California Public Employees' Retirement System

Parallel Valuation and Certification Report
CalPERS State and Schools Valuations

As of June 30, 2015

December 2016

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Members of the Board:

As provided in Contract 2015-8123, we have reviewed valuations prepared by the CalPERS professional actuarial staff in order to certify that such work satisfies applicable standards of the actuarial profession. In the following pages, we report the results of our review of the June 30, 2015 annual actuarial valuations prepared for the State and Schools plans.

We reviewed the assumptions, methods and procedures used by CalPERS staff to perform the State and Schools valuations we examined, and in our opinion they conform to applicable Actuarial Standards of Practice.

In addition, we completed parallel actuarial valuations for the State and Schools plans using the same assumptions and census, asset and benefit provision data that were used by CalPERS staff to prepare their June 30, 2015 valuations of these plans. We compared key results of our parallel valuations to those in the corresponding valuation reports published by CalPERS.

Each actuarial organization has its own valuation model and applies actuarial assumptions and methods in its preferred way. There is rarely a single “right” answer when it comes to actuarial calculations. For a pension actuarial valuation, we consider one actuary’s calculations to reasonably match another actuary’s calculations when the present values (liabilities), normal cost contributions, and total employer contributions computed by the two actuaries are within 5% of each other.

For all State and Schools plans, our computations of the contribution rates matched those prepared by CalPERS staff within 5%, which was the target tolerance level specified by CalPERS. We view the differences as not material. Our analysis also included a comparison of present values of future benefits, accrued liabilities and normal costs. For The Miscellaneous Tier 2 plan, our calculations of these components produced some results that differed by more than 5% from the corresponding results produced by CalPERS. We have documented causes of these differences in results.

Although not required by the Request for Proposal (No. 2015-7649), we also compared key valuation results for each individual participant (active members, transferred and terminated members, and retired members and beneficiaries) in the State and Schools plans. This enhanced reconciliation process provides a deeper review of the calculations and may highlight differences in the handling of individual participants in the valuation process whose effects offset each other when results are aggregated at the level of the entire plan.

The Table of Contents, which immediately follows, outlines the material contained in the report.

Future actuarial measurements may differ significantly from current measurements due to plan experience differing from that anticipated by the economic and demographic assumptions, changes expected as part of the natural operation of the methodology used for these measurements, and changes in plan provisions, applicable law or regulations. An analysis of the potential range of such future differences is beyond the scope of this study.

This report was prepared for the Board and professional staff of CalPERS for their use in evaluating the preparation of actuarial valuations by the System. Use of this report for any other purpose or by other parties may not be appropriate and may result in mistaken conclusions because of failure to understand applicable assumptions, methods, or inapplicability of the report for other purposes. No one may make any representations or warranties based on any statements or conclusions contained in this report without Buck Consultants' prior written consent.

The undersigned are Fellows of the Society of Actuaries, Members of the American Academy of Actuaries and Enrolled Actuaries. They each meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained in this report. This report has been prepared in accordance with all applicable Actuarial Standards of Practice, and we are available to answer questions about it.

Respectfully submitted,

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Section

Schedules

Section I - Introduction

Under the California Constitution, the Board of Administration has plenary authority and fiduciary responsibility to provide for actuarial services. The CalPERS Chief Actuary advises the Board and directs the activities of the CalPERS professional actuarial staff. The Board also retains the services of an outside actuarial firm to review the work of the CalPERS professional actuarial staff and to certify that such work satisfies actuarial professional standards.

Buck Consultants was contracted to provide parallel valuation and certification services to the Board.

This report summarizes our review of the State and Schools plans' actuarial valuation results as of June 30, 2015.

We first reviewed the actuarial assumptions and methods used for the June 30, 2015 State and Schools valuations. Our review reflects recent changes in the Actuarial Standards of Practice (ASOP) applicable to the selection of economic assumptions (ASOP 27) and the selection of demographic assumptions (ASOP 35). The results of our review are discussed in Section II.

Next, we completed parallel actuarial valuations for the State and Schools plans in order to compare our key valuation results with those published in the valuation reports prepared for the plans. CalPERS requested that we reconcile any differences of more than 5% between the two sets of valuation results. Section III contains a summary of our parallel valuation methodology. The results of our analysis are summarized in Section IV.

We have also reviewed the reports for the sample State and Schools plans in light of the relatively new requirements of ASOP 4, the standard of practice for measuring pension obligations and determining pension plan costs or contributions. ASOP 4 was significantly updated in late 2013 for valuations made on or after December 31, 2014.

Section II - Review of Actuarial Assumptions and Methods

We have reviewed the actuarial assumptions and methods used in the State and Schools valuations. The key valuation assumptions include the following:

- Expected rate of return on investments, net of expenses: 7.50%
- Payroll growth: 3.00%. This is used for projecting payroll in developing amortization payment schedules.
- Salary scale: varies by entry age, service, and type of employee
- Inflation: 2.75%
- Decrement assumptions including mortality, rates of termination and retirement: based on an experience study adopted by the Board in 2014

Actuarial Standard of Practice (ASOP) 27 discusses the selection of economic assumptions for the measurement of pension liabilities. Similarly, ASOP 35 discusses the selection of demographic assumptions for the measurement of pension liabilities. In our opinion, the assumptions used in the State and Schools valuations are reasonable and the methodology used to select these assumptions is appropriate and consistent with the guidance provided in ASOP 27 and ASOP 35.

We have reviewed the assumed annual rate of return on plan assets of 7.50% using our own economic modeling tool and determined that it is a reasonable assumed long-term expected rate of return for the plans covered by this report.

Section III – Parallel Actuarial Valuation Methodology

The steps followed in our parallel actuarial valuation are described below.

The State and Schools plans consist of the following separate plans:

State Plans

- State Miscellaneous Tier 1
- State Miscellaneous Tier 2
- State Industrial
- State Safety
- State Peace Officers & Firefighters
- California Highway Patrol

Schools Pool

We requested copies of the final June 30, 2015 valuation reports for the State and Schools plans.

For each of the seven plans we completed the following steps:

1. For each plan, we requested:
   a) The complete decrement tables used by CalPERS to prepare the valuation
   b) The final participant data used in generating the valuation report
   c) The key actuarial results presented in each valuation report (normal cost, actuarial accrued liability, present value of benefits, present value future salary, etc.) both in the aggregate and *on a per participant basis*.

2. Using the information provided in the two valuation reports and in 1(a) and 1(b) above, we produced valuations for each plan using ProVal®, a commercially available valuation system used worldwide by actuaries and investment professionals. We generated the key actuarial results for comparison to results published in the actuarial valuation reports.

3. In the reconciliation process, using the data provided in 1(c) above and the output from ProVal®, we compared the key results both on an aggregate basis and an individual basis. Reconciling results for individual participants as well as by plan may uncover multiple discrepancies that offset each other, producing aggregate results that fall within 5% tolerance level. Valuation results that differ by less than 5% in total may camouflage systematic errors with respect to particular types of participants. Comparing results by participant helps us to identify the reasons for differences in aggregate result that exceed the 5% tolerance and to identify hidden material discrepancies for results that are within the tolerance as well. As part of this enhanced reconciliation process, we provide in Schedule C a frequency distribution of the percentage difference in key actuarial results by participant.

4. We have communicated preliminary results to CalPERS via email and telephone discussions.

5. In our Summary of Findings in the next section, we provide the following:
   - A recap of issues found in each actuarial review
   - A discussion of how issues were resolved
   - A description of any outstanding issues

Section IV - Summary of Findings

Schedule B summarizes the results for the State and Schools plans.

In our parallel valuations and review, we compared present values of future pay, present values of future benefits, actuarial accrued liabilities, and total normal costs. We then used these key valuation results to compute and compare the total employer contribution rates. We are happy to report that for all plans our calculation of the employer contribution rates differed by less than 5% from the corresponding results reported by CalPERS.

For State Miscellaneous Tier 2, there were discrepancies of more than 5% between our calculations and CalPERS' calculations of the present value of benefits, actuarial accrued liabilities and total normal cost. In an effort to identify the reasons for these discrepancies, we analyzed differences in the development of our results as compared to the development of CalPERS' results.

As background, Tier 2 participants have the option to purchase Tier 1 level benefits by making additional employee contributions beyond those required under Tier 2 benefit provisions. The valuation assumes that all Tier 2 participants will elect to make these additional employee contributions and purchase Tier 1 level benefits. In order to reflect this assumption in our parallel valuation, additional special employee contributions were projected to accumulate with interest from participants' dates of participation to their dates of termination. From participants' dates of termination to their projected dates of retirement, special employee contribution accounts were accumulated with interest only. This total special employee contribution account was used to reduce the gross liability.

Listed below are issues identified in CalPERS' calculations for Tier 2 participants along with other types of members:

1. Tier 2 Findings:

    a) For some separated participants, the special employee contribution account was set to zero in the participant data, with balances accumulating only for future years. This missing starting value for the special employee account balance resulted in smaller offsets to the gross liability in both the CalPERS and Buck valuations and therefore an overstatement of the expected net liability.

    b) For separated participants, CalPERS accumulated the special employee contribution account with additional employee contributions in the future, even though they are no longer in covered employment and are thus unable to make such contributions. For the period after termination, Buck accumulated the special employee contribution account with interest only. The assumption of continued special employee contributions by separated participants resulted in an overstatement of the value of the special employee contribution account and an understatement of the liability in the CalPERS valuation.

    c) For active employees, there was a slight difference between the approaches Buck and CalPERS took to implementing the Entry Age Normal Cost Method in the valuation. Buck accumulated the special employee contributions from entry age so that they replicated the special employee contributions balances as of the valuation date. CalPERS calculated special employee contributions from entry age independently of the balances on the valuation date. Both methods are reasonable and the difference in these approaches affects only the split of actuarial liabilities between past and future service and not the amounts of the liabilities themselves. The net impact for Miscellaneous Tier 2 is that the Buck valuation produced a lower normal cost and correspondingly higher actuarial accrued liability than the CalPERS valuation.

2. Other Findings:

   a) For separated employees in all plans, we observed that the mortality assumption (decrement) was not being applied in the period prior to retirement for participants who have separated from employment and are entitled to benefits at a future retirement age. We believe the pre-retirement mortality decrement should be applied in determining liabilities for all participants for all future years.

Impact of Findings

While findings described in the Tier 2 Findings above resulted in individual key results that were outside of the 5% tolerance, the calculated employer contribution rates developed by Buck and CalPERS for Miscellaneous Tier 2 differed by less than 5%. The net impact of the recommendation made under Other Findings above, if implemented, would be a slight decrease in liabilities for separated members and within the 5% tolerance.

Section V – Additional Comments and Recommendations

Our review has indicated that the actuarial process followed by CalPERS is thorough, complete, and complies with applicable Actuarial Standards of Practice. In the prior section, we identified some technical aspects of the calculation of results that may be considered for further refinement, which are reiterated below. In this section, we also provide some additional comments and recommendations.

Recommendations

1. Add information to the reports to meet new ASOP 4 requirements.

Actuarial Standard of Practice 4 (ASOP 4), which provides guidance for measuring pension obligations and determining pension plan costs or contributions, was significantly revised in 2013 for measurements made as of dates on or after December 31, 2014. We have noted the following items that may be considered for inclusion in future reports in order to more completely fulfill the requirements of the current version of ASOP 4:

a) An enhanced description of the contribution allocation procedure, including a more detailed description of what the five-year ramp up and ramp-down in amortizations entail. (4.1(k) of ASOP 4)

b) A statement regarding the impact of the funding policy on future contributions; i.e., an explanation that the impact on funding associated with a current-year gain or loss will be increasing over the next five years before leveling out. This observation is similar to item (a) above but slightly different, as this is specifically addressed to the impact on future contributions. (4.1(m) of ASOP 4)

c) Some additional comments about the appropriateness of reported measures of the funded status of the plan for various purposes. (4.1(q) of ASOP 4)

d) In accordance with 4.1(r) (or 4.1(l) in the version of ASOP 4 that was in effect on June 30, 2014), a statement about future measurements and the fact that they may differ from current measurements. While some analysis was included in the reports we reviewed regarding the impact of potential variations in future investment returns, a more general statement about the potential effect of experience differing from assumptions may be needed in light of this requirement of ASOP 4.

e) In accordance with 4.1(s), more detail on the rationale for changes in assumptions than was present in the reports we reviewed.

f) While not specifically mandated by ASOP 4, a statement of the asset and liability transfers that are made between the State Safety and State Peace Officers & Firefighters plans. This transfer is described at the bottom of page C-1 of the State report, but we believe it would be helpful if the actual transfers were also disclosed in the body of the valuation report.

2. Consider revising the calculation of projected accumulated employee contributions for Tier 2 participants.

As described previously, there were three issues found with the calculation of projected accumulated employee contributions for Tier 2 participants. We recommend changes be made to address the first two of these issues. Specifically:

a) By starting with a zero balance for special employee contribution amounts for certain separated employees and not reflecting their prior special employee contributions, the total special employee contributions are being understated, resulting in an overstatement of the liability. If the data on the prior special employee contribution amounts is available, this should be reflected in future valuations.

b) The accumulation of additional special employee contributions for purchase of Tier 1 level benefits by participants who have separated from active employment results in the overstatement of employee contributions and an understatement of the net liability for this group. The calculation of the special accumulated employee contributions should be adjusted to accumulate balances with interest only for participants who have separated from active employment.

The third discrepancy identified was related to the normal cost methodology for Tier 2 members. While the difference between our approach and that taken by CalPERS in the treatment of special employee contributions in the development of entry age normal costs led to differences between our respective valuation results for active Tier 2 members, the methodology used by CalPERS is not unreasonable and no change is proposed.

3. Consider reflecting pre-retirement mortality for all separated participants.

As described in our findings, the valuation results can be refined by reflecting the pre-retirement mortality assumption for all separated participants. This will provide a more precise projection of expected possible outcomes in the future and, as a result, a more precise statement of the current liability of the plans. We recognize that this refinement would not be expected to have a material impact on the valuations' results.

Schedule A – Comparison of Active Member Data

Plan		Number of Actives	Average Age	Average Service	Average Pay
State Miscellaneous Tier 1	CalPERS	163,609	47.4	12.6	$64,763
	Buck	163,680	47.5	12.7	$64,849
State Miscellaneous Tier 2	CalPERS	4,977	52.5	20.7	$60,000
	Buck	4,977	52.5	20.8	$59,999
State Industrial	CalPERS	11,104	45.6	9.6	$54,026
	Buck	11,104	45.6	9.6	$54,066
State Safety	CalPERS	26,096	47.2	8.1	$77,115
	Buck	26,097	47.2	8.1	$78,313
State Peace Officers & Firefighters	CalPERS	40,525	42.1	12.3	$77,570
	Buck	40,253	42.1	12.3	$77,363
California Highway Patrol	CalPERS	7,223	40.6	13.8	$111,156
	Buck	7,223	40.6	13.8	$111,154
Schools Pool	CalPERS	297,951	47.3	11.0	$38,273
	Buck	297,951	47.3	10.9	$38,286

Note: The CalPERS data reflected above is based on successfully valued participants and ignores participants rejected by the valuation system as defective. The Buck counts are based on participant data fed into the valuation system and therefore may be slightly higher in some cases.

Schedule B – Comparison of Key Valuation Results

Plan		Present Value of Benefits	Accrued Liability	Projected Normal Cost (ER+EE)@	Employer Contribution Rate#
State Miscellaneous Tier 1	CalPERS	108,046,628,196	95,213,666,078	1,748,115,409	26.646%
	Buck	107,901,920,818	95,087,586,944	1,800,801,033	26.606%
	Difference	-0.13%	-0.13%	3.01%	-0.15%
State Miscellaneous Tier 2	CalPERS	2,831,648,419	2,617,491,701	31,195,837	26.095%
	Buck	3,071,097,784	2,879,071,486	28,478,589	25.390%
	Difference	8.46%	9.99%	-8.71%	-2.70%
State Industrial	CalPERS	4,594,218,730	3,669,191,968	114,687,017	18.365%
	Buck	4,617,960,952	3,719,129,010	115,157,906	17.777%
	Difference	0.52%	1.36%	0.41%	-3.20%
State Safety*	CalPERS	13,419,044,548	10,255,010,865	463,947,373	18.702%
	Buck	13,211,388,575	10,130,857,886	463,800,910	18.564%
	Difference	-1.55%	-1.21%	-0.03%	-0.74%
State Peace Officers & Firefighters*	CalPERS	46,831,518,716	39,393,965,231	918,584,561	40.229%
	Buck	46,478,105,410	39,113,799,521	944,500,742	40.490%
	Difference	-0.75%	-0.71%	2.82%	0.65%
California Highway Patrol	CalPERS	12,924,742,316	10,941,786,412	225,276,651	48.701%
	Buck	12,912,561,495	10,851,114,106	226,509,385	48.455%
	Difference	-0.09%	-0.83%	0.55%	-0.51%

* Reflects liability transfer of $237,888,451 to the State Peace Officers & Firefighters plan from the State Safety plan.
@ Normal cost projected to fiscal year 2016-17.
# Pension only contribution rates are shown. Rates for Group Term Life Benefits are not reflected.

Schedule B – Comparison of Key Valuation Results (continued)

Plan		Present Value of Benefits	Accrued Liability	Projected Normal Cost (ER+EE)@	Employer Contribution Rate
Schools Pool	CalPERS	86,037,664,407	73,324,977,003	1,825,596,586	13.888%
	Buck	85,564,732,400	72,937,694,553	1,818,006,477	13.772%
	Difference	-0.55%	-0.53%	-0.42%	-0.82%

@ Normal cost projected to fiscal year 2016-17.

Schedule C – Comparison of Individual Participant Results

Present Value of Future Benefit Weighted Differences

All Members for all 7 Plans Combined

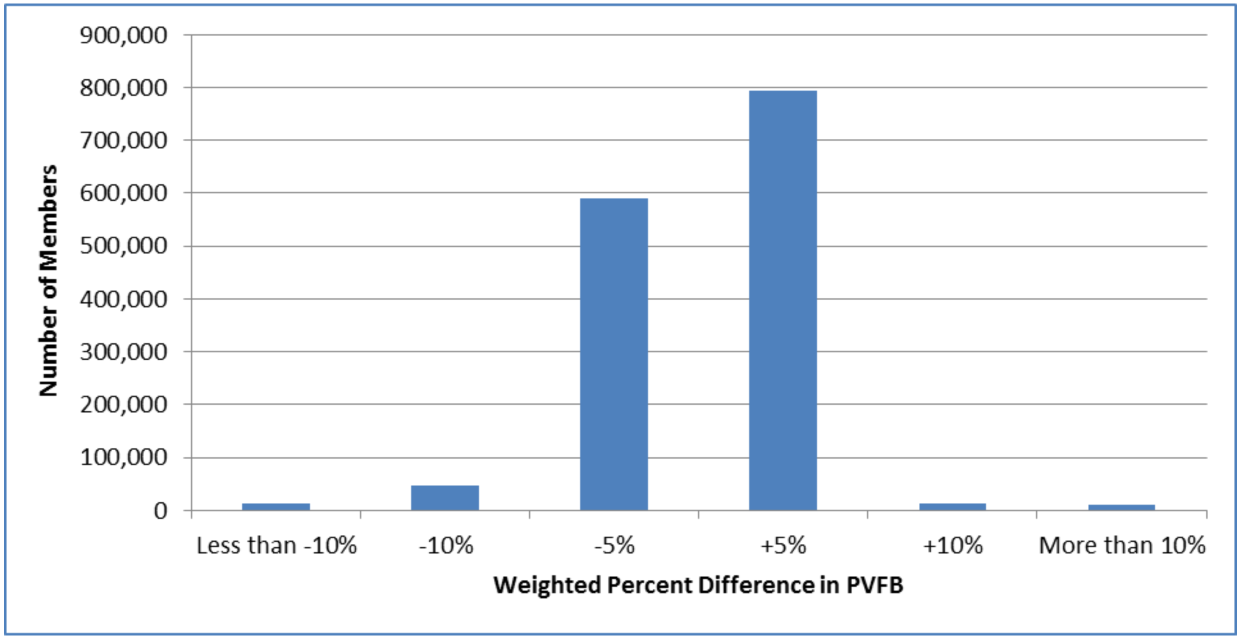

Chart Tabulation Method and Notation: The chart above reflects weighted percent differences between Buck and CalPERS results*, rounded to the nearest hundredth of a percent, where -5% reflects Buck results that were within the range from 0.00% to -4.99% compared to CalPERS results, where -10% reflects Buck results within -5.00% to -9.99% of CalPERS results, etc. Because small dollar differences may produce large percentage differences, the differences shown above were weighted using the average CalPERS State & Schools PVFB of $203,674.

*CalPERS individual participant results were generated after completion of the CalPERS valuation and reflect some data edits not reflected in the published CalPERS valuations. While not material, these post-valuation edits may impact the comparability of some of the individual results tabulated above.