OREGON SECRETARY OF STATE

An Independent Actuarial Review of the Oregon Public Employees Retirement System

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November 16, 2022

Secretary of State Audits Division
Secretary of State
255 Capitol Street, NE Suite 180
Salem, Oregon 97310

This report contains the results of the independent actuarial review of the Oregon Public Employees Retirement System (PERS). This study was conducted pursuant to Oregon Revised Statute 238.606.

This report is intended to be responsive to the scope of the review as determined by the Secretary of State and in statute. This actuarial review involves an independent verification and analysis of the assumptions, procedures, methods, and conclusions used by the retained actuary for PERS, in the rate setting actuarial valuation as of December 31, 2021, to ensure that the conclusions are technically sound and conform to the appropriate Standards of Practice as promulgated by the Actuarial Standards Board.

GRS is pleased to report that, in our professional opinion, the December 31, 2021 actuarial valuation prepared by the retained actuary provides a fair and reasonable assessment of the financial position of PERS and recommends reasonable contributions for PERS employers given the current funding policies and practices.

The work presented herein is based on data furnished by PERS and Milliman. We are grateful to PERS staff and Milliman, the retained actuary, for their cooperation throughout the actuarial review process.

This report was prepared at the request of the Secretary of State and is intended for use by the Secretary of State and those designated or approved by the Secretary of State. This report may be provided to parties other than the Secretary of State only in its entirety and only with the permission of the Secretary of State. GRS is not responsible for unauthorized use of this report.

The undersigned are independent actuaries and consultants. Both are Enrolled Actuaries, are Members of the American Academy of Actuaries, and meet all of the Qualification Standards of the American Academy of Actuaries. Both of the undersigned are experienced in performing valuations for large public retirement systems.

Respectfully submitted,
Gabriel, Roeder, Smith & Company

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Senior Consultant

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SECTION I

EXECUTIVE SUMMARY

Executive Summary

The Oregon Secretary of State engaged Gabriel, Roeder, Smith & Company (GRS) for an independent actuarial review of the December 31, 2021 actuarial valuation of the Oregon Public Employees Retirement System (PERS).

The purpose of this report is to:

- Provide an evaluation and express an opinion regarding the reasonableness and accuracy of the valuation results (including a determination of actuarial accrued liability, normal cost, and actuarially determined contributions), appropriateness of the actuarial assumptions, and application of the actuarial cost method for the 2021 actuarial valuation; and
- Include any recommendations regarding potential future enhancements to the actuarial valuation process.

The scope of this actuarial review includes an examination of the reasonableness and consistency of the following aspects of the December 31, 2021 actuarial valuation report as outlined by ORS 238.606:

- Actuarial methods used;
- Demographic and economic assumptions used;
- Census and asset data used;
- Valuation of the system, including projected future benefit payments, system liabilities, system normal cost and funded status;
- Employer contribution rates calculated;
- Rate collaring policy and calculation;
- Assumed rate of return and discount rate used;
- Comparison of legislative impact to actual impact; and
- Instructions provided by the Public Employees Retirement Board to the actuary.

Summary of our Review

Based on our review of the census data, experience study documents, liability replications, and actuarial valuation reports, we believe the December 31, 2021 actuarial valuation for PERS is reasonable for the purpose of assessing the financial condition of PERS and determining the employer contribution rates.

We offer the following comments and recommendations based on the valuation methods and assumptions used by the retained actuary in the December 31, 2021 actuarial valuation of PERS.

Actuarial Assumptions

- The set of actuarial assumptions and methods, taken in combination, is reasonable and generally established in accordance with ASOP No. 27, *Selection of Economic Assumptions for Measuring Pension Obligations*, and ASOP No. 35, *Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations*.

Actuarial Methods

- We believe the rate collaring process is a very well-developed funding procedure that will serve PERS and the stakeholders well in the future. Amortizing the UAL layers over 20 years or less, including the full normal cost in the recommended contribution, and restricting the decrease of the UAL rate are all strong attributes of the current contribution rate setting process and align with the guidance outlined in the new ASOP No. 4. The rate collaring provision is also an appropriate addition to the contribution calculation process considering the additional volatility that can be generated by utilizing an unsmoothed asset value in determining contribution requirements.

- We recommend that the retained actuary consider enhancing the current contribution calculation process to address the timing lag in the UAL rate during the next in-depth review of the contribution calculation process or experience study. We acknowledge that this enhancement to the process would further complicate a very complex process but we believe this enhancement will better comply with the future ASOPs and will improve the overall effectiveness of the contribution calculation process.

Actuarial Valuation Results

- In general, the data, sample liability calculations, and sample employer contribution calculations all appear to be reasonable and appropriate. We recommend that the retained actuary consider the noted comments and observations on decrement timing, the use of multiple service amounts, and the Oregon residency assumption as it applies to lump sums.

Content of Valuation Report

- In order to improve the ability of the report to communicate the assumptions, methods and plan provisions incorporated into the actuarial valuation of PERS, we recommend that the retained actuary incorporate the noted enhancements to future actuarial valuation reports.

SECTION II

GENERAL ACTUARIAL REVIEW PROCEDURE

General Actuarial Review Procedure

GRS received and reviewed the following items:

- December 31, 2021 actuarial valuation report proposing employer contribution rates for the pension and OPEB programs;
- December 31, 2020 advisory actuarial valuation report;
- Presentations to the PERS Board in July, 2022 and September, 2022;
- Samples of individual employer reports, including examples of different Tier 1/Tier 2 rate pooling categories;
- 2020 Experience Study for the four-year period ending December 31, 2020;
- A preliminary set of census data for plan participants and beneficiaries as of December 31, 2021 originally provided by PERS to the retained actuary for the actuarial valuation; and
- A final set of census data for plan participants and beneficiaries as of December 31, 2021 used by the retained actuary for the actuarial valuation, and
- Samples of individual test life detail of liability calculations as of December 31, 2021.

In performing our review, we:

- Reviewed descriptions of member benefits and applicable statutes to understand the pension and OPEB benefits provided by PERS;
- Reviewed the appropriateness of the actuarial assumptions and methods;
- Reviewed, in detail, the sample test lives provided to us,
- Reviewed actuarial valuation reports; and
- Reviewed the methods used to calculate the proposed employer contribution rate, including the rate collaring policy.

The actuarial review observations, which follow, are based on our review of this information and subsequent correspondence with the retained actuary for clarification and further documentation.

Key Actuarial Concepts

An actuarial valuation is a detailed statistical simulation of the future operation of a retirement system using the set of actuarial assumptions adopted by the governing board. It is designed to simulate all of the dynamics of such a retirement system for each current participant of the plan, including:

- Accrual of future service,
- Changes in benefits,
- Leaving the plan through retirement, disability, withdrawal, or death, and
- Determination of and payment of benefits from the plan.

This simulated dynamic is applied to each active member in the plan and results in a set of expected future benefit payments for that member. Discounting those future payments for the likelihood of survival at the assumed rate of investment return produces the Total Present Value of Plan Benefits (TPV) for that participant. The actuarial cost method will allocate this TPV between the participant's past service (actuarial accrued liability) and future service (future normal costs).

We believe that an actuarial review should not focus on finding differences in actuarial processes and procedures utilized by the consulting actuary and the reviewing actuary. Rather, our intent is to identify and suggest improvements to the process and procedures utilized by the retained actuary for PERS. In performing this actuarial review, we attempted to limit our discussions regarding opinion differences and focus our attention on the accuracy of the calculations of the liability and costs, completeness and reliability of reporting, and compliance with the Actuarial Standards of Practice that apply to the work performed by the retained actuary.

These key actuarial concepts will be discussed in more detail throughout this report.

Actuarial Qualifications

The December 31, 2021 actuarial valuation report was signed by Matt Larrabee, FSA, EA, MAAA and Scott Preppernau, FSA, EA, MAAA. Based on the information provided by the online actuarial directory sponsored by the Society of Actuaries, Mr. Larrabee and Mr. Preppernau have attained the actuarial credentials noted on the signature line of the actuarial valuation report and are compliant with the Society of Actuaries Continuing Professional Development requirement.

SECTION III

ACTUARIAL ASSUMPTIONS

Actuarial Assumptions

Overview

For any pension plan, actuarial assumptions are selected that are intended to provide reasonable estimates of future expected events, such as retirement, turnover, and mortality. These assumptions, along with an actuarial cost method, the employee census data, and the plan's provisions, are used to determine the actuarial liabilities and the overall actuarially determined funding requirements for the plan. The true cost to the plan over time will be the actual benefit payments and expenses required by the plan's provisions for the participant group under the plan. To the extent the actual experience deviates from the assumptions, experience gains and losses will occur. These gains (losses) then serve to reduce (increase) future actuarially determined contributions and increase (reduce) the funded ratio. The actuarial assumptions should be individually reasonable and consistent in the aggregate, and should be reviewed periodically to ensure that they remain appropriate.

The Actuarial Standards Board ("ASB") provides guidance on establishing actuarial assumptions for a retirement program through the following Actuarial Standards of Practices (ASOP):

(1) ASOP No. 4, *Measuring Pension Obligations and Determining Pension Plan Costs or Contributions*
(2) ASOP No. 23, *Data Quality*
(3) ASOP No. 25, *Credibility Procedures*
(4) ASOP No. 27, *Selection of Economic Assumptions for Measuring Pension Obligations*
(5) ASOP No. 35, *Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations*
(6) ASOP No. 44, *Selection and Use of Asset Valuation Methods for Pension Valuations*
(7) ASOP No. 51, *Assessment and Disclosure of Risk Associated with Measuring Pension Obligations and Determining Pension Plan Contributions*
(8) ASOP No. 56, *Modeling*

We generally reviewed the application of the ASOPs applicable on the valuation date of December 31, 2021 for PERS. Subsequent changes to the ASOPs will have to be reflected in future actuarial valuation reports.

The actuarial valuation report for PERS contains descriptions of the actuarial assumptions which were used in the December 31, 2021 actuarial valuation. Additionally, the retained actuary published an actuarial experience study report, dated July 20, 2021. We conducted a thorough review of these documents in order to assess the reasonableness of the assumptions used in the actuarial valuations.

Actuarial assumptions for the valuation of retirement programs are of two types: (i) demographic assumptions, and (ii) economic assumptions. We have assessed the reasonableness of both types as part of this actuarial review.

Demographic Assumptions

General

These assumptions simulate the movement of participants into and out of plan coverage and between status types. Key demographic assumptions are:

- turnover among active members,
- retirement patterns among active members, and
- healthy retiree mortality.

In addition, there are a number of other demographic assumptions with less substantial impact on the results of the process, such as:

- disability incidence and mortality among disabled benefit recipients,
- mortality among active members,
- percent of active members who are married and the relationship of the ages of participants and spouses, and
- benefit elections upon retirement or termination.

Experience Study Process

Demographic assumptions for retirement programs are normally established by statistical studies of recent actual experience, called experience studies. Such studies underlie the assumptions used in the valuations.

In an experience study, the actuary first determines the number of deaths, retirements, etc. that occurred during the experience period. Then the actuary determines the number "expected" to occur, based on the current actuarial assumptions. Finally, the actuary calculates the A/E ratio, where "A" is the actual number (of retirements, for example) and "E" is the expected number. If the current assumptions were "perfect", the A/E ratio would be 100%. When the A/E ratio varies much from 100%, it is a sign that new assumptions may be needed. (However, the actuary may prefer to set assumptions to produce an A/E ratio a little above or below 100%, in order to introduce some conservatism.)

The actuary can further enhance the "count-weighted" process, described above, by using an "amount-weighted" experience analysis. An amount-weighted analysis will generally use amounts such as benefits or liabilities to "weight" and review the experience. From the perspective of the retirement assumption, selecting an assumption based on headcount-weighting is consistent with estimating expected retirements, but selecting an assumption based on amount-weighting is consistent with minimizing gains and losses associated with expected retirements. By weighting the data by benefit amounts, the actuary gives more weight to members who have larger benefits (and thus have larger liabilities). The same concepts apply when the amount-weighted approach is applied to other demographic assumptions such as mortality and termination.

We noted that the retained actuary clearly used an "amount-weighted" approach when analyzing the mortality assumption in the most recent experience study. We recommend that the retained actuary consider more clearly disclosing the weighting procedures used to analyze the other demographic assumptions in the next experience study report.

Assumption Setting

Once it is determined whether or not an assumption needs adjustment, setting the new assumption depends upon the extent to which the current experience is an indicator of the long-term future.

- Full credibility may be given to the current experience. Under this approach, the new assumptions are set very close to recent experience.
- Alternatively, the recent experience might be given only partial credibility. Thus, the new assumptions may be set by blending the recent experience with the prior assumption.
- If recent experience is believed to be atypical of the future, such knowledge is taken into account.
- Finally, it may be determined that the size of the plan does not provide a large enough sample to make the data credible. In such cases, the experience of the plan may be disregarded and the assumption is set based upon industry standards for similar groups.

Actuarial Standards of Practice (ASOP) No. 35, *Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations*, applies to actuaries when they are selecting demographic assumptions. In accordance with ASOP No. 35, an actuary should identify the types of demographic assumptions to use for a specific measurement. In doing so, the actuary should determine the following:

a) The purpose and nature of the measurement;
b) The plan provisions or benefits and factors that will affect the timing and value of any potential benefit payments;
c) The characteristics of the obligation to be measured (such as measurement period, pattern of plan payments over time, open or closed group, and volatility);
d) The contingencies that give rise to benefits or result in loss of benefits;
e) The significance of each assumption; and
f) The characteristics of the covered group.

Not every contingency requires a separate assumption. For example, for a plan that is expected to provide benefits of equal value to employees who voluntarily terminate employment, become disabled, or retire, the actuary may use an assumption that reflects some or all of the above contingencies in combination rather than selecting a separate assumption for each.

Observations on Demographic Assumptions

Overall, it appears that the current demographic assumptions are reasonable for valuing the liabilities and assessing the contributions based on the December 31, 2021 actuarial valuation. The study itself was thorough and was clearly performed by an actuary with a deep understanding of the PERS actuarial valuation. The use of confidence intervals on the graphs improved the reader's ability to follow the analysis. Below, we provide some comments on the appropriateness of the retained actuary's process and rationale for some of the most significant assumptions, as well as offer some recommendations for consideration in future studies, if warranted.

Healthy Retiree Mortality

The most important demographic assumption is post-retirement mortality because this assumption is a predictor of how long pension payments will be made. The retained actuary uses versions of the recently published PUB-2010 mortality tables, identified by occupation, with full generational mortality improvements. This is industry best practice. The small change made to School District males is a rational adjustment.

Retirement from Active Status

Generally, only minor adjustments were made. Having different patterns based on service is a common approach and lowers the likelihood of experience from short service members causing the probability of retirement for a long service member to be understated. The change made to extend the maximum retirement age was supported by the data.

Retirement is one of the assumptions that we regularly see differences based on the salary (or liability) of the members. If the 2020 Experience Study utilized the "count-weighted" approach for the Retirement Assumption, the retained actuary should consider using a salary or liability weighted approach during the next study to see if there is a notable difference.

Termination Assumptions

Adjustments were only made to one group. A service-based pattern is a common approach and lowers the likelihood of experience from short service members causing the probability of termination for a long service member to be overstated. The change made to non-school district general service females was supported by the data.

Termination is one of the other assumptions where we regularly see differences based on the salary (or liability) of the members. If the 2020 Experience Study utilized the "count-weighted" approach for the Termination Assumption, the retained actuary should consider using a salary or liability weighted approach during the next study to see if there is a notable difference.

Termination, like salary, is one of the assumptions that can be influenced over the short term by the general economy, so we recommend the retained actuary consider using more years of data, either two experience studies worth, or a decade, in the next study to encompass data from an entire economic cycle.

Annual Individual Member Salary Increases

Adjustments were made to increase the expected annual salary increases across all groups. This change was validated based on the data provided, and more years of experience were used to increase the credibility of the data. A service-based pattern for merit increase is a common approach, as it is based on longevity and job performance. In most models, it is recognized that step increases and promotions are very rare late in careers. Thus, this allowance should trail away from relatively high levels for young or short service members to virtually nothing late in careers. We would expect that, as members approach retirement, this component would fade away.

Economic Assumptions

General

Economic assumptions simulate the impact of economic forces on the amounts and values of future benefits. Key economic assumptions are the assumed rate of investment return and assumed rates of future salary increase. All economic assumptions are built upon an underlying inflation assumption.

ASOP No. 27, *Selection of Economic Assumptions for Measuring Pension Obligations*, applies to actuaries when they are selecting economic assumptions. ASOP No. 27 states that each economic assumption selected by the actuary should be reasonable. For this purpose, an assumption is reasonable if it has the following characteristics:

a) It is appropriate for the purpose of the measurement;
b) It reflects the actuary's professional judgment;
c) It takes into account historical and current economic data that is relevant as of the measurement date;
d) It reflects the actuary's estimate of future experience, the actuary's observation of the estimates inherent in market data, or a combination thereof; and
e) It has no significant bias (i.e., it is not significantly optimistic or pessimistic), except when provisions for adverse deviation or plan provisions that are difficult to measure are included and disclosed, or when alternative assumptions are used for the assessment of risk.

Additionally, ASOP No. 27 states that communications regarding actuarial reports subject to this standard should contain the following:

a) A description of each significant assumption used in the measurement and whether the assumption represents an estimate of future experience, and
b) A description of the information and analysis used in selecting each economic assumption that has a significant effect on the measurement.

Observations on Economic Assumptions

Overall, it appears that the current economic assumptions are reasonable for valuing the liabilities and assessing the contributions based on the December 31, 2021 actuarial valuation. For all the assumptions, the retained actuary provides several sources of expectations as well as comparisons to peers. Below, we provide some comments on the appropriateness of the retained actuary's process and rationale for some of the most significant assumptions, as well as offer some recommendations for consideration in future studies, if warranted.

Inflation

The retained actuary provides several sources of expectations as well as comparisons to peers. We believe the inflation assumption of 2.40% is reasonable based on the information presented. The inflation rate is a component of investment returns, salary increase and COLAs, so it is an important building block that has a ripple effect throughout all of the economic assumptions.

Administrative Expenses

The administrative expenses assumed are provided by Staff based on estimates for the year. Comparing these amounts to actual administrative expenses paid during the year, it appears that these estimates are conservative. We find the process reasonable.

Investment Return

The investment return assumption is one of the principal assumptions in any actuarial valuation. It is used to discount future expected benefit payments to the valuation date to determine the liabilities of the retirement system. Even a small change to this assumption can produce significant changes to the liabilities and contribution rates.

The retained actuary provides several sources of expectations as well as comparisons to peers. There are good illustrations showing the range of various expectations and probabilities of success. We believe the investment return assumption of 6.90% is reasonable based on the information presented. Like many other large state pension plans, this assumption has been decreased several times over the past decade as capital market assumptions are coming in lower.

System Payroll Growth

Payroll growth is significant because the UAL is amortized as a level percentage of pay. That is the same as expecting all future amortization payments to grow at the same rate as total payroll. When payroll does not grow as assumed then the UAL is not going to be paid off as assumed. In order for the UAL to be paid off according to the current amortization schedules, payroll must grow at the assumed payroll growth. If payroll grows at a lower rate, there will be upward pressure on the contribution rates because contributions that are less than anticipated are flowing in the plan.

The systemwide payroll growth analysis focused on nationwide statistics. It would be beneficial to also provide some System-specific data to validate the use of national statistics in this analysis. We recommend the retained actuary to include PERS specific (or Oregon specific) data in their analysis in the next experience study.

SECTION IV

ACTUARIAL METHODS

Actuarial Methods

The ultimate cost of the retirement programs administered by PERS is equal to the benefits paid plus the expenses related to operating PERS. This cost is funded through contributions to PERS plus the investment return on accumulated contributions which are not immediately needed to pay benefits or expenses. The projected level and timing of the contributions needed to fund the ultimate cost are determined by the actuarial assumptions, plan provisions, participant characteristics, investment experience, and the actuarial cost method.

Actuarial Cost Methods

An actuarial cost method is a mathematical process for allocating the dollar amount of the total present value of plan benefits (TPV) between future normal costs and actuarial accrued liability (AAL). The retained actuary uses the Entry Age Normal actuarial cost method (EAN Method), characterized by:

(1) Normal Cost – the level-percent-of-pay contribution, paid from each participant's date of hire to date of retirement, which will accumulate enough assets at retirement to fund the participant's projected benefits from retirement to death.

(2) Actuarial Accrued Liability – the assets which would have accumulated to date had normal cost contributions been made since the date of the first benefit accrual, if all actuarial assumptions had been exactly realized, and there had been no benefit changes.

The EAN Method is the most prevalent funding method in the public sector. It is appropriate for the public sector because it produces costs that remain stable over time, resulting in intergenerational equity for taxpayers. We have reviewed the retained actuary's application of the Entry Age Normal actuarial cost method and we believe that the method is reasonable and appropriately applied.

Asset Smoothing Method

The retained actuary utilizes the market value of assets for all purposes, with no smoothing. While this is uncommon, it is not unreasonable. The contributions being set every biennium could be viewed as mimicking two-year smoothing, however, it does place significant emphasis on the market value on one date every two years. Also, there are reserves that are not included in the valuation results to assist with stabilizing the contributions. Finally, as discussed below, the rate collaring procedure is accomplishing many of the same objectives other Systems utilize asset smoothing for.

Unfunded Accrued Liability (UAL) Amortization Policy

To pay off the unfunded accrued liability, PERS uses a closed 20-year period as of December 31, 2021 for the Tier 1/Tier 2 UAL's. Future gains or losses will be set up on their own closed 20-year payment schedules and the payments are designed to be a level percent of future payroll. Similar approaches are applied for the UAL's for the OPSRP, RHIA, and RHIPA. This is a process called "laddered" amortization, and is the standard in the industry and should ensure "positive amortization" for each year's gain/loss.

In this context, "positive amortization" relates to the situation where the UAL is expected to go down each year. Positive amortization is not always achievable when the UAL is financed over a long period of time through contributions that are designed to be a level percent of payroll.

Current Rate Setting Process Including Rate Collaring Procedure

PERS operates under a two-year rate setting cycle. Rates are adjusted every "odd" year, and those rates are in-force for two years, starting 18 months after the actuarial valuation date.

The process of calculating the actuarially determined contribution based on an actuarial valuation is generally referred to as a "contribution allocation procedure" in the Actuarial Standards of Practice. There are two broad approaches to "smoothing" the pattern of contributions resulting from a contribution allocation procedure. The first, and possibly more common approach, is to smooth the "inputs" to the actuarial valuation which is intended to result in "smoothed" actuarially determined contributions. The most common example of input smoothing is the use of an actuarial value of assets that smooths investment gains and losses over a period of generally 5 years. As an alternative, smoothing the "outputs" of the contribution allocation procedure would involve completing the initial contribution calculation (without any smoothing of inputs) and then applying smoothing techniques to produce the actuarially determined contribution. This helps improve budgetary predictability and dampen contribution volatility. One primary benefit of output smoothing is that the initial calculations provide the maximum transparency to the current status of the retirement plan (e.g., funded status, contribution requirements, etc.) since none of the inputs include artificial smoothing.

The current process used to calculate the employer contributions for PERS would generally be considered to use the "output smoothing" approach. The primary indicators of this are the use of the market value of assets and the application of the rate collaring approach. As noted above, this procedure provides complete transparency about the current funded status of PERS and the immediate current contribution rate that would meet the PERS funding policy.

Modifications to the rate collar calculation methodology have been adopted since the previous rate-setting valuation which was performed as of December 31, 2019. The December 31, 2021 actuarial valuation report describes the current rate collaring approach as follows:

> *Contribution rate stabilization method*
> The UAL Rate component for a rate pool (e.g., Tier One/Tier Two SLGRP, Tier One/Tier Two School Districts, OPSRP) is confined to a collared range based on the prior biennium's collared UAL Rate component (prior to consideration of side account offsets, SLGRP transition liability or surplus rates, pre-SLGRP liability rate charges or offsets, or member redirect offsets).
>
> Collar Width: The rate pool's new UAL Rate component will generally not increase or decrease from the prior biennium's collared UAL Rate component by more than the following amount:
> - Tier One/Tier Two SLGRP and Tier One/Tier Two School Districts Pool: 3% of payroll
> - OPSRP: 1% of payroll
> - Tier One/Tier Two rates for independent employers: greater of 4% of payroll or one-third of the difference between the collared and uncollared UAL Rate at the prior rate-setting valuation. In addition, the UAL Rate will not be allowed to be less than 0.00% of payroll for

any Tier One/Tier Two independent employer with a funded status (excluding side accounts) less than 100%.

UAL Rate decrease restrictions: The UAL Rate component for any rate pool will not decrease from the prior biennium's collared UAL Rate component if the pool's funded status (excluding side accounts) is 87% or lower; the allowable decrease will phase into the full collar width for rate pools between 87% and 90% funded.

We believe this is a very well-developed rate collaring procedure that will serve PERS and the stakeholders well in the future. The superior aspect of this procedure is that the UAL rate is not allowed to decrease until the funded ratio is above 87%. We have modeled similar funding policies for our clients that involve "holding the rate" similar to this procedure and they always produce very positive long-term results for the funding and sustainability of the plans.

The second positive aspect of this procedure is that the normal cost is not subject to the collaring methodology. As a result, the full cost of the allocated benefit accrual for the year (i.e., the normal cost) will always be included in the recommended contribution (at least, as long as the plan is underfunded).

Based on the scope of this actuarial review, we are not in a position to prepare financial modeling to demonstrate the strength of this rate collaring approach. However, the retained actuary presented the results of their financial modeling of this rate collaring approach to the Board on December 3, 2021 which demonstrated the likelihood for success for certain metrics like the funded ratio and the ultimate collared contribution rate.

Recent revisions to ASOP No. 4 will be effective for the next rate setting valuation to be conducted as of December 31, 2023. These ASOP revisions will provide more formal guidance to the actuary on "output smoothing methods" and "contribution allocation procedures" than have not been as clearly articulated in previous ASOPs.

This guidance is not currently effective for the December 31, 2021 actuarial valuation but it provides a good perspective from which to view the current contribution calculation procedures now and for the future. The specific guidance is:

3.16 OUTPUT SMOOTHING METHOD
When selecting an output smoothing method, the actuary should select an output smoothing method that results in a reasonable relationship between the smoothed contribution and the corresponding actuarially determined contribution without output smoothing. A reasonable relationship includes the following:

a. the output smoothing method produces a value that does not fall below a reasonable range around the corresponding actuarially determined contribution without output smoothing; and
b. any shortfalls of the smoothed contribution to the corresponding actuarially determined contribution without output smoothing are recognized within a reasonable period of time.

3.17 ALLOCATION PROCEDURE
When selecting a cost allocation procedure or contribution allocation procedure, the actuary should take into account the following:

a. the balance among benefit security, intergenerational equity, and stability or predictability of periodic costs or actuarially determined contributions;
b. the timing and duration of expected benefit payments;
c. the nature and frequency of plan amendments; and
d. relevant input from the principal, for example, a desire to achieve a target funding level within a specified time frame.

We believe amortizing the UAL layers over 20 years or less, including the full normal cost in the recommended contribution, and restricting the decrease of the UAL rate are all strong attributes of the current contribution calculation process and align with the guidance outlined in the new ASOP No. 4.

Contribution Lag

Currently, the UAL amortization schedules are designed to pay every dollar of the outstanding UAL. The current contribution calculation process calculates the UAL contribution rate as if these payments to the UAL will commence immediately after the actuarial valuation date. As previously noted, the final employer contribution rates go into effect 18 months after the valuation date of the rate setting actuarial valuation.

This 18-month gap between the actuarial valuation date and the contribution effective date results in interest accruals in the new UAL layer for 18 months until the new payments commence. PERS is eventually made whole because these unfunded interest accruals are effectively picked up in the new UAL layer in the subsequent rate setting valuation. This payment timing gap could be addressed in the calculation of the UAL contribution rate by increasing both the new UAL liability layer and the expected payroll by 18 months while calculating the rate.

This adjustment for the timing lag would have a limited impact on the ultimate employer contribution rates since it would only impact the recommended contribution rates in years in which the true actuarially determined contribution is the recommended rate (i.e., the rate collars do not apply and a decrease in the UAL rate is not restricted).

However, it is important to note that another recent revision included in ASOP No. 4 directly addresses this timing lag:

> *3.20 CONTRIBUTION LAG*
> When calculating an actuarially determined contribution, the actuary should consider reflecting the passage of time between the measurement date and the expected timing of actual contributions.

Whereas, we do not believe addressing the timing lag will have a significant impact on the long-term contribution effort of the PERS employers, we recommended that the retained actuary consider enhancing the current contribution calculation process to address the timing lag in the UAL rate during the next in-depth review of the contribution calculation process or experience study. We acknowledge that this enhancement to the process would further complicate a very complex process but we believe this enhancement will better comply with the future ASOPs and will improve the overall effectiveness of the contribution calculation process.

Section Summary

We believe the actuarial methods are appropriate and the rate collaring procedure is a very well-developed method that will serve PERS and the stakeholders well in the future. Amortizing the UAL layers over 20 years or less, including the full normal cost in the recommended contribution, and restricting the decrease of the UAL rate are all strong attributes of the current contribution rate setting process and align with the guidance outlined in the new ASOP No. 4.

We recommended that the retained actuary consider enhancing the current contribution calculation process to address the timing lag in the UAL rate during the next in-depth review of the contribution calculation process or experience study. We acknowledge that this enhancement to the process would further complicate a very complex process but we believe this enhancement will better comply with the future ASOPs and will improve the overall effectiveness of the contribution calculation process.

SECTION V

ACTUARIAL VALUATION RESULTS

Actuarial Valuation Results

Data

As part of our actuarial review, we received a preliminary set of census data for plan participants and beneficiaries as of December 31, 2021 originally provided by PERS to the retained actuary for the actuarial valuation. Additionally, we received a final set of census data for plan participants and beneficiaries as of December 31, 2021 used by the retained actuary for the actuarial valuation.

We used this data, along with the census summaries included in the valuation report, to review the valuation data process. In total, we believe that the final valuation data used by the retained actuary is reasonable and valid for its purpose.

Review of Sample Liability Calculations

One of the most important steps of any actuarial review is to ensure that the retained actuary valued the correct benefit levels, used the correct assumptions, and calculated the liabilities correctly on an individual basis. In order to do this, we requested a number of sample cases from the retained actuary related to the December 31, 2021 actuarial valuation. We combined these with the methods, assumptions, and plan provisions listed in their report to review the liability values produced for these sample cases only.

We received seventeen sample cases for the following sample members:

- Tier 1/Tier 2:
    - Four active members with pension benefits – one general service member, one school district member, and two police & fire members
    - Four active members with RHIA benefits – one general service member, one school district member, and two police & fire members
    - One school district inactive vested member with pension benefits
    - One school district inactive vested member with RHIA benefits
    - Two retirees with pension benefits – one general service member and one police & fire member
    - One general service retiree with RHIA benefits
- OPSRP Members:
    - Two active members with pension benefits - one general service member and one police & fire member
    - One general service inactive vested member with pension benefits
    - One general service retiree with pension benefits

Note that the sample cases analyzed are not necessarily exposed to all of the possible benefits under the plans (i.e. already beyond the eligibility period for certain benefits, or not eligible for particular benefits). However, the vast majority of the liability for each plan is due to the retirement benefits (included for all active test lives). Also, the impact for any one test life may not be representative of the impact on the total plan.

Generally accepted actuarial standards and practices provide actuaries with the basic mathematics and framework for calculating the actuarial results. When it comes to applying those actuarial standards to

complex calculations, differences may exist due to individual opinion on the best way to make those complex calculations or other differences may occur due to nuances in the valuation software programming. This may lead to differences in the calculated results, but these differences should not be material. In particular, ancillary or non-retirement benefits such as death and disability tend to be low probability events (and hence low liability) and they also tend to have many "bells and whistles" which can be valued in different ways by different actuaries.

In order to review the liability calculations, we used the census data provided for the valuation, utilized the appropriate benefit provisions, and applied the actuarial assumptions and methods summarized in the valuation report. We were able to closely match the liabilities calculated by the retained actuary for the December 31, 2021 actuarial valuation. Below is a summary of our individual replications:

Active - Present Value of Benefits	Milliman	GRS	% Diff
General Service OPSRP Pension	367,377	367,769	0.1%
General Service Tier 2 Pension	353,811	358,566	1.3%
General Service Tier 2 RHIA	496	499	0.7%
Police & Fire OPSRP Pension	201,637	202,030	0.2%
Police & Fire Tier 1 Pension	1,100,504	1,075,730	-2.3%
Police & Fire Tier 1 RHIA	1,048	1,063	1.4%
Police & Fire Tier 2 Pension	1,060,901	1,038,300	-2.1%
Police & Fire Tier 2 RHIA	585	593	1.4%
School District Tier 1 Pension	834,552	833,032	-0.2%
School District Tier 1 RHIA	1,971	1,978	0.4%
Total	3,922,880	3,879,560	-1.1%
Active - Actuarial Accrued Liability	Milliman	GRS	% Diff
General Service OPSRP Pension	264,566	264,461	0.0%
General Service Tier 2 Pension	282,942	290,639	2.7%
General Service Tier 2 RHIA	368	370	0.7%
Police & Fire OPSRP Pension	22,177	22,235	0.3%
Police & Fire Tier 1 Pension	1,033,977	1,010,091	-2.3%
Police & Fire Tier 1 RHIA	975	986	1.2%
Police & Fire Tier 2 Pension	859,762	840,572	-2.2%
Police & Fire Tier 2 RHIA	456	462	1.3%
School District Tier 1 Pension	791,365	787,347	-0.5%
School District Tier 1 RHIA	1,867	1,875	0.4%
Total	3,258,454	3,219,038	-1.2%
Active - Normal Cost	Milliman	GRS	% Diff
General Service OPSRP Pension	10,334	10,365	0.3%
General Service Tier 2 Pension	8,005	7,670	-4.2%
General Service Tier 2 RHIA	14	15	2.2%
Police & Fire OPSRP Pension	11,368	11,389	0.2%
Police & Fire Tier 1 Pension	28,048	27,673	-1.3%
Police & Fire Tier 1 RHIA	31	33	5.3%
Police & Fire Tier 2 Pension	25,985	25,544	-1.7%
Police & Fire Tier 2 RHIA	17	17	0.5%
School District Tier 1 Pension	18,159	19,210	5.8%
School District Tier 1 RHIA	44	43	-0.6%
Total	102,004	101,959	0.0%
Inactive - Present Value of Benefits	Milliman	GRS	% Diff
Vested Term - School District Tier 2 Pension	191,360	191,189	-0.1%
Vested Term - School District Tier 2 RHIA	1,586	1,363	-14.1%
Vested Term - General Service OPSRP Pension	39,456	39,354	-0.3%
Retired - General Service Tier 1 Pension	778,728	778,479	0.0%
Retired - General Service Tier 1 RHIA	9,152	9,152	0.0%
Retired - Police & Fire Tier 2 Pension	150,678	150,675	0.0%
Retired - General Service OPSRP Pension	32,491	32,491	0.0%
Total	1,203,451	1,202,703	-0.1%

Based on our review, we believe the liability determination was reasonable and appropriately determined. As shown, we were able to match the liability amounts closely using the same data, assumptions, methods and plan provisions. We did have a few suggestions for future actuarial valuations:

- Decrements and pay increase timing appear to be assumed to occur at the beginning of each year. Decrements also appear to be independent probabilities. We recommend the retained actuary disclose these assumptions and methods in their report. Generally, the more common approach to decrement timing is to assume that the decrements apply at the middle of the year but there are certainly circumstances where a beginning of year decrement timing may be more appropriate. We recommend that the retained actuary carefully consider the decrement timing that is most appropriate for PERS during the next experience study and note the finding in the experience study report.

- The retained actuary appears to be using different service amounts for items such as salary increases, decrements, eligibility testing, and years since entry into the plan. While the use of these different service amounts is reasonable and often warranted, we recommend that these procedures be disclosed in the actuarial valuation report for better transparency and disclosure. If different service amounts are used, it is also important that the retained actuary uses these service amounts consistently when examining prior experience and setting future assumptions in the next experience study.

- For purposes of determining eligibility for SB 656/HB 3349 benefit adjustments, the retained actuary assumes 85% of retirees are assumed to remain Oregon residents after retirement. This 85% assumption is also being applied to lump sums, but we recommend that the retained actuary consider increasing this assumption, possibly up to 100%, during the next experience study. We would expect virtually all members are still living in Oregon at the time of retirement when they receive lump sums.

Additionally, we were pleased to see that the following suggested disclosure items from the prior actuarial review are now listed in the report, which allowed us to more closely match the liabilities:

- Application of 401(a)(17) salary limits and 415 benefit maximums
- Spouse assumptions
- Optional form and actuarial equivalence assumptions
- Assumptions for application of disability decrement rates
- Service purchase assumptions
- Police & fire unit purchase assumptions

Review of Contribution Calculations

We also reviewed the financing of results and contribution calculations that the retained actuary completed for the plans in aggregate, as well as a sample of individual employers. This is important to ensure that they are using the adopted actuarial methods and funding policy to set contribution rates for each employer correctly.

In addition to the system-wide actuarial valuation report, we received the following six sample individual employer reports:

- Three independent employers
    - One where the Tier1/Tier 2 rate collaring resulted in no collar being applied to the UAL rate
    - One where the Tier 1/Tier 2 rate collaring resulted in the minimum collar being applied to the UAL rate
    - One where the Tier 1/Tier 2 rate collaring results in the maximum collar being applied to the UAL rate
- Two SLGRP employers
- One School District employer

We were able to replicate all of the retained actuary's calculations and to confirm they are applying the proper contribution calculation methods and rate collaring.

Section Summary

In general, the data, liability calculations, and contribution calculations all appear to be reasonable and appropriate. We recommend that the retained actuary consider the noted enhancements in future actuarial valuations.

SECTION VI

CONTENT OF THE VALUATION REPORT

Content of the Valuation Report

ASOP No. 4, *Measuring Pension Obligations and Determining Pension Plan Costs or Contributions*, and ASOP No. 41, *Actuarial Communications*, provide guidance for measuring pension obligations and communicating the results. These Standards list specific elements to be included, either directly or by references to prior communication, in pension actuarial communications. The pertinent items that should be included in an actuarial valuation report on a pension plan should include:

- The name of the person or firm retaining the actuary and the purposes that the communication is intended to serve.
- A statement as to the effective date of the calculations, the date as of which the participant and financial information were compiled, and the sources and adequacy of such information.
- An outline of the benefits being discussed or valued and of any significant benefits not included in the actuarial determinations.
- A summary of the participant information, separated into significant categories such as active, retired, and terminated with future benefits payable. Actuaries are encouraged to include a detailed display of the characteristics of each category and reconciliation with prior reported data.
- A description of the actuarial assumptions, the cost method and the asset valuation method used. Changes in assumptions and methods from those used in previous communications should be stated and their effects noted. If the actuary expects that the long-term trend of costs resulting from the continued use of present assumptions and methods would result in a significantly increased or decreased cost basis, this should also be communicated.
- A summary of asset information and derivation of the actuarial value of assets. Actuaries are encouraged to include an asset summary by category of investment and reconciliation with prior reported assets showing total contributions, benefits, investment return, and any other reconciliation items.
- A statement of the findings, conclusions, or recommendations necessary to satisfy the purpose of the communication and a summary of the actuarial determinations upon which these are based. The communication should include applicable actuarial information regarding financial reporting. Actuaries are encouraged to include derivation of the items underlying these actuarial determinations.
- A disclosure of any facts which, if not disclosed, might reasonably be expected to lead to an incomplete understanding of the communication.

We have reviewed the actuarial valuation report prepared by the retained actuary and have noted a few modifications to the report that would allow the report to adhere more closely with ASOP Nos. 4, 41, 51 and 56.

Actuarial Standard of Practice No. 56, *Modeling* (ASOP No. 56)

ASOP No. 56 provides guidance to actuaries when performing actuarial services with respect to designing, developing, selecting, modifying, using, reviewing, or evaluating models. This Standard requires certain disclosures by the retained actuary as part of an actuarial valuation of the pension plan.

ASOP 56 generally requires the actuary to disclose:

- Ownership of the models utilized or disclosure of the extent of reliance of models designed, developed, or modified by others,
- Material inconsistencies, if any, among assumptions, and known reasons for such inconsistencies;
- Unreasonable output resulting from the aggregation of assumptions, if material; and
- Material limitations and known weaknesses.

We were not able to identify disclosures in the actuarial valuation report that would satisfy the requirements of ASOP No. 56. We recommend that the retained actuary closely consider the requirements of ASOP No. 56 and include the appropriate disclosures in future actuarial valuation reports.

Consideration for Executive Summary

The December 31, 2021 system-wide actuarial valuation report starts off with a 17-page Executive Summary which provides comprehensive summary of the notable results of the actuarial valuation. We believe it would enhance the communication of the key actuarial valuation results to add a true Executive Summary to the beginning of the actuarial valuation report which would be used to present the most important results from the actuarial valuation on, presumably, one page. This Executive Summary could include key metrics like the funded status for each plan and the final recommended contribution rates which are amounts that some readers of the valuation report may need to find quickly.

Illustration of UAL Amortization Bases

Each of the actuarial valuation reports includes a table that summarizes all of the outstanding UAL amortization bases that are used to calculate the UAL contribution rates. These tables provide the date each amortization base was established, the outstanding balance of each amortization base, and the next scheduled payment for each amortization base.

The amortization period can vary across different plans and groups. Additionally, the number of outstanding bases will increase with each successive rate setting valuation. As a result, we believe it would enhance the overall communication of the remaining amortization of the UAL for the retained actuary to add the remaining period for each individual amortization base to the tables included in the actuarial valuation reports.

Section Summary

In general, the actuarial valuation report complied with the applicable Actuarial Standards of Practice. In order to improve the ability of the report to communicate the assumptions, methods and plan provisions incorporated into the actuarial valuation, we recommend that the retained actuary incorporate the noted enhancements in future actuarial valuation reports.

SECTION VII

FINAL REMARKS

Final Remarks

The reviewing actuarial firm, Gabriel, Roeder, Smith & Company (GRS), is independent of the retained actuarial firm. The reviewing actuaries are not aware of any conflict of interest that would impair the objectivity of this work.

We have presented some suggestions for areas where we believe the product can be improved. The retained actuary has access to information and a long history of retirement systems similar to PERS. We understand that the retained actuary may agree with some of our recommendations, while rejecting others. We ask that the retained actuary and PERS consider our recommendations carefully. We hope that the retained actuary and PERS find these suggestions useful.

Oregon
Kate Brown, Governor

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December 5, 2022

Kip Memmott, Director
Secretary of State, Audits Division
255 Capitol St. NE, Suite 500
Salem, OR 97310

Dear Mr. Memmott,

This letter provides a written response to the Audits Division's report titled:
An Independent Actuarial Review of the Oregon Public Employees Retirement System.

Thank you for sharing this report that looked at the reasonableness and consistency of the methods, assumptions and data used in the December 31, 2021 actuarial valuation. The Public Employees Retirement System (PERS) Executive Management appreciates the collaborative approach taken by the Audits Division and their subcontractor conducting the review, GRS Retirement Consulting.

This was the second independent actuarial review conducted pursuant to House Bill 4163, Section 11 (2018) and was presented to the PERS Board at its December 2, 2022 meeting. PERS looks upon the report process as a learning experience and an opportunity to continue to mature, in concert with our consulting actuary, our actuarial practices. Items for consideration will be reviewed and, where applicable, incorporated into the PERS Board's upcoming review of actuarial assumptions and methodologies that will take place over the course of 2023.

The following is from the executive summary of the actuarial review which describes both the high-level findings as well as suggested items for consideration. Key excerpts from the report are provided in italics to provide further context for the summary.

Summary of our Review
Based on our review of the census data, experience study documents, liability replications, and actuarial valuation reports, we believe the December 31, 2021 actuarial valuation for PERS is reasonable for the purpose of assessing the financial condition of PERS and determining the employer contribution rates.

We offer the following comments and recommendations based on the valuation methods and assumptions used by the retained actuary in the December 31, 2021, actuarial valuation of PERS.

Actuarial Assumptions
The set of actuarial assumptions and methods, taken in combination, is reasonable and generally established in accordance with ASOP No. 27, Selection of Economic Assumptions for

Measuring Pension Obligations, and ASOP No. 35, Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations.

Actuarial Methods

We believe the rate collaring process is a very well-developed funding procedure that will serve PERS and the stakeholders well in the future. Amortizing the UAL layers over 20 years or less, including the full normal cost in the recommended contribution, and restricting the decrease of the UAL rate are all strong attributes of the current contribution rate setting process and align with the guidance outlined in the new ASOP No. 4. The rate collaring provision is also an appropriate addition to the contribution calculation process considering the additional volatility that can be generated by utilizing an unsmoothed asset value in determining contribution requirements.

We recommend that the retained actuary consider enhancing the current contribution calculation process to address the timing lag in the UAL rate during the next in-depth review of the contribution calculation process or experience study. We acknowledge that this enhancement to the process would further complicate a very complex process, but we believe this enhancement will better comply with the future ASOPs and will improve the overall effectiveness of the contribution calculation process.

This 18-month gap between the actuarial valuation date and the contribution effective date results in interest accruals in the new UAL layer for 18 months until the new payments commence. PERS is eventually made whole because these unfunded interest accruals are effectively picked up in the new UAL layer in the subsequent rate setting valuation. This payment timing gap could be addressed in the calculation of the UAL contribution rate by increasing both the new UAL liability layer and the expected payroll by 18 months while calculating the rate.

Actuarial Valuation Results

In general, the data, sample liability calculations, and sample employer contribution calculations all appear to be reasonable and appropriate. We recommend that the retained actuary consider the noted comments and observations on decrement timing, the use of multiple service amounts, and the Oregon residency assumption as it applies to lump sums.

The particular recommendations follow.

Decrements and pay increase timing appear to be assumed to occur at the beginning of each year. Decrements also appear to be independent probabilities. We recommend the retained actuary disclose these assumptions and methods in their report. Generally, the more common approach to decrement timing is to assume that the decrements apply at the middle of the year but there are certainly circumstances where a beginning of year decrement timing may be more appropriate. We recommend that the retained actuary carefully consider the decrement timing that is most appropriate for PERS during the next experience study and note the finding in the experience study report.

The retained actuary appears to be using different service amounts for items such as salary increases, decrements, eligibility testing, and years since entry into the plan. While the use of these different service amounts is reasonable and often warranted, we recommend that these procedures be disclosed in the actuarial valuation report for better transparency and disclosure. If different service amounts are used, it is also important that the retained actuary uses these service amounts consistently when examining prior experience and setting future assumptions in the next experience study.

For purposes of determining eligibility for SB 656/HB 3349 benefit adjustments, the retained actuary assumes 85% of retirees are assumed to remain Oregon residents after retirement. This 85% assumption is also being applied to lump sums, but we recommend that the retained actuary consider increasing this assumption, possibly up to 100%, during the next experience study. We would expect virtually all members are still living in Oregon at the time of retirement when they receive lump sums.

Content of Valuation Report

In order to improve the ability of the report to communicate the assumptions, methods and plan provisions incorporated into the actuarial valuation of PERS, we recommend that the retained actuary incorporate the noted enhancements to future actuarial valuation reports.

Actuarial Standard of Practice No. 56, Modeling (ASOP No. 56)
ASOP No. 56 provides guidance to actuaries when performing actuarial services with respect to designing, developing, selecting, modifying, using, reviewing, or evaluating models. This Standard requires certain disclosures by the retained actuary as part of an actuarial valuation of the pension plan.

ASOP 56 generally requires the actuary to disclose:
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• Material inconsistencies, if any, among assumptions, and known reasons for such inconsistencies;
• Unreasonable output resulting from the aggregation of assumptions, if material; and
• Material limitations and known weaknesses.

We were not able to identify disclosures in the actuarial valuation report that would satisfy the requirements of ASOP No. 56. We recommend that the retained actuary closely consider the requirements of ASOP No. 56 and include the appropriate disclosures in future actuarial valuation reports.

Consideration for Executive Summary

The December 31, 2021 system-wide actuarial valuation report starts off with a 17-page Executive Summary which provides comprehensive summary of the notable results of the actuarial valuation. We believe it would enhance the communication of the key actuarial valuation results to add a true Executive Summary to the beginning of the actuarial valuation report which would be used to present the most important results from the actuarial valuation on, presumably, one page. This Executive Summary could include key metrics like the funded

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The amortization period can vary across different plans and groups. Additionally, the number of outstanding bases will increase with each successive rate setting valuation. As a result, we believe it would enhance the overall communication of the remaining amortization of the UAL for the retained actuary to add the remaining period for each individual amortization base to the tables included in the actuarial valuation reports.

We look forward to having subsequent actuarial reviews as per House Bill 4163, Section 11 (2018) demonstrate that PERS continues to refine its actuarial practices, while ensuring items such as rate collaring, payroll growth assumptions and the assumed rate of return are regularly reviewed for appropriateness and soundness by the PERS Board as one of their principal fiduciary duties to PERS' members.

Please contact Kevin Olineck, Director at (503) 603-7695 with any questions.

Sincerely,

Kevin Olineck,
Director