600	0	0	0	0	91,054
75+	0	0	0	0	0	0	0	0	0	0
\$	0	0	0	0	0	0	0	0	0	0
Total	0	14	180	2,689	1,254	0	0	0	0	4,137
\$	0	94,536	89,542	98,283	100,025	0	0	0	0	98,418

All Tier 1/Tier 2 Active Members

	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40+	Total
<20	0	0	0	0	0	0	0	0	0	0
\$	0	0	0	0	0	0	0	0	0	0
20-24	0	0	0	0	0	0	0	0	0	0
\$	0	0	0	0	0	0	0	0	0	0
25-29	0	0	0	0	0	0	0	0	0	0
\$	0	0	0	0	0	0	0	0	0	0
30-34	0	1	12	15	0	0	0	0	0	28
\$	0	28,353	66,755	65,245	0	0	0	0	0	64,575
35-39	0	29	375	712	25	0	0	0	0	1,141
\$	0	53,835	71,307	73,640	70,030	0	0	0	0	72,290
40-44	19	145	895	4,363	737	12	0	0	0	6,171
\$	85,730	46,131	71,987	82,501	83,842	72,755	0	0	0	80,273
45-49	17	185	769	5,178	3,711	488	5	0	0	10,353
\$	79,874	45,471	68,542	81,429	88,139	89,755	85,613	0	0	82,626
50-54	20	133	619	4,346	3,737	2,321	334	6	0	11,516
\$	114,211	60,735	65,916	74,296	83,922	87,481	83,953	75,514	0	79,820
55-59	11	115	507	4,353	3,355	2,480	1,228	152	5	12,206
\$	95,885	63,802	62,048	66,552	74,510	81,856	86,918	81,446	80,194	73,902
60-64	6	72	333	3,091	2,630	1,715	843	309	49	9,048
\$	73,391	49,040	61,665	63,125	67,463	77,401	85,325	82,473	71,287	69,706
65-69	8	30	119	1,101	816	555	279	86	42	3,036
\$	24,936	53,283	66,882	63,319	68,719	75,789	87,840	93,329	79,771	70,320
70-74	2	12	24	197	119	80	54	23	18	529
\$	26,936	54,381	54,907	63,686	57,006	88,549	88,594	96,064	105,377	70,564
75+	3	1	6	42	18	18	12	7	11	118
\$	11,053	24,387	28,908	53,068	48,347	79,681	65,058	97,544	93,205	61,467
Total	86	723	3,659	23,398	15,148	7,669	2,755	583	125	54,146
\$	82,006	52,437	67,484	73,818	78,913	82,676	86,100	84,452	81,332	76,554

Age/Service and Prior Year Covered Payroll by Rate Pool

Tier 1/Tier 2 SLGRP Active Members

	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40+	Total
<20	0	0	0	0	0	0	0	0	0	0
\$	0	0	0	0	0	0	0	0	0	0
20-24	0	0	0	0	0	0	0	0	0	0
\$	0	0	0	0	0	0	0	0	0	0
25-29	0	0	0	0	0	0	0	0	0	0
\$	0	0	0	0	0	0	0	0	0	0
30-34	0	0	6	9	0	0	0	0	0	15
\$	0	0	74,848	67,632	0	0	0	0	0	70,518
35-39	0	8	128	434	22	0	0	0	0	592
\$	0	60,892	71,698	75,436	67,806	0	0	0	0	74,148
40-44	1	47	301	2,045	486	8	0	0	0	2,888
\$	40,829	60,265	74,038	84,358	85,829	73,145	0	0	0	83,091
45-49	2	63	272	2,581	1,959	338	4	0	0	5,219
\$	27,371	51,414	73,307	84,717	91,477	90,956	85,736	0	0	86,641
50-54	1	54	260	2,222	2,095	1,120	228	4	0	5,984
\$	69,466	56,341	75,924	82,210	88,166	91,180	86,834	82,035	0	85,641
55-59	5	57	225	2,128	1,813	1,305	658	109	5	6,305
\$	39,808	71,628	69,036	78,232	84,973	88,275	89,699	83,000	80,194	83,112
60-64	2	32	157	1,557	1,355	962	557	166	30	4,818
\$	36,414	54,379	72,410	74,643	80,351	89,820	90,184	84,399	78,919	81,215
65-69	5	16	60	638	479	329	204	58	32	1,821
\$	33,057	39,477	74,283	72,467	79,089	88,819	97,175	103,749	81,657	80,751
70-74	0	7	13	120	72	53	38	14	11	328
\$	0	53,437	65,223	75,246	65,832	108,968	99,473	122,071	116,375	83,951
75+	2	0	2	32	12	14	10	5	9	86
\$	16,157	0	28,895	57,264	56,024	91,854	65,021	122,279	104,858	70,769
Total	18	284	1,424	11,766	8,293	4,129	1,699	356	87	28,056
\$	35,250	57,851	72,932	80,484	86,018	89,934	90,436	89,110	87,418	83,603

Tier 1/Tier 2 School District Active Members

	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40+	Total
<20	0	0	0	0	0	0	0	0	0	0
\$	0	0	0	0	0	0	0	0	0	0
20-24	0	0	0	0	0	0	0	0	0	0
\$	0	0	0	0	0	0	0	0	0	0
25-29	0	0	0	0	0	0	0	0	0	0
\$	0	0	0	0	0	0	0	0	0	0
30-34	0	1	4	3	0	0	0	0	0	8
\$	0	28,353	52,739	41,301	0	0	0	0	0	45,401
35-39	0	18	227	192	2	0	0	0	0	439
\$	0	50,136	69,710	63,636	66,476	0	0	0	0	66,236
40-44	6	92	551	1,923	163	0	0	0	0	2,735
\$	16,121	36,424	69,534	77,259	70,529	0	0	0	0	73,794
45-49	7	113	448	2,139	1,409	88	0	0	0	4,204
\$	20,232	35,957	64,171	74,548	79,704	71,989	0	0	0	73,989
50-54	3	61	331	1,747	1,321	1,045	73	1	0	4,582
\$	11,714	40,788	56,331	61,776	73,457	81,613	71,727	39,152	0	69,116
55-59	0	41	242	1,934	1,326	1,012	506	35	0	5,096
\$	0	24,968	53,239	51,777	58,581	71,818	81,081	76,274	0	60,459
60-64	2	30	146	1,342	1,111	652	227	123	15	3,648
\$	35,581	30,498	47,044	48,370	49,672	57,411	70,338	75,449	55,689	52,485
65-69	3	7	46	389	279	199	59	23	9	1,014
\$	11,402	26,644	45,158	45,773	47,195	53,728	56,620	64,111	71,426	48,739
70-74	2	3	9	61	39	20	14	9	4	161
\$	26,936	15,185	25,987	39,402	35,947	39,110	50,551	55,608	54,844	39,432
75+	0	1	4	9	4	3	2	2	2	27
\$	0	24,387	28,915	40,981	34,378	23,198	65,243	35,705	40,765	37,015
Total	23	367	2,008	9,739	5,654	3,019	881	193	30	21,914
\$	18,814	35,499	61,714	63,037	65,182	70,644	75,379	72,723	59,303	64,586

Tier 1/Tier 2 Independent Employers Active Members

	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40+	Total
<20	0	0	0	0	0	0	0	0	0	0
\$	0	0	0	0	0	0	0	0	0	0
20-24	0	0	0	0	0	0	0	0	0	0
\$	0	0	0	0	0	0	0	0	0	0
25-29	0	0	0	0	0	0	0	0	0	0
\$	0	0	0	0	0	0	0	0	0	0
30-34	0	0	2	3	0	0	0	0	0	5
\$	0	0	70,509	82,030	0	0	0	0	0	77,421
35-39	0	3	20	86	1	0	0	0	0	110
\$	0	57,208	86,919	86,910	126,056	0	0	0	0	86,457
40-44	12	6	43	395	88	4	0	0	0	548
\$	124,276	84,253	89,062	98,413	97,530	71,973	0	0	0	97,756
45-49	8	9	49	458	343	62	1	0	0	930
\$	145,186	123,337	82,054	95,032	103,717	108,430	85,123	0	0	99,139
50-54	16	18	28	377	321	156	33	1	0	950
\$	136,226	141,516	86,297	85,670	99,289	100,241	91,095	85,789	0	94,782
55-59	6	17	40	291	216	163	64	8	0	805
\$	142,617	131,218	76,029	79,338	84,471	92,783	104,470	82,903	0	86,874
60-64	2	10	30	192	164	101	59	20	4	582
\$	148,179	87,579	76,594	72,848	81,503	88,162	97,111	109,693	72,544	82,373
65-69	0	7	13	74	58	27	16	5	1	201
\$	0	111,479	109,589	76,676	86,612	79,622	83,930	106,847	94,534	84,697
70-74	0	2	2	16	8	7	2	0	3	40
\$	0	116,478	117,998	69,564	80,231	75,195	148,179	0	132,425	86,095
75+	1	0	0	1	2	1	0	0	0	5
\$	844	0	0	27,570	30,228	78,712	0	0	0	33,516
Total	45	72	227	1,893	1,201	521	175	34	8	4,176
\$	133,007	117,420	84,342	87,852	94,499	94,877	97,978	102,268	97,748	92,007

OPSRP Active General Service Members

	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40+	Total
<20	99	0	0	0	0	0	0	0	0	99
\$	11,813	0	0	0	0	0	0	0	0	11,813
20-24	2,452	48	0	0	0	0	0	0	0	2,500
\$	24,764	25,776	0	0	0	0	0	0	0	24,784
25-29	8,615	1,175	17	0	0	0	0	0	0	9,807
\$	37,598	43,728	36,007	0	0	0	0	0	0	38,330
30-34	9,442	4,750	1,217	15	0	0	0	0	0	15,424
\$	43,396	53,470	56,065	51,974	0	0	0	0	0	47,506
35-39	8,683	5,407	5,403	200	0	0	0	0	0	19,693
\$	45,785	57,124	64,505	61,950	0	0	0	0	0	54,199
40-44	7,116	4,629	4,994	320	0	0	0	0	0	17,059
\$	46,471	57,791	66,968	71,701	0	0	0	0	0	56,017
45-49	5,811	4,099	4,483	316	0	0	0	0	0	14,709
\$	45,431	56,424	64,793	63,066	0	0	0	0	0	54,775
50-54	4,082	3,319	4,099	372	0	0	0	0	0	11,872
\$	44,918	53,183	59,180	55,416	0	0	0	0	0	52,482
55-59	3,398	2,722	3,613	434	0	0	0	0	0	10,167
\$	43,361	51,109	55,101	48,379	0	0	0	0	0	49,821
60-64	2,287	1,983	2,662	320	0	0	0	0	0	7,252
\$	41,705	51,305	55,167	51,445	0	0	0	0	0	49,701
65-69	929	879	967	126	0	0	0	0	0	2,901
\$	37,146	45,285	55,270	43,989	0	0	0	0	0	45,951
70-74	297	211	239	35	0	0	0	0	0	782
\$	24,837	34,614	45,211	47,849	0	0	0	0	0	34,732
75+	81	65	76	8	0	0	0	0	0	230
\$	22,054	27,865	34,646	27,353	0	0	0	0	0	28,041
Total	53,292	29,287	27,770	2,146	0	0	0	0	0	112,495
\$	42,362	53,968	61,133	56,641	0	0	0	0	0	50,289

OPSRP Active Police and Fire Members

	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40+	Total
<20	0	0	0	0	0	0	0	0	0	0
\$	0	0	0	0	0	0	0	0	0	0
20-24	313	3	0	0	0	0	0	0	0	316
\$	50,338	47,623	0	0	0	0	0	0	0	50,312
25-29	1,299	202	1	0	0	0	0	0	0	1,502
\$	59,993	74,154	88,055	0	0	0	0	0	0	61,916
30-34	1,078	805	269	3	0	0	0	0	0	2,155
\$	62,667	80,046	84,478	102,671	0	0	0	0	0	71,937
35-39	648	627	973	35	0	0	0	0	0	2,283
\$	62,542	79,403	89,000	93,766	0	0	0	0	0	78,928
40-44	355	423	714	42	0	0	0	0	0	1,534
\$	61,077	78,955	86,691	95,524	0	0	0	0	0	78,872
45-49	240	259	454	34	0	0	0	0	0	987
\$	59,836	76,240	84,501	92,029	0	0	0	0	0	76,595
50-54	156	170	249	21	0	0	0	0	0	596
\$	65,197	71,739	79,308	84,904	0	0	0	0	0	73,653
55-59	130	100	184	10	0	0	0	0	0	424
\$	66,487	73,855	76,153	71,590	0	0	0	0	0	72,540
60-64	55	68	99	8	0	0	0	0	0	230
\$	66,112	72,848	69,480	76,617	0	0	0	0	0	69,919
65-69	15	18	37	4	0	0	0	0	0	74
\$	64,165	72,039	71,305	67,176	0	0	0	0	0	69,813
70-74	2	6	9	1	0	0	0	0	0	18
\$	40,908	86,051	74,780	22,719	0	0	0	0	0	71,881
75+	1	1	1	0	0	0	0	0	0	3
\$	234,095	59,978	59,803	0	0	0	0	0	0	117,959
Total	4,292	2,682	2,990	158	0	0	0	0	0	10,122
\$	60,937	77,889	84,843	89,456	0	0	0	0	0	72,935

All OPSRP Active Members

	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40+	Total
<20	99	0	0	0	0	0	0	0	0	99
\$	11,813	0	0	0	0	0	0	0	0	11,813
20-24	2,765	51	0	0	0	0	0	0	0	2,816
\$	27,659	27,061	0	0	0	0	0	0	0	27,648
25-29	9,914	1,377	18	0	0	0	0	0	0	11,309
\$	40,533	48,191	38,898	0	0	0	0	0	0	41,463
30-34	10,520	5,555	1,486	18	0	0	0	0	0	17,579
\$	45,371	57,321	61,208	60,423	0	0	0	0	0	50,501
35-39	9,331	6,034	6,376	235	0	0	0	0	0	21,976
\$	46,949	59,439	68,243	66,688	0	0	0	0	0	56,768
40-44	7,471	5,052	5,708	362	0	0	0	0	0	18,593
\$	47,165	59,563	69,435	74,465	0	0	0	0	0	57,902
45-49	6,051	4,358	4,937	350	0	0	0	0	0	15,696
\$	46,002	57,602	66,605	65,880	0	0	0	0	0	56,147
50-54	4,238	3,489	4,348	393	0	0	0	0	0	12,468
\$	45,665	54,087	60,333	56,992	0	0	0	0	0	53,494
55-59	3,528	2,822	3,797	444	0	0	0	0	0	10,591
\$	44,213	51,915	56,121	48,902	0	0	0	0	0	50,731
60-64	2,342	2,051	2,761	328	0	0	0	0	0	7,482
\$	42,278	52,019	55,680	52,059	0	0	0	0	0	50,323
65-69	944	897	1,004	130	0	0	0	0	0	2,975
\$	37,575	45,822	55,861	44,703	0	0	0	0	0	46,544
70-74	299	217	248	36	0	0	0	0	0	800
\$	24,944	36,037	46,284	47,151	0	0	0	0	0	35,568
75+	82	66	77	8	0	0	0	0	0	233
\$	24,639	28,352	34,973	27,353	0	0	0	0	0	29,199
Total	57,584	31,969	30,760	2,304	0	0	0	0	0	122,617
\$	43,746	55,975	63,438	58,892	0	0	0	0	0	52,159

Inactive Member Data Exhibits

For the following exhibits, inactive members are counted by lives, not by segments.

Total Tier 1/Tier 2

Inactive Members			Retirees and Beneficiaries		
	Count	Average Deferred Monthly Benefit		Count	Average Monthly Benefit
<20	0	\$0	<45	560	\$1,191
20-24	0	0	45-49	369	1,784
25-29	0	0	50-54	1,209	3,257
30-34	41	226	55-59	5,287	3,096
35-39	538	587	60-64	18,072	2,975
40-44	2,330	920	65-69	33,790	2,939
45-49	3,819	1,255	70-74	33,351	2,862
50-54	4,491	1,449	75-79	22,582	2,674
55-59	5,745	1,403	80-84	14,117	2,368
60-64	4,715	1,540	85-89	8,308	2,032
65-69	2,970	1,667	90-94	4,338	1,584
70-74	1,141	1,284	95-99	1,451	1,134
75+	1,225	1,472	100+	200	932
Total	27,015	\$1,381	Total	143,634	\$2,712

OPSRP

Inactive Members			Retirees and Beneficiaries		
	Count	Average Deferred Monthly Benefit		Count	Average Monthly Benefit
<20	0	\$0	<45	20	\$1,771
20-24	10	137	45-49	18	1,896
25-29	309	207	50-54	36	1,527
30-34	1,663	327	55-59	287	382
35-39	3,636	440	60-64	938	417
40-44	3,073	484	65-69	2,366	544
45-49	2,603	481	70-74	1,315	498
50-54	2,348	444	75-79	240	434
55-59	2,115	441	80-84	36	402
60-64	1,547	430	85-89	3	272
65-69	756	262	90-94	0	0
70-74	417	117	95-99	0	0
75+	453	67	100+	0	0
Total	18,930	\$416	Total	5,259	\$511

System-Wide Totals

Inactive Members			Retirees and Beneficiaries		
	Count	Average Deferred Monthly Benefit		Count	Average Monthly Benefit
<20	0	\$0	<45	580	\$1,211
20-24	10	137	45-49	387	1,789
25-29	309	207	50-54	1,245	3,207
30-34	1,704	325	55-59	5,574	2,956
35-39	4,174	459	60-64	19,010	2,848
40-44	5,403	672	65-69	36,156	2,782
45-49	6,422	941	70-74	34,666	2,772
50-54	6,839	1,104	75-79	22,822	2,650
55-59	7,860	1,144	80-84	14,153	2,363
60-64	6,262	1,266	85-89	8,311	2,031
65-69	3,726	1,382	90-94	4,338	1,584
70-74	1,558	972	95-99	1,451	1,134
75+	1,678	1,093	100+	200	932
Total	45,945	\$983	Total	148,893	\$2,634

Retiree Healthcare Member Data Exhibits

For the following exhibits, inactive members are counted by lives, not by pool or employer segments.

RHIA Members

	As of December 31, 2018	As of December 31, 2017
Dormant members		
Number	12,954	13,535
Average Age	54.9	54.5
Retired members under age 65 eligible for deferred RHIA benefits		
Number	22,873	24,568
Average Age	60.2	60.3
Retired members receiving RHIA benefits		
Number	46,328	46,656
Average Age	76.2	76.0

RHIPA Members

	As of December 31, 2018	As of December 31, 2017
Active Tier 1/Tier 2 employees of RHIPA employers		
Number	14,688	15,785
Average Age	54.3	53.9
Average Service	21.5	20.8
Retired members receiving RHIPA benefits		
Number	984	1,082
Average Age	61.8	61.6
Average Monthly Subsidy Amount	382	355

Actuarial Methods and Assumptions

Tier 1/Tier 2 (including Retiree Healthcare)

Actuarial Methods and Valuation Procedures

In October 2019 the Board adopted the following actuarial methods and valuation procedures for the December 31, 2018 and 2019 actuarial valuations of PERS Tier 1/Tier 2 benefits.

Actuarial cost method

Entry Age Normal. Under the Entry Age Normal (EAN) cost method, each active member's **entry age present value of projected benefits** is allocated over the member's service from the member's date of entry until their assumed date of exit, taking into consideration expected future compensation increases. Thus, the total pension to which each member is expected to become entitled at retirement is broken down into units, each associated with a year of past or projected future credited service. Typically, when this method is introduced, there will be an initial liability for benefits credited for service prior to that date, and to the extent that the liability is not covered by assets of the plan, there is an unfunded accrued liability to be funded over a stipulated period in accordance with an amortization schedule.

A detailed description of the calculation follows:

- An individual member's **entry age present value of projected benefits** is the sum of the present value of the benefit described under the plan at each possible separation date, determined at the member's entry age using the projected compensation and service at each separation date.
 - An individual member's **entry age present value of projected salaries** is the sum of the present value of the projected compensation over the member's working career associated with each possible future separation date, determined at the member's entry age.
 - An individual member's **present value of projected benefits** is the sum of the present value of the benefit described under the plan at each possible separation date, determined at the valuation date using the projected compensation and service at each separation date.
 - An individual member's **normal cost** for a certain year is the member's **entry age present value of projected benefits** divided by the member's **entry age present value of projected salaries** and multiplied by the member's projected compensation for the year following the valuation date.
 - An individual member's **actuarial accrued liability** is the member's **present value of projected benefits** less the sum of the present value of the member's **normal costs** for each future year, determined at the valuation date using the projected compensation and service at each future year.
 - The plan's **normal cost** is the sum of the individual member normal costs, and the plan's **actuarial accrued liability** is the sum of the individual members' actuarial accrued liabilities.
-

<i>Tier 1/Tier 2 UAL amortization</i>	<p>The Tier 1/Tier 2 UAL amortization period was reset to 20 years as of December 31, 2013. Gains and losses between subsequent odd-year valuations have been amortized as a level percentage of projected combined valuation payroll (Tier 1/ Tier 2 plus OPSRP payroll) over a closed 20 year period from the valuation in which they are first recognized.</p> <p>Senate Bill 1049 was signed into law in June 2019 and requires a one-time re-amortization of Tier 1/Tier 2 UAL over a closed 22 year period at the December 31, 2019 rate-setting actuarial valuation, which will set actuarially determined contribution rates for the 2021-2023 biennium.</p>
<i>Retiree Healthcare UAL amortization</i>	<p>The UAL for Retiree Health Care as of December 31, 2007 is amortized as a level percentage of projected combined valuation payroll (Tier 1/ Tier 2 plus OPSRP payroll) over a closed 10 year period. Gains and losses between subsequent odd-year valuations are amortized as a level percentage of combined valuation payroll over a closed 10 year period from the valuation in which they are first recognized.</p>
<i>Asset valuation method</i>	<p>The actuarial value of assets equals the market value of assets, excluding the Contingency and Capital Preservation Reserves, and the Rate Guarantee Reserve when it is in positive surplus status.</p> <p>Market values are reported to Milliman by PERS. It is our understanding that select real estate and private equity investments are reported on a three-month lag basis. This valuation report does not attempt to quantify any effects of the reporting lag.</p>
<i>Contribution rate stabilization method</i>	<p>Contribution rates for a rate pool (e.g. Tier 1/Tier 2 SLGRP, Tier 1/Tier 2 School Districts rate pool, OPSRP) are confined to a collared range based on the prior contribution rate (prior to application of side accounts, pre-SLGRP liabilities, and 6 percent Independent Employer minimum). The new contribution rate will generally not increase or decrease from the prior contribution rate by more than the greater of 3 percent of payroll or 20 percent of the prior contribution rate. If the funded percentage excluding side accounts drops below 60% or increases above 140%, the size of the collar doubles. If the funded percentage excluding side accounts is between 60% and 70% or between 130% and 140%, the size of the rate collar is increased on a graded scale.</p>
<i>Offset for Member Redirect Contributions</i>	<p>Under Senate Bill 1049, a portion of the 6% of pay member contribution otherwise made to the IAP is redirected to fund Tier 1/Tier 2 and OPSRP defined benefits beginning July 1, 2020. For Tier 1/Tier 2 members, the redirected amount will be 2.50% of pay, and for OPSRP it will be 0.75% of pay. Members with less than \$2,500 in monthly pay (indexed in future years) will be exempt from the redirection. For employer contribution rates shown in this valuation, member redirect contributions are assumed to offset total contribution rates beginning with the July 2021 – June 2023 biennium. Reflecting the effect of the monthly pay level-based exemption noted above, the offset is assumed to be 2.45% of total payroll for Tier 1/Tier 2 and 0.70% of total payroll for OPSRP.</p>
<i>Allocation of Liability for Service Segments</i>	<p>For active Tier 1/Tier 2 members who have worked for multiple PERS employers over their career, the calculated actuarial accrued liability is allocated among the employers based on a weighted average of the Money Match methodology, which uses account balance, and the Full Formula methodology, which uses service. The allocation is 10% (0% for police & fire) based on account balance with each employer and 90% (100% for police & fire) based on service with each employer. The entire normal cost is allocated to the current employer.</p>

<i>Allocation of Benefits-In-Force (BIF) Reserve</i>	The BIF reserve is allocated to each rate pool in proportion to the retiree liability attributable to the rate pool.
<i>Census Data</i>	<p>PERS staff provided the data on plan members and beneficiaries upon which this valuation is based. Milliman did not audit the data, but did review it for reasonableness and consistency with data provided for previous years, in accordance with Actuarial Standard of Practice No. 23.</p> <p>PERS staff assisted in resolving questions and inconsistencies discovered in the data review, and provided updated records or direction for adjusting data as needed.</p> <p>The final census data is expected to be sufficiently accurate and complete for purposes of the actuarial valuation, and we are not aware of any significant concerns or unresolved issues that would materially affect results.</p>
<i>Internal Revenue Code 415 Benefit Limits</i>	<p>Annual benefit limits under Internal Revenue Code 415 are not explicitly reflected in the valuation.</p> <p>In accordance with ORS 238.488, we understand that members whose benefits are restricted by IRC 415 benefit limits are paid the difference between the unrestricted benefit and the IRC 415-restricted benefit from the Public Employee Benefit Equalization Fund.</p>

Economic Assumptions

The Board adopted the following economic assumptions for the December 31, 2018 and 2019 actuarial valuations. All assumptions were reviewed and adopted in conjunction with the 2018 Experience Study, published in July 2019. The assumption selection process and rationale is described in detail in that report.

<i>Investment return</i>	7.20% compounded annually
<i>Pre-2014 Interest crediting</i>	8.00% compounded annually on members' regular account balances 8.25% compounded annually on members' variable account balances
<i>Post-2013 Interest crediting</i>	7.20% compounded annually on members' regular account balances 7.20% compounded annually on members' variable account balances
<i>Inflation</i>	2.50% compounded annually
<i>Administrative expenses</i>	\$32.5 million per year is added to the normal cost.
<i>Payroll growth</i>	3.50% compounded annually. This assumption represents the sum of the inflation assumption and a real wage growth assumption of 100 basis points.
<i>Healthcare cost trend</i>	Healthcare cost trend rates are used to estimate increases in the RHIPA Maximum Subsidy. These rates include consideration of the excise tax scheduled to be introduced in 2022 by the Affordable Care Act.

Year ¹	Rate	Year	Rate
2019	7.1%	2045	5.6%
2020	5.8	2046 – 2047	5.5
2021	5.2	2048 – 2050	5.4
2022 – 2024	5.0	2051 – 2053	5.3
2025	5.1	2054 – 2058	5.2
2026 – 2029	5.0	2059 – 2063	5.1
2030	5.4	2064	5.0
2031 – 2033	5.9	2065	4.9
2034	5.8	2066 – 2067	4.8
2035	5.9	2068	4.7
2036 – 2039	5.8	2069	4.6
2040	5.7	2070	4.5
2041	5.8	2071 – 2072	4.4
2042	5.7	2073	4.3
2043	5.8	2074 – 2093	4.2
2044	5.7	2094+	4.1

¹ For valuation purposes, the health cost trend rates are assumed to be applied at the beginning of the plan year.

Demographic Assumptions

The Board adopted the following demographic assumptions for the December 31, 2018 and 2019 actuarial valuations. All assumptions were reviewed and adopted in conjunction with the 2018 Experience Study, published in July 2019. The study relied on data from an observation period of January 1, 2015 to December 31, 2018, with the exception of the merit scale assumption, which relied on data from 2010 through 2018. Assumptions selected from the study represent an estimate of future experience based on relevant recent experience and reasonable expectations about the future.

Mortality

Healthy Retired Members and Beneficiaries

The following healthy annuitant mortality tables were first adopted in the December 31 valuation of the years shown.

Basic Table	Pub-2010 Healthy Retiree, Sex Distinct, Generational Projection with Unisex Social Security Data Scale	Valuation Year Adopted
School District male	Teachers, no set back	2018
Other General Service male*	General Employees, set back 12 months	2018
Police & Fire male	Public Safety, no set back	2018
School District female	Teachers, no set back	2018
Other General Service female**	General Employees, no set back	2018
Police & Fire female	Public Safety, set back 12 months	2018

* including male beneficiaries of members of all classes

** including female beneficiaries of members of all classes

Disabled Retired Members

The following disabled retiree mortality rates were first adopted for the December 31, 2018 actuarial valuation.

Basic Table	Pub-2010 Disabled Retiree, Sex Distinct, Generational Projection with Unisex Social Security Data Scale
Police & Fire male	Blended 50% Public Safety, 50% Non-Safety, no set back
Other General Service male	Non-Safety, set forward 24 months
Police & Fire female	Blended 50% Public Safety, 50% Non-Safety, no set back
Other General Service female	Non-Safety, set forward 12 months

Non-Annuitant Members

The following non-annuitant mortality tables were first adopted in the December 31 valuation of the years shown.

Basic Table	Pub-2010 Employee, Sex Distinct, Generational Projection with Unisex Social Security Data Scale	Valuation Year Adopted
School District male	120% of Employee table with same job category and set back as Healthy Retiree assumption	2018
Other General Service male	115% of Employee table with same job category and set back as Healthy Retiree assumption	2018
Police & Fire male	100% of Employee table with same job category and set back as Healthy Retiree assumption	2018
School District female	100% of Employee table with same job category and set back as Healthy Retiree assumption	2018
Other General Service female	125% of Employee table with same job category and set back as Healthy Retiree assumption	2018
Police & Fire female	100% of Employee table with same job category and set back as Healthy Retiree assumption	2018

Retirement Assumptions

The retirement assumptions used in the actuarial valuation include the following:

- Retirement from active status/dormant status
- Probability a member will elect a lump sum option at retirement
- Percentage of members who elect to purchase credited service at retirement.

Rates of Retirement from Active Status

The following retirement rate assumptions were first adopted in the December 31, 2018 valuation.

Age	Police & Fire			General Service			School Districts			Judges
	< 13 yrs	13-24 yrs	25+ yrs	< 15 yrs	15-29 yrs	30+ yrs	< 15 yrs	15-29 yrs	30+ yrs	
Less than 50						15.00%			25.00%	
50	1.50%	2.50%	27.50%			15.00%			25.00%	
51	1.50%	2.50%	21.50%			15.00%			25.00%	
52	1.50%	2.50%	21.50%			15.00%			25.00%	
53	1.50%	2.50%	21.50%			15.00%			25.00%	
54	1.50%	3.50%	21.50%			15.00%			25.00%	
55	3.00%	12.00%	25.00%	1.50%	2.50%	15.00%	1.50%	3.50%	25.00%	
56	3.00%	8.00%	25.00%	1.50%	2.50%	15.00%	1.50%	3.50%	25.00%	
57	3.00%	8.00%	25.00%	1.50%	2.50%	15.00%	1.50%	3.50%	25.00%	
58	6.00%	8.00%	25.00%	1.50%	9.00%	21.00%	1.50%	11.00%	27.50%	
59	6.00%	8.00%	25.00%	3.50%	9.00%	21.00%	4.50%	11.00%	27.50%	

Age	Police & Fire			General Service			School Districts			Judges
	< 13 yrs	13-24 yrs	25+ yrs	< 15 yrs	15-29 yrs	30+ yrs	< 15 yrs	15-29 yrs	30+ yrs	
60	6.00%	11.00%	25.00%	6.00%	11.00%	21.00%	6.50%	12.50%	27.50%	8.50%
61	6.00%	14.00%	25.00%	6.00%	11.00%	21.00%	6.50%	12.50%	27.50%	8.50%
62	15.00%	25.00%	38.00%	13.00%	19.50%	31.00%	15.00%	23.50%	34.00%	8.50%
63	15.00%	15.00%	28.00%	11.50%	16.50%	23.00%	13.00%	19.50%	26.50%	8.50%
64	15.00%	15.00%	28.00%	12.50%	16.50%	23.00%	13.00%	19.50%	31.50%	8.50%
65	100.00%	100.00%	100.00%	19.50%	28.00%	35.50%	25.50%	33.50%	45.00%	8.50%
66				27.50%	36.00%	40.50%	23.00%	36.50%	45.00%	8.50%
67				22.50%	26.50%	28.50%	21.00%	34.50%	42.00%	16.00%
68				19.50%	26.50%	28.50%	21.00%	28.00%	28.50%	16.00%
69				19.50%	26.50%	28.50%	21.00%	28.00%	28.50%	16.00%
70				100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

Retirement from Dormant Status

Dormant members are assumed to retire at Normal Retirement Age (age 58 for Tier 1, age 60 for Tier 2, age 60 for Judges, and age 55 for Police & Fire) or at the first unreduced retirement age (30 years of service, or age 50 with 25 years of service for Police & Fire).

Lump Sum Option at Retirement

Members retiring may elect to receive a full or partial lump sum at retirement. The probability that a retiring member will elect a lump sum at retirement is summarized in the table below. The total lump sum rates were first adopted effective December 31, 2016. The partial lump sum rate was first adopted effective December 31, 2018.

Lump Sum Option at Retirement	
Partial Lump Sum:	3.0% for all years
Total Lump Sum:	1.0% for 2019, declining by 0.5% per year until reaching 0.0%
No Lump Sum:	96.0% in 2019, increasing by 0.5% per year until reaching 97.0%

Purchase of Credited Service at Retirement

The following percentages of members are assumed to purchase service credit at time of retirement for the six-month waiting period that occurs prior to establishing membership in the system. These rates were first adopted effective December 31, 2018.

Purchase of Credited Service at Retirement	
Money Match Retirements:	0%
Non-Money Match Retirements:	70%

The cost of the service purchase is estimated based on assumed salary and contribution rates at entry age.

State Judiciary Member Plan Election

All State Judiciary members are assumed to elect to retire under the provisions of Plan B.

Disability Assumptions

There are two disability assumptions used in the valuation - duty disability and ordinary (non-duty) disability. Duty disability rates are separated between Police & Fire and General Service, while ordinary disability is the same for all members. The rates for ordinary disability and for duty disability for General Service were first adopted effective December 31, 2018. The rates for duty disability for Police & Fire were first adopted effective December 31, 2012.

Percentage of the 1985 Disability Class 1 Rates	
Duty Disability Police & Fire	20%
Duty Disability General Service	0.8%
Ordinary Disability	30% with 0.18% cap

Ordinary disability rates are not applied until the minimum service requirement for non-duty disability benefits is met. Disability decrement rates continue to be applied after retirement eligibility.

Termination Assumptions

The General Service termination assumptions were first adopted effective December 31, 2018. The School District termination assumptions were first adopted effective December 31, 2016. The Police & Fire termination assumption was first adopted effective December 31, 2014.

Sample termination rates are shown for each group below:

Duration from Hire Date	School District Male	School District Female	General Service Male	General Service Female	Police & Fire
0	16.63%	13.50%	15.00%	15.50%	10.00%
1	14.25%	12.50%	12.50%	14.50%	5.97%
5	6.86%	7.13%	7.19%	8.04%	3.31%
10	3.31%	3.85%	4.13%	4.77%	2.23%
15	2.30%	2.68%	2.93%	3.43%	1.50%
20	1.62%	1.95%	2.08%	2.47%	1.01%
25	1.20%	1.50%	1.47%	1.78%	0.80%
30+	1.20%	1.50%	1.40%	1.40%	0.80%

Termination rates are not applied after a member reaches retirement eligibility. For a complete table of rates, please refer to the 2018 Experience Study report for the System, published in July 2019.

Oregon Residency Post-Retirement

For purposes of determining eligibility for SB 656/HB 3349 benefit adjustments, 85% of retirees are assumed to remain Oregon residents after retirement. This assumption was first adopted effective December 31, 2012.

Police & Fire Unit Purchase

Police & Fire members retiring from active service prior to age 65 are assumed to purchase additional benefit units at an estimated employer matching cost of \$4,000.

Salary Increase Assumptions

The salary increase assumptions reflected in the actuarial valuation include:

- Merit scale increases in addition to the payroll growth increase
- Unused Sick Leave adjustments
- Vacation Pay adjustments

Merit Scale Increases

Merit scale increases are based on duration of service for the following groups with sample rates shown in the following table. These rates were first adopted effective December 31, 2018, except for the Police & Fire assumption, which was adopted December 31, 2016.

Duration	School District	Other General Service	Police & Fire
0	3.72%	3.70%	4.44%
1	3.43%	3.37%	3.95%
5	2.34%	2.24%	2.39%
10	1.14%	1.21%	1.23%
15	0.17%	0.54%	0.69%
20	-0.53%	0.16%	0.52%
25	-0.89%	0.01%	0.44%
30+	-0.95%	0.00%	0.21%

The assumed merit scale increase for active State Judiciary members is 0.0%.

For a complete table of rates, please refer to the 2018 Experience Study for the System, published in July 2019.

Unused Sick Leave

Members covered by the provision allowing unused sick leave to be used to increase final average salary at time of retirement are assumed to receive increases in their final average salary in accordance with the table below. This adjustment is not applied to disability benefits. Effective dates for the current assumption are shown in the table.

Unused Sick Leave	Valuation year adopted
Actives	
• State General Service Male	7.00% 2018
• State General Service Female	3.75% 2010
• School District Male	7.75% 2018
• School District Female	5.75% 2012
• Local General Service Male	5.25% 2018
• Local General Service Female	3.50% 2018
• State Police & Fire	4.00% 2018
• Local Police & Fire	7.25% 2016
Dormant Members	3.25% 2016

Vacation Pay

Members eligible to include a lump sum payment of unused vacation pay in their final average salary calculation at time of retirement are assumed to receive increases in their final average salary in accordance with the table below. This adjustment is not applied to disability benefits. These rates were adopted December 31, 2018, except the school district rates which were adopted effective December 31, 2012.

Vacation Pay	
Tier 1	
• State General Service	2.25%
• School District	0.25%
• Local General Service	3.25%
• State Police & Fire	2.75%
• Local Police & Fire	4.25%
Tier 2	
	0.00%

Retiree Healthcare Participation

The following percentages of eligible retiring members are assumed to elect RHIPA and RHIA coverage:

Retiree Healthcare Participation	
RHIPA	
• 8 – 9 years of service	10.0%
• 10 – 14 years of service	10.0%
• 15 – 19 years of service	15.0%
• 20 – 24 years of service	19.0%
• 25 – 29 years of service	26.0%
• 30+ years of service	34.0%
RHIA	
• Healthy Retired	32.0%
• Disabled Retired	20.0%

The RHIA disabled retired rate was first adopted December 31, 2008. The RHIA healthy retired rate and RHIPA rates for 15 or more years of service were adopted December 31, 2018. RHIPA Rates up through 14 years of service were first adopted effective December 31, 2012

Spouse Assumptions

Non-annuitant death benefits are valued assuming all members are married. Future participants in RHIA and RHIPA are assumed to have eligible spouses. For these purposes, the spouse is assumed to be three years younger than a male member or three years older than a female member.

Actuarial Equivalence Assumptions

Early retirement factors and optional form conversion factors are assumed to remain level in all future years.

For members with pop-up annuities, the future amount payable if the spouse predeceases the member is estimated based on an assumed 0.90 optional form conversion factor for 100% contingent annuities and an assumed 0.94 optional form conversion factor for 50% contingent annuities.

OPSRP

Most of the methods and assumptions adopted for the OPSRP valuation are the same as those used for Tier 1/Tier 2. The methods and assumptions that differ for OPSRP are summarized below. The Board adopted the following methods, procedures and assumptions for the December 31, 2018 and December 31, 2019 actuarial valuations.

Actuarial Methods and Valuation Procedures

<i>OPSRP UAL amortization</i>	The UAL as of December 31, 2007 is amortized as a level percentage of projected combined valuation payroll (Tier 1/ Tier 2 plus OPSRP payroll) over a closed period 16 year period. Gains and losses between subsequent odd-year valuations are amortized as a level percentage of combined valuation payroll over 16 years from the valuation in which they are first recognized.
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Economic Assumptions

<i>Administrative expenses</i>	\$8.0 million per year is added to the normal cost.
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Demographic Assumptions

Rates of Retirement from Active Status

Age	Police & Fire			General Service			School Districts		
	< 13 yrs	13-24 yrs	25+ yrs	< 15 yrs	15-29 yrs	30+ yrs	< 15 yrs	15-29 yrs	30+ yrs
50	0.50%	1.50%	5.50%						
51	0.50%	1.50%	5.50%						
52	0.50%	1.50%	5.50%						
53	0.50%	1.50%	25.00%						
54	0.50%	1.50%	21.50%						
55	2.00%	5.00%	25.00%	1.00%	2.50%	5.00%	1.00%	2.50%	5.00%
56	2.00%	5.00%	25.00%	1.00%	2.50%	5.00%	1.00%	2.50%	5.00%
57	2.00%	5.00%	25.00%	1.00%	2.50%	7.50%	1.00%	2.50%	7.50%
58	5.00%	5.00%	25.00%	1.50%	3.00%	30.00%	1.50%	3.00%	30.00%
59	5.00%	5.00%	25.00%	2.00%	3.00%	25.00%	1.50%	3.00%	25.00%
60	5.00%	15.00%	25.00%	3.00%	3.75%	20.00%	2.50%	3.75%	20.00%
61	5.00%	8.50%	25.00%	3.00%	5.00%	20.00%	3.00%	5.00%	20.00%
62	10.00%	25.00%	38.00%	8.00%	12.00%	30.00%	6.00%	12.00%	30.00%
63	7.00%	15.00%	28.00%	7.00%	10.00%	20.00%	6.00%	10.00%	20.00%
64	7.00%	15.00%	28.00%	7.00%	10.00%	20.00%	6.00%	10.00%	20.00%
65	100.00%	100.00%	100.00%	14.50%	35.00%	20.00%	11.50%	35.00%	20.00%
66				18.50%	33.00%	20.00%	12.50%	33.00%	20.00%
67				17.00%	22.00%	30.00%	11.00%	22.00%	30.00%
68				13.00%	17.00%	20.00%	9.00%	17.00%	20.00%
69				13.00%	17.00%	20.00%	9.00%	17.00%	20.00%
70				100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

Retirement from Dormant Status

Dormant members are assumed to retire at their Normal Retirement Age.

Disability Assumptions

Assumed disability rates are not applied to OPSRP members after they reach Normal Retirement Age.

Cost of living increases for the adjusted salary used to calculate retirement benefits for disabled OPSRP members are estimated based on the valuation inflation assumption.

Changes in Actuarial Methods and Assumptions — Tier 1/Tier 2 and OPSRP

A summary of key changes implemented since the December 31, 2017 valuation are described briefly below. Additional detail and a comprehensive list of changes in methods and assumptions can be found in the 2018 Experience Study for the System, published in July 2019.

Changes in Actuarial Methods and Allocation Procedures

Tier 1/Tier 2 UAL Amortization

Senate Bill 1049 was signed into law in June 2019 and requires a one-time re-amortization of Tier 1/Tier 2 UAL over a closed 22 year period at the December 31, 2019 rate-setting actuarial valuation, which will set actuarially determined contribution rates for the 2021-2023 biennium.

Allocation of Liability for Service Segments

For purposes of allocating Tier 1/Tier 2 members' actuarial accrued liability among multiple employers, the valuation uses a weighted average of the Money Match methodology and the Full Formula methodology used by PERS when the member retires. The weights are determined based on the prevalence of each formula among the current Tier 1/Tier 2 population. For the December 31, 2016 and December 31, 2017 valuations, the Money Match was weighted 15 percent for General Service members and 0 percent for Police & Fire members. For the December 31, 2018 and December 31, 2019 valuations, this weighting has been adjusted to 10 percent for General Service members and 0 percent for Police & Fire members, based on the projected proportion of liability for new retirees attributable to Money Match benefits at those valuation dates.

Changes in Economic Assumptions

Administrative Expenses

The administrative expense assumptions were updated to \$32.5 million per year for Tier 1/Tier 2 and \$8.0 million per year for OPSRP. Previously these were assumed to be \$37.5 million per year and \$6.5 million per year, respectively.

Healthcare Cost Inflation

The healthcare cost inflation assumption for the maximum RHIPA subsidy was updated based on analysis performed by Milliman's healthcare actuaries. This analysis includes the consideration of the excise tax that is scheduled to be introduced in 2022 by the Affordable Care Act.

Changes in Demographic Assumptions

Healthy Annuitant Mortality Base Tables

The healthy annuitant mortality base tables were updated to Pub-2010 generational Healthy Retiree mortality tables with group-specific job category and setback adjustments. Previously they were based on RP-2014 generational Healthy Annuitant mortality tables with group-specific collar and setback adjustments.

Disabled Mortality Base Tables

The disabled mortality base tables were updated to Pub-2010 generational Disabled Retiree mortality tables with group-specified job category and setback adjustments. Previously they were based on RP-2014 generational Disabled Retiree mortality tables.

Non-Annuitant Mortality Base Tables

The non-annuitant mortality base tables were updated to Pub-2010 generational Employee mortality tables with the same group-specific job category and setback adjustments as for healthy annuitants, and with an

additional scaling factor adjustment for certain subgroups. Previously they were based on RP-2014 generational Employee mortality tables with the same group-specific collar and setback adjustments as for healthy annuitants.

Mortality Improvement Projection Scale

The mortality improvement projection scale applied to each of the base mortality tables described above was updated to reflect the most recent 60-year average unisex Social Security experience available at the time the assumptions were reviewed. The current assumption is based on experience through 2015. The previous assumption was based on experience through 2013.

Disability, Retirement from Active Status, and Termination

Rates for disability, retirement from active status, and termination were adjusted for certain subgroups. The rates at which members are assumed to elect partial lump sums or purchase credited service at retirement were also adjusted.

Merit Increases, Unused Sick Leave, and Vacation Pay

Assumed merit increases, Unused Sick Leave, and Vacation Pay rates were adjusted for certain subgroups.

Retiree Healthcare Participation

The RHIA participation rate for healthy retirees was reduced from 35% to 32%. The RHIPA participation rate was updated for members with 15 or more years of service.

Summary of Plan Provisions

Summary of Plan Provisions

The following section summarizes the plan provisions considered in the actuarial valuation. A more detailed description of plan provisions is available from PERS.

<i>Membership</i>	All employees of public employers participating in this System who are in qualifying positions become members of the System after completing six months of service except those who are eligible for and have elected to participate in an optional retirement plan. Different benefit provisions of the plan apply based on date of hire.	
	Tier 1	Hired prior to 1996
	Tier 2	Hired after 1995 and before August 29, 2003
	OPSRP	Hired after August 28, 2003, and neither a judge nor a former Tier 1/Tier 2 member eligible to reestablish Tier 1/Tier 2 membership
	Judges	Members of the State Judiciary
<i>Member Contributions</i>	Judges	7% of salary
	All others	None as of valuation date Prior to January 1, 2004, Tier 1/Tier 2 members contributed 6% of salary to member accounts. Effective July 1, 2020: 2.50% of salary for Tier 1/Tier 2 members and 0.75% of salary for OPSRP members (only applicable to members earning at least \$2,500 per month, indexed for inflation) will be contributed to Employee Pension Stability Accounts (EPSA). EPSA balances will not affect the calculation of Money Match or Formula Plus Annuity benefits.
<i>Employer Contributions</i>	Set by the PERS Board based on actuarial calculations that follow Board rate-setting policies for employers.	

Summary of Chapter 238 Provisions — Tier 1/Tier 2 and Judges

<i>Normal Retirement Date</i>	Police and Fire	Age 55
	Judges	Age 65
	Tier 1 General Service	Age 58
	Tier 2 General Service	Age 60

Normal Retirement Allowance For Members who are not Judges, the greatest of the Full Formula benefit, the Money Match benefit, or the Formula Plus Annuity benefit (only available to Members who made contributions before August 21, 1981). For Members with 15 or more years of creditable service, the benefit will not be less than the minimum service retirement allowance of \$100 per month, as described in ORS 238.310.

Full Formula The percentage multiplier from the table below multiplied by final average salary and years of creditable service plus a prior service pension, if applicable.

Percentage Multiplier	Membership Classification
2.00%	Fire, Police and Legislators
1.67%	All other members

Money Match The Member’s account balance and a matching employer amount converted to an actuarially equivalent annuity.

Formula Plus Annuity The Member’s account balance converted to an actuarially equivalent cash refund annuity plus the percentage multiplier from the table below multiplied by final average salary and years of creditable service, plus a prior service pension, if applicable.

Percentage Multiplier	Membership Classification
1.35%	Fire, Police and Legislators
1.00%	All other members

Judges Final average salary multiplied by the first percentage multiplier from the table below for up to 16 years of service plus the second percentage multiplier for any service in excess of 16 years, but not to exceed the maximum percentage of final average salary also shown below. Judges must elect Plan A or Plan B no later than age 60. A “Plan B” judge must serve as a pro tem judge for a total of 175 days postretirement.

Plan	Percentage Factor (up to 16 years)	Percentage Factor (after 16 years)	Maximum Percentage of Final Average Salary
A	2.8125%	1.67%	65%
B	3.75%	2.00%	75%

Final Average Salary The greater of:

- Average salary earned during the three calendar years in which the member was paid the highest salary, even if one of those years is less than a full calendar year.
- Total salary earned over the last 36 months of employment divided by the actual months of service during that 36 month period.

Covered salary for this purpose includes the value of member contributions assumed and paid by employers, any payment due to an employer’s participation in the Unused Sick Leave program, and, for Tier 1 members, lump sum payment of unused vacation time. For Tier 2 members, covered salary is limited by Internal Revenue Code 401(a)(17). The limit was \$280,000 in 2019. Tier 1 members are not subject to this limit.

Under Senate Bill 1049, passed during the 2019 legislative session, the salary included in the determination of Final Average Salary will be limited for all members beginning in 2020. The limit will be equal to \$195,000 in 2020, and will be indexed with inflation in later years. For this purpose, payment due to the unused sick leave program will not be affected by the Final Average Salary limit. However, lump sum payments of unused vacation time for Tier 1 members will be included in total salary subject to the limit.

Creditable Service The number of years and months an active Member is paid a salary by a participating PERS employer and PERS benefits are being funded.

Prior Service Pension Benefits payable on account of Prior Service Credit for a member’s service with a participating employer prior to the employer’s participation in PERS, as described in ORS 238.442.

SB 656/HB 3349 Adjustment All members receive an increase to their monthly retirement benefit equal to the greater of the increase under Senate Bill 656 (SB 656) or House Bill 3349 (HB 3349). The adjustment for SB 656 only applies to members who established membership prior to July 14, 1995. Senate Bill 822, enacted in 2013, limits eligibility for these adjustments to only PERS beneficiaries who pay Oregon state income tax.

SB 656 Increase	Years of Service	General Service	Police & Fire
	0-9	0.0%	0.0%
	10-14	1.0	1.0
	15-19	1.0	1.0
	20-24	2.0	2.5
	25-29	3.0	4.0
	30 & Over	4.0	4.0

HB 3349 Increase

$$\left(\frac{1}{1 - \text{maximum Oregon personal income tax rate (limited to 9\%)}} - 1 \right) \times \frac{\text{Service prior to October 1, 1991}}{\text{All Service}}$$

<i>Early Retirement Eligibility</i>	Police and Fire Judges General Service	Age 50 or 30 years of service Age 60 Age 55 or 30 years of service
<i>Early Retirement Allowance</i>		Normal retirement allowance, actuarially reduced to early retirement age. However, there is no reduction applied if a member has completed 30 years of service (25 years for police & fire members) or for judges in Plan B.
<i>Vesting</i>		Contributions made in any part of five calendar years or attainment of age 50 (45 for police & fire) while working in a qualifying position.
<i>Termination Benefits</i>	Non-Vested Vested	Payment of member's account balance. Same as normal (or early) retirement allowance, but commencement is deferred to normal (or early) retirement date.
<i>Optional Forms of Retirement Allowance</i>		The normal form of benefit is a cash refund annuity (joint and two-thirds survivor contingent annuity for a married judge). All optional amounts are adjusted to be actuarially equivalent. Options Available <ul style="list-style-type: none"> • Life annuity • Cash refund annuity • Life annuity guaranteed 15 years • Joint and 50% or 100% survivor contingent annuity, with or without pop-up feature • Partial Lump Sum: Refund of member contribution account balance plus a pension (under any optional form) of employer-paid portion of the Full Formula or Money Match annuity. • Total Lump Sum: Refund of member contribution account plus a matching employer amount.
<i>Preretirement Death Benefit Eligibility</i>	Judges All others	Six or more years of service. Death occurring while the member is an employee of a participating employer or within 120 days of termination provided the employee does not withdraw the account balance or retire, or a result of injuries received while in the service of a participating employer.
<i>Preretirement Death Benefit</i>	Judges All others	The spouse shall receive a life pension equal to two-thirds of the service retirement allowance. The beneficiary of an unmarried judge shall receive the member's accumulated contributions with interest. The member's account balance plus a matching employer amount.
<i>Additional Police & Fire Death Benefits</i>		Upon the death of a retired police officer or firefighter, the surviving spouse or dependent children under age 18 will receive a monthly benefit based on 25% of the cash refund retirement allowance due to police and fire service.
<i>Disability Benefit Eligibility</i>	Duty Non-Duty	Disability occurring as a direct result of a job-related injury or illness, regardless of length of service. Disability occurring after ten years of service (six years, if a judge), but prior to normal retirement eligibility.

<i>Disability Benefits</i>	<p>The normal retirement allowance calculated based on the service credit that would have been earned if the member had continued working to age 58 (age 55 for police and fire, age 65 for judge members) payable commencing immediately.</p> <p>Fire and Police Members' Alternative</p> <p>In lieu of the above, firefighters and police officers who qualify for duty disability may elect to receive a benefit of 50% of final average monthly salary at the time of disablement.</p> <p>Minimum Monthly Retirement Allowance</p> <p>Judges 45% of final average monthly salary.</p> <p>All others \$100 for a member with at least 15 years of creditable service, actuarially reduced if an optional form of benefit is chosen.</p> <p>Reduction of Benefits</p> <p>Whenever a disabled employee's disability benefit and earned income for any month exceed the monthly salary received at the time of disablement or \$400, if greater, the disability benefit will be reduced by the excess.</p> <p>For Tier Two members, the disability benefit may not exceed the member's salary at the time of disablement.</p>
<i>Waiting Time Service Purchases</i>	<p>Members with at least 10 years of combined credited and/or prior service under PERS may elect to purchase service credit for the six-month "waiting time" period worked prior to establishing membership in the system. The waiting time purchase is interest-free and must be purchased in one payment prior to retirement.</p>
<i>Police & Fire Unit Purchases</i>	<p>Police & fire members may purchase 60-month annuity benefits (up to \$80 per month) that must be paid out by age 65 and cannot commence prior to the earliest retirement age. The amount purchased by the member is matched by the employer. In certain situations, such as termination of employment prior to retiring, or working beyond age 65, the employer's matching purchase is forfeited.</p>
<i>Automatic Postretirement Cost of Living Adjustments (COLAs)</i>	<p>All monthly pension and annuity benefits except unit purchases are eligible for postretirement adjustments. As a result of the Senate Bills 822 and 861 and the Oregon Supreme Court decision in <i>Moro v. State of Oregon</i>, automatic postretirement adjustments are based on a blended COLA as described below.</p> <p>Automatic COLA prior to SB 822 and SB 861 Benefits were adjusted annually to reflect the increase or decrease in the Consumer Price Index (Portland area - all items) as published by the Bureau of Labor Statistics.</p> <p>The maximum adjustment to be made for any year was 2% of the previous year's benefit. Any CPI change in excess of the limit was accumulated for future benefit adjustments which would otherwise be less than the limit. No benefit was decreased below its original amount.</p> <p>Automatic Adjustments Provided by Senate Bills 822 and 861 This legislation, passed in 2013, provided for that benefits would be increased annually based on a marginal rate schedule. The increase is calculated as 1.25% on the first \$60,000 of annual benefit and 0.15% on amounts above \$60,000 of annual benefit.</p>

	Blended COLA after <i>Moro</i> decision	The Supreme Court decision in <i>Moro</i> requires that members “will be entitled to receive during retirement a blended COLA rate that reflects the different COLA provisions applicable to benefits earned at different times.” The Supreme Court did not articulate a specific methodology for determining the blended COLA. For purposes of this valuation, we have determined the blend based on creditable service earned before and after October 2013. This approach is consistent with OAR 459-005-0510 adopted by the PERS Board in September 2015.
<i>Ad Hoc Adjustments</i>		From time to time, as granted by the Legislature, retired members and beneficiaries have received increases in their monthly benefits.
<i>Variable Annuity Program</i>	Contributions	Prior to January 1, 2004, members could elect to have 25, 50 or 75 percent of their contributions invested in the variable account.
	Benefit	At retirement, members may elect to receive a variable annuity with the funds accumulated in their variable account. Alternatively, members may elect to have all or a portion of the funds in their variable account transferred back to the regular account and receive an annuity from the System as though no variable annuity program existed. The employer-provided benefit, however, is based on the earnings the member would have received in the regular account.
<i>Interest Credit on Member Accounts</i>	Tier 1 Regular	Actuarially assumed rate of return until the rate guarantee reserve has been fully funded for three consecutive years and the Board elects to credit additional interest.
	Tier 2 Regular	Amount determined by the Board based on actual investment earnings of the regular account.
	Variable	Actual earnings in variable account.
<i>Retiree Healthcare – Medicare Supplement (RHIA)</i>	Retiree Eligibility	All of the following must be met: (a) Currently receiving a retirement allowance from the System, (b) Covered for eight years before retirement, (c) Enrolled in a PERS-sponsored health plan, and (d) Enrolled in both Medicare Part A and Part B.
	Surviving Spouse or Dependent Eligibility	A surviving spouse or dependent of a deceased RHIA-eligible retiree is eligible for RHIA benefits if they are enrolled in both Medicare Part A and Part B, and <i>either</i> of the following criteria are met: (a) Currently receiving a retirement allowance from the System, or (b) The surviving spouse or dependent was covered under the eligible retiree’s PERS-sponsored health insurance at the time of the retiree’s death and the deceased retiree retired before May 1, 1991.

	Benefit Amount	A monthly contribution of up to \$60 per retiree is applied to PERS-sponsored Medicare supplemental insurance costs.
<i>Retiree Healthcare – Under Age 65 (RHIPA)</i>	Retiree Eligibility	Retired PERS members who were state employees at the time of retirement, are enrolled in a PERS-sponsored health plan, and are not eligible for Medicare.
	Surviving Spouse or Dependent Eligibility	A surviving spouse or dependent of a deceased RHIPA-eligible retiree is eligible for RHIPA benefits if they are not yet eligible for Medicare, and <i>either</i> of the following criteria are met: <ul style="list-style-type: none"> (a) Currently receiving a retirement allowance from the System, or (b) The surviving spouse or dependent was covered under the eligible retiree’s PERS-sponsored health plan at the time of the retiree’s death and the deceased retiree retired on or after September 29, 1991.
	Benefit	A percentage (as shown in the table below) of the maximum monthly subsidy based on years of service. The maximum monthly subsidy is calculated annually as the average difference between the health insurance premiums paid by active state employees and the premium retirees would pay if they were rated separately from active state employees. The maximum monthly subsidy for 2019 is \$412.48 per month.

Years of Service with State Employer	Subsidized Amount
Under 8	0%
8-9	50%
10-14	60%
15-19	70%
20-24	80%
25-29	90%
30 & Over	100%

Summary of Chapter 238A Provisions — OPSRP

<i>Normal Retirement Date</i>	<p>Police & Fire Age 60 or age 53 with 25 years of retirement credit</p> <p>General Service Age 65 or age 58 with 30 years of retirement credit</p> <p>School Districts Age 65 or age 58 with 30 calendar years of active membership</p>
<i>Normal Retirement Allowance</i>	A single life annuity equal to final average salary times years of retirement credit attributable to service as fire and police times 1.8% plus final average salary times all other years of retirement credit times 1.5%.
<i>Final Average Salary</i>	<p>The greater of:</p> <ul style="list-style-type: none"> • Average salary earned during the three calendar years in which the member was paid the highest salary, even if one of those years is less than a full calendar year. • Total salary earned over the last 36 months of employment divided by the actual months of service during that 36 month period. <p>Covered salary for this purpose includes base pay, plus overtime up to an average amount, plus bonuses, plus member contributions paid by the employer on a salary reduction basis. Excludes payments of unused vacation or accumulated sick leave at retirement, and member contributions “assumed and paid” by the employer.</p> <p>For OPSRP members, covered salary is limited by Internal Revenue Code 401(a)(17) The limit was \$280,000 in 2019.</p> <p>Under Senate Bill 1049 passed during the 2019 legislative session, the salary included in the determination of Final Average Salary will be limited for all members beginning in 2020. The limit will be equal to \$195,000 in 2020, and will be indexed with inflation in later years.</p>
<i>Early Retirement Eligibility</i>	<p>Police & Fire Age 50 and 5 years of vesting service</p> <p>General Service Age 55 and 5 years of vesting service</p>
<i>Early Retirement Allowance</i>	Normal retirement allowance, actuarially reduced to early retirement age.
<i>Vesting</i>	Five years or attainment of normal retirement age.
<i>Vested Termination Benefit</i>	Same as normal (or early) retirement allowance, but commencement is deferred to normal (or early) retirement date.
<i>Optional Forms of Retirement Benefit</i>	<p>The normal form of benefit is a life annuity. All optional amounts are adjusted to be actuarially equivalent.</p> <p>Options Available</p> <ul style="list-style-type: none"> • Life annuity • Joint and 50% or 100% survivor contingent benefit, with or without pop-up feature • Lump sum if monthly normal retirement benefit is less than \$200 or if lump sum value is less than \$5,000.
<i>Preretirement Death Benefit Eligibility</i>	Death of a vested member before retirement benefits begin.

<i>Preretirement Death Benefit</i>	If member was eligible for early retirement, the actuarial equivalent of 50% of the early retirement benefit the participant was eligible to receive at date of death. If member was not eligible for early retirement, the actuarial equivalent of 50% of the early retirement benefit the participant would have been eligible to receive if he terminated employment on his date of death and retired at the earliest possible date.
<i>Disability Benefit Eligibility</i>	<p>Duty Disablement occurring as a direct result of a job-related injury or illness, regardless of length of service.</p> <p>Non-Duty Disablement occurring after ten years of service, but prior to normal retirement eligibility.</p>
<i>Disability Benefit Amounts</i>	<p>Preretirement Benefit 45% of salary during last full month of employment before disability, reduced if the total benefit exceeds 75% of salary. Benefit is payable monthly until normal retirement age.</p> <p>Retirement Benefit Same formula as Normal Retirement Benefit, except: Final average salary is adjusted to reflect cost-of-living increases from date of disability to normal retirement age, and Retirement credits continue to accrue from date of disability to normal retirement age.</p>
<i>Postretirement Adjustments</i>	<p>All monthly pension and annuity benefits except unit purchases are eligible for postretirement adjustments. As a result of the Senate Bills 822 and 861 and the Oregon Supreme Court decision in <i>Moro v. State of Oregon</i>, automatic postretirement adjustments are based on a blended COLA as described below.</p> <p>Automatic COLA prior to SB 822 and SB 861 Benefits were adjusted annually to reflect the increase or decrease in the Consumer Price Index (Portland area - all items) as published by the Bureau of Labor Statistics. The maximum adjustment to be made for any year was 2% of the previous year's benefit. Any CPI change in excess of the limit was accumulated for future benefit adjustments which would otherwise be less than the limit. No benefit was decreased below its original amount.</p> <p>Automatic Adjustments Provided by Senate Bills 822 and 861 This legislation, passed in 2013, provided for that benefits would be increased annually based on a marginal rate schedule. The increase is calculated as 1.25% on the first \$60,000 of annual benefit and 0.15% on amounts above \$60,000 of annual benefit.</p>

Changes in Plan Provisions — Tier 1/Tier 2 and OPSRP

Senate Bill 1049, signed into law in June 2019, made a number of changes to the PERS system, including:

- Effective with calendar year 2020, annual salary included in the calculation of Final Average Salary will be limited to \$195,000 (as indexed for inflation in future years).
- The PERS Board was required to implement a one-time re-amortization of Tier 1/Tier 2 UAL over a closed 22 year period at the December 31, 2019 rate-setting actuarial valuation, which will set actuarially determined contribution rates for the 2021-2023 biennium.
- For years 2020 through 2024, the limitation on the hours that can be worked by a rehired retiree is eliminated. Effective January 1, 2020, contributions will also be charged on the payroll of rehired retirees.
- Effective July 1, 2020, a portion of the 6% of salary member contribution to the Individual Account Program (IAP) will be redirected to Employee Pension Stability Accounts, which will help fund the defined benefits provided under Tier 1/Tier 2 and OPSRP. For Tier 1/Tier 2 members, the prospectively redirected amount will be 2.50% of salary, and for OPSRP members the amount will be 0.75% of salary. The redirection will only apply to members earning \$2,500 per month or more (indexed for inflation).

The projected benefits in this valuation reflect the limit on annual salary starting in 2020, which reduced the actuarial accrued liability. The re-amortization of Tier 1/Tier 2 UAL is incorporated in the calculation of the advisory Tier 1/Tier 2 UAL rate. The changes related to the work after retirement provisions are not explicitly reflected in the determination of liabilities or contribution rates shown in this valuation. Our understanding is that redirected member contributions are expected to help pay the total collared contribution rates adopted for the 2021-2023 biennium and will serve as an offset to employer contributions, and we have illustrated that offset for advisory 2021-23 rates shown in this report.

Risk Disclosure



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

Risk Disclosure

The purpose of this appendix is to identify, assess, and provide illustrations of risks that are significant to Oregon PERS, and in some cases to PERS members.

The results of any actuarial valuation are based on one set of assumptions. Although we believe the current assumptions for the System provide a reasonable estimate of future expectations, it is almost certain that future experience will differ from the assumptions to some extent. It is therefore important to consider the potential impacts of these potential differences between assumptions and experience when making decisions that may affect the future financial health of the System, or of the System's members.

Actuarial Standard of Practice No. 51 (ASOP 51) addresses these issues by providing actuaries with guidance for assessing and disclosing the risk associated with measuring pension liabilities and the determination of pension plan contributions. Specifically, it directs the actuary to:

- Identify risks that may be significant to the plan.
- Assess the risks identified as significant to the plan. The assessment does not need to include numerical calculations.
- Disclose plan maturity measures and historical information that are significant to understanding the plan's risks.

ASOP 51 states that if in the actuary's professional judgment, a more detailed assessment would be significantly beneficial in helping the individuals responsible for the plan to understand the risks identified by the actuary, then the actuary should recommend that such an assessment be performed.

This Section uses the framework of ASOP 51 to communicate important information about significant risks to the System, the System's maturity, and relevant historical data.

Identification of Risks

There are a number of factors that affect future valuation results. To the extent actual experience for these factors varies from the assumptions, this will likely cause either increases or decreases in the System's future funding level and calculated contribution rates. Examples of factors that can have a significant impact on valuation results are:

- Investment return, as this will impact the level of assets available to pay benefits
- Change in combined (Tier 1/Tier 2 and OPSRP) valuation payroll, as this will impact the size of contributions received and the ability to finance unfunded amounts as a percent of future pay
- Legislative changes and judicial rulings, as these can impact both benefit levels and contribution rates
- Individual member salary variation, as this will impact the size of benefits members receive as a percent of final earnings
- Mortality, as this will impact how long retirees receive benefits
- Service retirement, as this will impact how long retirees receive benefits, the size of retiree benefits, the amount of time over which employer and employee contributions are received, and the amount of time for investment earnings to accumulate on those contributions
- Termination (members leaving active employment for reasons other than death, disability or service retirement), as this will impact the size of benefits for those members

Investment Return

Of the factors listed above, we believe the factor with the greatest potential risk is future investment returns. For this reason, we prepare a financial modeling analysis for the PERS Board each year that illustrates a wide range of potential future investment returns. In that analysis, we perform both deterministic and stochastic projections to study the impact of various investment return scenarios on future system-average contribution rates and funded status compared to the case in which the actual investment rate of return matches the assumed investment rate of return.

System Payroll Growth

Under the current funding policy, UAL amounts are amortized as a level percentage of projected combined valuation payroll over the selected amortization period. If the System's payroll grows at the assumed rate, and all other assumptions are met, this would produce a UAL contribution rate that remains level as a percentage of payroll during the amortization period. However, if payroll grows less than assumed, the dollar amount of contributions will be less than projected, and the UAL contribution rate in subsequent valuations would have to increase to make up for those UAL losses.

Legislative Changes and Judicial Rulings

Legislative changes and judicial rulings can affect both benefit levels and contribution rates. Examples include 2013 legislative changes, which reduced COLA levels and directed the PERS Board to reduce previously-adopted contribution rates; a 2015 judicial ruling, which overturned much of the previous reduction to COLA levels; and 2019 legislative changes, which directed the PERS Board to re-amortize Tier 1/Tier 2 UAL over a new 22-year period and redirected a portion of Member IAP contributions to offset future employer contribution rates. If future legislative changes limit or reduce short-term contributions, then contribution rates may need to be increased in future to make up the shortfall. And if future judicial rulings overturn past benefit changes, then future contribution rates may need to be increased to cover the resulting impact on liabilities.

Demographic Experience

While future investment returns will likely cause the greatest deviation from expected experience, there are many other assumptions made in an actuarial valuation. For these assumptions, differences between actual and assumed experience will also result in actuarial gains and losses. The executive summary of this report provides a look at the impact in the past year of actual experience deviating from assumed.

Maturity Measures and Historical Information

The remainder of this section contains historical information concerning the System's Asset Volatility Ratio (AVR) and Liability Volatility Ratio (LVR). Additional historical information can be found in the executive summary and the *Accounting/CAFR Exhibits* section.

Asset Volatility Ratios and Liability Volatility Ratios

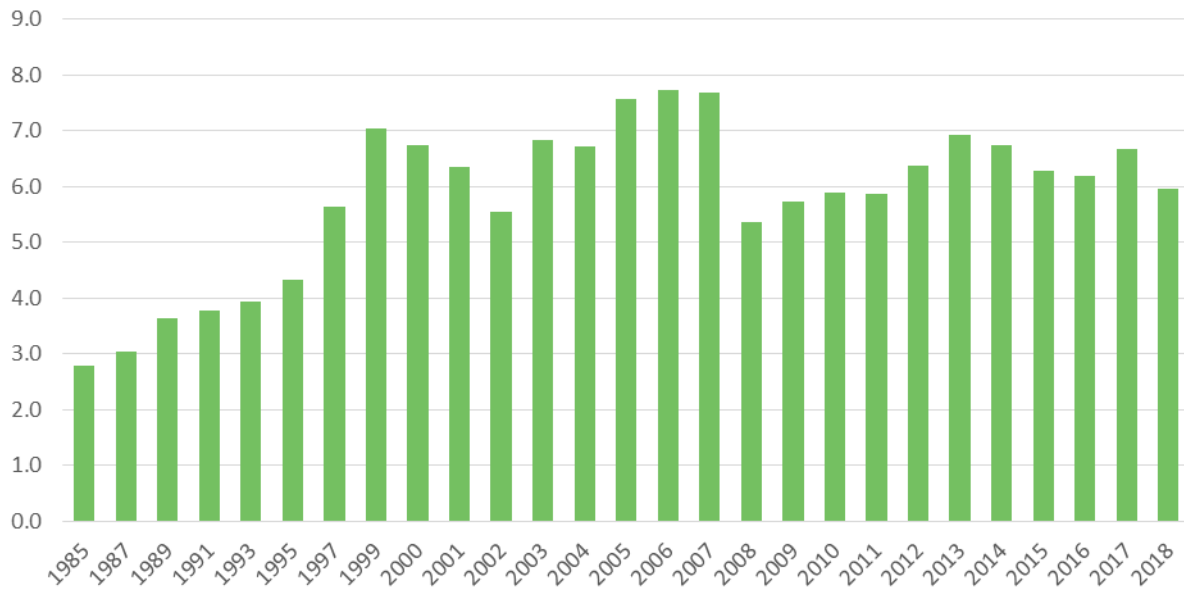
The magnitude of any contribution rate increase or decrease is affected by the System's maturity level. As a system matures, its liabilities and assets tend to grow relative to the size of its covered payroll. This creates more volatility in the contributions needed to fund the system.

One indicator of this potential volatility is the Asset Volatility Ratio (AVR), which is equal to the market value of assets divided by total valuation payroll. As assets grow compared to valuation payroll, any percentage gain or loss on those assets will be larger compared to valuation payroll. This causes any resulting changes in required contributions from those gains or losses to also be larger when measured as a percentage of valuation payroll. Therefore, plans with a high AVR will be subject to a greater level of volatility in required

contributions. The AVR is a current measure since it is based on the current level of assets and will vary from year to year.

The current AVR on a combined basis for Tier 1/Tier 2 and OPSRP (including side accounts) is 6.0. The AVR grew from 2.8 at December 31, 1985 to a high of 7.7 at December 31, 2006. The graph below shows how the System matured during the last 33 years, as represented by the increasing AVR.

Asset Volatility Ratio (Market Value of Assets ÷ Valuation Payroll)



The following chart provides an illustration of how increases in the AVR increase the volatility of contributions due to the larger relative size of asset gains and losses.

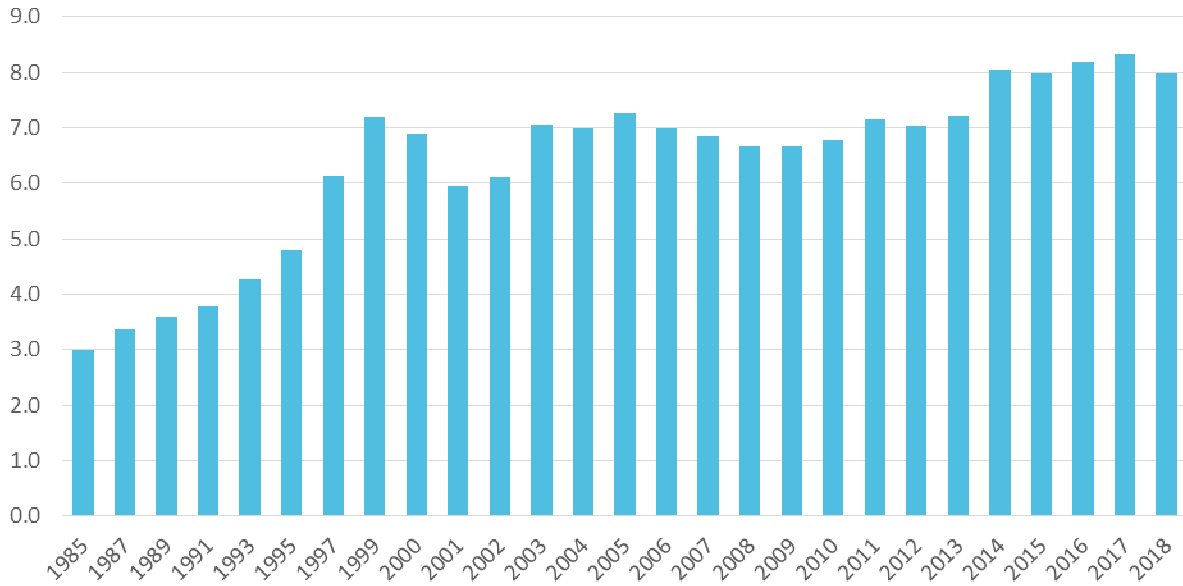
Illustrative effect of 10% asset loss (compared to assumed rate) with 20 year amortization using PERS assumptions	
Asset Volatility Ratio	Uncollared Contribution Rate Increase
3.0	2.12%
4.0	2.82%
5.0	3.53%
6.0	4.24%
7.0	4.94%

A one-year return of negative 2.80% is approximately a 10% asset loss for Oregon PERS because it is 10% below the 7.20% investment return assumption. As shown in the chart, if a return of negative 2.80% is not offset by future gains and the AVR was 3.0, the loss is expected to increase the uncollared contribution rate by 2.12% of pay if amortized over 20 years. However, with the AVR of 6.0, the same return is expected to increase contributions by 4.24% of valuation payroll if amortized over 20 years.

Another measure of a system’s maturity is the Liability Volatility Ratio (LVR), which is equal to the AL divided by the total valuation payroll. This ratio provides an indication of the longer-term potential for contribution volatility for any given level of investment volatility. In addition, this ratio provides an indication of the potential contribution volatility due to demographic experience (gains and losses) and liability re-measurements (assumption changes). For Oregon PERS, the current LVR is 8.0.

The graph below shows the historical LVR since December 31, 1985. It follows a similar pattern to the Asset Volatility Ratio, except the increase is more gradual and the year-to-year variance is significantly less.

Liability Volatility Ratio (Actuarial Accrued Liability ÷ Valuation Payroll)



Glossary

Glossary

Actuarial Accrued Liability. The portion of the present value of prospective benefits allocated to service and compensation before the valuation date in accordance with the actuarial cost method.

Actuarial Value of Assets. The value of assets used in calculating the required contributions. The actuarial value of assets may be equal to the fair market value of assets, or it may spread the recognition of certain investment gains or losses over a period of years in accordance with an asset valuation method.

Actuarial Assumptions. Assumptions as to the occurrence of future events affecting pension costs, such as: mortality, withdrawal, disablement and retirement; rates of investment earnings and other relevant items.

Actuarial Cost Method. Sometimes called “funding method,” a particular technique used by actuaries to establish the amount and incidence of the annual actuarial cost of pension plan benefits, or normal cost, and the related unfunded accrued liability. Ordinarily, the annual contribution to the plan comprises the normal cost and an amount for amortization of the unfunded accrued liability.

Actuarial Gain or (Loss). A measure of the difference between actual experience and that expected based upon a set of actuarial assumptions, during the period between two actuarial valuation dates, as determined in accordance with a particular actuarial cost method.

Combined Valuation Payroll. Projected payroll subject to PERS employer contribution rates for the calendar year following the valuation date for Tier 1, Tier 2 and OPSRP active members. This payroll is used to calculate UAL rates.

Employer Contribution Rate. Consists of the normal cost rate and the UAL rates, plus adjustments for items such as side account rate offsets.

Fundamental Cost Equation. An expression of the long-term cost of a pension plan, which states that:

$$\text{Benefits} + \text{Expenses} = \text{Contributions} + \text{Investment Earnings}$$

Funded Status. The actuarial value of assets expressed as a percentage of the actuarial accrued liability.

Normal Cost. The annual cost allocated to the current year, under the actuarial cost method in use. The normal cost divided by the applicable payroll is the normal cost rate.

OPSRP Valuation Payroll. Projected payroll subject to PERS employer contribution rates for the calendar year following the valuation date for OPSRP active members. This payroll is used to calculate OPSRP normal cost rates.

Pre-SLGRP Liability/(Surplus). The sum of Pre-SLGRP Pooled Liabilities and Transition Liabilities.

Pre-SLGRP Pooled Liability/(Surplus). The difference between the total UAL and the UAL attributable to the SLGRP for a pool of employers that joined the SLGRP. There are currently two pre-SLGRP pools. One was created for State Agencies and Community Colleges when the SLGRP was formed. The other one was created when the Local Government Rate Pool joined the SLGRP.

Present Value. Sometimes called “actuarial present value,” the estimated cost (as of the valuation date) of a series of future payments. The present value is determined by discounting the future payments at a predetermined rate of interest, taking into account the probability of payment.

Present Value of Future Normal Cost (PVFNC). The present value (as of the valuation date) of all future annual normal costs for current members expected to be allocated to future years in accordance with the actuarial cost method in use. By definition, this is equal to the difference between the total actuarial present value of benefits less the actuarial accrued liability under the actuarial cost method.

Rate Collar. A methodology that defines the maximum permissible period-to-period change in the base employer contribution rate. The width of the rate collar is determined by the current contribution rate and funded status.

Required Supplementary Information (RSI). Schedules, statistical data, and other information that are an essential part of financial reporting and should be presented with, but are not part of, the basic financial statements of a governmental entity.

Statement No. 67 of the Governmental Accounting Standards Board (GASB 67). The accounting standard establishing financial reporting standards for defined benefit pension plans. The standard replaced GASB Statement 25 for plan fiscal years beginning after June 15, 2013.

Statement No. 68 of the Governmental Accounting Standards Board (GASB 68). The accounting standard governing a governmental employer's accounting for pensions. The standard replaced GASB Statement 27 for employer fiscal years beginning after June 15, 2014.

Statement No. 74 of the Governmental Accounting Standards Board (GASB 74). The accounting standard establishing financial reporting standards for post-employment benefits other than pensions. The standard replaced GASB Statement 43 for plan fiscal years beginning after June 15, 2016.

Statement No. 75 of the Governmental Accounting Standards Board (GASB 75). The accounting standard governing a governmental employer's accounting for post-employment benefits other than pensions. The standard replaced GASB Statement 45 for employer fiscal years beginning after June 15, 2017.

Tier 1/Tier 2 Valuation Payroll. Projected payroll subject to PERS employer contribution rates for the calendar year following the valuation date for Tier 1 and Tier 2 active members. This payroll is used to calculate Tier 1/Tier 2 normal cost rates.

Total Actuarial Present Value of Benefits. Sometimes referred to simply as "Present Value of Benefits" (PVB) or "Total Liability", the present value of all prospective benefits projected to be paid to current plan members. This amount is equal to the sum of the actuarial accrued liability and the present value of future normal costs, and is unaffected by the choice of actuarial cost method.

Transition Liability/(Surplus). The difference between the total UAL and the UAL attributable to the SLGRP for an individual employer that joined the SLGRP or the Local Government Rate Pool. The initial balance of liability or surplus is calculated at the time employer joins the pool. That balance is then amortized over time via employer contribution rate charges (for a liability) or rate offsets (for a surplus).

Unfunded Accrued Liability (UAL). The excess of the Actuarial Accrued Liability over the Actuarial Value of Assets. The UAL is divided by combined valuation payroll and an amortization factor to determine an initial, pre-collar UAL rate. The final UAL rate can be adjusted by the rate collar.