Town of Moraga	Agenda Item
Ordinances, Resolutions, Requests for Action	11. A.

Meeting Date: October 23, 2019

TOWN OF MORAGA **STAFF REPORT**

To: **Honorable Mayor and Councilmembers**

From: **Cynthia Battenberg, Town Manager**
Norm Veloso, Administrative Services Director

Subject: **Review and Accept the CalPERS Actuarial Analysis June 30, 2018 Valuation for the Town of Moraga**

Background

In an effort to better understand the Town's CalPERS unfunded pension liability, the Council directed staff to seek actuarial services to conduct a CalPERS Unfunded Liability Study for the Town during the Fiscal Year (FY) 2019/20 budget process.

The unfunded pension liability analysis focuses on the paydown of CalPERS pension liability only as the Town is not burdened by OPEB (Other Post-Employment Benefits) liabilities. Many agencies are also facing growing OPEB, such as retiree health care. Moraga's benefit formulas, which are some of the lowest in CalPERS, also place Moraga in a better position in terms of managing unfunded liability than many other agencies.

Current CalPERS Valuation

Under the Town's retirement contract with CalPERS, Town staff are grouped by a number of characteristics that ultimately result in four distinct pension plans, each of which has assets, requirements and liabilities.

One characteristic distinguishing employee membership in a plan is the type of service provided to the Town. Sworn police personnel are members of the "Safety" group, while all other regular employees are classified as members of the "Miscellaneous" group. Another characteristic is based on the date that the employee began working with a CalPERS agency. The statewide Public Employee Pension Reform Act (PEPRA) created a second tier of retirement benefits for employers hired after January 1, 2013. Employees who were CalPERS members before the PEPRA implementation are considered "Classic" members and those employees hired after January 1, 2013 are considered "PEPRA" members.

Annually, CalPERS provides each member agency an Annual Valuation Report of CalPERS pension plans (CalPERS Reports). The CalPERS Reports determine the minimum required employer contribution for the following fiscal year. The required employer contribution is the sum of the Plan's Employer Normal Cost Rate (expressed as a percentage of payroll) plus the Employer Unfunded Accrued Liability (UAL) Contribution Amount (UAL is the difference between the market value of assets and the accrued liability). The CalPERS Reports as of June 30, 2018 for Moraga's four employee groups are included as Attachments B-E.

The FY 2020/21 through FY 2024/25 projected employer contribution rates are:

Miscellaneous Classic	10.484%	(6.484% after employee 4% cost share)
Safety Classic	18.152%	(14.152% after employee 4% cost share)
Miscellaneous PEPRA	7.732%	
Safety PEPRA	13.044%	

The Town's total UAL according to the June 30, 2018 CalPERS Reports is $7.3 million, an increase from the $5.97 million projection included in the June 30, 2017 CalPERS Reports. Should the Town decide to terminate the CalPERS pension plan, the hypothetical termination liability, with an assumed effective termination discount rate of 2.5%, is $50.1 million. This higher termination liability is due to CalPERS' approach to a more conservative investment policy and asset allocation strategy secured by risk free assets.

The CalPERS Reports project employer UAL for the next six years as follows:

	FY 20/21	FY21/22	FY 22/23	FY 23/24	FY 24/25	FY 25/26
Miscellaneous	$257,784	$305,000	$344,000	$369,000	$396,000	$407,000
Safety	$214,235	$249,000	$277,000	$295,000	$312,000	$321,000
Total	$472,019	$554,000	$621,000	$664,000	$708,000	$728,000

The Town budgets according to the CalPERS Reports and in FY 2019/20 the combined contribution rate for both the employer contribution and UAL was 19.1% of payroll (the UAL contribution was $406,949).

Consultant Analysis

Bartel and Associates was retained to review the CalPERS Actuarial Valuation Reports dated June 30, 2018 (released in July 2019), provide contribution projections through FY 2030/31 including the impact of a discount rate reduction to 6.5% as opposed to the 7% CalPERS assumed rate. The analysis provides the Town contribution rate projections over a longer period (though FY 2028/29 and beyond), and includes asset return sensitivity for each fiscal year to provide the Town ranges of likely future contributions and includes the impact of:

- PEPRA new hires,
- CalPERS new amortization policy
- Discount rate changes, including risk mitigation strategy
- Lower expected investment returns over the next 10 years, and
- Investment return volatility.

The study also provides a comprehensive review and summary of historical CalPERS actuarial information including:

- Review of historical actuarial valuation reports;
- Summary of historical information for the Miscellaneous and Safety plans;
- Participant demographic information;
- Funded status; and
- Contribution rates.

Bartel prepared options to pay down the unfunded liability, including a supplemental pension trust (Rate Stabilization) model to pay down the unfunded liability and mitigate contribution rate fluctuations. This information is intended to assist the Town in considering an initial contribution and/or subsequent contributions and to guide the Town in exploring a target level to trigger CalPERS payments from the trust.

Discussion

The Town of Moraga CalPERS Actuarial Analysis June 30, 2018 Valuation (Report) prepared by Bartel Associates is included as Attachment A. The Report is intended to assist the Town in evaluating the current funding situation and strategies to stabilize future payments. Bartel recommends the Town evaluate and address two primary issues - unfunded liability and future contributions.

An important premise of the Bartel analysis is the reduction in the CalPERS discount rate from 7% to 6.5% which results in an increase in the Town's June 30, 2018 CalPERS Report UAL of $7.3 million to $9.3 million.

As inflation assumptions can make it difficult to understand the relative value of future costs over twenty years, the Report includes contribution rate projections which are the percentage of salary contributed towards CalPERS for both the required annual contribution rates (net of employees' 4% contribution) and the UAL. A summary of the required contribution rates by plan and overall for the next twenty years should the Town assume payments consistent with Bartel's 6.5% discount rate payment schedule follows:

Miscellaneous Plan: In FY 2019/20 the contribution rate was 15.2%. That amount is projected to increase over the next 12 years to a high of 30.0% in FY 31/32, dropping to below 25% in FY 35/36 and 19.2% in FY 39/40.

Safety Plan: In FY 2019/20 the contribution rate was 25.5%. That amount is projected to increase to a high of 46.3% in FY 31/32, dropping to below 25% in FY 35/36 and 19.2% in FY 39/40.

Overall: In FY 2019/20 the blended contribution rate was 19.1%. That amount is projected to increase to a high of 35.2% in FY 31/32, dropping to 26.4% in FY 37/38 and 22.2% in FY 39/40.

Should the Town identify funding, there are options available to reduce the CalPERS unfunded liability and/or mitigate expected volatility of future CalPERS contributions.

Bartel recommends contributions to a Supplemental Pension Trust qualified under Section 115 of the Internal Revenue Code and the use the trust funds to pay future contributions.

Bartel analyzed the Town's current pension liability and recommends three scenarios for discussion where funds are deposited into a Trust which would then be used to pay the future anticipated contribution increases. In scenario 2, the funds are also used to offset the rising cost of the Town's contribution to CalPERS consistent with their annual valuation report. The overall contribution rate in all scenarios is projected to stabilize at 30% in FY 29/30 or earlier.

Scenario 1
Town would make a $1 million contribution on June 30, 2020 to a Trust with $500,000 million to the Miscellaneous Plan and $500,000 to the Safety Plan and continue to make contributions to CalPERS consistent with their annual valuation report through FY 26/27 when the payments would reach 30% of payroll.

Scenario 2
The Town would invest $265,000 annually into a Trust or to pay a portion of the projected CalPERS contribution, making a $135,000 annual contribution to the Miscellaneous Plan Trust and a $130,000 annual contribution to the Safety Plan Trust. The total contribution would be $2.65 million.

Scenario 3
The Town would invest $100,000 annually over the next ten years, making a $50,000 annual contribution to the Miscellaneous Plan Trust and a $50,000 annual contribution to the Safety Plan Trust. The total contribution would be $1 million.

Next Steps

The CalPERS pension liability study is one of the three unfunded needs assessments the Council requested. The Capital Asset Replacement Analysis and Report was presented to the Council on September 25, 2019 and the 2019 Addendum to the Storm Drain Master Plan is scheduled to be presented to the Council on November 13, 2019.

Staff plans to share the report findings in the About Town Newsletter, Facebook and NextDoor and post the reports online. As directed by the Council on September 25, 2019, staff also plans to hold a community meeting to discuss the findings of the three unfunded needs assessments, create an unfunded needs assessment brochure (similar to the Budget at a Glance) and share this information with service groups and organizations.

Based on input from the community, the Town could then develop a prioritization survey to better understand community desires.

Fiscal Impact

Implications will be determined based on policy direction in subsequent conversations.

Alternatives

1. Review and accept the Town of Moraga CalPERS Actuarial Analysis June 30, 2018 Valuation Report; or
2. Do not accept the Town of Moraga CalPERS Actuarial Analysis June 30, 2018 Valuation Report and provide direction to staff.

Recommendation

Staff recommends the Town Council review and accept the Town of Moraga CalPERS Actuarial Analysis June 30, 2019 Valuation Report.

Attachments:

- **A.** Town of Moraga CalPERS Actuarial Analysis June 30, 2018 Valuation Report prepared by Bartel Associates, Inc.
- **B.** CalPERS Annual Valuation Report as of June 30, 2018 – Miscellaneous Classic
- **C.** CalPERS Annual Valuation Report as of June 30, 2018 – Miscellaneous PEPRA
- **D.** CalPERS Annual Valuation Report as of June 30, 2018 – Safety Classic
- **E.** CalPERS Annual Valuation Report as of June 30, 2018 – Safety PEPRA

ATTACHMENT A

Town of Moraga CalPERS Actuarial Analysis June 30, 2018
Valuation Report prepared by Bartel Associates, Inc.

BARTEL ASSOCIATES, LLC

Town of Moraga

CalPERS Actuarial Analysis
June 30, 2018 Valuation

October 2019

INDEX

TOWN OF MORAGA
CALPERS ACTUARIAL ANALYSIS – JUNE 30, 2018 VALUATION
INTRODUCTION

The Town of Moraga retained Bartel Associates to provide CalPERS-related actuarial consulting services. This Executive Summary analyzes the Town's CalPERS Miscellaneous and Safety pension plans to assist the Town in evaluating the current funding situation.

We believe there are 2 primary issues the Town should evaluate and address with respect to the CalPERS pension plan, the Unfunded Actuarial Accrued Liability (unfunded liability) and future contributions. The unfunded liability provides an estimated value at a single point in time of additional contributions needed to pay off past accrued liabilities. Projected future contributions represent the future cash outlay required to defease the unfunded liability. Therefore, both need to be considered:

- Unfunded Liability
  The Town's June 30, 2018 Unfunded Actuarial Liability (UAL) is $4.1 million for the Miscellaneous plan and $3.2 million for the Safety plan. This is measured by CalPERS based on a 7.00% discount rate. If a 6.5% discount rate is used, the UAL is $5.2 million for the Miscellaneous plan and $4.1 million for the Safety plan.

- Future Contributions
  Due primarily to CalPERS actuarial assumption and methods changes over the last 5 years, Town contributions are expected to gradually increase from $363 thousand in 2019/20 to $862 thousand in fiscal year 2030/31 for the Miscellaneous plan and from $371 thousand to $786 thousand for the Safety plan. For both plans, significantly higher contributions should be expected for many years to come.

Future unfunded liabilities and contributions will vary significantly depending on investment returns. Our analysis provides measurements of this variability to help the Town understand the impact of investment volatility. Our projections show that under most investment return scenarios, contributions are expected to remain significantly above current levels for 15 years or more.

We believe agencies should strongly consider funding amounts above the contributions CalPERS currently requires, with the level of funding being an individual agency budgetary decision. Additional funding could be paid directly to CalPERS, or to a supplemental pension trust.

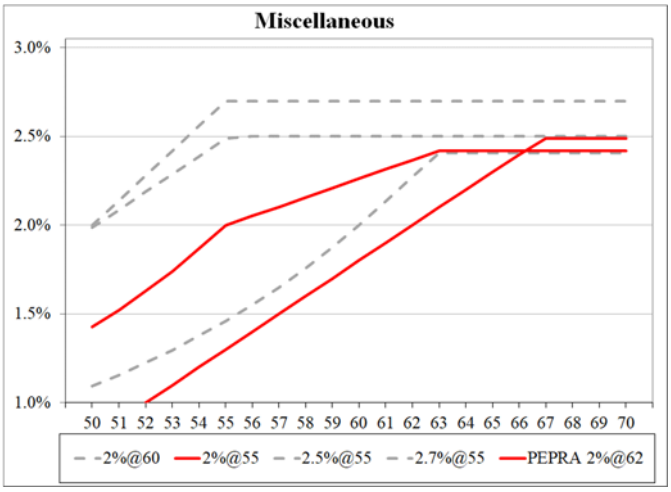
We understand the Town's primary objectives are to control long term costs and volatility. We believe these objectives are better achieved through additional contributions to a supplemental trust. The supplemental trust provides more flexibility for the Town to both level out contributions and mitigate year-to-year contribution volatility.

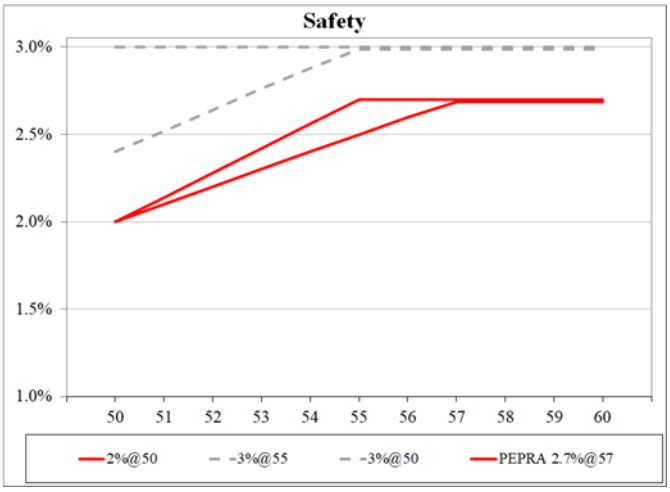
Benefits

Current employees have the following benefit formulas:

	Miscellaneous	Safety
Hired before January 1, 2013	2% @ 55	2% @ 50
New members hired on or after January 1, 2013	2% @ 62 (PEPRA)	2.7% @ 57 (PEPRA)

Following are the benefit factors for these formulas. Town formulas are red lines, other formulas provided for comparative purposes for surrounding cities.





Funded Status

Following is the June 30, 2018 plan funded status based on the actuarial valuation 7% discount rate.

(in $ millions)

	Miscellaneous	Safety	Total
■ Actuarial Accrued Liability	$16.1	$12.1	$28.2
■ Assets	12.0	8.9	20.9
■ Unfunded Liability	4.1	3.2	7.3
■ Funded Ratio	74.3%	73.7%	74.0%
■ Funded Ratio for all CalPERS agencies	71.7%	68.3%	70.4%

CalPERS risk mitigation policy is expected to reduce future portfolio risk and investment returns. Bartel Associates modeling projects the impact of this policy will be to gradually (over the next approximate 20 years) resulting in a long term return probably closer to 6.5% than 7%. Following is the June 30, 2018 plan funded status based on a 6.50% discount rate. Comparable funded ratios for all CalPERS plans are not available.

(in $ millions)

	Miscellaneous	Safety	Total
■ Actuarial Accrued Liability	$17.2	$13.0	$30.2
■ Assets	12.0	8.9	20.9
■ Unfunded Liability	5.2	4.1	9.3
■ Funded Ratio	69.8%	68.5%	69.2%

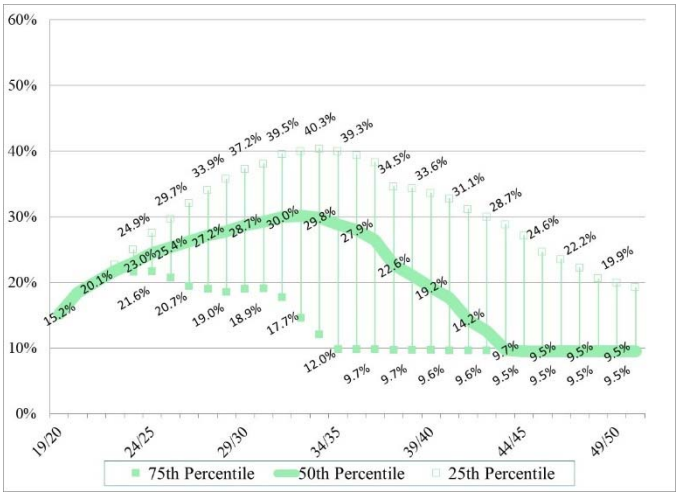
Our projections[1] incorporate the following:

- Discount rate reductions due to risk mitigation. CalPERS risk mitigation policy is expected to reduce future portfolio risk and investment returns. Bartel Associates modeling projects the impact of this policy will be to gradually (over the next approximate 20 years) reduce expected returns, and the discount rate, to 6%.
- The 6.7% investment return reported by CalPERS for 18/19, and subsequent lower (6.5%) investment returns over the next approximate 10 years.
- CalPERS actual investment return will significantly affect Town contribution rates. Our projections show the Town's contribution rates assuming future (beyond June 30, 2019) investment returns will average 0.1%, 7.0%, and 14.8% for the 25th, 50th and 75th confidence levels[2] respectively for the first approximate 10 years. After this period slightly higher returns are assumed.
- The impact of new hires coming in with PEPRA benefits assuming:
  - 7.5% of 2019/20 new hires will be classic members (laterals).
  - 92.5% of 2019/20 new hires will be new members with PEPRA benefits.
  - Classic members will decrease from 7.5% to 0% of new hires over 3 years.
- The Town has employee cost sharing:
  - Miscellaneous Employees
    Classic employees pay 2% of pay before 7/9/17, 3% of pay effective 7/9/17, and 4% of pay effective 7/8/18. These additional employee cost sharing amounts reduce the Town's CalPERS contributions.
  - Safety Employees.
    Classic employees pay 2% of pay before 7/9/17, 3% of pay effective 7/9/17, and 4% of pay effective 7/8/18. These additional employee cost sharing amounts reduce the Town's CalPERS contributions.

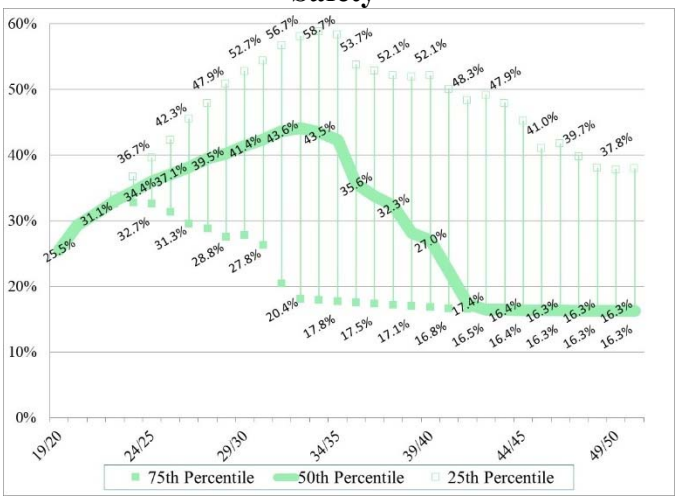
[1] Our projections are on a combined basis; CalPERS provides separate actuarial reports for each benefit tier.
[2] Reflects the likelihood actual investment return will exceed confidence level.

Below are contribution rate projections and the Plan's projected funded status. In each chart, the thick line in the middle represents the expectation (50th percentile), with the width of the lines above and below each data point representing a range over which the result is expected to vary to capture ½ of all outcomes (based on investment volatility).

Miscellaneous

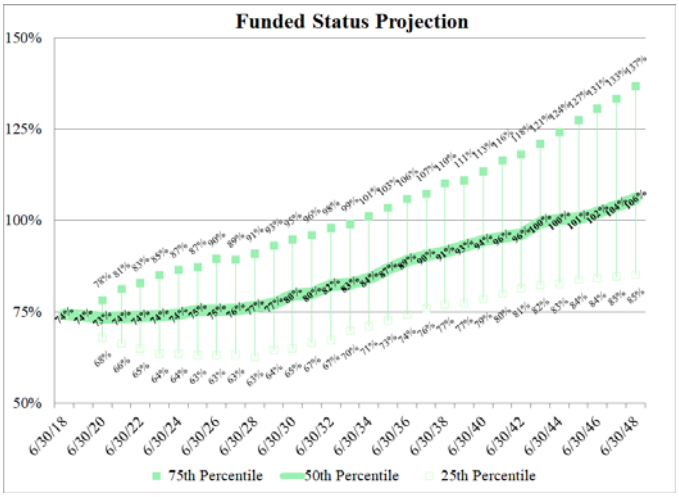


Safety

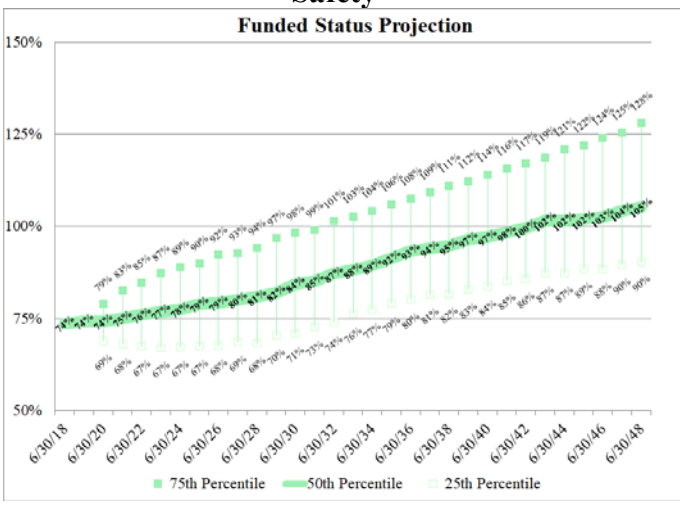


The increased contributions are expected to pay down the unfunded liability. The projected funded status (as measured by the ratio of Plan assets to Actuarial Accrued Liability) follows. In each chart, the thick line in the middle represents the expectation (50th percentile), with the width of the lines above and below each data point representing a range over which the result is expected to vary to capture ½ of all outcomes (based on investment volatility). Both plans are projected to reach 100% funded status in 20-30 years.

Miscellaneous

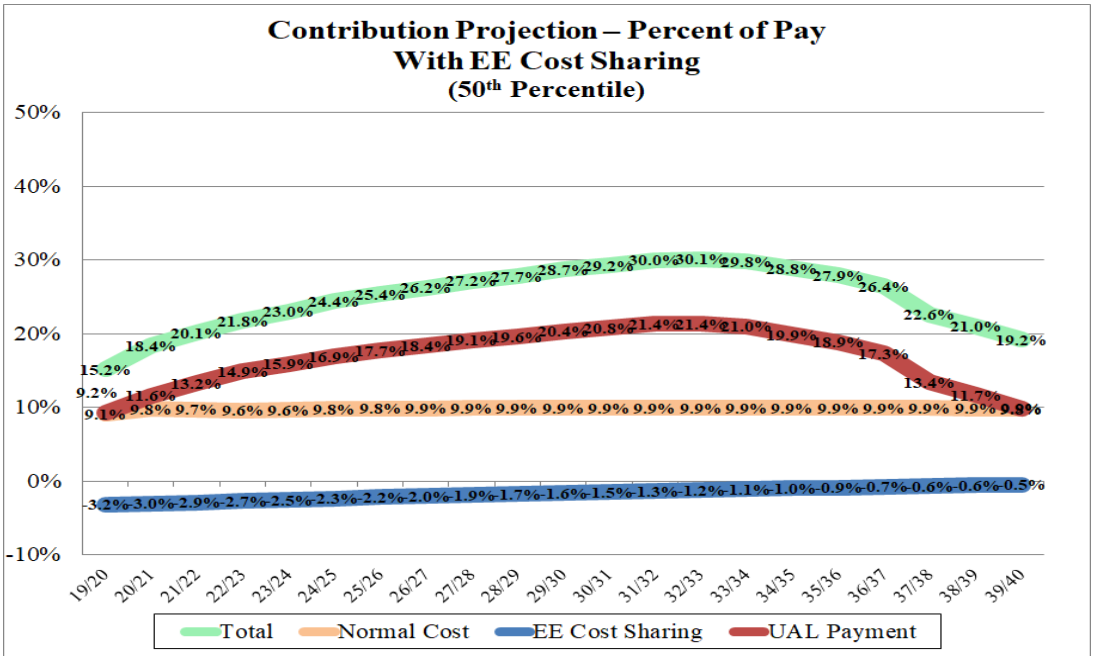


Safety

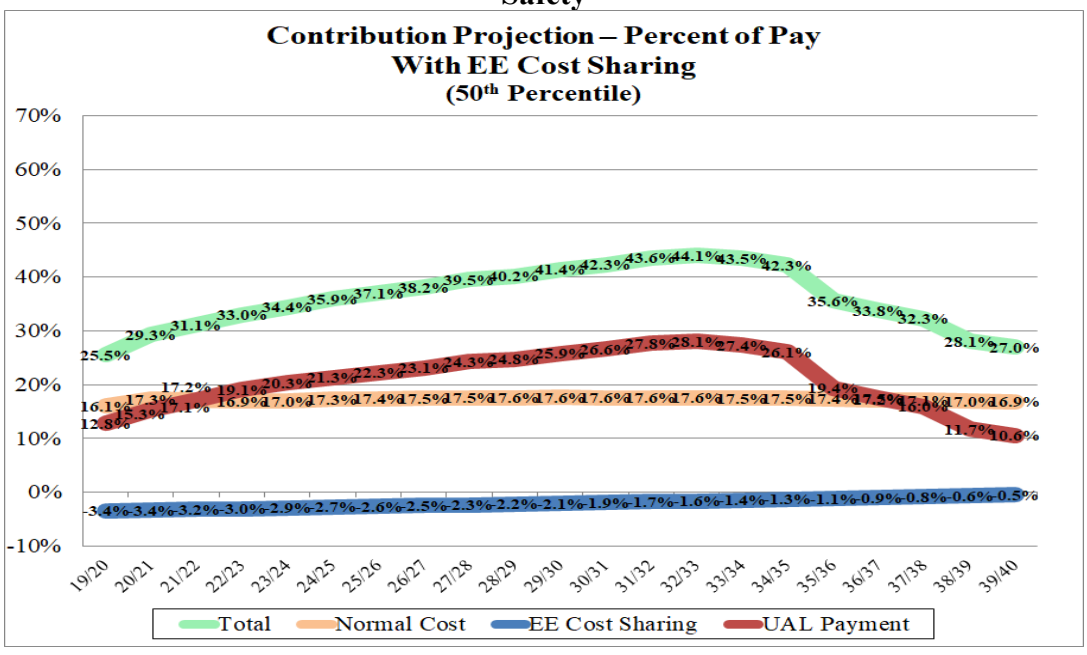


Projected contributions (using the "expected" 50th percentile results above) as a percentage of projected payroll, and as dollar amounts, are provided below. The contribution is provided for the Normal Cost, Unfunded Actuarial Liability (UAL) and employee cost sharing components.

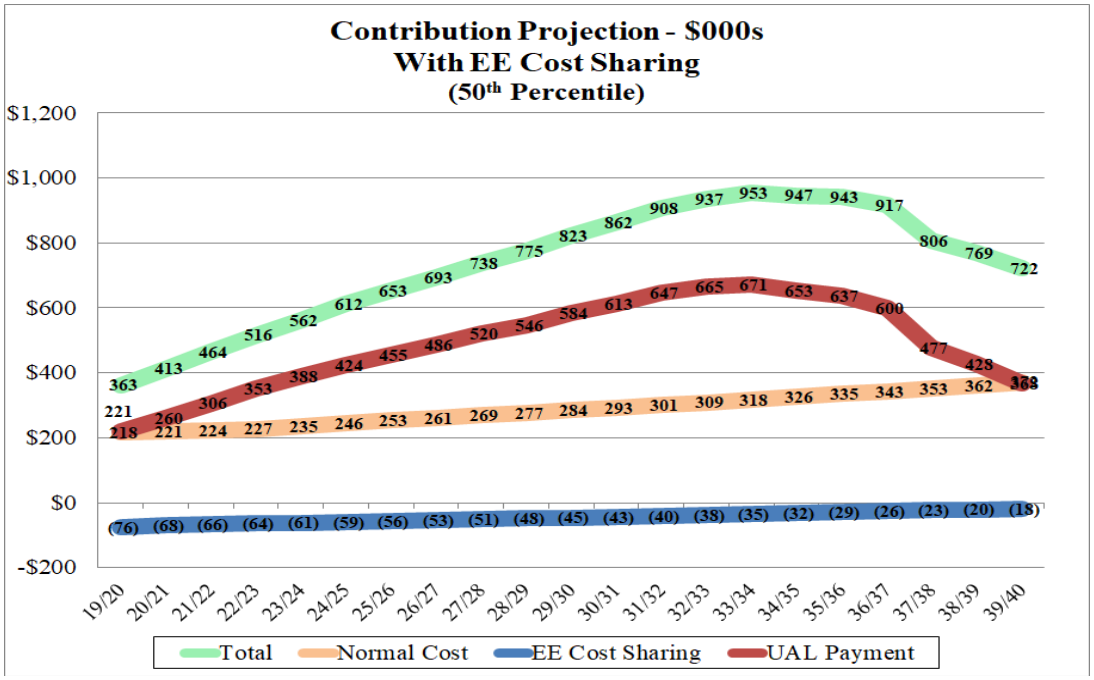
Miscellaneous



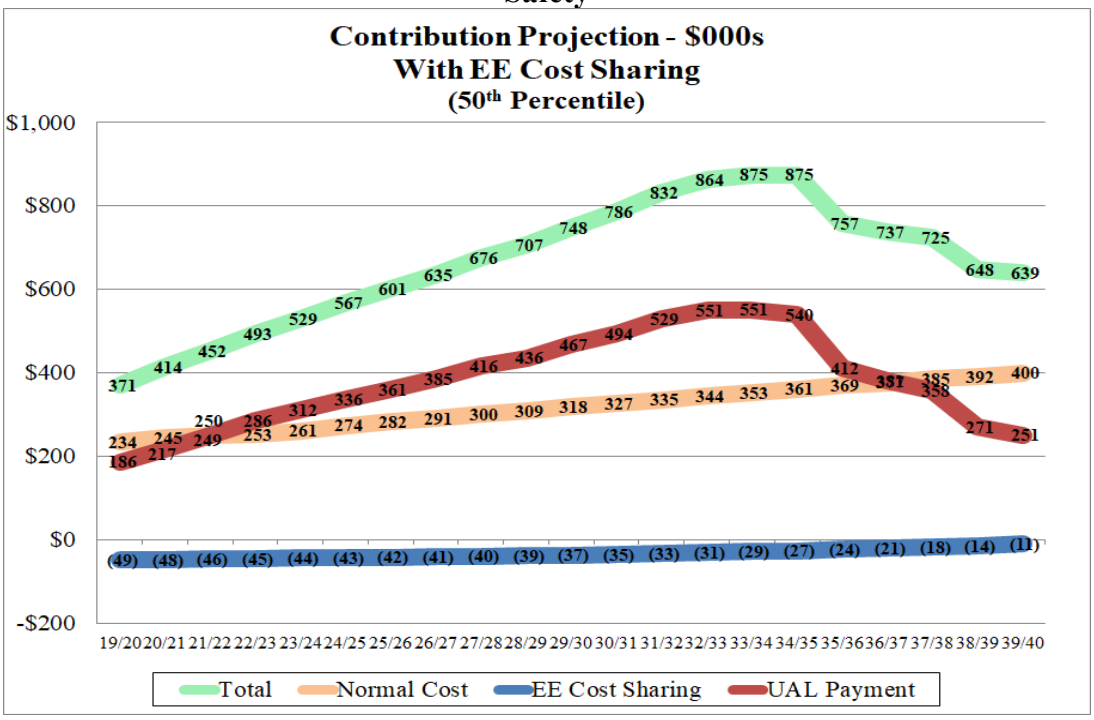
Safety



Miscellaneous



Safety



The Town has many options available to reduce the CalPERS unfunded liability and/or mitigate expected volatility of future CalPERS contributions.

We recommend the Town consider establishing a Supplemental Pension Trust, qualified under Section 115 of the Internal Revenue Code.

The Trust has the following characteristics:

- Funds deposited into the trust are irrevocable
- Funds can be used only to pay CalPERS directly or reimburse the Town for CalPERS contributions
- Assets are not restricted in the same way as the Town's funds. Prudent investments could be expected to earn 5% to 6% or more in the long run.
- Funds can be deposited into the trust at the Town's option; contributions are not required or mandated in any year
- Trust assets do not reduce the net pension liability in the Town's financial statements. However, the funds will be a Town asset and can be disclosed in the financial statement notes.

The Town's current budgeted contributions through 23/24 are based on CalPERS projections, which are slightly below our projections. The Town will review current budgeted amounts to cover this gap. Additionally, the Town is looking at a one-time Supplemental Trust contribution to limit the further contribution increases that are anticipated after for 23/24:

- For Miscellaneous, the 23/24 contribution rate of 23.0% is expected to gradually increase until reaching a peak of 30.1% in 32/33 before gradually declining until reaching 22.6% in 37/38
- For Safety, the 23/24 contribution rate of 34.4% is expected to gradually increase until reaching a peak of 44.1% in 32/33 before gradually declining until reaching 33.8% in 36/37.

The most effective approach to limit peak rates is to accumulate funds in a Supplemental Pension Trust that would then be used to pay the future anticipated contribution increases. We modeled the Supplemental Pension Trust for the Miscellaneous and Safety plan under 3 scenarios.

- Scenario 1
  This scenario assumes the Town pays exactly the expected CalPERS contributions and makes a $1 million Supplemental Trust contribution on 6/30/20 with $0.5 million to the Miscellaneous Plan and $0.5 million to the Safety Plan.
  - For the Miscellaneous Plan, the Town would pay the amount billed by CalPERS through 25/26. Then, the Town would pay the total target amount of 26% of pay starting in 26/27, with any excess over the actual amount billed by CalPERS being deposited to the supplemental trust, and any shortfall (if the required CalPERS contribution is higher than the budgeted amount) being paid from the trust.
  - For the Safety Plan, the Town would pay the amount billed by CalPERS through 24/25. Then, the Town would pay the total target amount of 37% of pay starting in 25/26, with any excess over the actual amount billed by CalPERS being deposited to the supplemental trust, and any shortfall (if the required CalPERS contribution is higher than the budgeted amount) being paid from the trust.

- Scenario 2

  This scenario assumes the Town continues with the budgeted contributions, but with additional amounts as follows:

  - Miscellaneous plan: $135,000 above current budget each year from 20/21 through 29/30, total $1,350,000.
    The Town would pay the amount billed by CalPERS through 29/30. Then, the Town would pay the total target amount of 26% of pay starting in 30/31. Any excess over the actual amount billed by CalPERS will be deposited to the supplemental trust, and any shortfall (if the required CalPERS contribution is higher than the budgeted amount) will be paid from the trust.
  - Safety plan: $130,000 above current budget each year from 20/21 through 29/30, total $1,300,000
    The Town would pay the amount billed by CalPERS through 29/30. Then, the Town would pay the total target amount of 37% of pay starting in 30/31, with any excess over the actual amount billed by CalPERS being deposited to the supplemental trust, and any shortfall (if the required CalPERS contribution is higher than the budgeted amount) being paid from the trust.

- Scenario 3

  This scenario assumes the Town pays exactly the expected CalPERS contributions and makes a $100,000 Supplemental Trust contribution each year from 20/21 through 29/30, with $50,000 to the Miscellaneous Plan and $50,000 to the Safety Plan.

  - For the Miscellaneous Plan, the Town would pay the amount billed by CalPERS through 29/30. Then, the Town would pay the total target amount of 26% of pay starting in 30/31, with any excess over the actual amount billed by CalPERS being deposited to the supplemental trust, and any shortfall (if the required CalPERS contribution is higher than the budgeted amount) being paid from the trust.
  - For the Safety Plan, the Town would pay the amount billed by CalPERS through 29/30. Then, the Town would pay the total target amount of 36% of pay starting in 30/31, with any excess over the actual amount billed by CalPERS being deposited to the supplemental trust, and any shortfall (if the required CalPERS contribution is higher than the budgeted amount) being paid from the trust.

The table below compares Scenario 1, Scenario 2 and Scenario 3.

Miscellaneous			
	Scenario 1	**Scenario 2**	**Scenario 3**
■ Additional contribution above current budget			
• 20/21	$500,000	$135,000	$50,000
• 21/22 through 29/30	n/a	$135,000 / per year	$50,000 / per year
■ Target Rate	26.0%	26.0%	26.0%
• 1st year	26/27	30/31	30/31
• Last year	36/37	36/37	36/37
■ Trust Return	5%	5%	5%
■ Contributions	CalPERS	Less than CalPERS	CalPERS

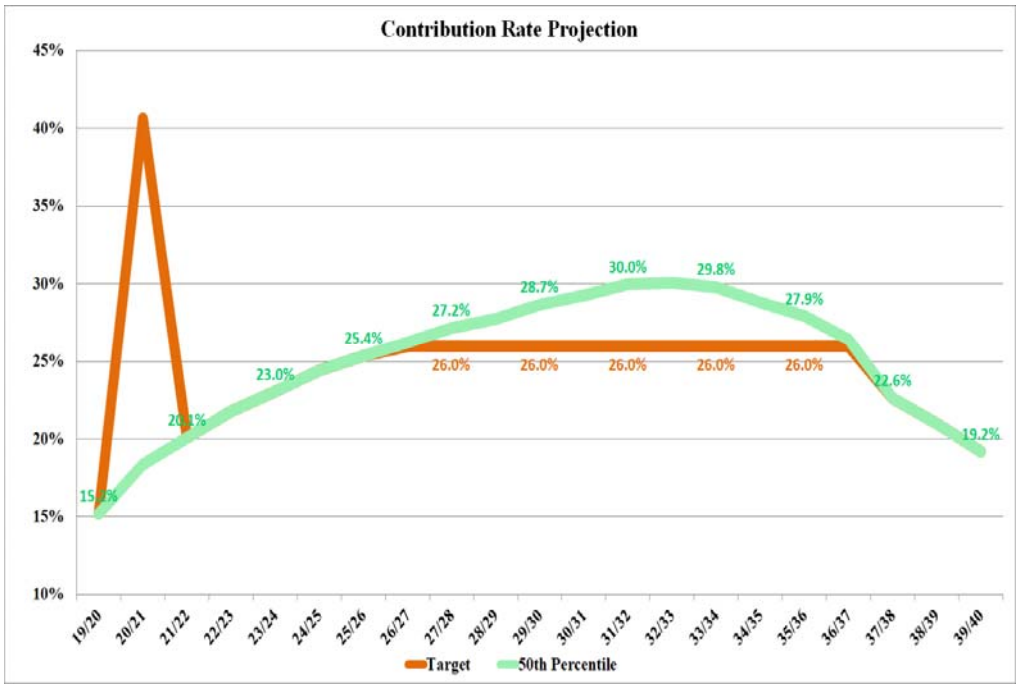
Safety			
	Scenario 1	**Scenario 2**	**Scenario 3**
■ Additional contribution above current budget			
• 20/21	$500,000	$130,000	$50,000
• 21/22 through 29/30	n/a	$130,000 / per year	$50,000 / per year
■ Target Rate	37.0%	37.0%	36.0%
• 1st year	26/27	30/31	30/31
• Last year	35/36	34/35	34/35
■ Trust Return	5%	5%	5%
■ Contributions	CalPERS	Less than CalPERS	CalPERS

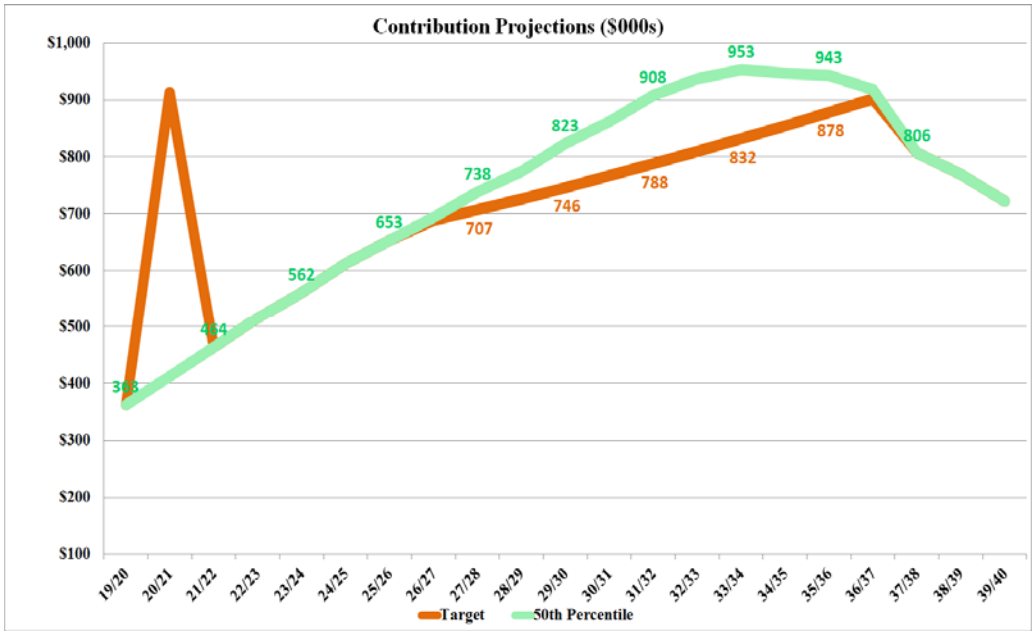
The projected supplemental trust balance is expected to be positive through the last year of the target rate, assuming assets earn 5% per year under all 3 scenarios. This indicates that the Town is likely to keep total contributions at the budgeted level. At the end of the projection, the supplemental trust balance will go to $0.

Note we assume the Town's payroll will growth at 2.75% per year in the projections.

Scenario 1:

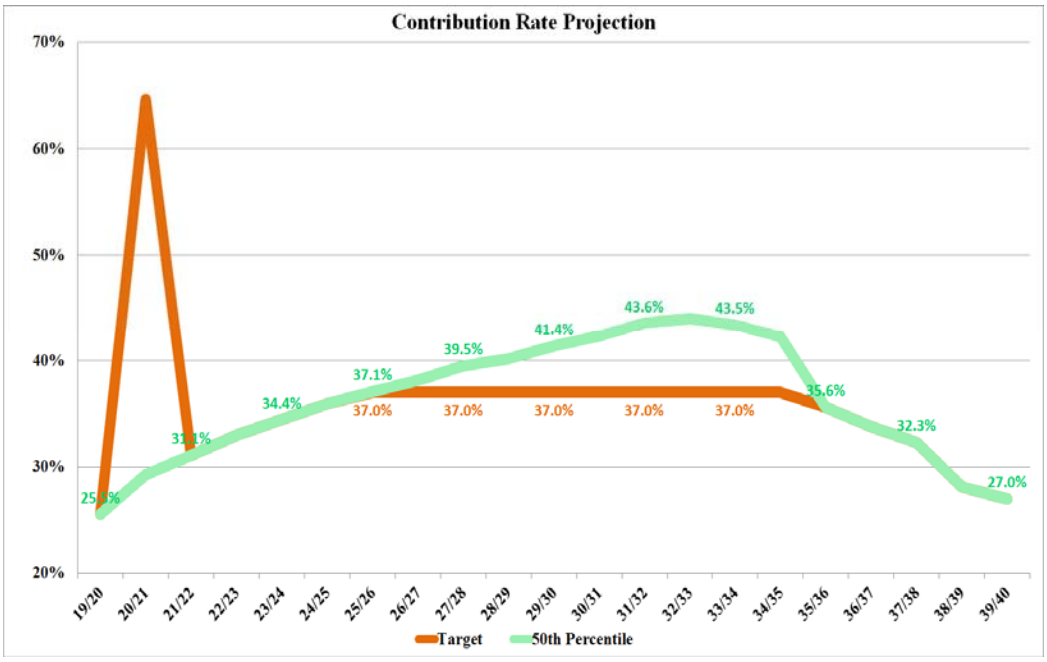
Miscellaneous:

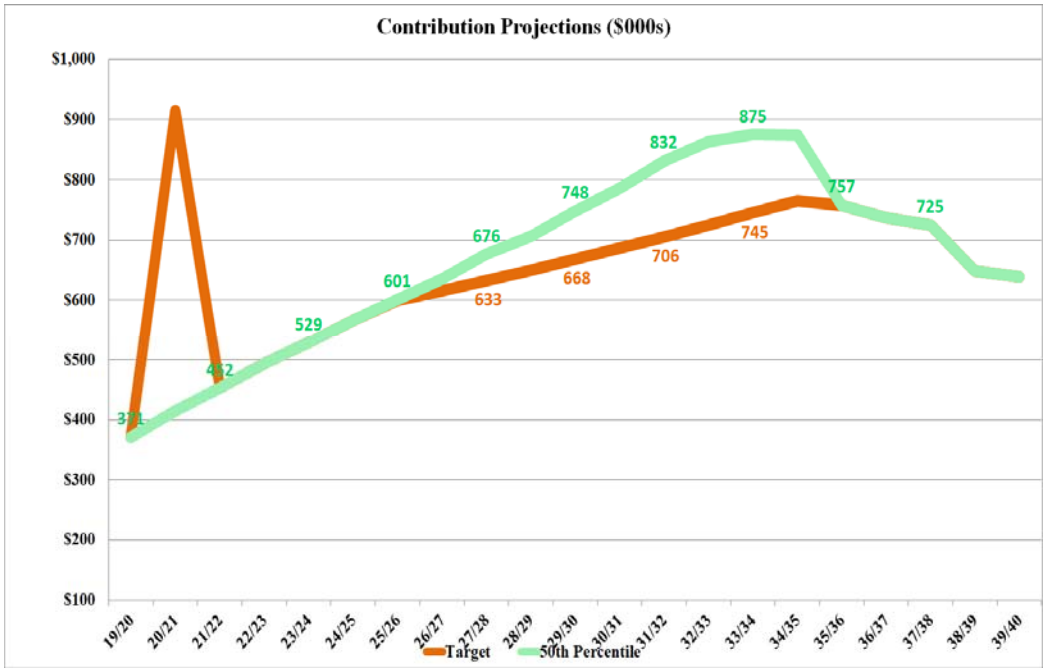




Scenario 1 (continued):

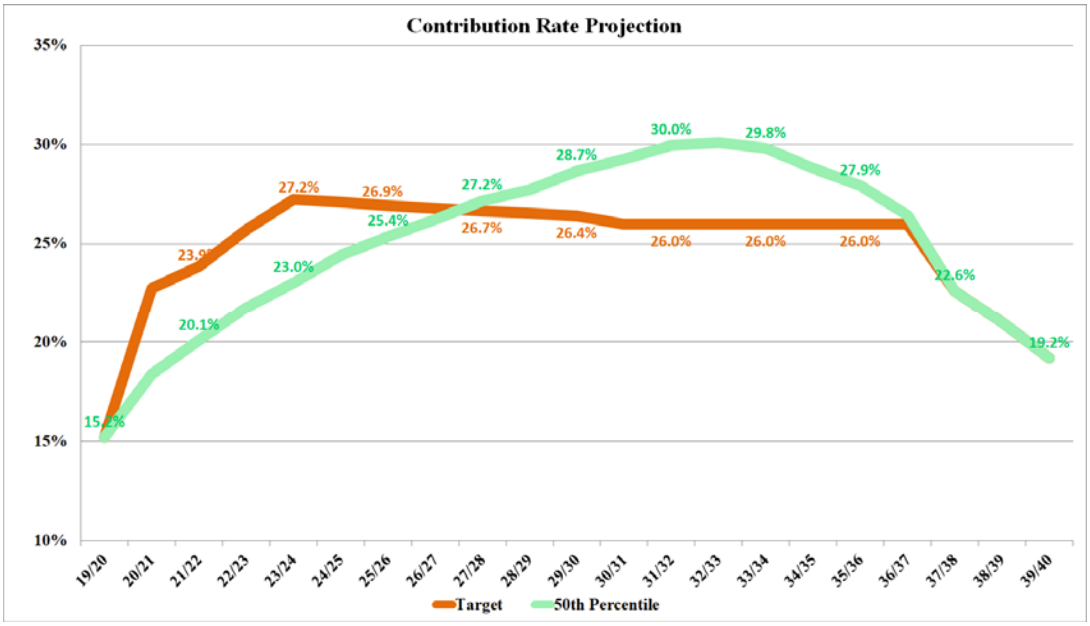
Safety:

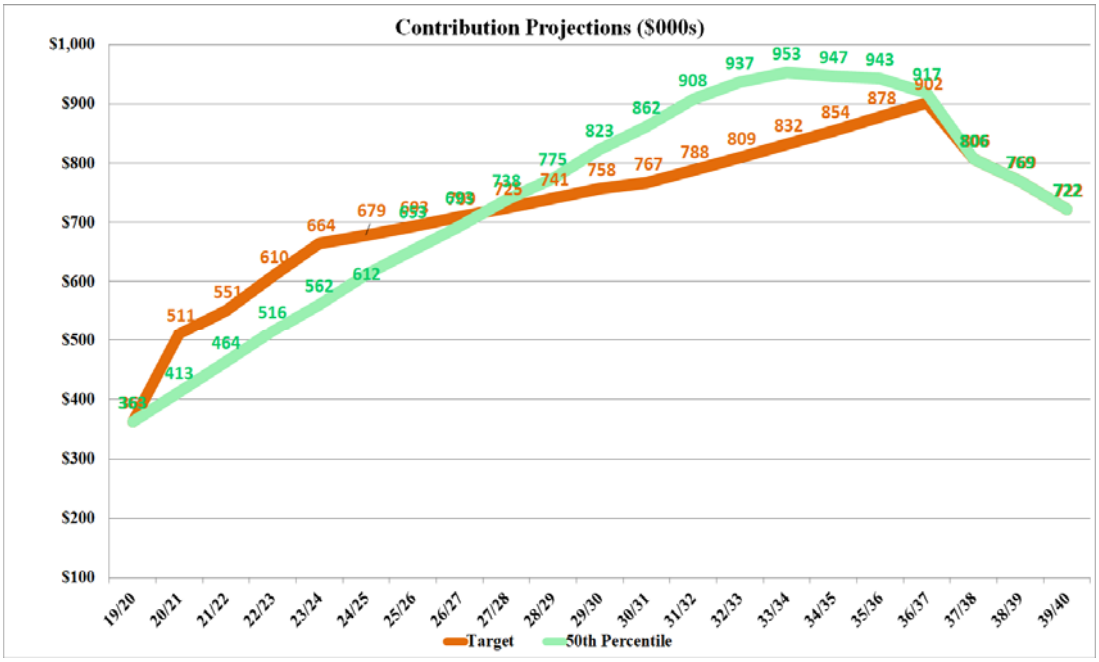




Scenario 2:

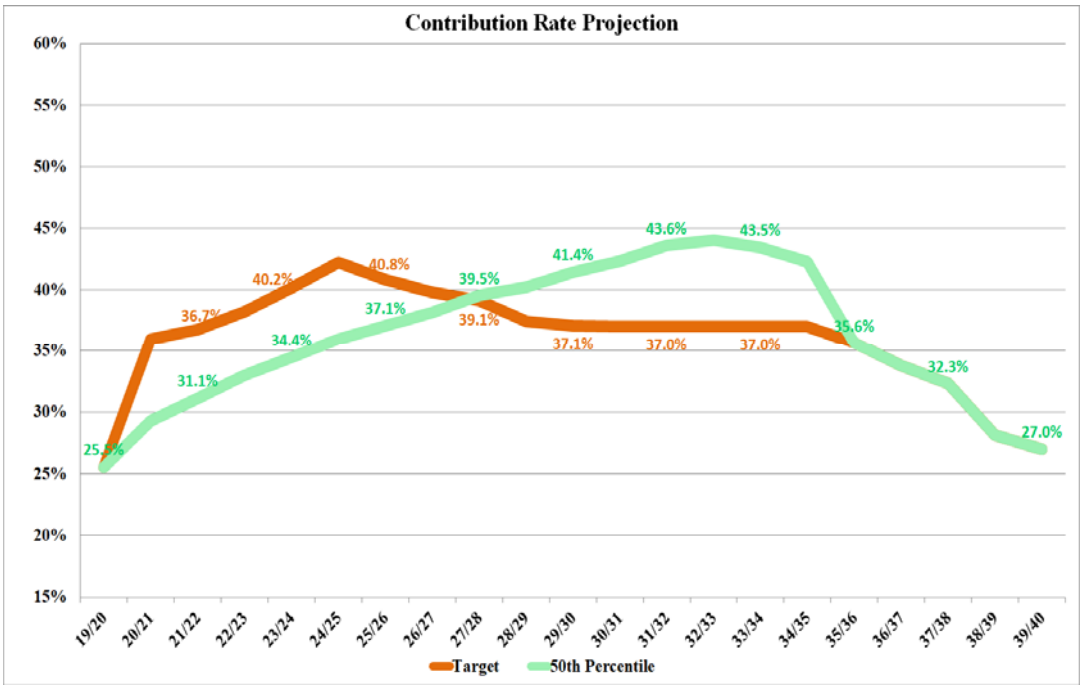
Miscellaneous:

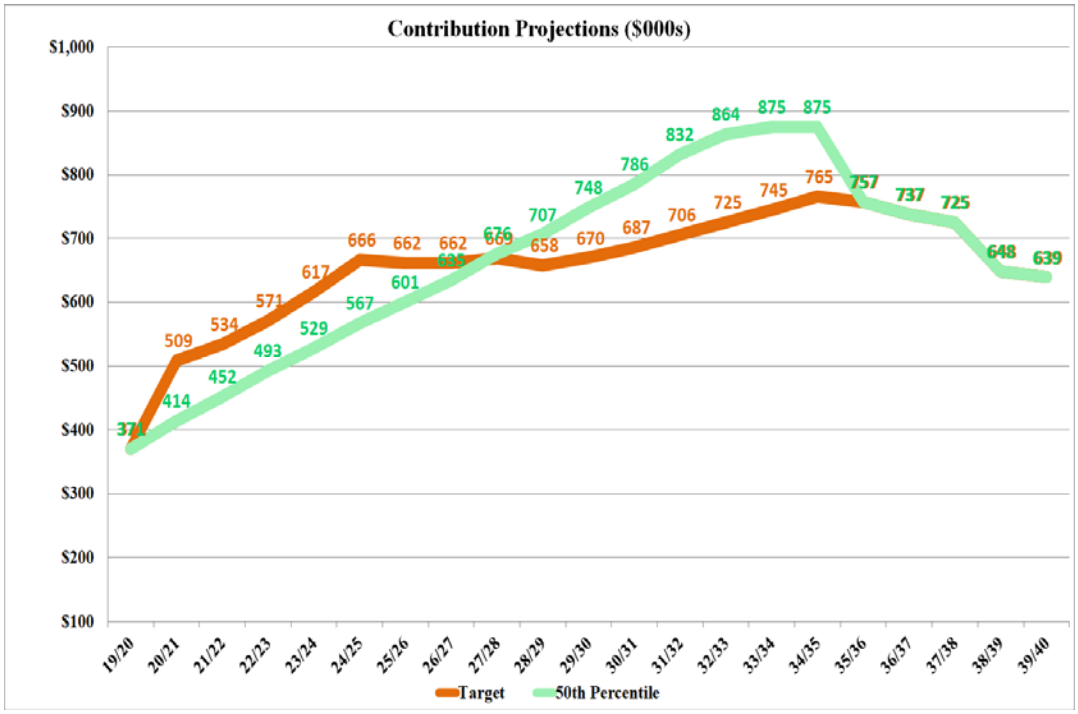




Scenario 2 (continued):

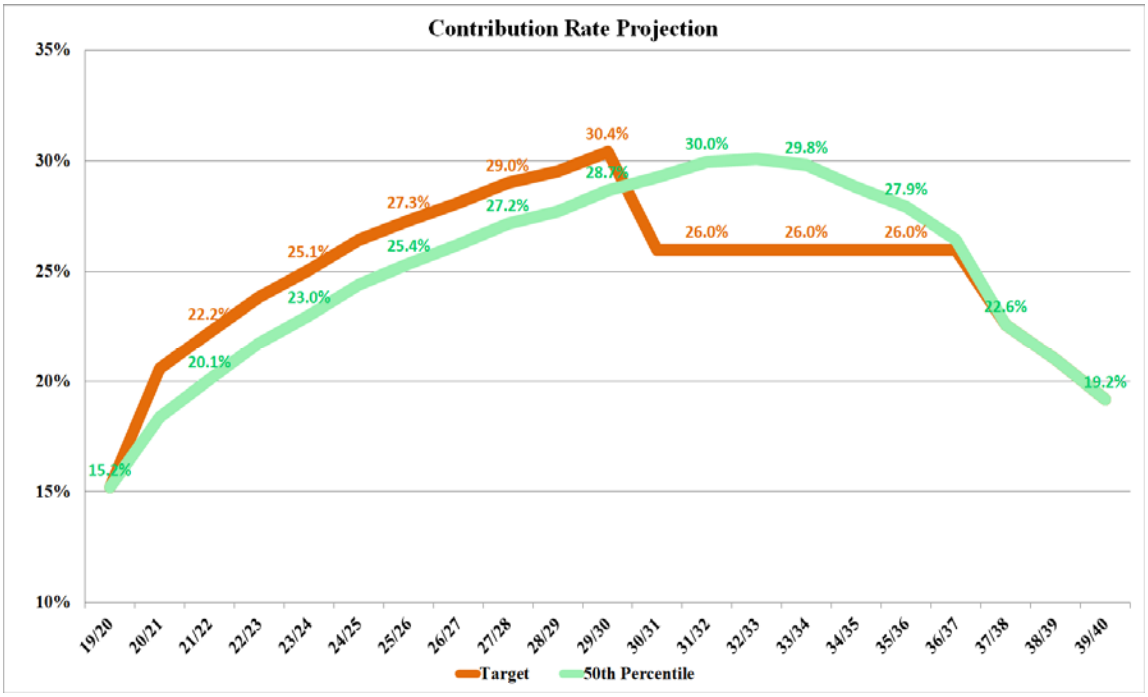
Safety:

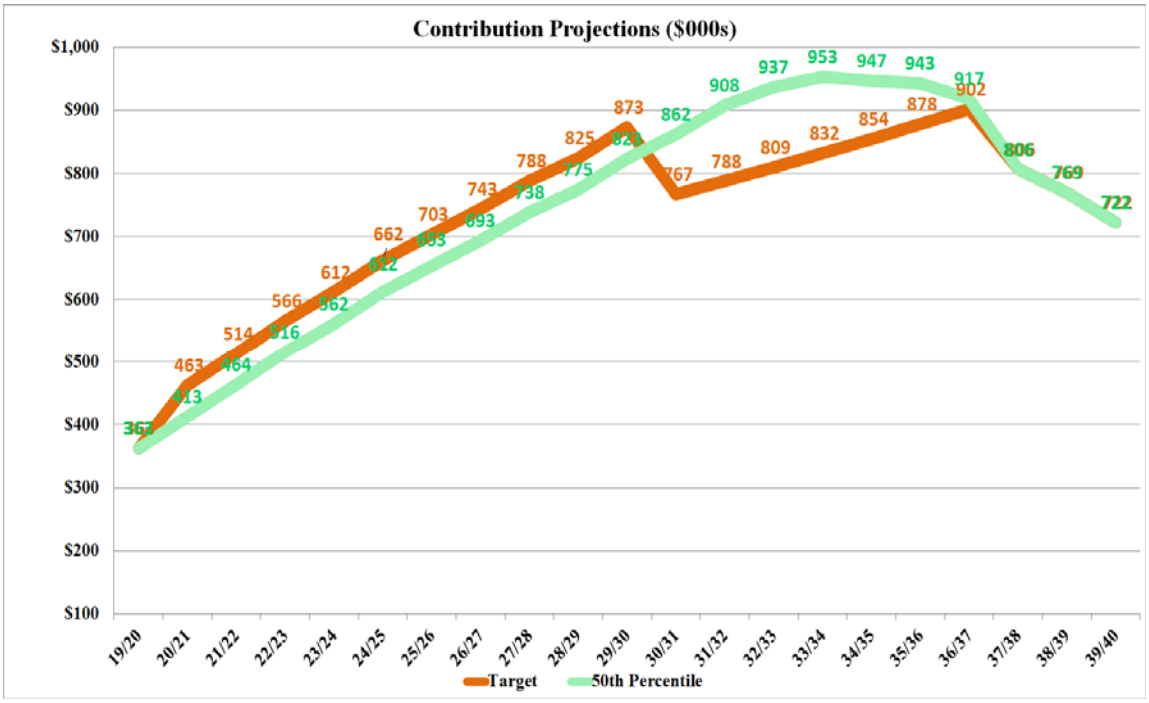




Scenario 3:

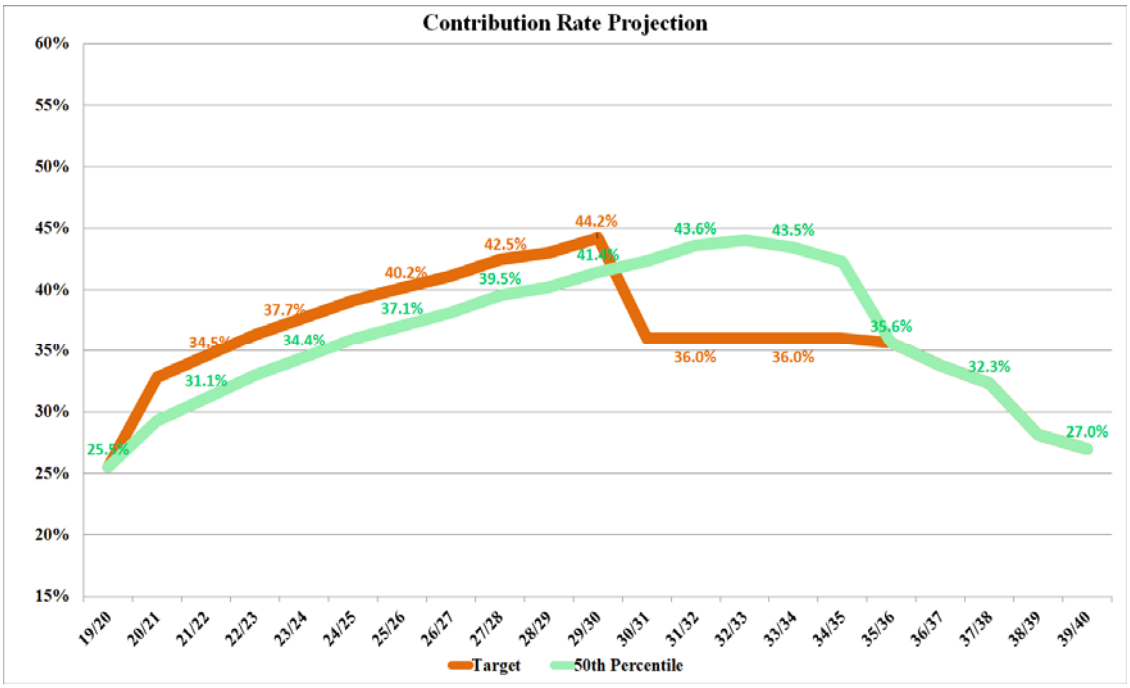
Miscellaneous:

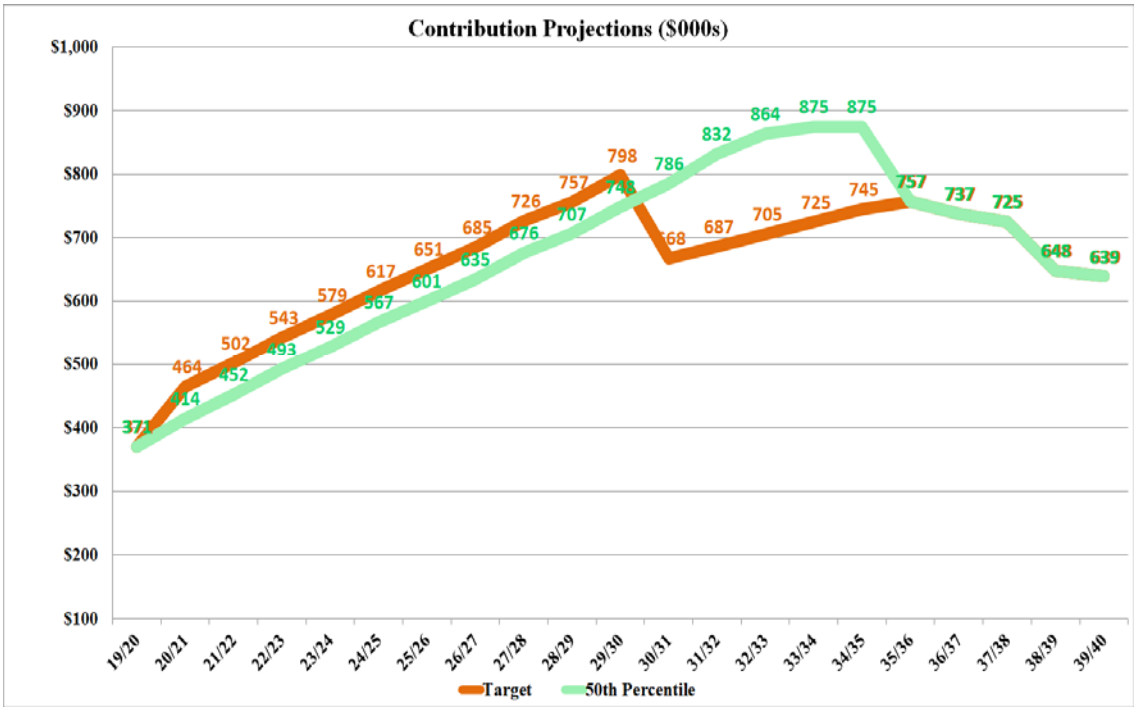




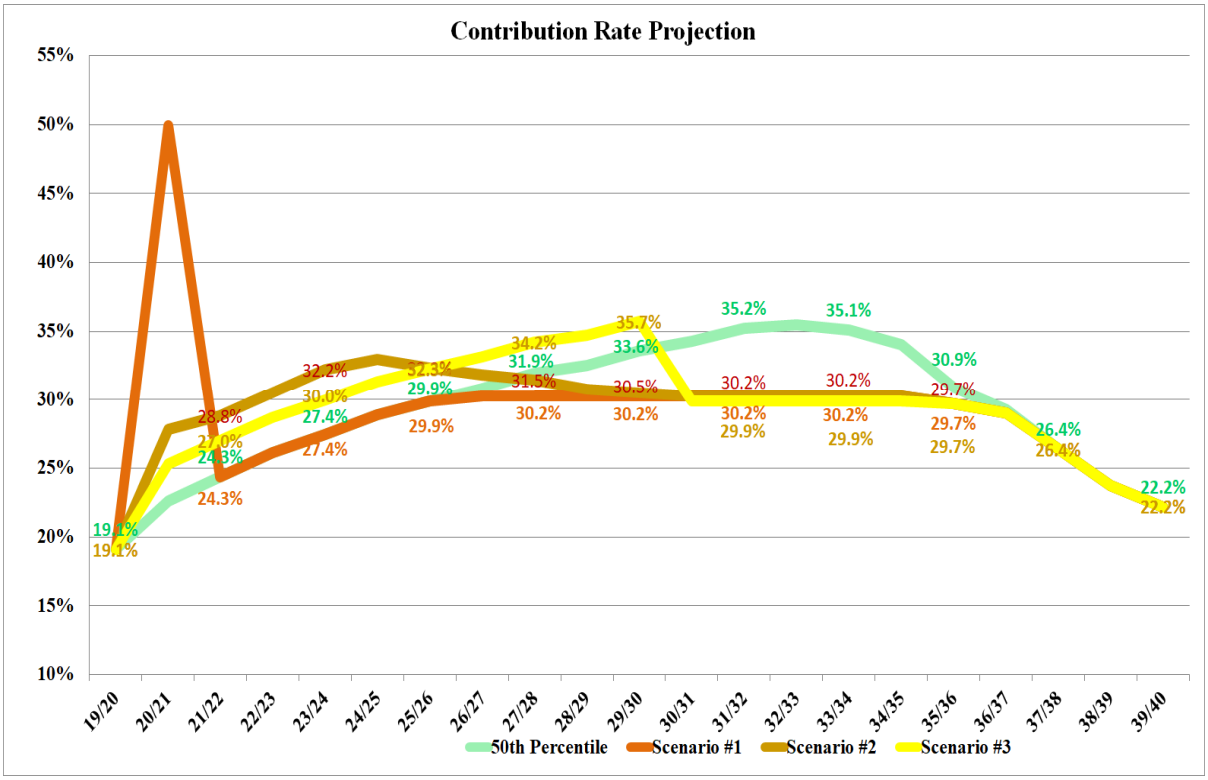
Scenario 3 (Continued):

Safety:





Combined Miscellaneous and Safety for all 3 Scenarios



The California Legislature passed and the Governor signed AB 340 in 2012 – commonly called the California Public Employees' Pension Reform Act of 2013. Highlights of PEPRA follow:

- **New Members** – Generally, employees hired after January 1, 2013 who did not previously participate in a reciprocal retirement system.
- **Pension Formulas for New Members**
  - Miscellaneous – 2% @ 62; earliest service retirement age 52
  - Safety – 2% @ 57, 2.5% @ 57 and 2.7% @ 57; earliest service retirement age 50.
- **Plan Compensation Limit for New Members**
  - $121,388 (100% of 2013 Social Security Wage Base, $124,180 for 2019)
  - $145,666 (120% for members not in Social Security for 2013, $149,016 for 2019)
  - Increasing annually with CPI
  - Employers can provide a defined contribution plan for pay above the limit.
- **Final Compensation for New Members**
  - Highest average plan compensation over 36 consecutive months
  - Plan compensation is the normal monthly rate of pay or base pay.
- **Benefit Enhancements**
  - Benefit enhancements after January 1, 2013 apply only to future service
  - No limits on COLAs.
- **Safety Industrial Disability**
  - Increase in benefit for those under 50 with long service
  - Trial period ending January 1, 2018.
- **Supplemental Defined Benefit Pension Plans**
  - Employer cannot adopt a supplemental defined benefit pension plan after January 1, 2013
  - New employees cannot participate in existing plan.
- **Pension Holidays**
  - Total employer and employee contributions cannot be less than the normal cost.
- **Air Time Service Purchase**
  - Eliminated for all members January 1, 2013.
- **Other Postemployment Employee Benefits**
  - An employer cannot provide better vesting schedule to unrepresented employees than to represented employees
  - Law is unclear whether it applies:
    - Only to vesting schedule or also to the amount of benefit provided
    - To new members, existing members, and/or current retirees.

- **Cost Sharing**
  - Target of 50% of total normal cost sharing for all employees
  - PEPRA members must pay greater of 50% of total normal cost or bargained amount if higher
  - Employers cannot pay any part of PEPRA member required employee contributions
  - Employer may impose Classic employees pay 50% of total normal cost (limited to 8% Miscellaneous, 12% Safety) if not agreed through collective bargaining by January 1, 2018.

- **Miscellaneous Plan 2020/21 Total Normal Cost**:

	Classic Members Tier 1 2%@55 FAE3	New Members PEPRA 2%@62 FAE3
Employer Normal Cost	6.5%	7.73%
Employee Normal Cost	11.0%[3]	6.75%
Total Normal Cost	17.5%	14.48%
50% Target	8.75%	7.24%

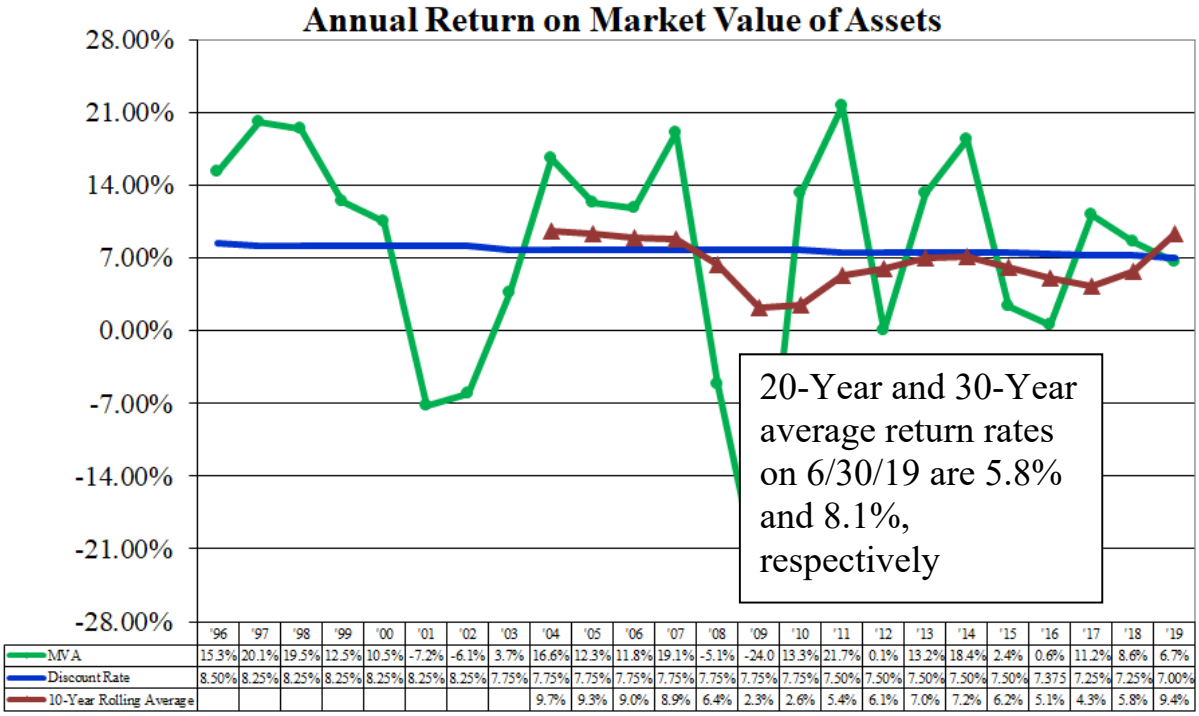
- **Safety Plan 2020/21 Total Normal Cost**:

	Classic Members Tier 1 2%@50 FAE3	New Members PEPRA 2.7%@57 FAE3
Employer Normal Cost	14.2%	13.04%
Employee Normal Cost	13.0%[4]	13.00%
Total Normal Cost	27.2%	26.04%
50% Target	13.6%	13.02%

[3] Included 4% employee cost sharing
[4] Included 4% employee cost sharing

Historical Returns

Following are CalPERS investment returns over the past several years:



	'96	'97	'98	'99	'00	'01	'02	'03	'04	'05	'06	'07	'08	'09	'10	'11	'12	'13	'14	'15	'16	'17	'18	'19
MVA	15.3%	20.1%	19.5%	12.5%	10.5%	-7.2%	-6.1%	3.7%	16.6%	12.3%	11.8%	19.1%	-5.1%	-24.0	13.3%	21.7%	0.1%	13.2%	18.4%	2.4%	0.6%	11.2%	8.6%	6.7%
Discount Rate	8.50%	8.25%	8.25%	8.25%	8.25%	8.25%	8.25%	7.75%	7.75%	7.75%	7.75%	7.75%	7.75%	7.75%	7.75%	7.50%	7.50%	7.50%	7.50%	7.50%	7.375	7.25%	7.25%	7.00%
10-Year Rolling Average									9.7%	9.3%	9.0%	8.9%	6.4%	2.3%	2.6%	5.4%	6.1%	7.0%	7.2%	6.2%	5.1%	4.3%	5.8%	9.4%

The 2019 investment return was 6.7%, based on CalPERS July 2019 press release. Average annual returns were 9.4% for the last 10 years (July 1, 2009 through June 30, 2019) and 5.8% for the last 20 years (July 1, 1999 through June 30, 2019)[5]. Returns averaged over longer terms tend to be higher.

[5] Averages are geometric averages, which represent a better measurement of returns when compared to the discount rate

New Contribution Policy (Adopted April 2013)
CalPERS Board adopted the new *direct rate smoothing* contribution policy to:

- Mitigate volatility generated by the asset corridor (under the old smoothing policy) when extreme events happen
- Improve progress toward increased funded status
- Enhance transparency over the current method
- Recognize GASBS 68 encourages more rapid funding by requiring a lower discount rate when funding progress is too slow.

The new contribution policy:

- Smooths employer contribution rates directly, rather than smoothing asset values and hoping that will produce smooth contribution rates
- Uses market assets values to determine the unfunded liability and set contribution rates, rather than using a smoother (actuarial) asset value
- Sets fixed amortization periods for future gains and losses – 5-year ramp up plus 20 years full payment plus 5-year ramp down (including the difference between market and actuarial asset values at June 30, 2013)
- Sets fixed amortization periods for future assumption changes – 5-year ramp up plus 10 years full payment plus 5-year ramp down
- Converts all existing contribution rate amortization bases that use rolling amortization periods to fixed periods.

Under the new contribution policy:

- Year-to-year rate changes will be somewhat higher in most years, but lower in years with extreme market events
- Funded status will improve faster – all gains/losses will be fully amortized and paid for 30 years after they occur
- Employer rates will go up, beginning in 2015/16.

New Actuarial Assumptions (Adopted February 2014)
CalPERS Board adopted the new assumptions based on their asset liability management study and new experience study.

- No change to the discount rate assumption of 7.5%
- The most significant change for demographic assumptions is anticipated future mortality improvement; for example, a person age 70 today having a shorter life expectancy than someone age 70 in 30 years.

Under the new actuarial assumptions:

- Since retirees will be projected to live longer and collect their pensions longer, employer contribution rates increase
- The new assumptions first impact 2016/17 rates, with the resulting liability increase calculated in the 2014 valuation and amortized over 20 years (5-year ramp up and ramp down).

New Risk Mitigation Policy (Adopted November 2015)
CalPERS Board adopted the new risk mitigation policy to:

- Reduce expected volatility of investment returns to 8% (as measured by the standard deviation of expected returns) in 21 years
- Improve progress toward increased funded status
- Minimize increases above projected employer contribution rates.

The new risk mitigation policy:

- Lowers the discount rate by 0.05% - 0.25% in years when investment returns exceed the discount rate by 4% or more
- Uses investment gains to pay for future cost increases.

Under the new risk mitigation policy:

- The 4% threshold would offset increases to employer rates that would otherwise increase when the discount rate is lowered
- Funded status will improve faster – investment gains will be used to reduce future investment volatility.

Because of the reduction in discount rate (see the next paragraph), on February 14, 2017 CalPERS Board suspended the implementation of the risk mitigation policy until 2020/2021 and revised the threshold investment return in order to trigger a discount rate reduction from 4% to 2%.

New Discount Rate Assumption (Adopted December 2016)
CalPERS Board approved lowering the discount rate assumption based on the mid cycle review of their asset liability management study and changing market conditions to:

- Strengthen the long-term sustainability of the fund
- Increase the likelihood CalPERS investments earn the assumed rate of return
- Reduce negative cash flows caused by more retirees
- Reduce the probability of funded ratios falling below undesirable levels
- Reduce the risk of employer rate increases due to the volatility of investment markets.

Under the new discount rate assumption:

- The lowered discount rate of 7.375% was used in the June 30, 2016 valuation, 7.25% in the June 30, 2017 valuation, and 7.00% in the June 30, 2018 valuation and onward
- Employer rates will increase, beginning in 2018/19 fiscal year
- Risk mitigation suspended until the June 30, 2018 valuation
- Risk mitigation will not trigger a discount rate reduction in the 6/30/2019 valuation.

New Amortization Policy (Adopted February 2018)
CalPERS Board approved a new amortization policy applying only to newly established amortization bases:

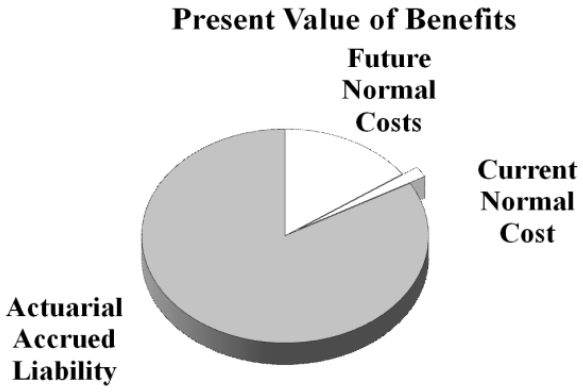
- Fixed dollar amortization rather than level percentage of payroll
- Amortizes gains and losses over 20 rather than 30 years
- 5 year ramp up (no ramp down) for investment gains and losses
- No ramp up or down for other amortization bases

The new amortization policy minimizes total interest paid over time and pays of the unfunded actuarially accrued liability faster. The policy is effective in the June 30, 2019 valuation for 2021/22 contribution.

Present Value of Benefits (PVB): When CalPERS (or any actuary) prepares a pension valuation, they first gather participant data (active employees, former employees not in payment status, participants and beneficiaries in payment status) at the valuation date (for example June 30, 2018). Using this data and actuarial assumptions, they project benefit payments. (The assumptions predict, among other things, when people will retire, terminate, die or become disabled, as well as what salary increases, inflation and investment return might be.) Those future benefit payments are discounted, using expected investment return, back to the valuation date. This discounted present value is the plan's PVB. It represents the amount the plan needs as of the valuation date to pay all future benefits – if all assumptions are met and no future contributions (employee or employer) are made.

Actuarial Accrued Liability (AAL): This represents the portion of the PVB that participants have earned (on an actuarial, not actual, basis) through the valuation date.

Current Employer Normal Cost: The total normal cost represents the portion of the PVB expected to be earned (on an actuarial, not actual, basis) in the coming year. Current Employer Normal Cost represents the employer's portion of total normal cost – that is, the total normal cost offset by employee contributions.



The above graph shows PVB as the sum of AAL, Current Employer Normal Cost, and future normal costs. Once these amounts are calculated, the actuary compares actuarial assets to the AAL. When assets equal liabilities, a plan is considered on track for funding. When assets are greater than liabilities, the plan has excess assets; when assets are less than liabilities, the plan has an unfunded liability.

Contribution Rate: CalPERS does not require a Town to make up any shortfall (unfunded liability) immediately, nor do they allow an immediate credit for any excess assets. Instead, the difference is amortized over time. A Town's contribution rate is the Current Employer Normal Cost, plus the amortized unfunded liability or less the amortized excess assets. In other words, it's the value of employer benefits earned during the year plus something to move the plan toward being on track for funding. There is a 2-year delay from the valuation date to contribution effective date. For example, the June 30, 2018 valuation generates a Town's fiscal year 2020/21 contribution. CalPERS instituted this delay a few years

ago to ensure public agencies would have contribution rates as they begin their budgeting process for each fiscal year.

Market Value of Assets (MVA): The actual value of plan assets based on their price if sold.

Unfunded Actuarial Liability (UAL): The difference between the AAL and the MVA. This difference is the portion of the AAL that has not yet been funded.

ATTACHMENT B

CalPERS Annual Valuation Report as of June 30, 2018 –
Miscellaneous Classic

California Public Employees' Retirement System
Actuarial Office
400 Q Street, Sacramento, CA 95811 |Phone: (916) 795-3000 | Fax: (916) 795-2744
888 CalPERS (or **888**-225-7377) | TTY: (877) 249-7442 | **www.calpers.ca.gov**

July 2019

Miscellaneous Plan of the Town of Moraga
(CalPERS ID: 6510195742)
Annual Valuation Report as of June 30, 2018

Dear Employer,

Attached to this letter, you will find the June 30, 2018 actuarial valuation report of your CalPERS pension plan. **Provided in this report is the determination of the minimum required employer contributions for Fiscal Year 2020-21**. In addition, the report contains important information regarding the current financial status of the plan as well as projections and risk measures to aid in planning for the future.

Because this plan is in a risk pool, the following valuation report has been separated into two sections:

- Section 1 contains specific information for the plan including the development of the current and projected employer contributions, and
- Section 2 contains the Risk Pool Actuarial Valuation appropriate to the plan as of June 30, 2018.

Section 2 can be found on the CalPERS website (www.calpers.ca.gov). From the home page, go to "*Forms & Publications*" and select "*View All*". In the search box, enter "*Risk Pool*" and from the results list download the Miscellaneous or Safety Risk Pool Actuarial Valuation Report as appropriate.

Your June 30, 2018 actuarial valuation report contains important actuarial information about your pension plan at CalPERS. Your assigned CalPERS staff actuary, whose signature appears in the Actuarial Certification section on page 1, is available to discuss the report with you after August 1, 2019.

Actuarial valuations are based on assumptions regarding future plan experience including investment return and payroll growth, eligibility for the types of benefits provided, and longevity among retirees. The CalPERS Board of Administration adopts these assumptions after considering the advice of CalPERS actuarial and investment teams and other professionals. Each actuarial valuation reflects all prior differences between actual and assumed experience and adjusts the contribution rates as needed. This valuation is based on an investment return assumption of 7.0% which was adopted by the board in December 2016. Other assumptions used in this report are those recommended in the CalPERS Experience Study and Review of Actuarial Assumptions report from December 2017.

Required Contribution

The exhibit below displays the minimum employer contributions, before any cost sharing, for Fiscal Year 2020-21 along with estimates of the required contributions for Fiscal Year 2021-22. Member contributions other than cost sharing (whether paid by the employer or the employee) are in addition to the results shown below. **The employer contributions in this report do not reflect any cost sharing arrangements you may have with your employees**.

Fiscal Year	Employer Normal Cost Rate	Employer Amortization of Unfunded Accrued Liability
2020-21	10.484%	$257,784
Projected Results		
2021-22	*10.5%*	*$305,000*

The actual investment return for Fiscal Year 2018-19 was not known at the time this report was prepared. The projections above assume the investment return for that year would be 7.00 percent. ***If the actual investment return for Fiscal Year 2018-19 differs from 7.00 percent, the actual contribution requirements for the projected years will differ from those shown above.*** For additional details regarding the assumptions and methods used for these projections please refer to the "Projected Employer Contributions" in the "Highlights and Executive Summary" section. This section also contains projected required contributions through fiscal year 2025-26.

Changes from Previous Year's Valuation

CalPERS continues to strive to provide comprehensive risk assessments regarding plan funding and sustainability consistent with the Board of Administration's pension and investment beliefs. Your report this year includes new metrics on plan maturity in recognition of the fact that most pension plans at CalPERS are maturing as anticipated. As plans mature, they become more sensitive to risks than plans that are less mature. The "Risk Analysis" section of your report will help you understand how your plan is affected by investment return volatility and other economic assumptions. We have included plan sensitivity analysis with respect to longevity and inflation to further that discussion and encourage you to review our most recent Annual Review of Funding Levels and Risks report on our website that takes a holistic view of the system.

Upcoming Change for June 30, 2019 Valuations

The CalPERS Board of Administration has adopted a new amortization policy effective with the June 30, 2019 actuarial valuation. The new policy shortens the period over which actuarial gains and losses are amortized from 30 years to 20 years with the payments computed using a level dollar amount. In addition, the new policy removes the 5-year ramp-up and ramp-down on Unfunded Accrued Liability (UAL) bases attributable to assumption changes and non-investment gains/losses. The new policy removes the 5-year ramp-down on investment gains/losses. These changes will apply only to new UAL bases established on or after June 30, 2019.

Besides the above noted changes, there may also be changes specific to the plan such as contract amendments and funding changes.

Further descriptions of general changes are included in the "Highlights and Executive Summary" section and in Appendix A, "Statement of Actuarial Data, Methods and Assumptions" of the Section 2 report.

We understand that you might have a number of questions about these results. While we are very interested in discussing these results with your agency, in the interest of allowing us to give every public agency their results, we ask that you wait until after August 1 2019 to contact us with actuarial questions.

If you have other questions, please call our customer contact center at (888) CalPERS or (**888-225-7377**).

Sincerely,

SCOTT TERANDO
Chief Actuary

Actuarial Valuation as of June 30, 2018

for the Miscellaneous Plan of the Town of Moraga

(CalPERS ID: 6510195742)

Required Contributions for Fiscal Year July 1, 2020 - June 30, 2021

Table of Contents

Section 1

CALIFORNIA PUBLIC EMPLOYEES' RETIREMENT SYSTEM

Plan Specific Information for the Miscellaneous Plan of the Town of Moraga

(CalPERS ID: 6510195742)
(Valuation Rate Plan ID: 1162)

Table of Contents

Actuarial Certification

Section 1 of this report is based on the member and financial data contained in our records as of June 30, 2018 which was provided by your agency and the benefit provisions under your contract with CalPERS. Section 2 of this report is based on the member and financial data as of June 30, 2018 provided by employers participating in the Miscellaneous Risk Pool to which the plan belongs and benefit provisions under the CalPERS contracts for those agencies.

As set forth in Section 2 of this report, the pool actuaries have certified that, in their opinion, the valuation of the risk pool containing your Miscellaneous Plan has been performed in accordance with generally accepted actuarial principles consistent with standards of practice prescribed by the Actuarial Standards Board, and that the assumptions and methods are internally consistent and reasonable for the risk pool as of the date of this valuation and as prescribed by the CalPERS Board of Administration according to provisions set forth in the California Public Employees' Retirement Law.

Having relied upon the information set forth in Section 2 of this report and based on the census and benefit provision information for the plan, it is my opinion as the plan actuary that Unfunded Accrued Liability amortization bases as of June 30, 2018 and employer contribution as of July 1, 2020, have been properly and accurately determined in accordance with the principles and standards stated above.

The undersigned is an actuary for CalPERS, a member of both the American Academy of Actuaries and Society of Actuaries and meets the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein.

TONY CUNY, ASA, MAAA
Associate Pension Actuary, CalPERS
Plan Actuary

Highlights and Executive Summary

- **Introduction**
- **Purpose of Section 1**
- **Required Employer Contributions**
- **Plan's Funded Status**
- **Projected Employer Contributions**
- **Changes Since the Prior Year's Valuation**
- **Subsequent Events**

Introduction

This report presents the results of the June 30, 2018 actuarial valuation of the Miscellaneous Plan of the Town of Moraga of the California Public Employees' Retirement System (CalPERS). This actuarial valuation sets the required employer contributions for Fiscal Year 2020-21.

Purpose of Section 1

This Section 1 report for the Miscellaneous Plan of the Town of Moraga of the California Public Employees' Retirement System (CalPERS) was prepared by the plan actuary in order to:

- Set forth the assets and accrued liabilities of this plan as of June 30, 2018;
- Determine the minimum required employer contribution for this plan for the fiscal year July 1, 2020 through June 30, 2021; and
- Provide actuarial information as of June 30, 2018 to the CalPERS Board of Administration and other interested parties.

The pension funding information presented in this report should not be used in financial reports subject to GASB Statement No. 68 for a Cost Sharing Employer Defined Benefit Pension Plan. A separate accounting valuation report for such purposes is available from CalPERS and details for ordering are available on our website.

The measurements shown in this actuarial valuation may not be applicable for other purposes. The employer should contact their actuary before disseminating any portion of this report for any reason that is not explicitly described above.

Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the following: plan experience differing from that anticipated by the economic or demographic assumptions; changes in economic or demographic assumptions; changes in actuarial policies; and changes in plan provisions or applicable law.

California Actuarial Advisory Panel Recommendations

This report includes all the basic disclosure elements as described in the *Model Disclosure Elements for Actuarial Valuation Reports* recommended in 2011 by the California Actuarial Advisory Panel (CAAP), with the exception of including the original base amounts of the various components of the unfunded liability in the Schedule of Amortization Bases shown on page 10.

Additionally, this report includes the following "Enhanced Risk Disclosures" also recommended by the CAAP in the Model Disclosure Elements document and consistent with the recommendations of Actuarial Standard of Practice No. 51:

- A "Scenario Test," projecting future results under different investment income scenarios.
- A "Sensitivity Analysis," showing the impact on current valuation results using alternative discount rates of 6.0 percent and 8.0 percent.
- A "Sensitivity Analysis," showing the impact on current valuation results using a 1.0 percent plus or minus change in the inflation rate.
- A "Sensitivity Analysis," showing the impact on current valuation results assuming post-retirement rates of mortality are 10 percent lower or 10 percent higher than our current mortality assumptions adopted in 2017. This type of analysis highlights the impact on the plan of improving or worsening mortality over the long-term.
- Plan maturity measures which indicate how sensitive a plan may be to the risks noted above.

Required Employer Contributions

Required Employer Contributions		Fiscal Year 2020-21
Employer Normal Cost Rate		**10.484%**
Plus, Either		
1) Monthly Employer Dollar UAL Payment	**$**	**21,481.97**
Or		
2) Annual UAL Prepayment Option*	**$**	**249,209**

*The total minimum required employer contribution is the **sum** of the Plan's Employer Normal Cost Rate (expressed as a percentage of payroll) **plus** the Employer Unfunded Accrued Liability (UAL) Contribution Amount (billed monthly in dollars).*

** Only the UAL portion of the employer contribution can be prepaid **(which must be received in full no later than July 31)**. Any prepayment totaling over $5 million requires a 72-hour notice email to FCSD_public_agency_wires@calpers.ca.gov. Plan Normal Cost contributions will be made as part of the payroll reporting process. If there is contractual cost sharing or other change, this amount will change.*

In accordance with Sections 20537 and 20572 of the Public Employees' Retirement Law, if a contracting agency fails to remit the required contributions when due, interest and penalties may apply.

		Fiscal Year 2019-20		Fiscal Year 2020-21
Development of Normal Cost as a Percentage of Payroll[1]				
Base Total Normal Cost for Formula		16.586%		17.392%
Surcharge for Class 1 Benefits[2]				
None		0.000%		0.000%
Phase out of Normal Cost Difference[3]		0.000%		0.000%
Plan's Total Normal Cost		16.586%		17.392%
Formula's Expected Employee Contribution Rate		6.906%		6.908%
Employer Normal Cost Rate		9.680%		10.484%
Projected Payroll for the Contribution Fiscal Year	$	1,892,069	$	1,711,226
Estimated Employer Contributions Based on Projected Payroll				
Plan's Estimated Employer Normal Cost	$	183,152	$	179,405
Plan's Payment on Amortization Bases[4]		218,431		257,784
% of Projected Payroll (illustrative only)		11.545%		15.064%
Estimated Total Employer Contribution	$	401,583	$	437,189
% of Projected Payroll (illustrative only)		21.225%		25.548%

[1] The results shown for Fiscal Year 2019-20 reflect the prior year valuation and may not take into account any lump sum payment, side fund payoff, or rate adjustment made after April 30, 2018.

[2] Section 2 of this report contains a list of Class 1 benefits and corresponding surcharges for each benefit.

[3] The normal cost difference is phased out over a five-year period. The phase out of normal cost difference is 100 percent for the first year of pooling, and is incrementally reduced by 20 percent of the original normal cost difference for each subsequent year. This is non-zero only for plans that joined a pool within the past 5 years. Most plans joined a pool June 30, 2003, when risk pooling was implemented.

[4] See page 10 for a breakdown of the Amortization Bases.

Plan's Funded Status

	June 30, 2017	June 30, 2018
1. Present Value of Projected Benefits (PVB)	$ 16,963,628	$ 18,480,704
2. Entry Age Normal Accrued Liability (AL)	14,480,189	15,875,173
3. Plan's Market Value of Assets (MVA)	11,216,445	11,757,481
4. Unfunded Accrued Liability (UAL) [(2) - (3)]	3,263,744	4,117,692
5. Funded Ratio [(3) / (2)]	77.5%	74.1%

This measure of funded status is an assessment of the need for future employer contributions based on the selected actuarial cost method used to fund the plan. The UAL is the present value of future employer contributions for service that has already been earned and is in addition to future normal cost contributions for active members. For a measure of funded status that is appropriate for assessing the sufficiency of plan assets to cover estimated termination liabilities, please see "Hypothetical Termination Liability" in the "Risk Analysis" section.

Projected Employer Contributions

The table below shows projected employer contributions (before cost sharing) for the next six fiscal years. Projected results reflect the adopted changes to the discount rate described in Appendix A, "Statement of Actuarial Data, Methods and Assumptions" of the Section 2 report. The projections also assume that all actuarial assumptions will be realized and that no further changes to assumptions, contributions, benefits, or funding will occur during the projection period.

	Required Contribution	Projected Future Employer Contributions (Assumes 7.00% Return for Fiscal Year 2018-19)				
Fiscal Year	**2020-21**	**2021-22**	**2022-23**	**2023-24**	**2024-25**	**2025-26**
Normal Cost %	10.484%	10.5%	10.5%	10.5%	10.5%	10.5%
UAL Payment	$257,784	$305,000	$344,000	$369,000	$396,000	$407,000

Changes in the UAL due to actuarial gains or losses as well as changes in actuarial assumptions or methods are amortized using a 5-year ramp up. For more information, please see "Amortization of the Unfunded Actuarial Accrued Liability" under "Actuarial Methods" in Appendix A of Section 2. This method phases in the impact of unanticipated changes in UAL over a 5-year period and attempts to minimize employer cost volatility from year to year. As a result of this methodology, dramatic changes in the required employer contributions in any one year are less likely. However, required contributions can change gradually and significantly over the next five years. In years where there is a large increase in UAL the relatively small amortization payments during the ramp up period could result in a funded ratio that is projected to decrease initially while the contribution impact of the increase in the UAL is phased in.

For projected contributions under alternate investment return scenarios, please see the "Future Investment Return Scenarios" in the "Risk Analysis" section.

Changes Since the Prior Year's Valuation

Benefits

None. This valuation generally reflects plan changes by amendments effective before the date of the report. Please refer to the "Plan's Major Benefit Options" and Appendix B of Section 2 for a summary of the plan provisions used in this valuation.

Actuarial Methods and Assumptions

In December of 2016 the CalPERS Board of Administration lowered the discount rate from 7.50 percent to 7.00 percent using a three-year phase-in beginning with the June 30, 2016 actuarial valuation. The minimum employer contributions for Fiscal Year 2020-21 determined in this valuation were calculated using a discount rate of 7.00 percent, payroll growth of 2.75 percent and an inflation rate of 2.50 percent. The projected employer contributions on Page 5 are calculated under the assumption that the discount rate remains at 7.00 percent going forward and that furthermore the realized rate of return on assets for Fiscal Year 2018-19 is 7.00 percent.

The decision to reduce the discount rate was primarily based on reduced capital market assumptions provided by external investment consultants and CalPERS investment staff. The specific decision adopted by the Board reflected recommendations from CalPERS staff and additional input from employer and employee stakeholder groups. Based on the investment allocation adopted by the Board and capital market assumptions, the reduced discount rate assumption provides a more realistic assumption for the long-term investment return of the fund.

CalPERS has implemented a new actuarial valuation software system for the June 30, 2018 valuation. With this new system we have refined and improved some of our calculation methodology. Any difference in liability between the old software and new software calculations is captured as a method change line item.

Subsequent Events

The CalPERS Board of Administration has adopted a new amortization policy effective with the June 30, 2019 actuarial valuation. The new policy shortens the period over which actuarial gains and losses are amortized from 30 years to 20 years with the payments computed using a level dollar amount. In addition, the new policy removes the 5-year ramp-up and ramp-down on UAL bases attributable to assumption changes and non-investment gains/losses. The new policy removes the 5-year ramp-down on investment gains/losses. These changes will apply only to new UAL bases established on or after June 30, 2019.

For inactive employers the new amortization policy imposes a maximum amortization period of 15 years for all unfunded accrued liabilities effective June 30, 2018. Furthermore, the plan actuary has the ability to shorten the amortization period on any valuation date based on the life expectancy of plan members and projected cash flow needs to the plan. The impact of this has been reflected in the current valuation results.

The contribution requirements determined in this actuarial valuation report are based on demographic and financial information as of June 30, 2018, and may reflect additional discretionary payments made by the employer through April 30, 2019. Changes in the value of assets subsequent to that date are not reflected. Investment returns below the assumed rate of return will increase the required contribution, while investment returns above the assumed rate of return will decrease the required contribution.

This actuarial valuation report reflects statutory changes, regulatory changes and CalPERS Board actions through January 2019. Any subsequent changes or actions are not reflected.

Assets and Liabilities

- **Breakdown of Entry Age Normal Accrued Liability**
- **Allocation of Plan's Share of Pool's Experience/Assumption Change**
- **Development of Plan's Share of Pool's Market Value of Assets**
- **Schedule of Plan's Amortization Bases**
- **Amortization Schedule and Alternatives**
- **Employer Contribution History**
- **Funding History**

Breakdown of Entry Age Normal Accrued Liability

Active Members	$	2,619,882
Transferred Members		2,336,186
Terminated Members		1,196,785
Members and Beneficiaries Receiving Payments		9,722,320
Total	$	15,875,173

Allocation of Plan's Share of Pool's Experience/Assumption Change

It is the policy of CalPERS to ensure equity within the risk pools by allocating the pool's experience gains/losses and assumption changes in a manner that treats each employer equitably and maintains benefit security for the members of the System while minimizing substantial variations in employer contributions. The Pool's experience gains/losses and impact of assumption/method changes is allocated to the plan as follows:

1.	Plan's Accrued Liability	$	15,875,173
2.	Projected UAL balance at 6/30/18		3,385,660
3.	Pool's Accrued Liability[1]		17,424,237,070
4.	Sum of Pool's Individual Plan UAL Balances at 6/30/18[1]		3,777,499,883
5.	Pool's 2017/18 Investment & Asset (Gain)/Loss[1]		(135,628,188)
6.	Pool's 2017/18 Other (Gain)/Loss[1]		66,272,613
7.	Plan's Share of Pool's Asset (Gain)/Loss: [(1) - (2)] ÷ [(3) - (4)] × (5)		(124,127)
8.	Plan's Share of Pool's Other (Gain)/Loss: (1) ÷ (3) × (6)		60,381
9.	Plan's New (Gain)/Loss as of 6/30/2018: (7) + (8)		(63,746)
10.	Increase in Pool's Accrued Liability due to Change in Assumptions[1]		453,914,155
11.	Plan's Share of Pool's Change in Assumptions: (1) ÷ (3) × (10)		413,560
12.	Increase in Pool's Accrued Liability due to Change in Method[1]		128,995,852
13.	Plan's Share of Pool's Change in Method: (1) ÷ (3) × (12)		117,528

[1] Does not include plans that transferred to Pool on the valuation date.

Development of the Plan's Share of Pool's Market Value of Assets

14.	Plan's UAL: (2) + (9) + (11) + (13)	$	4,117,692
15.	Plan's Share of Pool's MVA: (1) - (14)	$	**11,757,481**

Schedule of Plan's Amortization Bases

On the next page is the schedule of the plan's amortization bases. Note that there is a two-year lag between the valuation date and the start of the contribution fiscal year.

- The assets, liabilities, and funded status of the plan are measured as of the valuation date: June 30, 2018.
- The required employer contributions determined by the valuation are for the fiscal year beginning two years after the valuation date: Fiscal Year 2020-21.

This two-year lag is necessary due to the amount of time needed to extract and test the membership and financial data, and the need to provide public agencies with their required employer contribution well in advance of the start of the fiscal year.

The Unfunded Accrued Liability (UAL) is used to determine the employer contribution and therefore must be rolled forward two years from the valuation date to the first day of the fiscal year for which the contribution is being determined. The UAL is rolled forward each year by subtracting the expected payment on the UAL for the fiscal year and adjusting for interest. The expected payment on the UAL for a fiscal year is equal to the Expected Employer Contribution for the fiscal year minus the Expected Normal Cost for the year. The Employer Contribution for the first fiscal year is determined by the actuarial valuation two years ago and the contribution for the second year is from the actuarial valuation one year ago. Additional discretionary payments are reflected in the Expected Payments column in the fiscal year they were made by the agency.

Schedule of Plan's Amortization Bases

										Amounts for Fiscal 2020-21
Reason for Base	**Date Established**	**Ramp Up/Down 2020-21**	**Escalation Rate**	**Amortization Period**	**Balance 6/30/18**	**Payment 2018-19**	**Balance 6/30/19**	**Payment 2019-20**	**Balance 6/30/20**	**Scheduled Payment for 2020-21**
SHARE OF PRE-2013 POOL UAL	06/30/13	No Ramp	2.750%	17	$931,982	$72,112	$922,628	$74,073	$910,590	$75,137
NON-ASSET (GAIN)/LOSS	06/30/13	100% →	2.750%	25	$(13,860)	$(735)	$(14,070)	$(944)	$(14,078)	$(955)
ASSET (GAIN)/LOSS	06/30/13	100% →	2.750%	25	$1,441,882	$76,454	$1,463,729	$98,183	$1,464,629	$99,356
NON-ASSET (GAIN)/LOSS	06/30/14	100% →	2.750%	26	$1,193	$48	$1,227	$65	$1,246	$82
ASSET (GAIN)/LOSS	06/30/14	100% →	2.750%	26	$(1,115,386)	$(44,463)	$(1,147,470)	$(60,910)	$(1,164,787)	$(77,024)
ASSUMPTION CHANGE	06/30/14	100% →	2.750%	16	$685,122	$37,692	$694,092	$51,623	$689,279	$65,543
NON-ASSET (GAIN)/LOSS	06/30/15	80% ↗	2.750%	27	$(54,819)	$(1,479)	$(57,126)	$(2,280)	$(58,766)	$(3,074)
ASSET (GAIN)/LOSS	06/30/15	80% ↗	2.750%	27	$691,729	$18,665	$720,843	$28,768	$741,544	$38,786
NON-ASSET (GAIN)/LOSS	06/30/16	60% ↗	2.750%	28	$(100,238)	$(1,391)	$(105,816)	$(2,859)	$(110,266)	$(4,333)
ASSET (GAIN)/LOSS	06/30/16	60% ↗	2.750%	28	$832,301	$11,550	$878,615	$23,736	$915,565	$35,980
ASSUMPTION CHANGE	06/30/16	60% ↗	2.750%	18	$251,426	$4,744	$264,119	$9,749	$272,523	$14,837
NON-ASSET (GAIN)/LOSS	06/30/17	40% ↗	2.750%	29	$(20,791)	$0	$(22,246)	$(309)	$(23,484)	$(624)
ASSET (GAIN)/LOSS	06/30/17	40% ↗	2.750%	29	$(412,564)	$0	$(441,443)	$(6,133)	$(466,000)	$(12,387)
ASSUMPTION CHANGE	06/30/17	40% ↗	2.750%	19	$267,683	$(13,325)	$300,204	$5,670	$315,353	$11,499
AL SIGNIFICANT INCREASE*	06/30/18	20% ↗	2.750%	30	$264,691	$0	$283,220	$0	$303,045	$4,139
NON-ASSET (GAIN)/LOSS	06/30/18	20% ↗	2.750%	30	$60,381	$0	$64,607	$0	$69,130	$944
ASSET (GAIN)/LOSS	06/30/18	20% ↗	2.750%	30	$(124,127)	$0	$(132,816)	$0	$(142,113)	$(1,941)
METHOD CHANGE	06/30/18	20% ↗	2.750%	20	$117,528	$(737)	$126,517	$(757)	$136,156	$2,539
ASSUMPTION CHANGE	06/30/18	20% ↗	2.750%	20	$413,560	$(11,132)	$454,024	$(11,438)	$497,638	$9,278
TOTAL					**$4,117,693**	**$148,003**	**$4,252,838**	**$206,237**	**$4,337,204**	**$257,784**

*Government Code Section 20791 requires that a significant increase in actuarial liability to a contracting agency due to increased compensation by a subsequent employer to a non-represented employee is borne by the agency that created the increase in liability.

The (gain)/loss bases are the plan's allocated share of the risk pool's (gain)/loss for the fiscal year as disclosed in "Allocation of Plan's Share of Pool's Experience/Assumption Change" earlier in this section. These (gain)/loss bases will be amortized according to Board policy over 30 years with a 5-year ramp-up.

If the total Unfunded Liability is negative (i.e., plan has a surplus), the scheduled payment is $0, because the minimum required contribution under PEPRA must be at least equal to the normal cost.

Amortization Schedule and Alternatives

The amortization schedule on the previous page shows the minimum contributions required according to CalPERS amortization policy. There has been considerable interest from many agencies in paying off these unfunded accrued liabilities sooner and the possible savings in doing so. As a result, we have provided alternate amortization schedules to help analyze the current amortization schedule and illustrate the advantages of accelerating unfunded liability payments.

Shown on the following page are future year amortization payments based on: 1) the current amortization schedule reflecting the individual bases and remaining periods shown on the previous page, and 2) alternate "fresh start" amortization schedules using two sample periods that would both result in interest savings relative to the current amortization schedule. Note that the payments under each alternate scenario increase by 2.75 percent for each year into the future, except for inactive plans.

The Current Amortization Schedule typically contains individual bases that are both positive and negative. Positive bases result from plan changes, assumption changes or plan experience that result in increases to unfunded liability. Negative bases result from plan changes, assumption changes or plan experience that result in decreases to unfunded liability. The combination of positive and negative bases within an amortization schedule can result in unusual or problematic circumstances in future years such as:

- A positive total unfunded liability with a negative total payment,
- A negative total unfunded liability with a positive total payment, or
- Total payments that completely amortize the unfunded liability over a very short period of time

In any year where one of the above scenarios occurs, the actuary will consider corrective action such as replacing the existing unfunded liability bases with a single "fresh start" base and amortizing it over a reasonable period.

The Current Amortization Schedule on the following page may appear to show that, based on the current amortization bases, one of the above scenarios will occur at some point in the future. It is impossible to know today whether such a scenario will in fact arise since there will be additional bases added to the amortization schedule in each future year. Should such a scenario arise in any future year, the actuary will take appropriate action based on guidelines in the CalPERS amortization policy.

Amortization Schedule and Alternatives

	Current Amortization Schedule		Alternate Schedules			
			20 Year Amortization		15 Year Amortization	
Date	**Balance**	**Payment**	**Balance**	**Payment**	**Balance**	**Payment**
6/30/2020	4,337,203	257,784	4,337,203	320,844	4,337,203	391,188
6/30/2021	4,374,154	304,561	4,308,924	329,667	4,236,159	401,946
6/30/2022	4,365,305	344,290	4,269,538	338,733	4,116,914	413,000
6/30/2023	4,314,740	369,165	4,218,017	348,048	3,977,888	424,357
6/30/2024	4,234,904	395,991	4,153,254	357,620	3,817,381	436,027
6/30/2025	4,121,731	406,881	4,074,057	367,454	3,633,568	448,018
6/30/2026	3,989,371	418,070	3,979,143	377,559	3,424,485	460,338
6/30/2027	3,836,172	429,567	3,867,133	387,942	3,188,021	472,998
6/30/2028	3,660,356	441,380	3,736,542	398,611	2,921,910	486,005
6/30/2029	3,460,014	453,518	3,585,774	409,572	2,623,716	499,370
6/30/2030	3,233,093	465,990	3,413,113	420,836	2,290,824	513,103
6/30/2031	2,977,385	478,805	3,216,715	432,409	1,920,424	527,213
6/30/2032	2,690,523	473,819	2,994,598	444,300	1,509,500	541,711
6/30/2033	2,388,737	468,197	2,744,632	456,518	1,054,815	556,609
6/30/2034	2,071,642	454,677	2,464,531	469,072	552,891	571,915
6/30/2035	1,746,335	431,422	2,151,836	481,972		
6/30/2036	1,422,312	388,305	1,803,908	495,226		
6/30/2037	1,120,208	244,116	1,417,916	508,845		
6/30/2038	946,107	214,143	990,817	522,838		
6/30/2039	790,823	190,619	519,346	537,216		
6/30/2040	649,003	175,531				
6/30/2041	512,863	145,569				
6/30/2042	398,186	141,776				
6/30/2043	279,404	121,003				
6/30/2044	173,796	78,750				
6/30/2045	104,502	46,901				
6/30/2046	63,303	46,722				
6/30/2047	19,405	14,487				
6/30/2048	5,777	(473)				
6/30/2049	6,671	6,901				
Totals	**8,408,466**		**8,405,284**		**7,143,798**	
Interest Paid	**4,071,263**		**4,068,081**		**2,806,595**	
Estimated Savings			**3,183**		**1,264,668**	

Employer Contribution History

The table below provides a recent history of the required employer contributions for the plan, as determined by the annual actuarial valuation. It does not account for prepayments or benefit changes made during a fiscal year.

Fiscal Year	Employer Normal Cost	Unfunded Liability Payment ($)
2016 - 17	8.377%	$102,817
2017 - 18	8.418%	$130,767
2018 - 19	8.892%	$173,196
2019 - 20	9.680%	$218,431
2020 - 21	10.484%	$257,784

Funding History

The funding history below shows the plan's actuarial accrued liability, share of the pool's market value of assets, share of the pool's unfunded liability, funded ratio, and annual covered payroll.

Valuation Date	Accrued Liability (AL)	Share of Pool's Market Value of Assets (MVA)	Plan's Share of Pool's Unfunded Liability	Funded Ratio	Annual Covered Payroll
06/30/2011	$ 9,194,685	$ 7,523,970	$ 1,670,715	81.8%	$ 1,892,451
06/30/2012	9,707,971	7,492,310	2,215,661	77.2%	1,516,932
06/30/2013	10,667,342	8,669,306	1,998,036	81.3%	1,924,663
06/30/2014	11,962,832	10,207,345	1,755,487	85.3%	1,971,338
06/30/2015	12,717,657	10,369,974	2,347,683	81.5%	1,741,459
06/30/2016	13,495,513	10,207,811	3,287,702	75.6%	1,535,348
06/30/2017	14,480,189	11,216,445	3,263,744	77.5%	1,737,830
06/30/2018	15,875,173	11,757,481	4,117,692	74.1%	1,577,473

Risk Analysis

- **Future Investment Return Scenarios**
- **Discount Rate Sensitivity**
- **Mortality Rate Sensitivity**
- **Inflation Rate Sensitivity**
- **Maturity Measures**
- **Hypothetical Termination Liability**

Future Investment Return Scenarios

Analysis was performed to determine the effects of various future investment returns on required employer contributions. The projections below provide a range of results based on five investment return scenarios assumed to occur during the next four fiscal years (2018-19, 2019-20, 2020-21 and 2021-22). The projections also assume that all other actuarial assumptions will be realized and that no further changes to assumptions, contributions, benefits, or funding will occur.

For fiscal years 2018-19, 2019-20, 2020-21, and 2021-22, each scenario assumes an alternate fixed annual return. The fixed return assumptions for the five scenarios are 1.0 percent, 4.0 percent, 7.0 percent, 9.0 percent and 12.0 percent.

These alternate investment returns were chosen based on stochastic analysis of possible future investment returns over the four-year period ending June 30, 2022. Using the expected returns and volatility of the asset classes in which the funds are invested, we produced five thousand stochastic outcomes for this period based on the most recently completed Asset Liability Management process. We then selected annual returns that approximate the 5th, 25th, 50th, 75th, and 95th percentiles for these outcomes. For example, of all the 4-year outcomes generated in the stochastic analysis, approximately 25 percent of them had an average annual return of 4.0 percent or less.

Required contributions outside of this range are also possible. In particular, whereas it is unlikely that investment returns will average less than 1.0 percent or greater than 12.0 percent over this four-year period, the possibility of a single investment return less than 1.0 percent or greater than 12.0 percent in any given year is much greater.

Assumed Annual Return From 2018-19 through 2021-22	Projected Employer Contributions			
	2021-22	2022-23	2023-24	2024-25
1.0%				
Normal Cost	10.5%	10.5%	10.5%	10.5%
UAL Contribution	$322,000	$397,000	$475,000	$574,000
4.0%				
Normal Cost	10.5%	10.5%	10.5%	10.5%
UAL Contribution	$313,000	$371,000	$423,000	$487,000
7.0%				
Normal Cost	10.5%	10.5%	10.5%	10.5%
UAL Contribution	$305,000	$344,000	$369,000	$396,000
9.0%				
Normal Cost	10.7%	10.9%	11.1%	11.3%
UAL Contribution	$300,000	$331,000	$343,000	$352,000
12.0%				
Normal Cost	10.7%	10.9%	11.1%	11.3%
UAL Contribution	$291,000	$304,000	$286,000	$253,000

In addition, the projections above reflect the recent changes to the new amortization policy effective with the June 30, 2019 valuation. The projections above incorporate the impact of the CalPERS risk mitigation policy which reduces the discount rate when investment returns are above specified trigger points.

Discount Rate Sensitivity

Shown below are various valuation results as of June 30, 2018 assuming alternate discount rates. Results are shown using the current discount rate of 7.0 percent as well as alternate discount rates of 6.0 percent and 8.0 percent. The rates of 6.0 percent and 8.0 percent were selected since they illustrate the impact of a 1 percent increase or decrease to the 7.0 percent assumption. This analysis shows the potential plan impacts if the PERF were to realize investment returns of 6.0 percent or 8.0 percent over the long-term.

This type of analysis gives the reader a sense of the long-term risk to required contributions. For a measure of funded status that is appropriate for assessing the sufficiency of plan assets to cover estimated termination liabilities, please see "Hypothetical Termination Liability" at the end of this section.

Sensitivity Analysis				
As of June 30, 2018	**Plan's Total Normal Cost**	**Accrued Liability**	**Unfunded Accrued Liability**	**Funded Status**
7.0% (current discount rate)	17.392%	$15,875,173	$4,117,692	74.1%
6.0%	21.662%	$18,002,951	$6,245,470	65.3%
8.0%	14.117%	$14,128,290	$2,370,809	83.2%

Mortality Rate Sensitivity

The following table looks at the change in the June 30, 2018 plan costs and funded ratio under two different longevity scenarios, namely assuming post-retirement rates of mortality are 10 percent lower or 10 percent higher than our current mortality assumptions adopted in 2017. This type of analysis highlights the impact on the plan of improving or worsening mortality over the long-term.

As of June 30, 2018	**Current Mortality**	**10% Lower Mortality Rates**	**10% Higher Mortality Rates**
a) Accrued Liability	$15,875,173	$16,205,324	$15,571,296
b) Market Value of Assets	$11,757,481	$11,757,481	$11,757,481
c) Unfunded Liability (Surplus) [(a)-(b)]	$4,117,692	$4,447,843	$3,813,815
d) Funded Status	74.1%	72.6%	75.5%

A 10 percent increase (decrease) in assumed mortality rates over the long-term would result in approximately a 1.4 percent increase (decrease) to the funded ratio.

Inflation Rate Sensitivity

The following analysis looks at the change in the June 30, 2018 plan costs and funded ratio under two different inflation rate scenarios, namely assuming the liability inflation rate is 1 percent lower or 1 percent higher than the current valuation inflation rate assumption of 2.50%, while holding the discount rate fixed at 7.0%. This type of analysis highlights the impact on the plan of increased or decreased inflation of active salaries and retiree COLAs over the long-term.

As of June 30, 2018	Current Inflation Rate	-1% Inflation Rate	+1% Inflation Rate
a) Accrued Liability	$15,875,173	$14,852,249	$16,638,615
b) Market Value of Assets	$11,757,481	$11,757,481	$11,757,481
c) Unfunded Liability (Surplus) [(a)-(b)]	$4,117,692	$3,094,768	$4,881,134
d) Funded Status	74.1%	79.2%	70.7%

A decrease of 1 percent in the liability inflation rate (2.50 percent to 1.50 percent) reduces the Accrued Liability by 6.4 percent. However, a 1 percent increase in the liability inflation rate (2.50 percent to 3.50 percent) increases the Accrued Liability by 4.8 percent.

Maturity Measures

As pension plans mature they become much more sensitive to risks than plans that are less mature. Understanding plan maturity and how it affects the ability of a pension plan to tolerate risk is important in understanding how the plan is impacted by investment return volatility, other economic variables and changes in longevity or other demographic assumptions. One way to look at the maturity level of CalPERS and its plans is to look at the ratio of a plan's retiree liability to its total liability. A pension plan in its infancy will have a very low ratio of retiree liability to total liability. As the plan matures, the ratio starts increasing. A mature plan will often have a ratio above 0.60 to 0.65. For both CalPERS and other retirement systems in the United States, these ratios have been steadily increasing in recent years.

Ratio of Retiree Accrued Liability to Total Accrued Liability	June 30, 2017	June 30, 2018
1. Retired Accrued Liability	8,892,991	9,722,320
2. Total Accrued Liability	14,480,189	15,875,173
3. Ratio of Retiree AL to Total AL [(1) / (2)]	0.61	0.61

Another way to look at the maturity level of CalPERS and its plans is to look at the ratio of actives to retirees. A pension plan in its infancy will have a very high ratio of active to retired members. As the plan matures, and members retire, the ratio starts declining. A mature plan will often have a ratio near or below one. The average support ratio for CalPERS public agency plans is 1.25.

Support Ratio	June 30, 2017	June 30, 2018
1. Number of Actives	16	15
2. Number of Retirees	34	37
3. Support Ratio [(1) / (2)]	0.47	0.41

Actuarial calculations are based on a number of assumptions about long-term demographic and economic behavior. Unless these assumptions (e.g., terminations, deaths, disabilities, retirements, salary growth, and investment return) are exactly realized each year, there will be differences on a year-to-year basis. The year-to-year differences between actual experience and the assumptions are called actuarial gains and losses and serve to lower or raise required employer contributions from one year to the next. Therefore, employer contributions will inevitably fluctuate, especially due to the ups and downs of investment returns.

Asset Volatility Ratio (AVR)

Plans that have higher asset-to-payroll ratios experience more volatile employer contributions (as a percentage of payroll) due to investment return. For example, a plan with an asset-to-payroll ratio of 8 may experience twice the contribution volatility due to investment return volatility than a plan with an asset-to-payroll ratio of 4. Shown below is the asset volatility ratio, a measure of the plan's current contribution volatility. It should be noted that this ratio is a measure of the current situation. It increases over time but generally tends to stabilize as the plan matures.

Liability Volatility Ratio (LVR)

Plans that have higher liability-to-payroll ratios experience more volatile employer contributions (as a percentage of payroll) due to investment return and changes in liability. For example, a plan with a liability-to-payroll ratio of 8 is expected to have twice the contribution volatility of a plan with a liability-to-payroll ratio of 4. The liability volatility ratio is also shown in the table below. It should be noted that this ratio indicates a longer-term potential for contribution volatility. The asset volatility ratio, described above, will tend to move closer to the liability volatility ratio as the plan matures.

Contribution Volatility		**June 30, 2017**		**June 30, 2018**
1. Market Value of Assets	$	11,216,445	$	11,757,481
2. Payroll		1,737,830		1,577,473
3. Asset Volatility Ratio (AVR) [(1) / (2)]		6.5		7.5
4. Accrued Liability	$	14,480,189	$	15,875,173
5. Liability Volatility Ratio (LVR) [(4) / (2)]		8.3		10.1
6. Accrued Liability (7.00% discount rate)		14,882,266		15,875,173
7. Projected Liability Volatility Ratio [(6) / (2)]		8.6		10.1

Hypothetical Termination Liability

The hypothetical termination liability is an estimate of the financial position of the plan had the contract with CalPERS been terminated as of June 30, 2018. The plan liability on a termination basis is calculated differently compared to the plan's ongoing funding liability. For the hypothetical termination liability calculation, both compensation and service are frozen as of the valuation date and no future pay increases or service accruals are assumed. This measure of funded status is not appropriate for assessing the need for future employer contributions in the case of an ongoing plan, that is, for an employer that continues to provide CalPERS retirement benefits to active employees.

A more conservative investment policy and asset allocation strategy was adopted by the CalPERS Board for the Terminated Agency Pool. The Terminated Agency Pool has limited funding sources since no future employer contributions will be made. Therefore, expected benefit payments are secured by risk-free assets and benefit security for members is increased while funding risk is limited. However, this asset allocation has a lower expected rate of return than the PERF and consequently, a lower discount rate is assumed. The lower discount rate for the Terminated Agency Pool results in higher liabilities for terminated plans.

The effective termination discount rate will depend on actual market rates of return for risk-free securities on the date of termination. As market discount rates are variable, the table below shows a range for the hypothetical termination liability based on the lowest and highest interest rates observed during an approximate 2-year period centered around the valuation date.

Market Value of Assets (MVA)	Hypothetical Termination Liability[1,2] @ 2.50%	Funded Status	Unfunded Termination Liability @ 2.50%	Hypothetical Termination Liability[1,2] @ 3.25%	Funded Status	Unfunded Termination Liability @ 3.25%
$11,757,481	$27,590,241	42.6%	$15,832,760	$25,175,784	46.7%	$13,418,303

[1] The hypothetical liabilities calculated above include a 5 percent mortality contingency load in accordance with Board policy. Other actuarial assumptions can be found in Appendix A of the Section 2 report.

[2] The current discount rate assumption used for termination valuations is a weighted average of the 10-year and 30-year U.S. Treasury yields where the weights are based on matching asset and liability durations as of the termination date. The discount rates used in the table are based on 20-year Treasury bonds, rounded to the nearest quarter percentage point, which is a good proxy for most plans. The 20-year Treasury yield was 2.91 percent on June 30, 2018, and was 2.83 percent on January 31, 2019.

In order to terminate the plan, you must first contact our Retirement Services Contract Unit to initiate a Resolution of Intent to Terminate. The completed Resolution will allow the plan actuary to give you a preliminary termination valuation with a more up-to-date estimate of the plan liabilities. CalPERS advises you to consult with the plan actuary before beginning this process.

Participant Data

The table below shows a summary of your plan's member data upon which this valuation is based:

		June 30, 2017		June 30, 2018
Reported Payroll	$	1,737,830	$	1,577,473
Projected Payroll for Contribution Purposes	$	1,892,069	$	1,711,226
Number of Members				
Active		16		15
Transferred		21		22
Separated		20		19
Retired		34		37

List of Class 1 Benefit Provisions

This plan has the additional Class 1 Benefit Provisions:

- None

Plan's Major Benefit Options

Shown below is a summary of the major optional benefits for which your agency has contracted. A description of principal standard and optional plan provisions is in the following section of this Appendix.

	Benefit Group			
Member Category	Misc	Misc	EXL*	
Demographics				
Actives	Yes	No	No	
Transfers/Separated	Yes	No	No	
Receiving	Yes	Yes	Yes	
Benefit Provision				
Benefit Formula	2% @ 55	2% @ 60	2% @ 55	
Social Security Coverage	No	No	No	
Full/Modified	Full	Full	Full	
Employee Contribution Rate	7.00%			
Final Average Compensation Period	Three Year	Three Year	One Year	
Sick Leave Credit	Yes	Yes	Yes	
Non-Industrial Disability	Standard	Standard	Standard	
Industrial Disability	No	No	No	
Pre-Retirement Death Benefits				
Optional Settlement 2	Yes	No	No	
1959 Survivor Benefit Level	Level 4	Level 4	Level 4	
Special	No	No	No	
Alternate (firefighters)	No	No	No	
Post-Retirement Death Benefits				
Lump Sum	$500	$500	$0	
Survivor Allowance (PRSA)	No	No	No	
COLA	2%	2%	2%	

* The benefits listed here are those associated with the plan where an accrued liability adjustment has been made in accordance with Government Code Section 20791 and not of the contracting agency.

Section 2

CALIFORNIA PUBLIC EMPLOYEES' RETIREMENT SYSTEM

Section 2 may be found on the CalPERS website (www.calpers.ca.gov) in the Forms and Publications section

ATTACHMENT C

CalPERS Annual Valuation Report as of June 30, 2018 –
Miscellaneous PEPRA

California Public Employees' Retirement System
Actuarial Office
400 Q Street, Sacramento, CA 95811 |Phone: (916) 795-3000 | Fax: (916) 795-2744
888 CalPERS (or **888**-225-7377) | TTY: (877) 249-7442 | **www.calpers.ca.gov**

July 2019

PEPRA Miscellaneous Plan of the Town of Moraga
(CalPERS ID: 6510195742)
Annual Valuation Report as of June 30, 2018

Dear Employer,

Attached to this letter, you will find the June 30, 2018 actuarial valuation report of your CalPERS pension plan. **Provided in this report is the determination of the minimum required employer contributions for Fiscal Year 2020-21**. In addition, the report contains important information regarding the current financial status of the plan as well as projections and risk measures to aid in planning for the future.

Because this plan is in a risk pool, the following valuation report has been separated into two sections:

- Section 1 contains specific information for the plan including the development of the current and projected employer contributions, and
- Section 2 contains the Risk Pool Actuarial Valuation appropriate to the plan as of June 30, 2018.

Section 2 can be found on the CalPERS website (www.calpers.ca.gov). From the home page, go to "*Forms & Publications*" and select "*View All*". In the search box, enter "*Risk Pool*" and from the results list download the Miscellaneous or Safety Risk Pool Actuarial Valuation Report as appropriate.

Your June 30, 2018 actuarial valuation report contains important actuarial information about your pension plan at CalPERS. Your assigned CalPERS staff actuary, whose signature appears in the Actuarial Certification section on page 1, is available to discuss the report with you after August 1, 2019.

Actuarial valuations are based on assumptions regarding future plan experience including investment return and payroll growth, eligibility for the types of benefits provided, and longevity among retirees. The CalPERS Board of Administration adopts these assumptions after considering the advice of CalPERS actuarial and investment teams and other professionals. Each actuarial valuation reflects all prior differences between actual and assumed experience and adjusts the contribution rates as needed. This valuation is based on an investment return assumption of 7.0% which was adopted by the board in December 2016. Other assumptions used in this report are those recommended in the CalPERS Experience Study and Review of Actuarial Assumptions report from December 2017.

Required Contribution

The exhibit below displays the minimum employer contributions, before any cost sharing, for Fiscal Year 2020-21 along with estimates of the required contributions for Fiscal Year 2021-22. Member contributions other than cost sharing (whether paid by the employer or the employee) are in addition to the results shown below. **The employer contributions in this report do not reflect any cost sharing arrangements you may have with your employees**.

Fiscal Year	Employer Normal Cost Rate	Employer Amortization of Unfunded Accrued Liability	PEPRA Employee Rate
2020-21	7.732%	$2,638	6.750%
Projected Results			
2021-22	*7.7%*	*$3,100*	*TBD*

The actual investment return for Fiscal Year 2018-19 was not known at the time this report was prepared. The projections above assume the investment return for that year would be 7.00 percent. ***If the actual investment return for Fiscal Year 2018-19 differs from 7.00 percent, the actual contribution requirements for the projected years will differ from those shown above.*** For additional details regarding the assumptions and methods used for these projections please refer to the "Projected Employer Contributions" in the "Highlights and Executive Summary" section. This section also contains projected required contributions through fiscal year 2025-26.

Changes from Previous Year's Valuation

CalPERS continues to strive to provide comprehensive risk assessments regarding plan funding and sustainability consistent with the Board of Administration's pension and investment beliefs. Your report this year includes new metrics on plan maturity in recognition of the fact that most pension plans at CalPERS are maturing as anticipated. As plans mature, they become more sensitive to risks than plans that are less mature. The "Risk Analysis" section of your report will help you understand how your plan is affected by investment return volatility and other economic assumptions. We have included plan sensitivity analysis with respect to longevity and inflation to further that discussion and encourage you to review our most recent Annual Review of Funding Levels and Risks report on our website that takes a holistic view of the system.

Upcoming Change for June 30, 2019 Valuations

The CalPERS Board of Administration has adopted a new amortization policy effective with the June 30, 2019 actuarial valuation. The new policy shortens the period over which actuarial gains and losses are amortized from 30 years to 20 years with the payments computed using a level dollar amount. In addition, the new policy removes the 5-year ramp-up and ramp-down on Unfunded Accrued Liability (UAL) bases attributable to assumption changes and non-investment gains/losses. The new policy removes the 5-year ramp-down on investment gains/losses. These changes will apply only to new UAL bases established on or after June 30, 2019.

Besides the above noted changes, there may also be changes specific to the plan such as contract amendments and funding changes.

Further descriptions of general changes are included in the "Highlights and Executive Summary" section and in Appendix A, "Statement of Actuarial Data, Methods and Assumptions" of the Section 2 report.

We understand that you might have a number of questions about these results. While we are very interested in discussing these results with your agency, in the interest of allowing us to give every public agency their results, we ask that you wait until after August 1 2019 to contact us with actuarial questions.

If you have other questions, please call our customer contact center at (888) CalPERS or (**888-225-7377**).

Sincerely,

SCOTT TERANDO
Chief Actuary

Actuarial Valuation as of June 30, 2018

for the PEPRA Miscellaneous Plan of the Town of Moraga

(CalPERS ID: 6510195742)

Required Contributions for Fiscal Year July 1, 2020 - June 30, 2021

Table of Contents

Section 1

CALIFORNIA PUBLIC EMPLOYEES' RETIREMENT SYSTEM

Plan Specific Information for the PEPRA Miscellaneous Plan of the Town of Moraga

(CalPERS ID: 6510195742)
(Valuation Rate Plan ID: 26746)

Table of Contents

Actuarial Certification

Section 1 of this report is based on the member and financial data contained in our records as of June 30, 2018 which was provided by your agency and the benefit provisions under your contract with CalPERS. Section 2 of this report is based on the member and financial data as of June 30, 2018 provided by employers participating in the Miscellaneous Risk Pool to which the plan belongs and benefit provisions under the CalPERS contracts for those agencies.

As set forth in Section 2 of this report, the pool actuaries have certified that, in their opinion, the valuation of the risk pool containing your PEPRA Miscellaneous Plan has been performed in accordance with generally accepted actuarial principles consistent with standards of practice prescribed by the Actuarial Standards Board, and that the assumptions and methods are internally consistent and reasonable for the risk pool as of the date of this valuation and as prescribed by the CalPERS Board of Administration according to provisions set forth in the California Public Employees' Retirement Law.

Having relied upon the information set forth in Section 2 of this report and based on the census and benefit provision information for the plan, it is my opinion as the plan actuary that Unfunded Accrued Liability amortization bases as of June 30, 2018 and employer contribution as of July 1, 2020, have been properly and accurately determined in accordance with the principles and standards stated above.

The undersigned is an actuary for CalPERS, a member of both the American Academy of Actuaries and Society of Actuaries and meets the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein.

TONY CUNY, ASA, MAAA
Associate Pension Actuary, CalPERS
Plan Actuary

Highlights and Executive Summary

- **Introduction**
- **Purpose of Section 1**
- **Required Employer Contributions**
- **Plan's Funded Status**
- **Projected Employer Contributions**
- **Changes Since the Prior Year's Valuation**
- **Subsequent Events**

Introduction

This report presents the results of the June 30, 2018 actuarial valuation of the PEPRA Miscellaneous Plan of the Town of Moraga of the California Public Employees' Retirement System (CalPERS). This actuarial valuation sets the required employer contributions for Fiscal Year 2020-21.

Purpose of Section 1

This Section 1 report for the PEPRA Miscellaneous Plan of the Town of Moraga of the California Public Employees' Retirement System (CalPERS) was prepared by the plan actuary in order to:

- Set forth the assets and accrued liabilities of this plan as of June 30, 2018;
- Determine the minimum required employer contribution for this plan for the fiscal year July 1, 2020 through June 30, 2021; and
- Provide actuarial information as of June 30, 2018 to the CalPERS Board of Administration and other interested parties.

The pension funding information presented in this report should not be used in financial reports subject to GASB Statement No. 68 for a Cost Sharing Employer Defined Benefit Pension Plan. A separate accounting valuation report for such purposes is available from CalPERS and details for ordering are available on our website.

The measurements shown in this actuarial valuation may not be applicable for other purposes. The employer should contact their actuary before disseminating any portion of this report for any reason that is not explicitly described above.

Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the following: plan experience differing from that anticipated by the economic or demographic assumptions; changes in economic or demographic assumptions; changes in actuarial policies; and changes in plan provisions or applicable law.

California Actuarial Advisory Panel Recommendations

This report includes all the basic disclosure elements as described in the *Model Disclosure Elements for Actuarial Valuation Reports* recommended in 2011 by the California Actuarial Advisory Panel (CAAP), with the exception of including the original base amounts of the various components of the unfunded liability in the Schedule of Amortization Bases shown on page 10.

Additionally, this report includes the following "Enhanced Risk Disclosures" also recommended by the CAAP in the Model Disclosure Elements document and consistent with the recommendations of Actuarial Standard of Practice No. 51:

- A "Scenario Test," projecting future results under different investment income scenarios.
- A "Sensitivity Analysis," showing the impact on current valuation results using alternative discount rates of 6.0 percent and 8.0 percent.
- A "Sensitivity Analysis," showing the impact on current valuation results using a 1.0 percent plus or minus change in the inflation rate.
- A "Sensitivity Analysis," showing the impact on current valuation results assuming post-retirement rates of mortality are 10 percent lower or 10 percent higher than our current mortality assumptions adopted in 2017. This type of analysis highlights the impact on the plan of improving or worsening mortality over the long-term.
- Plan maturity measures which indicate how sensitive a plan may be to the risks noted above.

Required Employer Contributions

		Fiscal Year
Required Employer Contributions		**2020-21**
Employer Normal Cost Rate		**7.732%**
Plus, Either		
1) Monthly Employer Dollar UAL Payment	**$**	**219.80**
Or		
2) Annual UAL Prepayment Option*	**$**	**2,550**

*The total minimum required employer contribution is the **sum** of the Plan's Employer Normal Cost Rate (expressed as a percentage of payroll) **plus** the Employer Unfunded Accrued Liability (UAL) Contribution Amount (billed monthly in dollars).*

** Only the UAL portion of the employer contribution can be prepaid **(which must be received in full no later than July 31)**. Any prepayment totaling over $5 million requires a 72-hour notice email to FCSD_public_agency_wires@calpers.ca.gov. Plan Normal Cost contributions will be made as part of the payroll reporting process. If there is contractual cost sharing or other change, this amount will change.*

In accordance with Sections 20537 and 20572 of the Public Employees' Retirement Law, if a contracting agency fails to remit the required contributions when due, interest and penalties may apply.

		Fiscal Year 2019-20		Fiscal Year 2020-21
Development of Normal Cost as a Percentage of Payroll[1]				
Base Total Normal Cost for Formula		13.735%		14.482%
Surcharge for Class 1 Benefits[2]				
None		0.000%		0.000%
Phase out of Normal Cost Difference[3]		0.000%		0.000%
Plan's Total Normal Cost		13.735%		14.482%
Plan's Employee Contribution Rate[4]		6.750%		6.750%
Employer Normal Cost Rate		6.985%		7.732%
Projected Payroll for the Contribution Fiscal Year	$	494,048	$	536,515
Estimated Employer Contributions Based on Projected Payroll				
Plan's Estimated Employer Normal Cost	$	34,509	$	41,483
Plan's Payment on Amortization Bases[5]		2,197		2,638
% of Projected Payroll (illustrative only)		0.445%		0.492%
Estimated Total Employer Contribution	$	36,706	$	44,121
% of Projected Payroll (illustrative only)		7.430%		8.224%

[1] The results shown for Fiscal Year 2019-20 reflect the prior year valuation and may not take into account any lump sum payment, side fund payoff, or rate adjustment made after April 30, 2018.

[2] Section 2 of this report contains a list of Class 1 benefits and corresponding surcharges for each benefit.

[3] The normal cost difference is phased out over a five-year period. The phase out of normal cost difference is 100 percent for the first year of pooling, and is incrementally reduced by 20 percent of the original normal cost difference for each subsequent year. This is non-zero only for plans that joined a pool within the past 5 years. Most plans joined a pool June 30, 2003, when risk pooling was implemented.

[4] For detail regarding the determination of the required PEPRA employee contribution rate see Section on PEPRA Member Contribution Rates.

[5] See page 10 for a breakdown of the Amortization Bases.

Plan's Funded Status

	June 30, 2017	June 30, 2018
1. Present Value of Projected Benefits (PVB)	$ 776,923	$ 902,208
2. Entry Age Normal Accrued Liability (AL)	157,186	218,538
3. Plan's Market Value of Assets (MVA)	152,179	202,973
4. Unfunded Accrued Liability (UAL) [(2) - (3)]	5,007	15,565
5. Funded Ratio [(3) / (2)]	96.8%	92.9%

This measure of funded status is an assessment of the need for future employer contributions based on the selected actuarial cost method used to fund the plan. The UAL is the present value of future employer contributions for service that has already been earned and is in addition to future normal cost contributions for active members. For a measure of funded status that is appropriate for assessing the sufficiency of plan assets to cover estimated termination liabilities, please see "Hypothetical Termination Liability" in the "Risk Analysis" section.

Projected Employer Contributions

The table below shows projected employer contributions (before cost sharing) for the next six fiscal years. Projected results reflect the adopted changes to the discount rate described in Appendix A, "Statement of Actuarial Data, Methods and Assumptions" of the Section 2 report. The projections also assume that all actuarial assumptions will be realized and that no further changes to assumptions, contributions, benefits, or funding will occur during the projection period.

	Required Contribution	Projected Future Employer Contributions (Assumes 7.00% Return for Fiscal Year 2018-19)				
Fiscal Year	**2020-21**	**2021-22**	**2022-23**	**2023-24**	**2024-25**	**2025-26**
Normal Cost %	7.732%	7.7%	7.7%	7.7%	7.7%	7.7%
UAL Payment	$2,638	$3,100	$3,600	$1,800	$2,200	$2,300

Changes in the UAL due to actuarial gains or losses as well as changes in actuarial assumptions or methods are amortized using a 5-year ramp up. For more information, please see "Amortization of the Unfunded Actuarial Accrued Liability" under "Actuarial Methods" in Appendix A of Section 2. This method phases in the impact of unanticipated changes in UAL over a 5-year period and attempts to minimize employer cost volatility from year to year. As a result of this methodology, dramatic changes in the required employer contributions in any one year are less likely. However, required contributions can change gradually and significantly over the next five years. In years where there is a large increase in UAL the relatively small amortization payments during the ramp up period could result in a funded ratio that is projected to decrease initially while the contribution impact of the increase in the UAL is phased in.

For projected contributions under alternate investment return scenarios, please see the "Future Investment Return Scenarios" in the "Risk Analysis" section.

Changes Since the Prior Year's Valuation

Benefits

None. This valuation generally reflects plan changes by amendments effective before the date of the report. Please refer to the "Plan's Major Benefit Options" and Appendix B of Section 2 for a summary of the plan provisions used in this valuation.

Actuarial Methods and Assumptions

In December of 2016 the CalPERS Board of Administration lowered the discount rate from 7.50 percent to 7.00 percent using a three-year phase-in beginning with the June 30, 2016 actuarial valuation. The minimum employer contributions for Fiscal Year 2020-21 determined in this valuation were calculated using a discount rate of 7.00 percent, payroll growth of 2.75 percent and an inflation rate of 2.50 percent. The projected employer contributions on Page 5 are calculated under the assumption that the discount rate remains at 7.00 percent going forward and that furthermore the realized rate of return on assets for Fiscal Year 2018-19 is 7.00 percent.

The decision to reduce the discount rate was primarily based on reduced capital market assumptions provided by external investment consultants and CalPERS investment staff. The specific decision adopted by the Board reflected recommendations from CalPERS staff and additional input from employer and employee stakeholder groups. Based on the investment allocation adopted by the Board and capital market assumptions, the reduced discount rate assumption provides a more realistic assumption for the long-term investment return of the fund.

CalPERS has implemented a new actuarial valuation software system for the June 30, 2018 valuation. With this new system we have refined and improved some of our calculation methodology. Any difference in liability between the old software and new software calculations is captured as a method change line item.

Subsequent Events

The CalPERS Board of Administration has adopted a new amortization policy effective with the June 30, 2019 actuarial valuation. The new policy shortens the period over which actuarial gains and losses are amortized from 30 years to 20 years with the payments computed using a level dollar amount. In addition, the new policy removes the 5-year ramp-up and ramp-down on UAL bases attributable to assumption changes and non-investment gains/losses. The new policy removes the 5-year ramp-down on investment gains/losses. These changes will apply only to new UAL bases established on or after June 30, 2019.

For inactive employers the new amortization policy imposes a maximum amortization period of 15 years for all unfunded accrued liabilities effective June 30, 2018. Furthermore, the plan actuary has the ability to shorten the amortization period on any valuation date based on the life expectancy of plan members and projected cash flow needs to the plan. The impact of this has been reflected in the current valuation results.

The contribution requirements determined in this actuarial valuation report are based on demographic and financial information as of June 30, 2018, and may reflect additional discretionary payments made by the employer through April 30, 2019. Changes in the value of assets subsequent to that date are not reflected. Investment returns below the assumed rate of return will increase the required contribution, while investment returns above the assumed rate of return will decrease the required contribution.

This actuarial valuation report reflects statutory changes, regulatory changes and CalPERS Board actions through January 2019. Any subsequent changes or actions are not reflected.

Assets and Liabilities

- **Breakdown of Entry Age Normal Accrued Liability**
- **Allocation of Plan's Share of Pool's Experience/Assumption Change**
- **Development of Plan's Share of Pool's Market Value of Assets**
- **Schedule of Plan's Amortization Bases**
- **Amortization Schedule and Alternatives**
- **Employer Contribution History**
- **Funding History**

Breakdown of Entry Age Normal Accrued Liability

Active Members	$	142,988
Transferred Members		50,950
Terminated Members		24,600
Members and Beneficiaries Receiving Payments		0
Total	$	218,538

Allocation of Plan's Share of Pool's Experience/Assumption Change

It is the policy of CalPERS to ensure equity within the risk pools by allocating the pool's experience gains/losses and assumption changes in a manner that treats each employer equitably and maintains benefit security for the members of the System while minimizing substantial variations in employer contributions. The Pool's experience gains/losses and impact of assumption/method changes is allocated to the plan as follows:

1.	Plan's Accrued Liability	$	218,538
2.	Projected UAL balance at 6/30/18		9,500
3.	Pool's Accrued Liability[1]		17,424,237,070
4.	Sum of Pool's Individual Plan UAL Balances at 6/30/18[1]		3,777,499,883
5.	Pool's 2017/18 Investment & Asset (Gain)/Loss[1]		(135,628,188)
6.	Pool's 2017/18 Other (Gain)/Loss[1]		66,272,613
7.	Plan's Share of Pool's Asset (Gain)/Loss: [(1) - (2)] ÷ [(3) - (4)] × (5)		(2,078)
8.	Plan's Share of Pool's Other (Gain)/Loss: (1) ÷ (3) × (6)		831
9.	Plan's New (Gain)/Loss as of 6/30/2018: (7) + (8)		(1,246)
10.	Increase in Pool's Accrued Liability due to Change in Assumptions[1]		453,914,155
11.	Plan's Share of Pool's Change in Assumptions: (1) ÷ (3) × (10)		5,693
12.	Increase in Pool's Accrued Liability due to Change in Method[1]		128,995,852
13.	Plan's Share of Pool's Change in Method: (1) ÷ (3) × (12)		1,618

[1] Does not include plans that transferred to Pool on the valuation date.

Development of the Plan's Share of Pool's Market Value of Assets

14.	Plan's UAL: (2) + (9) + (11) + (13)	$	15,565
15.	Plan's Share of Pool's MVA: (1) - (14)	$	**202,973**

Schedule of Plan's Amortization Bases

On the next page is the schedule of the plan's amortization bases. Note that there is a two-year lag between the valuation date and the start of the contribution fiscal year.

- The assets, liabilities, and funded status of the plan are measured as of the valuation date: June 30, 2018.
- The required employer contributions determined by the valuation are for the fiscal year beginning two years after the valuation date: Fiscal Year 2020-21.

This two-year lag is necessary due to the amount of time needed to extract and test the membership and financial data, and the need to provide public agencies with their required employer contribution well in advance of the start of the fiscal year.

The Unfunded Accrued Liability (UAL) is used to determine the employer contribution and therefore must be rolled forward two years from the valuation date to the first day of the fiscal year for which the contribution is being determined. The UAL is rolled forward each year by subtracting the expected payment on the UAL for the fiscal year and adjusting for interest. The expected payment on the UAL for a fiscal year is equal to the Expected Employer Contribution for the fiscal year minus the Expected Normal Cost for the year. The Employer Contribution for the first fiscal year is determined by the actuarial valuation two years ago and the contribution for the second year is from the actuarial valuation one year ago. Additional discretionary payments are reflected in the Expected Payments column in the fiscal year they were made by the agency.

Schedule of Plan's Amortization Bases

									Amounts for Fiscal 2020-21	
Reason for Base	**Date Established**	**Ramp Up/Down 2020-21**	**Escalation Rate**	**Amortization Period**	**Balance 6/30/18**	**Payment 2018-19**	**Balance 6/30/19**	**Payment 2019-20**	**Balance 6/30/20**	**Scheduled Payment for 2020-21**
FRESH START	06/30/16	No Ramp	2.750%	3	$9,039	$2,035	$7,567	$2,089	$5,936	$2,130
NON-ASSET (GAIN)/LOSS	06/30/17	40% ↗	2.750%	29	$(226)	$0	$(242)	$(3)	$(256)	$(7)
ASSET (GAIN)/LOSS	06/30/17	40% ↗	2.750%	29	$(5,576)	$0	$(5,966)	$(83)	$(6,298)	$(167)
ASSUMPTION CHANGE	06/30/17	40% ↗	2.750%	19	$6,263	$(3,479)	$10,300	$194	$10,820	$395
NON-ASSET (GAIN)/LOSS	06/30/18	20% ↗	2.750%	30	$831	$0	$889	$0	$952	$13
ASSET (GAIN)/LOSS	06/30/18	20% ↗	2.750%	30	$(2,078)	$0	$(2,223)	$0	$(2,379)	$(32)
ASSUMPTION CHANGE	06/30/18	20% ↗	2.750%	20	$5,693	$(3,490)	$9,702	$(3,586)	$14,091	$263
METHOD CHANGE	06/30/18	20% ↗	2.750%	20	$1,618	$(231)	$1,970	$(237)	$2,353	$44
TOTAL					**$15,564**	**$(5,165)**	**$21,997**	**$(1,626)**	**$25,219**	**$2,638**

The (gain)/loss bases are the plan's allocated share of the risk pool's (gain)/loss for the fiscal year as disclosed in "Allocation of Plan's Share of Pool's Experience/Assumption Change" earlier in this section. These (gain)/loss bases will be amortized according to Board policy over 30 years with a 5-year ramp-up.

If the total Unfunded Liability is negative (i.e., plan has a surplus), the scheduled payment is $0, because the minimum required contribution under PEPRA must be at least equal to the normal cost.

Amortization Schedule and Alternatives

The amortization schedule on the previous page shows the minimum contributions required according to CalPERS amortization policy. There has been considerable interest from many agencies in paying off these unfunded accrued liabilities sooner and the possible savings in doing so. As a result, we have provided alternate amortization schedules to help analyze the current amortization schedule and illustrate the advantages of accelerating unfunded liability payments.

Shown on the following page are future year amortization payments based on: 1) the current amortization schedule reflecting the individual bases and remaining periods shown on the previous page, and 2) alternate "fresh start" amortization schedules using two sample periods that would both result in interest savings relative to the current amortization schedule. Note that the payments under each alternate scenario increase by 2.75 percent for each year into the future, except for inactive plans.

The Current Amortization Schedule typically contains individual bases that are both positive and negative. Positive bases result from plan changes, assumption changes or plan experience that result in increases to unfunded liability. Negative bases result from plan changes, assumption changes or plan experience that result in decreases to unfunded liability. The combination of positive and negative bases within an amortization schedule can result in unusual or problematic circumstances in future years such as:

- A positive total unfunded liability with a negative total payment,
- A negative total unfunded liability with a positive total payment, or
- Total payments that completely amortize the unfunded liability over a very short period of time

In any year where one of the above scenarios occurs, the actuary will consider corrective action such as replacing the existing unfunded liability bases with a single "fresh start" base and amortizing it over a reasonable period.

The Current Amortization Schedule on the following page may appear to show that, based on the current amortization bases, one of the above scenarios will occur at some point in the future. It is impossible to know today whether such a scenario will in fact arise since there will be additional bases added to the amortization schedule in each future year. Should such a scenario arise in any future year, the actuary will take appropriate action based on guidelines in the CalPERS amortization policy.

Amortization Schedule and Alternatives

	Current Amortization Schedule		Alternate Schedules			
			10 Year Amortization		5 Year Amortization	
Date	**Balance**	**Payment**	**Balance**	**Payment**	**Balance**	**Payment**
6/30/2020	25,219	2,638	25,219	3,109	25,219	5,649
6/30/2021	24,256	3,118	23,768	3,195	21,141	5,804
6/30/2022	22,728	3,624	22,126	3,283	16,617	5,963
6/30/2023	20,571	1,843	20,279	3,373	11,612	6,127
6/30/2024	20,104	2,214	18,210	3,466	6,087	6,296
6/30/2025	19,221	2,275	15,899	3,561		
6/30/2026	18,213	2,337	13,329	3,659		
6/30/2027	17,070	2,402	10,477	3,760		
6/30/2028	15,781	2,468	7,321	3,863		
6/30/2029	14,333	2,536	3,837	3,969		
6/30/2030	12,713	2,605				
6/30/2031	10,908	2,677				
6/30/2032	8,902	2,751				
6/30/2033	6,680	2,826				
6/30/2034	4,224	2,904				
6/30/2035	1,516	1,568				
6/30/2036						
6/30/2037						
6/30/2038						
6/30/2039						
6/30/2040						
6/30/2041						
6/30/2042						
6/30/2043						
6/30/2044						
6/30/2045						
6/30/2046						
6/30/2047						
6/30/2048						
6/30/2049						
Totals	**40,786**		**35,239**		**29,839**	
Interest Paid	**15,567**		**10,020**		**4,621**	
Estimated Savings			**5,548**		**10,947**	

Employer Contribution History

The table below provides a recent history of the required employer contributions for the plan, as determined by the annual actuarial valuation. It does not account for prepayments or benefit changes made during a fiscal year.

Fiscal Year	Employer Normal Cost	Unfunded Liability Payment ($)
2016 - 17	6.555%	$0
2017 - 18	6.533%	$1,041
2018 - 19	6.842%	$2,035
2019 - 20	6.985%	$2,197
2020 - 21	7.732%	$2,638

Funding History

The funding history below shows the plan's actuarial accrued liability, share of the pool's market value of assets, share of the pool's unfunded liability, funded ratio, and annual covered payroll.

Valuation Date	Accrued Liability (AL)	Share of Pool's Market Value of Assets (MVA)	Plan's Share of Pool's Unfunded Liability	Funded Ratio	Annual Covered Payroll
06/30/2013	$ 2,269	$ 3,044	$ (775)	134.2%	$ 55,987
06/30/2014	10,276	11,640	(1,364)	113.3%	91,797
06/30/2015	28,189	27,769	420	98.5%	275,062
06/30/2016	65,902	60,140	5,762	91.3%	358,497
06/30/2017	157,186	152,179	5,007	96.8%	453,774
06/30/2018	218,538	202,973	15,565	92.9%	494,580

Risk Analysis

- **Future Investment Return Scenarios**
- **Discount Rate Sensitivity**
- **Mortality Rate Sensitivity**
- **Inflation Rate Sensitivity**
- **Maturity Measures**
- **Hypothetical Termination Liability**

Future Investment Return Scenarios

Analysis was performed to determine the effects of various future investment returns on required employer contributions. The projections below provide a range of results based on five investment return scenarios assumed to occur during the next four fiscal years (2018-19, 2019-20, 2020-21 and 2021-22). The projections also assume that all other actuarial assumptions will be realized and that no further changes to assumptions, contributions, benefits, or funding will occur.

For fiscal years 2018-19, 2019-20, 2020-21, and 2021-22, each scenario assumes an alternate fixed annual return. The fixed return assumptions for the five scenarios are 1.0 percent, 4.0 percent, 7.0 percent, 9.0 percent and 12.0 percent.

These alternate investment returns were chosen based on stochastic analysis of possible future investment returns over the four-year period ending June 30, 2022. Using the expected returns and volatility of the asset classes in which the funds are invested, we produced five thousand stochastic outcomes for this period based on the most recently completed Asset Liability Management process. We then selected annual returns that approximate the 5th, 25th, 50th, 75th, and 95th percentiles for these outcomes. For example, of all the 4-year outcomes generated in the stochastic analysis, approximately 25 percent of them had an average annual return of 4.0 percent or less.

Required contributions outside of this range are also possible. In particular, whereas it is unlikely that investment returns will average less than 1.0 percent or greater than 12.0 percent over this four-year period, the possibility of a single investment return less than 1.0 percent or greater than 12.0 percent in any given year is much greater.

Assumed Annual Return From 2018-19 through 2021-22	Projected Employer Contributions			
	2021-22	2022-23	2023-24	2024-25
1.0%				
Normal Cost	7.7%	7.7%	7.7%	7.7%
UAL Contribution	$3,400	$4,500	$3,700	$5,300
4.0%				
Normal Cost	7.7%	7.7%	7.7%	7.7%
UAL Contribution	$3,300	$4,100	$2,800	$3,800
7.0%				
Normal Cost	7.7%	7.7%	7.7%	7.7%
UAL Contribution	$3,100	$3,600	$1,800	$2,200
9.0%				
Normal Cost	7.9%	7.3%	7.5%	7.7%
UAL Contribution	$3,100	$3,400	$1,500	$1,500
12.0%				
Normal Cost	7.9%	7.3%	7.5%	7.7%
UAL Contribution	$2,900	$3,000	$0	$0

In addition, the projections above reflect the recent changes to the new amortization policy effective with the June 30, 2019 valuation. The projections above incorporate the impact of the CalPERS risk mitigation policy which reduces the discount rate when investment returns are above specified trigger points.

Discount Rate Sensitivity

Shown below are various valuation results as of June 30, 2018 assuming alternate discount rates. Results are shown using the current discount rate of 7.0 percent as well as alternate discount rates of 6.0 percent and 8.0 percent. The rates of 6.0 percent and 8.0 percent were selected since they illustrate the impact of a 1 percent increase or decrease to the 7.0 percent assumption. This analysis shows the potential plan impacts if the PERF were to realize investment returns of 6.0 percent or 8.0 percent over the long-term.

This type of analysis gives the reader a sense of the long-term risk to required contributions. For a measure of funded status that is appropriate for assessing the sufficiency of plan assets to cover estimated termination liabilities, please see "Hypothetical Termination Liability" at the end of this section.

Sensitivity Analysis				
As of June 30, 2018	**Plan's Total Normal Cost**	**Accrued Liability**	**Unfunded Accrued Liability**	**Funded Status**
7.0% (current discount rate)	14.482%	$218,538	$15,565	92.9%
6.0%	17.929%	$268,698	$65,725	75.5%
8.0%	11.838%	$181,157	$(21,816)	112.0%

Mortality Rate Sensitivity

The following table looks at the change in the June 30, 2018 plan costs and funded ratio under two different longevity scenarios, namely assuming post-retirement rates of mortality are 10 percent lower or 10 percent higher than our current mortality assumptions adopted in 2017. This type of analysis highlights the impact on the plan of improving or worsening mortality over the long-term.

As of June 30, 2018	**Current Mortality**	**10% Lower Mortality Rates**	**10% Higher Mortality Rates**
a) Accrued Liability	$218,538	$222,526	$214,894
b) Market Value of Assets	$202,973	$202,973	$202,973
c) Unfunded Liability (Surplus) [(a)-(b)]	$15,565	$19,553	$11,921
d) Funded Status	92.9%	91.2%	94.5%

A 10 percent increase (decrease) in assumed mortality rates over the long-term would result in approximately a 1.6 percent increase (decrease) to the funded ratio.

Inflation Rate Sensitivity

The following analysis looks at the change in the June 30, 2018 plan costs and funded ratio under two different inflation rate scenarios, namely assuming the liability inflation rate is 1 percent lower or 1 percent higher than the current valuation inflation rate assumption of 2.50%, while holding the discount rate fixed at 7.0%. This type of analysis highlights the impact on the plan of increased or decreased inflation of active salaries and retiree COLAs over the long-term.

As of June 30, 2018	Current Inflation Rate	-1% Inflation Rate	+1% Inflation Rate
a) Accrued Liability	$218,538	$191,838	$246,240
b) Market Value of Assets	$202,973	$202,973	$202,973
c) Unfunded Liability (Surplus) [(a)-(b)]	$15,565	$(11,135)	$43,267
d) Funded Status	92.9%	105.8%	82.4%

A decrease of 1 percent in the liability inflation rate (2.50 percent to 1.50 percent) reduces the Accrued Liability by 12.2 percent. However, a 1 percent increase in the liability inflation rate (2.50 percent to 3.50 percent) increases the Accrued Liability by 12.7 percent.

Maturity Measures

As pension plans mature they become much more sensitive to risks than plans that are less mature. Understanding plan maturity and how it affects the ability of a pension plan to tolerate risk is important in understanding how the plan is impacted by investment return volatility, other economic variables and changes in longevity or other demographic assumptions. One way to look at the maturity level of CalPERS and its plans is to look at the ratio of a plan's retiree liability to its total liability. A pension plan in its infancy will have a very low ratio of retiree liability to total liability. As the plan matures, the ratio starts increasing. A mature plan will often have a ratio above 0.60 to 0.65. For both CalPERS and other retirement systems in the United States, these ratios have been steadily increasing in recent years.

Ratio of Retiree Accrued Liability to Total Accrued Liability	June 30, 2017	June 30, 2018
1. Retired Accrued Liability	0	0
2. Total Accrued Liability	157,186	218,538
3. Ratio of Retiree AL to Total AL [(1) / (2)]	0.00	0.00

Another way to look at the maturity level of CalPERS and its plans is to look at the ratio of actives to retirees. A pension plan in its infancy will have a very high ratio of active to retired members. As the plan matures, and members retire, the ratio starts declining. A mature plan will often have a ratio near or below one. The average support ratio for CalPERS public agency plans is 1.25.

Support Ratio	June 30, 2017	June 30, 2018
1. Number of Actives	8	7
2. Number of Retirees	0	0
3. Support Ratio [(1) / (2)]	N/A	N/A

Actuarial calculations are based on a number of assumptions about long-term demographic and economic behavior. Unless these assumptions (e.g., terminations, deaths, disabilities, retirements, salary growth, and investment return) are exactly realized each year, there will be differences on a year-to-year basis. The year-to-year differences between actual experience and the assumptions are called actuarial gains and losses and serve to lower or raise required employer contributions from one year to the next. Therefore, employer contributions will inevitably fluctuate, especially due to the ups and downs of investment returns.

Asset Volatility Ratio (AVR)

Plans that have higher asset-to-payroll ratios experience more volatile employer contributions (as a percentage of payroll) due to investment return. For example, a plan with an asset-to-payroll ratio of 8 may experience twice the contribution volatility due to investment return volatility than a plan with an asset-to-payroll ratio of 4. Shown below is the asset volatility ratio, a measure of the plan's current contribution volatility. It should be noted that this ratio is a measure of the current situation. It increases over time but generally tends to stabilize as the plan matures.

Liability Volatility Ratio (LVR)

Plans that have higher liability-to-payroll ratios experience more volatile employer contributions (as a percentage of payroll) due to investment return and changes in liability. For example, a plan with a liability-to-payroll ratio of 8 is expected to have twice the contribution volatility of a plan with a liability-to-payroll ratio of 4. The liability volatility ratio is also shown in the table below. It should be noted that this ratio indicates a longer-term potential for contribution volatility. The asset volatility ratio, described above, will tend to move closer to the liability volatility ratio as the plan matures.

Contribution Volatility		**June 30, 2017**		**June 30, 2018**
1. Market Value of Assets	$	152,179	$	202,973
2. Payroll		453,774		494,580
3. Asset Volatility Ratio (AVR) [(1) / (2)]		0.3		0.4
4. Accrued Liability	$	157,186	$	218,538
5. Liability Volatility Ratio (LVR) [(4) / (2)]		0.3		0.4
6. Accrued Liability (7.00% discount rate)		164,150		218,538
7. Projected Liability Volatility Ratio [(6) / (2)]		0.4		0.4

Hypothetical Termination Liability

The hypothetical termination liability is an estimate of the financial position of the plan had the contract with CalPERS been terminated as of June 30, 2018. The plan liability on a termination basis is calculated differently compared to the plan's ongoing funding liability. For the hypothetical termination liability calculation, both compensation and service are frozen as of the valuation date and no future pay increases or service accruals are assumed. This measure of funded status is not appropriate for assessing the need for future employer contributions in the case of an ongoing plan, that is, for an employer that continues to provide CalPERS retirement benefits to active employees.

A more conservative investment policy and asset allocation strategy was adopted by the CalPERS Board for the Terminated Agency Pool. The Terminated Agency Pool has limited funding sources since no future employer contributions will be made. Therefore, expected benefit payments are secured by risk-free assets and benefit security for members is increased while funding risk is limited. However, this asset allocation has a lower expected rate of return than the PERF and consequently, a lower discount rate is assumed. The lower discount rate for the Terminated Agency Pool results in higher liabilities for terminated plans.

The effective termination discount rate will depend on actual market rates of return for risk-free securities on the date of termination. As market discount rates are variable, the table below shows a range for the hypothetical termination liability based on the lowest and highest interest rates observed during an approximate 2-year period centered around the valuation date.

Market Value of Assets (MVA)	Hypothetical Termination Liability[1,2] @ 2.50%	Funded Status	Unfunded Termination Liability @ 2.50%	Hypothetical Termination Liability[1,2] @ 3.25%	Funded Status	Unfunded Termination Liability @ 3.25%
$202,973	$445,329	45.6%	$242,356	$369,475	54.9%	$166,502

[1] The hypothetical liabilities calculated above include a 5 percent mortality contingency load in accordance with Board policy. Other actuarial assumptions can be found in Appendix A of the Section 2 report.

[2] The current discount rate assumption used for termination valuations is a weighted average of the 10-year and 30-year U.S. Treasury yields where the weights are based on matching asset and liability durations as of the termination date. The discount rates used in the table are based on 20-year Treasury bonds, rounded to the nearest quarter percentage point, which is a good proxy for most plans. The 20-year Treasury yield was 2.91 percent on June 30, 2018, and was 2.83 percent on January 31, 2019.

In order to terminate the plan, you must first contact our Retirement Services Contract Unit to initiate a Resolution of Intent to Terminate. The completed Resolution will allow the plan actuary to give you a preliminary termination valuation with a more up-to-date estimate of the plan liabilities. CalPERS advises you to consult with the plan actuary before beginning this process.

Participant Data

The table below shows a summary of your plan's member data upon which this valuation is based:

		June 30, 2017		June 30, 2018
Reported Payroll	$	453,774	$	494,580
Projected Payroll for Contribution Purposes	$	494,048	$	536,515
Number of Members				
Active		8		7
Transferred		1		3
Separated		1		3
Retired		0		0

List of Class 1 Benefit Provisions

This plan has the additional Class 1 Benefit Provisions:

- None

Plan's Major Benefit Options

Shown below is a summary of the major optional benefits for which your agency has contracted. A description of principal standard and optional plan provisions is in the following section of this Appendix.

	Benefit Group	
Member Category	Misc	
Demographics		
Actives	Yes	
Transfers/Separated	Yes	
Receiving	No	
Benefit Provision		
Benefit Formula	2% @ 62	
Social Security Coverage	No	
Full/Modified	Full	
Employee Contribution Rate	6.75%	
Final Average Compensation Period	Three Year	
Sick Leave Credit	Yes	
Non-Industrial Disability	Standard	
Industrial Disability	No	
Pre-Retirement Death Benefits		
Optional Settlement 2	Yes	
1959 Survivor Benefit Level	Level 4	
Special	No	
Alternate (firefighters)	No	
Post-Retirement Death Benefits		
Lump Sum	$500	
Survivor Allowance (PRSA)	No	
COLA	2%	

PEPRA Member Contribution Rates

The table below shows the determination of the PEPRA Member contribution rates based on 50 percent of the Total Normal Cost for each respective plan on June 30, 2018. Assembly Bill (AB) 340 created PEPRA that implemented new benefit formulas and a final compensation period as well as new contribution requirements for new employees. In accordance with Section Code 7522.30(b), "new members … shall have an initial contribution rate of at least 50 percent of the normal cost rate." The normal cost for the plan is dependent on the benefit levels, actuarial assumptions and demographics of the plan particularly the entry age into the plan. Should the total normal cost of the plan change by one percent or more from the base total normal cost established for the plan, the new member rate shall be 50 percent of the new normal cost rounded to the nearest quarter percent.

		Basis for Current Rate		Rates Effective July 1, 2020			
Rate Plan Identifier	**Benefit Group Name**	**Total Normal Cost**	**Member Rate**	**Total Normal Cost**	**Change**	**Change Needed**	**Member Rate**
26746	Miscellaneous PEPRA Level	13.735%	6.750%	14.482%	0.747%	No	6.750%

Section 2

CALIFORNIA PUBLIC EMPLOYEES' RETIREMENT SYSTEM

Section 2 may be found on the CalPERS website (www.calpers.ca.gov) in the Forms and Publications section

ATTACHMENT D

CalPERS Annual Valuation Report as of June 30, 2018 –
Safety Classic

California Public Employees' Retirement System
Actuarial Office
400 Q Street, Sacramento, CA 95811 |Phone: (916) 795-3000 | Fax: (916) 795-2744
888 CalPERS (or **888**-225-7377) | TTY: (877) 249-7442 | **www.calpers.ca.gov**

July 2019

Safety Police Plan of the Town of Moraga
(CalPERS ID: 6510195742)
Annual Valuation Report as of June 30, 2018

Dear Employer,

Attached to this letter, you will find the June 30, 2018 actuarial valuation report of your CalPERS pension plan. **Provided in this report is the determination of the minimum required employer contributions for Fiscal Year 2020-21**. In addition, the report contains important information regarding the current financial status of the plan as well as projections and risk measures to aid in planning for the future.

Because this plan is in a risk pool, the following valuation report has been separated into two sections:

- Section 1 contains specific information for the plan including the development of the current and projected employer contributions, and
- Section 2 contains the Risk Pool Actuarial Valuation appropriate to the plan as of June 30, 2018.

Section 2 can be found on the CalPERS website (www.calpers.ca.gov). From the home page, go to "*Forms & Publications*" and select "*View All*". In the search box, enter "*Risk Pool*" and from the results list download the Miscellaneous or Safety Risk Pool Actuarial Valuation Report as appropriate.

Your June 30, 2018 actuarial valuation report contains important actuarial information about your pension plan at CalPERS. Your assigned CalPERS staff actuary, whose signature appears in the Actuarial Certification section on page 1, is available to discuss the report with you after August 1, 2019.

Actuarial valuations are based on assumptions regarding future plan experience including investment return and payroll growth, eligibility for the types of benefits provided, and longevity among retirees. The CalPERS Board of Administration adopts these assumptions after considering the advice of CalPERS actuarial and investment teams and other professionals. Each actuarial valuation reflects all prior differences between actual and assumed experience and adjusts the contribution rates as needed. This valuation is based on an investment return assumption of 7.0% which was adopted by the board in December 2016. Other assumptions used in this report are those recommended in the CalPERS Experience Study and Review of Actuarial Assumptions report from December 2017.

Required Contribution

The exhibit below displays the minimum employer contributions, before any cost sharing, for Fiscal Year 2020-21 along with estimates of the required contributions for Fiscal Year 2021-22. Member contributions other than cost sharing (whether paid by the employer or the employee) are in addition to the results shown below. **The employer contributions in this report do not reflect any cost sharing arrangements you may have with your employees**.

Fiscal Year	Employer Normal Cost Rate	Employer Amortization of Unfunded Accrued Liability
2020-21	18.152%	$214,235
Projected Results		
2021-22	*18.2%*	*$249,000*

The actual investment return for Fiscal Year 2018-19 was not known at the time this report was prepared. The projections above assume the investment return for that year would be 7.00 percent. ***If the actual investment return for Fiscal Year 2018-19 differs from 7.00 percent, the actual contribution requirements for the projected years will differ from those shown above.*** For additional details regarding the assumptions and methods used for these projections please refer to the "Projected Employer Contributions" in the "Highlights and Executive Summary" section. This section also contains projected required contributions through fiscal year 2025-26.

Changes from Previous Year's Valuation

CalPERS continues to strive to provide comprehensive risk assessments regarding plan funding and sustainability consistent with the Board of Administration's pension and investment beliefs. Your report this year includes new metrics on plan maturity in recognition of the fact that most pension plans at CalPERS are maturing as anticipated. As plans mature, they become more sensitive to risks than plans that are less mature. The "Risk Analysis" section of your report will help you understand how your plan is affected by investment return volatility and other economic assumptions. We have included plan sensitivity analysis with respect to longevity and inflation to further that discussion and encourage you to review our most recent Annual Review of Funding Levels and Risks report on our website that takes a holistic view of the system.

Upcoming Change for June 30, 2019 Valuations

The CalPERS Board of Administration has adopted a new amortization policy effective with the June 30, 2019 actuarial valuation. The new policy shortens the period over which actuarial gains and losses are amortized from 30 years to 20 years with the payments computed using a level dollar amount. In addition, the new policy removes the 5-year ramp-up and ramp-down on Unfunded Accrued Liability (UAL) bases attributable to assumption changes and non-investment gains/losses. The new policy removes the 5-year ramp-down on investment gains/losses. These changes will apply only to new UAL bases established on or after June 30, 2019.

Besides the above noted changes, there may also be changes specific to the plan such as contract amendments and funding changes.

Further descriptions of general changes are included in the "Highlights and Executive Summary" section and in Appendix A, "Statement of Actuarial Data, Methods and Assumptions" of the Section 2 report.

We understand that you might have a number of questions about these results. While we are very interested in discussing these results with your agency, in the interest of allowing us to give every public agency their results, we ask that you wait until after August 1 2019 to contact us with actuarial questions.

If you have other questions, please call our customer contact center at (888) CalPERS or (**888-225-7377**).

Sincerely,

SCOTT TERANDO
Chief Actuary

Actuarial Valuation as of June 30, 2018

for the Safety Police Plan of the Town of Moraga

(CalPERS ID: 6510195742)

Required Contributions for Fiscal Year July 1, 2020 - June 30, 2021

Table of Contents

Section 1

CALIFORNIA PUBLIC EMPLOYEES' RETIREMENT SYSTEM

Plan Specific Information for the Safety Police Plan of the Town of Moraga

(CalPERS ID: 6510195742)
(Valuation Rate Plan ID: 6142)

Table of Contents

Actuarial Certification

Section 1 of this report is based on the member and financial data contained in our records as of June 30, 2018 which was provided by your agency and the benefit provisions under your contract with CalPERS. Section 2 of this report is based on the member and financial data as of June 30, 2018 provided by employers participating in the Safety Risk Pool to which the plan belongs and benefit provisions under the CalPERS contracts for those agencies.

As set forth in Section 2 of this report, the pool actuaries have certified that, in their opinion, the valuation of the risk pool containing your Safety Police Plan has been performed in accordance with generally accepted actuarial principles consistent with standards of practice prescribed by the Actuarial Standards Board, and that the assumptions and methods are internally consistent and reasonable for the risk pool as of the date of this valuation and as prescribed by the CalPERS Board of Administration according to provisions set forth in the California Public Employees' Retirement Law.

Having relied upon the information set forth in Section 2 of this report and based on the census and benefit provision information for the plan, it is my opinion as the plan actuary that Unfunded Accrued Liability amortization bases as of June 30, 2018 and employer contribution as of July 1, 2020, have been properly and accurately determined in accordance with the principles and standards stated above.

The undersigned is an actuary for CalPERS, a member of both the American Academy of Actuaries and Society of Actuaries and meets the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein.

TONY CUNY, ASA, MAAA
Associate Pension Actuary, CalPERS
Plan Actuary

Highlights and Executive Summary

- **Introduction**
- **Purpose of Section 1**
- **Required Employer Contributions**
- **Plan's Funded Status**
- **Projected Employer Contributions**
- **Changes Since the Prior Year's Valuation**
- **Subsequent Events**

Introduction

This report presents the results of the June 30, 2018 actuarial valuation of the Safety Police Plan of the Town of Moraga of the California Public Employees' Retirement System (CalPERS). This actuarial valuation sets the required employer contributions for Fiscal Year 2020-21.

Purpose of Section 1

This Section 1 report for the Safety Police Plan of the Town of Moraga of the California Public Employees' Retirement System (CalPERS) was prepared by the plan actuary in order to:

- Set forth the assets and accrued liabilities of this plan as of June 30, 2018;
- Determine the minimum required employer contribution for this plan for the fiscal year July 1, 2020 through June 30, 2021; and
- Provide actuarial information as of June 30, 2018 to the CalPERS Board of Administration and other interested parties.

The pension funding information presented in this report should not be used in financial reports subject to GASB Statement No. 68 for a Cost Sharing Employer Defined Benefit Pension Plan. A separate accounting valuation report for such purposes is available from CalPERS and details for ordering are available on our website.

The measurements shown in this actuarial valuation may not be applicable for other purposes. The employer should contact their actuary before disseminating any portion of this report for any reason that is not explicitly described above.

Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the following: plan experience differing from that anticipated by the economic or demographic assumptions; changes in economic or demographic assumptions; changes in actuarial policies; and changes in plan provisions or applicable law.

California Actuarial Advisory Panel Recommendations

This report includes all the basic disclosure elements as described in the *Model Disclosure Elements for Actuarial Valuation Reports* recommended in 2011 by the California Actuarial Advisory Panel (CAAP), with the exception of including the original base amounts of the various components of the unfunded liability in the Schedule of Amortization Bases shown on page 10.

Additionally, this report includes the following "Enhanced Risk Disclosures" also recommended by the CAAP in the Model Disclosure Elements document and consistent with the recommendations of Actuarial Standard of Practice No. 51:

- A "Scenario Test," projecting future results under different investment income scenarios.
- A "Sensitivity Analysis," showing the impact on current valuation results using alternative discount rates of 6.0 percent and 8.0 percent.
- A "Sensitivity Analysis," showing the impact on current valuation results using a 1.0 percent plus or minus change in the inflation rate.
- A "Sensitivity Analysis," showing the impact on current valuation results assuming post-retirement rates of mortality are 10 percent lower or 10 percent higher than our current mortality assumptions adopted in 2017. This type of analysis highlights the impact on the plan of improving or worsening mortality over the long-term.
- Plan maturity measures which indicate how sensitive a plan may be to the risks noted above.

Required Employer Contributions

		Fiscal Year
Required Employer Contributions		**2020-21**
Employer Normal Cost Rate		**18.152%**
Plus, Either		
1) Monthly Employer Dollar UAL Payment	**$**	**17,852.90**
Or		
2) Annual UAL Prepayment Option*	**$**	**207,109**

*The total minimum required employer contribution is the **sum** of the Plan's Employer Normal Cost Rate (expressed as a percentage of payroll) **plus** the Employer Unfunded Accrued Liability (UAL) Contribution Amount (billed monthly in dollars).*

** Only the UAL portion of the employer contribution can be prepaid **(which must be received in full no later than July 31)**. Any prepayment totaling over $5 million requires a 72-hour notice email to FCSD_public_agency_wires@calpers.ca.gov. Plan Normal Cost contributions will be made as part of the payroll reporting process. If there is contractual cost sharing or other change, this amount will change.*

In accordance with Sections 20537 and 20572 of the Public Employees' Retirement Law, if a contracting agency fails to remit the required contributions when due, interest and penalties may apply.

		Fiscal Year 2019-20		Fiscal Year 2020-21
Development of Normal Cost as a Percentage of Payroll[1]				
Base Total Normal Cost for Formula		25.575%		27.094%
Surcharge for Class 1 Benefits[2]				
None		0.000%		0.000%
Phase out of Normal Cost Difference[3]		0.000%		0.000%
Plan's Total Normal Cost		25.575%		27.094%
Formula's Expected Employee Contribution Rate		8.939%		8.942%
Employer Normal Cost Rate		16.636%		18.152%
Projected Payroll for the Contribution Fiscal Year	$	1,231,953	$	1,189,116
Estimated Employer Contributions Based on Projected Payroll				
Plan's Estimated Employer Normal Cost	$	204,948	$	215,848
Plan's Payment on Amortization Bases[4]		184,632		214,235
% of Projected Payroll (illustrative only)		14.987%		18.016%
Estimated Total Employer Contribution	$	389,580	$	430,083
% of Projected Payroll (illustrative only)		31.623%		36.168%

[1] The results shown for Fiscal Year 2019-20 reflect the prior year valuation and may not take into account any lump sum payment, side fund payoff, or rate adjustment made after April 30, 2018.

[2] Section 2 of this report contains a list of Class 1 benefits and corresponding surcharges for each benefit.

[3] The normal cost difference is phased out over a five-year period. The phase out of normal cost difference is 100 percent for the first year of pooling, and is incrementally reduced by 20 percent of the original normal cost difference for each subsequent year. This is non-zero only for plans that joined a pool within the past 5 years. Most plans joined a pool June 30, 2003, when risk pooling was implemented.

[4] See page 10 for a breakdown of the Amortization Bases.

Plan's Funded Status

	June 30, 2017	June 30, 2018
1. Present Value of Projected Benefits (PVB)	$ 13,685,606	$ 14,519,939
2. Entry Age Normal Accrued Liability (AL)	10,904,955	11,909,172
3. Plan's Market Value of Assets (MVA)	8,197,579	8,740,433
4. Unfunded Accrued Liability (UAL) [(2) - (3)]	2,707,376	3,168,739
5. Funded Ratio [(3) / (2)]	75.2%	73.4%

This measure of funded status is an assessment of the need for future employer contributions based on the selected actuarial cost method used to fund the plan. The UAL is the present value of future employer contributions for service that has already been earned and is in addition to future normal cost contributions for active members. For a measure of funded status that is appropriate for assessing the sufficiency of plan assets to cover estimated termination liabilities, please see "Hypothetical Termination Liability" in the "Risk Analysis" section.

Projected Employer Contributions

The table below shows projected employer contributions (before cost sharing) for the next six fiscal years. Projected results reflect the adopted changes to the discount rate described in Appendix A, "Statement of Actuarial Data, Methods and Assumptions" of the Section 2 report. The projections also assume that all actuarial assumptions will be realized and that no further changes to assumptions, contributions, benefits, or funding will occur during the projection period.

	Required Contribution	Projected Future Employer Contributions (Assumes 7.00% Return for Fiscal Year 2018-19)				
Fiscal Year	**2020-21**	**2021-22**	**2022-23**	**2023-24**	**2024-25**	**2025-26**
Normal Cost %	18.152%	18.2%	18.2%	18.2%	18.2%	18.2%
UAL Payment	$214,235	$249,000	$277,000	$295,000	$312,000	$321,000

Changes in the UAL due to actuarial gains or losses as well as changes in actuarial assumptions or methods are amortized using a 5-year ramp up. For more information, please see "Amortization of the Unfunded Actuarial Accrued Liability" under "Actuarial Methods" in Appendix A of Section 2. This method phases in the impact of unanticipated changes in UAL over a 5-year period and attempts to minimize employer cost volatility from year to year. As a result of this methodology, dramatic changes in the required employer contributions in any one year are less likely. However, required contributions can change gradually and significantly over the next five years. In years where there is a large increase in UAL the relatively small amortization payments during the ramp up period could result in a funded ratio that is projected to decrease initially while the contribution impact of the increase in the UAL is phased in.

For projected contributions under alternate investment return scenarios, please see the "Future Investment Return Scenarios" in the "Risk Analysis" section.

Changes Since the Prior Year's Valuation

Benefits

None. This valuation generally reflects plan changes by amendments effective before the date of the report. Please refer to the "Plan's Major Benefit Options" and Appendix B of Section 2 for a summary of the plan provisions used in this valuation.

Actuarial Methods and Assumptions

In December of 2016 the CalPERS Board of Administration lowered the discount rate from 7.50 percent to 7.00 percent using a three-year phase-in beginning with the June 30, 2016 actuarial valuation. The minimum employer contributions for Fiscal Year 2020-21 determined in this valuation were calculated using a discount rate of 7.00 percent, payroll growth of 2.75 percent and an inflation rate of 2.50 percent. The projected employer contributions on Page 5 are calculated under the assumption that the discount rate remains at 7.00 percent going forward and that furthermore the realized rate of return on assets for Fiscal Year 2018-19 is 7.00 percent.

The decision to reduce the discount rate was primarily based on reduced capital market assumptions provided by external investment consultants and CalPERS investment staff. The specific decision adopted by the Board reflected recommendations from CalPERS staff and additional input from employer and employee stakeholder groups. Based on the investment allocation adopted by the Board and capital market assumptions, the reduced discount rate assumption provides a more realistic assumption for the long-term investment return of the fund.

CalPERS has implemented a new actuarial valuation software system for the June 30, 2018 valuation. With this new system we have refined and improved some of our calculation methodology. Any difference in liability between the old software and new software calculations is captured as a method change line item.

Subsequent Events

The CalPERS Board of Administration has adopted a new amortization policy effective with the June 30, 2019 actuarial valuation. The new policy shortens the period over which actuarial gains and losses are amortized from 30 years to 20 years with the payments computed using a level dollar amount. In addition, the new policy removes the 5-year ramp-up and ramp-down on UAL bases attributable to assumption changes and non-investment gains/losses. The new policy removes the 5-year ramp-down on investment gains/losses. These changes will apply only to new UAL bases established on or after June 30, 2019.

For inactive employers the new amortization policy imposes a maximum amortization period of 15 years for all unfunded accrued liabilities effective June 30, 2018. Furthermore, the plan actuary has the ability to shorten the amortization period on any valuation date based on the life expectancy of plan members and projected cash flow needs to the plan. The impact of this has been reflected in the current valuation results.

The contribution requirements determined in this actuarial valuation report are based on demographic and financial information as of June 30, 2018. Changes in the value of assets subsequent to that date are not reflected. Investment returns below the assumed rate of return will increase the required contribution, while investment returns above the assumed rate of return will decrease the required contribution.

This actuarial valuation report reflects statutory changes, regulatory changes and CalPERS Board actions through January 2019. Any subsequent changes or actions are not reflected.

Assets and Liabilities

- **Breakdown of Entry Age Normal Accrued Liability**
- **Allocation of Plan's Share of Pool's Experience/Assumption Change**
- **Development of Plan's Share of Pool's Market Value of Assets**
- **Schedule of Plan's Amortization Bases**
- **Amortization Schedule and Alternatives**
- **Employer Contribution History**
- **Funding History**

Breakdown of Entry Age Normal Accrued Liability

Active Members	$	2,791,341
Transferred Members		366,238
Terminated Members		0
Members and Beneficiaries Receiving Payments		8,751,593
Total	$	11,909,172

Allocation of Plan's Share of Pool's Experience/Assumption Change

It is the policy of CalPERS to ensure equity within the risk pools by allocating the pool's experience gains/losses and assumption changes in a manner that treats each employer equitably and maintains benefit security for the members of the System while minimizing substantial variations in employer contributions. The Pool's experience gains/losses and impact of assumption/method changes is allocated to the plan as follows:

1.	Plan's Accrued Liability	$	11,909,172
2.	Projected UAL balance at 6/30/18		2,813,154
3.	Pool's Accrued Liability[1]		22,716,935,494
4.	Sum of Pool's Individual Plan UAL Balances at 6/30/18[1]		5,835,345,753
5.	Pool's 2017/18 Investment & Asset (Gain)/Loss[1]		(166,826,991)
6.	Pool's 2017/18 Other (Gain)/Loss[1]		79,829,358
7.	Plan's Share of Pool's Asset (Gain)/Loss: [(1) - (2)] ÷ [(3) - (4)] × (5)		(89,889)
8.	Plan's Share of Pool's Other (Gain)/Loss: (1) ÷ (3) × (6)		41,850
9.	Plan's New (Gain)/Loss as of 6/30/2018: (7) + (8)		(48,039)
10.	Increase in Pool's Accrued Liability due to Change in Assumptions[1]		623,352,408
11.	Plan's Share of Pool's Change in Assumptions: (1) ÷ (3) × (10)		326,788
12.	Increase in Pool's Accrued Liability due to Change in Method[1]		146,565,925
13.	Plan's Share of Pool's Change in Method: (1) ÷ (3) × (12)		76,836

[1] Does not include plans that transferred to Pool on the valuation date.

Development of the Plan's Share of Pool's Market Value of Assets

14.	Plan's UAL: (2) + (9) + (11) + (13)	$	3,168,739
15.	Plan's Share of Pool's MVA: (1) - (14)	$	**8,740,433**

Schedule of Plan's Amortization Bases

On the next page is the schedule of the plan's amortization bases. Note that there is a two-year lag between the valuation date and the start of the contribution fiscal year.

- The assets, liabilities, and funded status of the plan are measured as of the valuation date: June 30, 2018.
- The required employer contributions determined by the valuation are for the fiscal year beginning two years after the valuation date: Fiscal Year 2020-21.

This two-year lag is necessary due to the amount of time needed to extract and test the membership and financial data, and the need to provide public agencies with their required employer contribution well in advance of the start of the fiscal year.

The Unfunded Accrued Liability (UAL) is used to determine the employer contribution and therefore must be rolled forward two years from the valuation date to the first day of the fiscal year for which the contribution is being determined. The UAL is rolled forward each year by subtracting the expected payment on the UAL for the fiscal year and adjusting for interest. The expected payment on the UAL for a fiscal year is equal to the Expected Employer Contribution for the fiscal year minus the Expected Normal Cost for the year. The Employer Contribution for the first fiscal year is determined by the actuarial valuation two years ago and the contribution for the second year is from the actuarial valuation one year ago. Additional discretionary payments are reflected in the Expected Payments column in the fiscal year they were made by the agency.

Schedule of Plan's Amortization Bases

										Amounts for Fiscal 2020-21
Reason for Base	**Date Established**	**Ramp Up/Down 2020-21**	**Escalat-ion Rate**	**Amorti-zation Period**	**Balance 6/30/18**	**Payment 2018-19**	**Balance 6/30/19**	**Payment 2019-20**	**Balance 6/30/20**	**Scheduled Payment for 2020-21**
SHARE OF PRE-2013 POOL UAL	06/30/13	No Ramp	2.750%	15	$773,581	$64,503	$761,009	$66,253	$745,747	$67,262
NON-ASSET (GAIN)/LOSS	06/30/13	100% →	2.750%	25	$(68,641)	$(3,640)	$(69,681)	$(4,674)	$(69,724)	$(4,730)
ASSET (GAIN)/LOSS	06/30/13	100% →	2.750%	25	$1,201,232	$63,694	$1,219,433	$81,796	$1,220,183	$82,774
NON-ASSET (GAIN)/LOSS	06/30/14	100% →	2.750%	26	$9,924	$396	$10,209	$542	$10,363	$685
ASSET (GAIN)/LOSS	06/30/14	100% →	2.750%	26	$(814,245)	$(32,459)	$(837,666)	$(44,465)	$(850,308)	$(56,228)
ASSUMPTION CHANGE	06/30/14	100% →	2.750%	16	$543,539	$29,902	$550,656	$40,955	$546,838	$51,998
NON-ASSET (GAIN)/LOSS	06/30/15	80% ↗	2.750%	27	$(1,795)	$(48)	$(1,871)	$(75)	$(1,924)	$(101)
ASSET (GAIN)/LOSS	06/30/15	80% ↗	2.750%	27	$501,212	$13,525	$522,306	$20,844	$537,306	$28,103
NON-ASSET (GAIN)/LOSS	06/30/16	60% ↗	2.750%	28	$(99,778)	$(1,385)	$(105,330)	$(2,845)	$(109,760)	$(4,313)
ASSET (GAIN)/LOSS	06/30/16	60% ↗	2.750%	28	$623,570	$8,653	$658,269	$17,783	$685,953	$26,957
ASSUMPTION CHANGE	06/30/16	60% ↗	2.750%	18	$200,811	$3,789	$210,948	$7,786	$217,660	$11,850
NON-ASSET (GAIN)/LOSS	06/30/17	40% ↗	2.750%	29	$7,382	$0	$7,899	$110	$8,338	$222
ASSET (GAIN)/LOSS	06/30/17	40% ↗	2.750%	29	$(297,950)	$0	$(318,806)	$(4,429)	$(336,541)	$(8,946)
ASSUMPTION CHANGE	06/30/17	40% ↗	2.750%	19	$234,312	$(16,132)	$267,401	$5,051	$280,894	$10,243
NON-ASSET (GAIN)/LOSS	06/30/18	20% ↗	2.750%	30	$41,850	$0	$44,779	$0	$47,914	$654
ASSET (GAIN)/LOSS	06/30/18	20% ↗	2.750%	30	$(89,889)	$0	$(96,181)	$0	$(102,913)	$(1,406)
ASSUMPTION CHANGE	06/30/18	20% ↗	2.750%	20	$326,788	$(14,349)	$364,506	$(14,744)	$405,272	$7,556
METHOD CHANGE	06/30/18	20% ↗	2.750%	20	$76,836	$(331)	$82,557	$(340)	$88,688	$1,654
TOTAL					**$3,168,739**	**$116,118**	**$3,270,437**	**$169,548**	**$3,323,986**	**$214,235**

The (gain)/loss bases are the plan's allocated share of the risk pool's (gain)/loss for the fiscal year as disclosed in "Allocation of Plan's Share of Pool's Experience/Assumption Change" earlier in this section. These (gain)/loss bases will be amortized according to Board policy over 30 years with a 5-year ramp-up.

If the total Unfunded Liability is negative (i.e., plan has a surplus), the scheduled payment is $0, because the minimum required contribution under PEPRA must be at least equal to the normal cost.

Amortization Schedule and Alternatives

The amortization schedule on the previous page shows the minimum contributions required according to CalPERS amortization policy. There has been considerable interest from many agencies in paying off these unfunded accrued liabilities sooner and the possible savings in doing so. As a result, we have provided alternate amortization schedules to help analyze the current amortization schedule and illustrate the advantages of accelerating unfunded liability payments.

Shown on the following page are future year amortization payments based on: 1) the current amortization schedule reflecting the individual bases and remaining periods shown on the previous page, and 2) alternate "fresh start" amortization schedules using two sample periods that would both result in interest savings relative to the current amortization schedule. Note that the payments under each alternate scenario increase by 2.75 percent for each year into the future.

The Current Amortization Schedule typically contains individual bases that are both positive and negative. Positive bases result from plan changes, assumption changes or plan experience that result in increases to unfunded liability. Negative bases result from plan changes, assumption changes or plan experience that result in decreases to unfunded liability. The combination of positive and negative bases within an amortization schedule can result in unusual or problematic circumstances in future years such as:

- A positive total unfunded liability with a negative total payment,
- A negative total unfunded liability with a positive total payment, or
- Total payments that completely amortize the unfunded liability over a very short period of time

In any year where one of the above scenarios occurs, the actuary will consider corrective action such as replacing the existing unfunded liability bases with a single "fresh start" base and amortizing it over a reasonable period.

The Current Amortization Schedule on the following page may appear to show that, based on the current amortization bases, one of the above scenarios will occur at some point in the future. It is impossible to know today whether such a scenario will in fact arise since there will be additional bases added to the amortization schedule in each future year. Should such a scenario arise in any future year, the actuary will take appropriate action based on guidelines in the CalPERS amortization policy.

Amortization Schedule and Alternatives

	Current Amortization Schedule		Alternate Schedules			
			15 Year Amortization		10 Year Amortization	
Date	**Balance**	**Payment**	**Balance**	**Payment**	**Balance**	**Payment**
6/30/2020	3,323,986	214,235	3,323,986	299,803	3,323,986	409,846
6/30/2021	3,335,059	248,605	3,246,547	308,047	3,132,716	421,117
6/30/2022	3,311,354	277,313	3,155,158	316,519	2,916,400	432,698
6/30/2023	3,256,294	294,938	3,048,610	325,223	2,672,962	444,597
6/30/2024	3,179,148	312,477	2,925,600	334,166	2,400,174	456,823
6/30/2025	3,078,459	321,070	2,784,727	343,356	2,095,644	469,386
6/30/2026	2,961,834	329,900	2,624,488	352,798	1,756,803	482,294
6/30/2027	2,827,911	338,972	2,443,265	362,500	1,380,890	495,557
6/30/2028	2,675,230	348,294	2,239,320	372,469	964,944	509,185
6/30/2029	2,502,218	357,872	2,010,788	382,712	505,785	523,188
6/30/2030	2,307,188	367,713	1,755,663	393,236		
6/30/2031	2,088,326	377,825	1,471,792	404,050		
6/30/2032	1,843,683	373,814	1,156,865	415,162		
6/30/2033	1,586,064	369,297	808,399	426,579		
6/30/2034	1,315,085	358,473	423,730	438,310		
6/30/2035	1,036,334	238,041				
6/30/2036	862,646	200,318				
6/30/2037	715,821	176,833				
6/30/2038	583,011	151,905				
6/30/2039	466,690	132,087				
6/30/2040	362,727	119,874				
6/30/2041	264,119	95,579				
6/30/2042	183,740	90,033				
6/30/2043	103,470	71,045				
6/30/2044	37,223	36,471				
6/30/2045	2,104	2,176				
6/30/2046						
6/30/2047						
6/30/2048						
6/30/2049						
Totals	**6,205,159**		**5,474,930**		**4,644,692**	
Interest Paid	**2,881,173**		**2,150,944**		**1,320,707**	
Estimated Savings			**730,230**		**1,560,468**	

Employer Contribution History

The table below provides a recent history of the required employer contributions for the plan, as determined by the annual actuarial valuation. It does not account for prepayments or benefit changes made during a fiscal year.

Fiscal Year	Employer Normal Cost	Unfunded Liability Payment ($)
2016 - 17	14.785%	$89,479
2017 - 18	14.971%	$112,851
2018 - 19	15.719%	$146,931
2019 - 20	16.636%	$184,632
2020 - 21	18.152%	$214,235

Funding History

The funding history below shows the plan's actuarial accrued liability, share of the pool's market value of assets, share of the pool's unfunded liability, funded ratio, and annual covered payroll.

Valuation Date	Accrued Liability (AL)	Share of Pool's Market Value of Assets (MVA)	Plan's Share of Pool's Unfunded Liability	Funded Ratio	Annual Covered Payroll
06/30/2011	$ 7,079,354	$ 5,580,464	$ 1,498,890	78.8%	$ 959,932
06/30/2012	7,354,813	5,494,655	1,860,158	74.7%	1,090,902
06/30/2013	7,794,444	6,145,551	1,648,893	78.8%	1,109,973
06/30/2014	8,742,113	7,240,413	1,501,700	82.8%	921,621
06/30/2015	9,469,056	7,500,049	1,969,007	79.2%	998,690
06/30/2016	10,221,744	7,560,177	2,661,567	74.0%	1,171,008
06/30/2017	10,904,955	8,197,579	2,707,376	75.2%	1,131,526
06/30/2018	11,909,172	8,740,433	3,168,739	73.4%	1,096,172

Risk Analysis

- **Future Investment Return Scenarios**
- **Discount Rate Sensitivity**
- **Mortality Rate Sensitivity**
- **Inflation Rate Sensitivity**
- **Maturity Measures**
- **Hypothetical Termination Liability**

Future Investment Return Scenarios

Analysis was performed to determine the effects of various future investment returns on required employer contributions. The projections below provide a range of results based on five investment return scenarios assumed to occur during the next four fiscal years (2018-19, 2019-20, 2020-21 and 2021-22). The projections also assume that all other actuarial assumptions will be realized and that no further changes to assumptions, contributions, benefits, or funding will occur.

For fiscal years 2018-19, 2019-20, 2020-21, and 2021-22, each scenario assumes an alternate fixed annual return. The fixed return assumptions for the five scenarios are 1.0 percent, 4.0 percent, 7.0 percent, 9.0 percent and 12.0 percent.

These alternate investment returns were chosen based on stochastic analysis of possible future investment returns over the four-year period ending June 30, 2022. Using the expected returns and volatility of the asset classes in which the funds are invested, we produced five thousand stochastic outcomes for this period based on the most recently completed Asset Liability Management process. We then selected annual returns that approximate the 5th, 25th, 50th, 75th, and 95th percentiles for these outcomes. For example, of all the 4-year outcomes generated in the stochastic analysis, approximately 25 percent of them had an average annual return of 4.0 percent or less.

Required contributions outside of this range are also possible. In particular, whereas it is unlikely that investment returns will average less than 1.0 percent or greater than 12.0 percent over this four-year period, the possibility of a single investment return less than 1.0 percent or greater than 12.0 percent in any given year is much greater.

Assumed Annual Return From 2019-20 through 2021-22	Projected Employer Contributions			
	2021-22	2022-23	2023-24	2024-25
1.0%				
Normal Cost	18.2%	18.2%	18.2%	18.2%
UAL Contribution	$262,000	$316,000	$373,000	$443,000
4.0%				
Normal Cost	18.2%	18.2%	18.2%	18.2%
UAL Contribution	$255,000	$297,000	$335,000	$380,000
7.0%				
Normal Cost	18.2%	18.2%	18.2%	18.2%
UAL Contribution	$249,000	$277,000	$295,000	$312,000
9.0%				
Normal Cost	18.5%	18.8%	19.1%	19.5%
UAL Contribution	$245,000	$268,000	$277,000	$282,000
12.0%				
Normal Cost	18.5%	18.8%	19.1%	19.5%
UAL Contribution	$239,000	$248,000	$235,000	$209,000

In addition, the projections above reflect the recent changes to the new amortization policy effective with the June 30, 2019 valuation. The projections above incorporate the impact of the CalPERS risk mitigation policy which reduces the discount rate when investment returns are above specified trigger points.

Discount Rate Sensitivity

Shown below are various valuation results as of June 30, 2018 assuming alternate discount rates. Results are shown using the current discount rate of 7.0 percent as well as alternate discount rates of 6.0 percent and 8.0 percent. The rates of 6.0 percent and 8.0 percent were selected since they illustrate the impact of a 1 percent increase or decrease to the 7.0 percent assumption. This analysis shows the potential plan impacts if the PERF were to realize investment returns of 6.0 percent or 8.0 percent over the long-term.

This type of analysis gives the reader a sense of the long-term risk to required contributions. For a measure of funded status that is appropriate for assessing the sufficiency of plan assets to cover estimated termination liabilities, please see "Hypothetical Termination Liability" at the end of this section.

Sensitivity Analysis				
As of June 30, 2018	**Plan's Total Normal Cost**	**Accrued Liability**	**Unfunded Accrued Liability**	**Funded Status**
7.0% (current discount rate)	27.094%	$11,909,172	$3,168,739	73.4%
6.0%	33.598%	$13,573,189	$4,832,756	64.4%
8.0%	22.090%	$10,547,923	$1,807,490	82.9%

Mortality Rate Sensitivity

The following table looks at the change in the June 30, 2018 plan costs and funded ratio under two different longevity scenarios, namely assuming post-retirement rates of mortality are 10 percent lower or 10 percent higher than our current mortality assumptions adopted in 2017. This type of analysis highlights the impact on the plan of improving or worsening mortality over the long-term.

As of June 30, 2018	**Current Mortality**	**10% Lower Mortality Rates**	**10% Higher Mortality Rates**
a) Accrued Liability	$11,909,172	$12,085,788	$11,744,657
b) Market Value of Assets	$8,740,433	$8,740,433	$8,740,433
c) Unfunded Liability (Surplus) [(a)-(b)]	$3,168,739	$3,345,355	$3,004,224
d) Funded Status	73.4%	72.3%	74.4%

A 10 percent increase (decrease) in assumed mortality rates over the long-term would result in approximately a 1.0 percent increase (decrease) to the funded ratio.

Inflation Rate Sensitivity

The following analysis looks at the change in the June 30, 2018 plan costs and funded ratio under two different inflation rate scenarios, namely assuming the liability inflation rate is 1 percent lower or 1 percent higher than the current valuation inflation rate assumption of 2.50%, while holding the discount rate fixed at 7.0%. This type of analysis highlights the impact on the plan of increased or decreased inflation of active salaries and retiree COLAs over the long-term.

As of June 30, 2018	Current Inflation Rate	-1% Inflation Rate	+1% Inflation Rate
a) Accrued Liability	$11,909,172	$11,132,281	$12,521,264
b) Market Value of Assets	$8,740,433	$8,740,433	$8,740,433
c) Unfunded Liability (Surplus) [(a)-(b)]	$3,168,739	$2,391,848	$3,780,831
d) Funded Status	73.4%	78.5%	69.8%

A decrease of 1 percent in the liability inflation rate (2.50 percent to 1.50 percent) reduces the Accrued Liability by 6.5 percent. However, a 1 percent increase in the liability inflation rate (2.50 percent to 3.50 percent) increases the Accrued Liability by 5.1 percent.

Maturity Measures

As pension plans mature they become much more sensitive to risks than plans that are less mature. Understanding plan maturity and how it affects the ability of a pension plan to tolerate risk is important in understanding how the plan is impacted by investment return volatility, other economic variables and changes in longevity or other demographic assumptions. One way to look at the maturity level of CalPERS and its plans is to look at the ratio of a plan's retiree liability to its total liability. A pension plan in its infancy will have a very low ratio of retiree liability to total liability. As the plan matures, the ratio starts increasing. A mature plan will often have a ratio above 0.60 to 0.65. For both CalPERS and other retirement systems in the United States, these ratios have been steadily increasing in recent years.

Ratio of Retiree Accrued Liability to Total Accrued Liability	June 30, 2017	June 30, 2018
1. Retired Accrued Liability	6,147,162	8,751,593
2. Total Accrued Liability	10,904,955	11,909,172
3. Ratio of Retiree AL to Total AL [(1) / (2)]	0.56	0.74

Another way to look at the maturity level of CalPERS and its plans is to look at the ratio of actives to retirees. A pension plan in its infancy will have a very high ratio of active to retired members. As the plan matures, and members retire, the ratio starts declining. A mature plan will often have a ratio near or below one. The average support ratio for CalPERS public agency plans is 1.25.

Support Ratio	June 30, 2017	June 30, 2018
1. Number of Actives	10	9
2. Number of Retirees	7	9
3. Support Ratio [(1) / (2)]	1.43	1.00

Actuarial calculations are based on a number of assumptions about long-term demographic and economic behavior. Unless these assumptions (e.g., terminations, deaths, disabilities, retirements, salary growth, and investment return) are exactly realized each year, there will be differences on a year-to-year basis. The year-to-year differences between actual experience and the assumptions are called actuarial gains and losses and serve to lower or raise required employer contributions from one year to the next. Therefore, employer contributions will inevitably fluctuate, especially due to the ups and downs of investment returns.

Asset Volatility Ratio (AVR)

Plans that have higher asset-to-payroll ratios experience more volatile employer contributions (as a percentage of payroll) due to investment return. For example, a plan with an asset-to-payroll ratio of 8 may experience twice the contribution volatility due to investment return volatility than a plan with an asset-to-payroll ratio of 4. Shown below is the asset volatility ratio, a measure of the plan's current contribution volatility. It should be noted that this ratio is a measure of the current situation. It increases over time but generally tends to stabilize as the plan matures.

Liability Volatility Ratio (LVR)

Plans that have higher liability-to-payroll ratios experience more volatile employer contributions (as a percentage of payroll) due to investment return and changes in liability. For example, a plan with a liability-to-payroll ratio of 8 is expected to have twice the contribution volatility of a plan with a liability-to-payroll ratio of 4. The liability volatility ratio is also shown in the table below. It should be noted that this ratio indicates a longer-term potential for contribution volatility. The asset volatility ratio, described above, will tend to move closer to the liability volatility ratio as the plan matures.

Contribution Volatility		**June 30, 2017**		**June 30, 2018**
1. Market Value of Assets	$	8,197,579	$	8,740,433
2. Payroll		1,131,526		1,096,172
3. Asset Volatility Ratio (AVR) [(1) / (2)]		7.2		8.0
4. Accrued Liability	$	10,904,955	$	11,909,172
5. Liability Volatility Ratio (LVR) [(4) / (2)]		9.6		10.9
6. Accrued Liability (7.00% discount rate)		11,222,830		11,909,172
7. Projected Liability Volatility Ratio [(6) / (2)]		9.9		10.9

Hypothetical Termination Liability

The hypothetical termination liability is an estimate of the financial position of the plan had the contract with CalPERS been terminated as of June 30, 2018. The plan liability on a termination basis is calculated differently compared to the plan's ongoing funding liability. For the hypothetical termination liability calculation, both compensation and service are frozen as of the valuation date and no future pay increases or service accruals are assumed. This measure of funded status is not appropriate for assessing the need for future employer contributions in the case of an ongoing plan, that is, for an employer that continues to provide CalPERS retirement benefits to active employees.

A more conservative investment policy and asset allocation strategy was adopted by the CalPERS Board for the Terminated Agency Pool. The Terminated Agency Pool has limited funding sources since no future employer contributions will be made. Therefore, expected benefit payments are secured by risk-free assets and benefit security for members is increased while funding risk is limited. However, this asset allocation has a lower expected rate of return than the PERF and consequently, a lower discount rate is assumed. The lower discount rate for the Terminated Agency Pool results in higher liabilities for terminated plans.

The effective termination discount rate will depend on actual market rates of return for risk-free securities on the date of termination. As market discount rates are variable, the table below shows a range for the hypothetical termination liability based on the lowest and highest interest rates observed during an approximate 2-year period centered around the valuation date.

Market Value of Assets (MVA)	Hypothetical Termination Liability[1,2] @ 2.50%	Funded Status	Unfunded Termination Liability @ 2.50%	Hypothetical Termination Liability[1,2] @ 3.25%	Funded Status	Unfunded Termination Liability @ 3.25%
$8,740,433	$22,360,143	39.1%	$13,619,710	$20,400,108	42.9%	$11,659,675

[1] The hypothetical liabilities calculated above include a 5 percent mortality contingency load in accordance with Board policy. Other actuarial assumptions can be found in Appendix A of the Section 2 report.

[2] The current discount rate assumption used for termination valuations is a weighted average of the 10-year and 30-year U.S. Treasury yields where the weights are based on matching asset and liability durations as of the termination date. The discount rates used in the table are based on 20-year Treasury bonds, rounded to the nearest quarter percentage point, which is a good proxy for most plans. The 20-year Treasury yield was 2.91 percent on June 30, 2018, and was 2.83 percent on January 31, 2019.

In order to terminate the plan, you must first contact our Retirement Services Contract Unit to initiate a Resolution of Intent to Terminate. The completed Resolution will allow the plan actuary to give you a preliminary termination valuation with a more up-to-date estimate of the plan liabilities. CalPERS advises you to consult with the plan actuary before beginning this process.

Participant Data

The table below shows a summary of your plan's member data upon which this valuation is based:

		June 30, 2017		June 30, 2018
Reported Payroll	$	1,131,526	$	1,096,172
Projected Payroll for Contribution Purposes	$	1,231,953	$	1,189,116
Number of Members				
Active		10		9
Transferred		8		7
Separated		0		0
Retired		7		9

List of Class 1 Benefit Provisions

This plan has the additional Class 1 Benefit Provisions:

- None

Plan's Major Benefit Options

Shown below is a summary of the major optional benefits for which your agency has contracted. A description of principal standard and optional plan provisions is in the following section of this Appendix.

	Benefit Group	
Member Category	Police	
Demographics		
Actives	Yes	
Transfers/Separated	Yes	
Receiving	Yes	
Benefit Provision		
Benefit Formula	2% @ 50	
Social Security Coverage	No	
Full/Modified	Full	
Employee Contribution Rate	9.00%	
Final Average Compensation Period	Three Year	
Sick Leave Credit	Yes	
Non-Industrial Disability	Standard	
Industrial Disability	Standard	
Pre-Retirement Death Benefits		
Optional Settlement 2	Yes	
1959 Survivor Benefit Level	Level 4	
Special	Yes	
Alternate (firefighters)	No	
Post-Retirement Death Benefits		
Lump Sum	$500	
Survivor Allowance (PRSA)	No	
COLA	2%	

Section 2

CALIFORNIA PUBLIC EMPLOYEES' RETIREMENT SYSTEM

Section 2 may be found on the CalPERS website (www.calpers.ca.gov) in the Forms and Publications section

ATTACHMENT E

CalPERS Annual Valuation Report as of June 30, 2018 –
Safety PEPRA

California Public Employees' Retirement System
Actuarial Office
400 Q Street, Sacramento, CA 95811 |Phone: (916) 795-3000 | Fax: (916) 795-2744
888 CalPERS (or **888**-225-7377) | TTY: (877) 249-7442 | **www.calpers.ca.gov**

July 2019

PEPRA Safety Police Plan of the Town of Moraga
(CalPERS ID: 6510195742)
Annual Valuation Report as of June 30, 2018

Dear Employer,

Attached to this letter, you will find the June 30, 2018 actuarial valuation report of your CalPERS pension plan. **Provided in this report is the determination of the minimum required employer contributions for Fiscal Year 2020-21**. In addition, the report contains important information regarding the current financial status of the plan as well as projections and risk measures to aid in planning for the future.

Because this plan is in a risk pool, the following valuation report has been separated into two sections:

- Section 1 contains specific information for the plan including the development of the current and projected employer contributions, and
- Section 2 contains the Risk Pool Actuarial Valuation appropriate to the plan as of June 30, 2018.

Section 2 can be found on the CalPERS website (www.calpers.ca.gov). From the home page, go to "*Forms & Publications*" and select "*View All*". In the search box, enter "*Risk Pool*" and from the results list download the Miscellaneous or Safety Risk Pool Actuarial Valuation Report as appropriate.

Your June 30, 2018 actuarial valuation report contains important actuarial information about your pension plan at CalPERS. Your assigned CalPERS staff actuary, whose signature appears in the Actuarial Certification section on page 1, is available to discuss the report with you after August 1, 2019.

Actuarial valuations are based on assumptions regarding future plan experience including investment return and payroll growth, eligibility for the types of benefits provided, and longevity among retirees. The CalPERS Board of Administration adopts these assumptions after considering the advice of CalPERS actuarial and investment teams and other professionals. Each actuarial valuation reflects all prior differences between actual and assumed experience and adjusts the contribution rates as needed. This valuation is based on an investment return assumption of 7.0% which was adopted by the board in December 2016. Other assumptions used in this report are those recommended in the CalPERS Experience Study and Review of Actuarial Assumptions report from December 2017.

Required Contribution

The exhibit below displays the minimum employer contributions, before any cost sharing, for Fiscal Year 2020-21 along with estimates of the required contributions for Fiscal Year 2021-22. Member contributions other than cost sharing (whether paid by the employer or the employee) are in addition to the results shown below. **The employer contributions in this report do not reflect any cost sharing arrangements you may have with your employees**.

Fiscal Year	Employer Normal Cost Rate	Employer Amortization of Unfunded Accrued Liability	PEPRA Employee Rate
2020-21	13.044%	$2,292	13.000%
Projected Results			
2021-22	*13.0%*	*$2,900*	*TBD*

The actual investment return for Fiscal Year 2018-19 was not known at the time this report was prepared. The projections above assume the investment return for that year would be 7.00 percent. ***If the actual investment return for Fiscal Year 2018-19 differs from 7.00 percent, the actual contribution requirements for the projected years will differ from those shown above.*** For additional details regarding the assumptions and methods used for these projections please refer to the "Projected Employer Contributions" in the "Highlights and Executive Summary" section. This section also contains projected required contributions through fiscal year 2025-26.

Changes from Previous Year's Valuation

CalPERS continues to strive to provide comprehensive risk assessments regarding plan funding and sustainability consistent with the Board of Administration's pension and investment beliefs. Your report this year includes new metrics on plan maturity in recognition of the fact that most pension plans at CalPERS are maturing as anticipated. As plans mature, they become more sensitive to risks than plans that are less mature. The "Risk Analysis" section of your report will help you understand how your plan is affected by investment return volatility and other economic assumptions. We have included plan sensitivity analysis with respect to longevity and inflation to further that discussion and encourage you to review our most recent Annual Review of Funding Levels and Risks report on our website that takes a holistic view of the system.

Upcoming Change for June 30, 2019 Valuations

The CalPERS Board of Administration has adopted a new amortization policy effective with the June 30, 2019 actuarial valuation. The new policy shortens the period over which actuarial gains and losses are amortized from 30 years to 20 years with the payments computed using a level dollar amount. In addition, the new policy removes the 5-year ramp-up and ramp-down on Unfunded Accrued Liability (UAL) bases attributable to assumption changes and non-investment gains/losses. The new policy removes the 5-year ramp-down on investment gains/losses. These changes will apply only to new UAL bases established on or after June 30, 2019.

Besides the above noted changes, there may also be changes specific to the plan such as contract amendments and funding changes.

Further descriptions of general changes are included in the "Highlights and Executive Summary" section and in Appendix A, "Statement of Actuarial Data, Methods and Assumptions" of the Section 2 report.

We understand that you might have a number of questions about these results. While we are very interested in discussing these results with your agency, in the interest of allowing us to give every public agency their results, we ask that you wait until after August 1 2019 to contact us with actuarial questions.

If you have other questions, please call our customer contact center at (888) CalPERS or (**888-225-7377**).

Sincerely,

SCOTT TERANDO
Chief Actuary

Actuarial Valuation as of June 30, 2018

for the PEPRA Safety Police Plan of the Town of Moraga

(CalPERS ID: 6510195742)

Required Contributions for Fiscal Year July 1, 2020 - June 30, 2021

Table of Contents

Section 1

CALIFORNIA PUBLIC EMPLOYEES' RETIREMENT SYSTEM

Plan Specific Information for the PEPRA Safety Police Plan of the Town of Moraga

(CalPERS ID: 6510195742)
(Valuation Rate Plan ID: 25551)

Table of Contents

Actuarial Certification

Section 1 of this report is based on the member and financial data contained in our records as of June 30, 2018 which was provided by your agency and the benefit provisions under your contract with CalPERS. Section 2 of this report is based on the member and financial data as of June 30, 2018 provided by employers participating in the Safety Risk Pool to which the plan belongs and benefit provisions under the CalPERS contracts for those agencies.

As set forth in Section 2 of this report, the pool actuaries have certified that, in their opinion, the valuation of the risk pool containing your PEPRA Safety Police Plan has been performed in accordance with generally accepted actuarial principles consistent with standards of practice prescribed by the Actuarial Standards Board, and that the assumptions and methods are internally consistent and reasonable for the risk pool as of the date of this valuation and as prescribed by the CalPERS Board of Administration according to provisions set forth in the California Public Employees' Retirement Law.

Having relied upon the information set forth in Section 2 of this report and based on the census and benefit provision information for the plan, it is my opinion as the plan actuary that Unfunded Accrued Liability amortization bases as of June 30, 2018 and employer contribution as of July 1, 2020, have been properly and accurately determined in accordance with the principles and standards stated above.

The undersigned is an actuary for CalPERS, a member of both the American Academy of Actuaries and Society of Actuaries and meets the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein.

TONY CUNY, ASA, MAAA
Associate Pension Actuary, CalPERS
Plan Actuary

Highlights and Executive Summary

- **Introduction**
- **Purpose of Section 1**
- **Required Employer Contributions**
- **Plan's Funded Status**
- **Projected Employer Contributions**
- **Changes Since the Prior Year's Valuation**
- **Subsequent Events**

Introduction

This report presents the results of the June 30, 2018 actuarial valuation of the PEPRA Safety Police Plan of the Town of Moraga of the California Public Employees' Retirement System (CalPERS). This actuarial valuation sets the required employer contributions for Fiscal Year 2020-21.

Purpose of Section 1

This Section 1 report for the PEPRA Safety Police Plan of the Town of Moraga of the California Public Employees' Retirement System (CalPERS) was prepared by the plan actuary in order to:

- Set forth the assets and accrued liabilities of this plan as of June 30, 2018;
- Determine the minimum required employer contribution for this plan for the fiscal year July 1, 2020 through June 30, 2021; and
- Provide actuarial information as of June 30, 2018 to the CalPERS Board of Administration and other interested parties.

The pension funding information presented in this report should not be used in financial reports subject to GASB Statement No. 68 for a Cost Sharing Employer Defined Benefit Pension Plan. A separate accounting valuation report for such purposes is available from CalPERS and details for ordering are available on our website.

The measurements shown in this actuarial valuation may not be applicable for other purposes. The employer should contact their actuary before disseminating any portion of this report for any reason that is not explicitly described above.

Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the following: plan experience differing from that anticipated by the economic or demographic assumptions; changes in economic or demographic assumptions; changes in actuarial policies; and changes in plan provisions or applicable law.

California Actuarial Advisory Panel Recommendations

This report includes all the basic disclosure elements as described in the *Model Disclosure Elements for Actuarial Valuation Reports* recommended in 2011 by the California Actuarial Advisory Panel (CAAP), with the exception of including the original base amounts of the various components of the unfunded liability in the Schedule of Amortization Bases shown on page 10.

Additionally, this report includes the following "Enhanced Risk Disclosures" also recommended by the CAAP in the Model Disclosure Elements document and consistent with the recommendations of Actuarial Standard of Practice No. 51:

- A "Scenario Test," projecting future results under different investment income scenarios.
- A "Sensitivity Analysis," showing the impact on current valuation results using alternative discount rates of 6.0 percent and 8.0 percent.
- A "Sensitivity Analysis," showing the impact on current valuation results using a 1.0 percent plus or minus change in the inflation rate.
- A "Sensitivity Analysis," showing the impact on current valuation results assuming post-retirement rates of mortality are 10 percent lower or 10 percent higher than our current mortality assumptions adopted in 2017. This type of analysis highlights the impact on the plan of improving or worsening mortality over the long-term.
- Plan maturity measures which indicate how sensitive a plan may be to the risks noted above.

Required Employer Contributions

		Fiscal Year
Required Employer Contributions		**2020-21**
Employer Normal Cost Rate		**13.044%**
Plus, Either		
1) Monthly Employer Dollar UAL Payment	**$**	**191.04**
Or		
2) Annual UAL Prepayment Option*	**$**	**2,216**

*The total minimum required employer contribution is the **sum** of the Plan's Employer Normal Cost Rate (expressed as a percentage of payroll) **plus** the Employer Unfunded Accrued Liability (UAL) Contribution Amount (billed monthly in dollars).*

** Only the UAL portion of the employer contribution can be prepaid **(which must be received in full no later than July 31)**. Any prepayment totaling over $5 million requires a 72-hour notice email to FCSD_public_agency_wires@calpers.ca.gov. Plan Normal Cost contributions will be made as part of the payroll reporting process. If there is contractual cost sharing or other change, this amount will change.*

In accordance with Sections 20537 and 20572 of the Public Employees' Retirement Law, if a contracting agency fails to remit the required contributions when due, interest and penalties may apply.

		Fiscal Year 2019-20		Fiscal Year 2020-21
Development of Normal Cost as a Percentage of Payroll[1]				
Base Total Normal Cost for Formula		25.034%		26.044%
Surcharge for Class 1 Benefits[2]				
None		0.000%		0.000%
Phase out of Normal Cost Difference[3]		0.000%		0.000%
Plan's Total Normal Cost		25.034%		26.044%
Plan's Employee Contribution Rate[4]		12.000%		13.000%
Employer Normal Cost Rate		13.034%		13.044%
Projected Payroll for the Contribution Fiscal Year	$	219,418	$	225,931
Estimated Employer Contributions Based on Projected Payroll				
Plan's Estimated Employer Normal Cost	$	28,599	$	29,470
Plan's Payment on Amortization Bases[5]		1,689		2,292
% of Projected Payroll (illustrative only)		0.770%		1.015%
Estimated Total Employer Contribution	$	30,288	$	31,762
% of Projected Payroll (illustrative only)		13.804%		14.058%

[1] The results shown for Fiscal Year 2019-20 reflect the prior year valuation and may not take into account any lump sum payment, side fund payoff, or rate adjustment made after April 30, 2018.

[2] Section 2 of this report contains a list of Class 1 benefits and corresponding surcharges for each benefit.

[3] The normal cost difference is phased out over a five-year period. The phase out of normal cost difference is 100 percent for the first year of pooling, and is incrementally reduced by 20 percent of the original normal cost difference for each subsequent year. This is non-zero only for plans that joined a pool within the past 5 years. Most plans joined a pool June 30, 2003, when risk pooling was implemented.

[4] For detail regarding the determination of the required PEPRA employee contribution rate see Section on PEPRA Member Contribution Rates.

[5] See page 10 for a breakdown of the Amortization Bases.

Plan's Funded Status

	June 30, 2017	June 30, 2018
1. Present Value of Projected Benefits (PVB)	$ 787,102	$ 854,928
2. Entry Age Normal Accrued Liability (AL)	175,080	220,475
3. Plan's Market Value of Assets (MVA)	161,513	196,321
4. Unfunded Accrued Liability (UAL) [(2) - (3)]	13,567	24,154
5. Funded Ratio [(3) / (2)]	92.3%	89.0%

This measure of funded status is an assessment of the need for future employer contributions based on the selected actuarial cost method used to fund the plan. The UAL is the present value of future employer contributions for service that has already been earned and is in addition to future normal cost contributions for active members. For a measure of funded status that is appropriate for assessing the sufficiency of plan assets to cover estimated termination liabilities, please see "Hypothetical Termination Liability" in the "Risk Analysis" section.

Projected Employer Contributions

The table below shows projected employer contributions (before cost sharing) for the next six fiscal years. Projected results reflect the adopted changes to the discount rate described in Appendix A, "Statement of Actuarial Data, Methods and Assumptions" of the Section 2 report. The projections also assume that all actuarial assumptions will be realized and that no further changes to assumptions, contributions, benefits, or funding will occur during the projection period.

	Required Contribution	Projected Future Employer Contributions (Assumes 7.00% Return for Fiscal Year 2018-19)				
Fiscal Year	**2020-21**	**2021-22**	**2022-23**	**2023-24**	**2024-25**	**2025-26**
Normal Cost %	13.044%	13.0%	13.0%	13.0%	13.0%	13.0%
UAL Payment	$2,292	$2,900	$2,400	$2,800	$3,200	$3,300

Changes in the UAL due to actuarial gains or losses as well as changes in actuarial assumptions or methods are amortized using a 5-year ramp up. For more information, please see "Amortization of the Unfunded Actuarial Accrued Liability" under "Actuarial Methods" in Appendix A of Section 2. This method phases in the impact of unanticipated changes in UAL over a 5-year period and attempts to minimize employer cost volatility from year to year. As a result of this methodology, dramatic changes in the required employer contributions in any one year are less likely. However, required contributions can change gradually and significantly over the next five years. In years where there is a large increase in UAL the relatively small amortization payments during the ramp up period could result in a funded ratio that is projected to decrease initially while the contribution impact of the increase in the UAL is phased in.

For projected contributions under alternate investment return scenarios, please see the "Future Investment Return Scenarios" in the "Risk Analysis" section.

Changes Since the Prior Year's Valuation

Benefits

None. This valuation generally reflects plan changes by amendments effective before the date of the report. Please refer to the "Plan's Major Benefit Options" and Appendix B of Section 2 for a summary of the plan provisions used in this valuation.

Actuarial Methods and Assumptions

In December of 2016 the CalPERS Board of Administration lowered the discount rate from 7.50 percent to 7.00 percent using a three-year phase-in beginning with the June 30, 2016 actuarial valuation. The minimum employer contributions for Fiscal Year 2020-21 determined in this valuation were calculated using a discount rate of 7.00 percent, payroll growth of 2.75 percent and an inflation rate of 2.50 percent. The projected employer contributions on Page 5 are calculated under the assumption that the discount rate remains at 7.00 percent going forward and that furthermore the realized rate of return on assets for Fiscal Year 2018-19 is 7.00 percent.

The decision to reduce the discount rate was primarily based on reduced capital market assumptions provided by external investment consultants and CalPERS investment staff. The specific decision adopted by the Board reflected recommendations from CalPERS staff and additional input from employer and employee stakeholder groups. Based on the investment allocation adopted by the Board and capital market assumptions, the reduced discount rate assumption provides a more realistic assumption for the long-term investment return of the fund.

CalPERS has implemented a new actuarial valuation software system for the June 30, 2018 valuation. With this new system we have refined and improved some of our calculation methodology. Any difference in liability between the old software and new software calculations is captured as a method change line item.

Subsequent Events

The CalPERS Board of Administration has adopted a new amortization policy effective with the June 30, 2019 actuarial valuation. The new policy shortens the period over which actuarial gains and losses are amortized from 30 years to 20 years with the payments computed using a level dollar amount. In addition, the new policy removes the 5-year ramp-up and ramp-down on UAL bases attributable to assumption changes and non-investment gains/losses. The new policy removes the 5-year ramp-down on investment gains/losses. These changes will apply only to new UAL bases established on or after June 30, 2019.

For inactive employers the new amortization policy imposes a maximum amortization period of 15 years for all unfunded accrued liabilities effective June 30, 2018. Furthermore, the plan actuary has the ability to shorten the amortization period on any valuation date based on the life expectancy of plan members and projected cash flow needs to the plan. The impact of this has been reflected in the current valuation results.

The contribution requirements determined in this actuarial valuation report are based on demographic and financial information as of June 30, 2018. Changes in the value of assets subsequent to that date are not reflected. Investment returns below the assumed rate of return will increase the required contribution, while investment returns above the assumed rate of return will decrease the required contribution.

This actuarial valuation report reflects statutory changes, regulatory changes and CalPERS Board actions through January 2019. Any subsequent changes or actions are not reflected.

Assets and Liabilities

- **Breakdown of Entry Age Normal Accrued Liability**
- **Allocation of Plan's Share of Pool's Experience/Assumption Change**
- **Development of Plan's Share of Pool's Market Value of Assets**
- **Schedule of Plan's Amortization Bases**
- **Amortization Schedule and Alternatives**
- **Employer Contribution History**
- **Funding History**

Breakdown of Entry Age Normal Accrued Liability

Active Members	$	173,801
Transferred Members		44,318
Terminated Members		2,356
Members and Beneficiaries Receiving Payments		0
Total	$	220,475

Allocation of Plan's Share of Pool's Experience/Assumption Change

It is the policy of CalPERS to ensure equity within the risk pools by allocating the pool's experience gains/losses and assumption changes in a manner that treats each employer equitably and maintains benefit security for the members of the System while minimizing substantial variations in employer contributions. The Pool's experience gains/losses and impact of assumption/method changes is allocated to the plan as follows:

1.	Plan's Accrued Liability	$	220,475
2.	Projected UAL balance at 6/30/18		17,909
3.	Pool's Accrued Liability[1]		22,716,935,494
4.	Sum of Pool's Individual Plan UAL Balances at 6/30/18[1]		5,835,345,753
5.	Pool's 2017/18 Investment & Asset (Gain)/Loss[1]		(166,826,991)
6.	Pool's 2017/18 Other (Gain)/Loss[1]		79,829,358
7.	Plan's Share of Pool's Asset (Gain)/Loss: [(1) - (2)] ÷ [(3) - (4)] × (5)		(2,002)
8.	Plan's Share of Pool's Other (Gain)/Loss: (1) ÷ (3) × (6)		775
9.	Plan's New (Gain)/Loss as of 6/30/2018: (7) + (8)		(1,227)
10.	Increase in Pool's Accrued Liability due to Change in Assumptions[1]		623,352,408
11.	Plan's Share of Pool's Change in Assumptions: (1) ÷ (3) × (10)		6,050
12.	Increase in Pool's Accrued Liability due to Change in Method[1]		146,565,925
13.	Plan's Share of Pool's Change in Method: (1) ÷ (3) × (12)		1,422

[1] Does not include plans that transferred to Pool on the valuation date.

Development of the Plan's Share of Pool's Market Value of Assets

14.	Plan's UAL: (2) + (9) + (11) + (13)	$	24,154
15.	Plan's Share of Pool's MVA: (1) - (14)	$	**196,321**

Schedule of Plan's Amortization Bases

On the next page is the schedule of the plan's amortization bases. Note that there is a two-year lag between the valuation date and the start of the contribution fiscal year.

- The assets, liabilities, and funded status of the plan are measured as of the valuation date: June 30, 2018.
- The required employer contributions determined by the valuation are for the fiscal year beginning two years after the valuation date: Fiscal Year 2020-21.

This two-year lag is necessary due to the amount of time needed to extract and test the membership and financial data, and the need to provide public agencies with their required employer contribution well in advance of the start of the fiscal year.

The Unfunded Accrued Liability (UAL) is used to determine the employer contribution and therefore must be rolled forward two years from the valuation date to the first day of the fiscal year for which the contribution is being determined. The UAL is rolled forward each year by subtracting the expected payment on the UAL for the fiscal year and adjusting for interest. The expected payment on the UAL for a fiscal year is equal to the Expected Employer Contribution for the fiscal year minus the Expected Normal Cost for the year. The Employer Contribution for the first fiscal year is determined by the actuarial valuation two years ago and the contribution for the second year is from the actuarial valuation one year ago. Additional discretionary payments are reflected in the Expected Payments column in the fiscal year they were made by the agency.

Schedule of Plan's Amortization Bases

										Amounts for Fiscal 2020-21
Reason for Base	**Date Established**	**Ramp Up/Down 2020-21**	**Escalation Rate**	**Amortization Period**	**Balance 6/30/18**	**Payment 2018-19**	**Balance 6/30/19**	**Payment 2019-20**	**Balance 6/30/20**	**Scheduled Payment for 2020-21**
FRESH START	06/30/15	No Ramp	2.750%	2	$4,093	$1,129	$3,212	$1,158	$2,239	$1,181
NON-ASSET (GAIN)/LOSS	06/30/16	60% ↗	2.750%	28	$(1,185)	$(16)	$(1,251)	$(34)	$(1,303)	$(51)
ASSET (GAIN)/LOSS	06/30/16	60% ↗	2.750%	28	$8,915	$124	$9,411	$254	$9,807	$385
ASSUMPTION CHANGE	06/30/16	60% ↗	2.750%	18	$5,416	$102	$5,690	$210	$5,871	$320
NON-ASSET (GAIN)/LOSS	06/30/17	40% ↗	2.750%	29	$119	$0	$127	$2	$134	$4
ASSET (GAIN)/LOSS	06/30/17	40% ↗	2.750%	29	$(5,843)	$0	$(6,252)	$(87)	$(6,600)	$(175)
ASSUMPTION CHANGE	06/30/17	40% ↗	2.750%	19	$6,394	$(2,873)	$9,813	$185	$10,309	$376
NON-ASSET (GAIN)/LOSS	06/30/18	20% ↗	2.750%	30	$775	$0	$829	$0	$887	$12
ASSET (GAIN)/LOSS	06/30/18	20% ↗	2.750%	30	$(2,002)	$0	$(2,142)	$0	$(2,292)	$(31)
METHOD CHANGE	06/30/18	20% ↗	2.750%	20	$1,422	$(63)	$1,587	$(65)	$1,765	$33
ASSUMPTION CHANGE	06/30/18	20% ↗	2.750%	20	$6,050	$(2,726)	$9,293	$(2,801)	$12,842	$239
TOTAL					**$24,154**	**$(4,323)**	**$30,317**	**$(1,178)**	**$33,659**	**$2,292**

The (gain)/loss bases are the plan's allocated share of the risk pool's (gain)/loss for the fiscal year as disclosed in "Allocation of Plan's Share of Pool's Experience/Assumption Change" earlier in this section. These (gain)/loss bases will be amortized according to Board policy over 30 years with a 5-year ramp-up.

If the total Unfunded Liability is negative (i.e., plan has a surplus), the scheduled payment is $0, because the minimum required contribution under PEPRA must be at least equal to the normal cost.

Amortization Schedule and Alternatives

The amortization schedule on the previous page shows the minimum contributions required according to CalPERS amortization policy. There has been considerable interest from many agencies in paying off these unfunded accrued liabilities sooner and the possible savings in doing so. As a result, we have provided alternate amortization schedules to help analyze the current amortization schedule and illustrate the advantages of accelerating unfunded liability payments.

Shown on the following page are future year amortization payments based on: 1) the current amortization schedule reflecting the individual bases and remaining periods shown on the previous page, and 2) alternate "fresh start" amortization schedules using two sample periods that would both result in interest savings relative to the current amortization schedule. Note that the payments under each alternate scenario increase by 2.75 percent for each year into the future.

The Current Amortization Schedule typically contains individual bases that are both positive and negative. Positive bases result from plan changes, assumption changes or plan experience that result in increases to unfunded liability. Negative bases result from plan changes, assumption changes or plan experience that result in decreases to unfunded liability. The combination of positive and negative bases within an amortization schedule can result in unusual or problematic circumstances in future years such as:

- A positive total unfunded liability with a negative total payment,
- A negative total unfunded liability with a positive total payment, or
- Total payments that completely amortize the unfunded liability over a very short period of time

In any year where one of the above scenarios occurs, the actuary will consider corrective action such as replacing the existing unfunded liability bases with a single "fresh start" base and amortizing it over a reasonable period.

The Current Amortization Schedule on the following page may appear to show that, based on the current amortization bases, one of the above scenarios will occur at some point in the future. It is impossible to know today whether such a scenario will in fact arise since there will be additional bases added to the amortization schedule in each future year. Should such a scenario arise in any future year, the actuary will take appropriate action based on guidelines in the CalPERS amortization policy.

Amortization Schedule and Alternatives

	Current Amortization Schedule		Alternate Schedules			
			15 Year Amortization		10 Year Amortization	
Date	**Balance**	**Payment**	**Balance**	**Payment**	**Balance**	**Payment**
6/30/2020	33,658	2,292	33,658	3,036	33,658	4,150
6/30/2021	33,642	2,944	32,874	3,119	31,721	4,264
6/30/2022	32,952	2,383	31,948	3,205	29,531	4,381
6/30/2023	32,793	2,834	30,869	3,293	27,066	4,502
6/30/2024	32,157	3,194	29,624	3,384	24,303	4,626
6/30/2025	31,105	3,282	28,197	3,477	21,220	4,753
6/30/2026	29,887	3,372	26,575	3,572	17,789	4,884
6/30/2027	28,491	3,465	24,740	3,671	13,982	5,018
6/30/2028	26,902	3,560	22,675	3,772	9,771	5,156
6/30/2029	25,102	3,658	20,361	3,875	5,121	5,298
6/30/2030	23,076	3,759	17,777	3,982		
6/30/2031	20,803	3,862	14,903	4,091		
6/30/2032	18,264	3,968	11,714	4,204		
6/30/2033	15,438	4,077	8,186	4,319		
6/30/2034	12,302	4,034	4,291	4,438		
6/30/2035	8,990	3,702				
6/30/2036	5,790	2,929				
6/30/2037	3,166	2,111				
6/30/2038	1,204	1,245				
6/30/2039	1	1				
6/30/2040						
6/30/2041						
6/30/2042						
6/30/2043						
6/30/2044						
6/30/2045						
6/30/2046						
6/30/2047						
6/30/2048						
6/30/2049						
Totals	**60,671**		**55,438**		**47,031**	
Interest Paid	**27,013**		**21,780**		**13,373**	
Estimated Savings			**5,233**		**13,640**	

Employer Contribution History

The table below provides a recent history of the required employer contributions for the plan, as determined by the annual actuarial valuation. It does not account for prepayments or benefit changes made during a fiscal year.

Fiscal Year	Employer Normal Cost	Unfunded Liability Payment ($)
2016 - 17	12.082%	$104
2017 - 18	11.990%	$1,101
2018 - 19	12.141%	$1,338
2019 - 20	13.034%	$1,689
2020 - 21	13.044%	$2,292

Funding History

The funding history below shows the plan's actuarial accrued liability, share of the pool's market value of assets, share of the pool's unfunded liability, funded ratio, and annual covered payroll.

Valuation Date	Accrued Liability (AL)	Share of Pool's Market Value of Assets (MVA)	Plan's Share of Pool's Unfunded Liability	Funded Ratio	Annual Covered Payroll
06/30/2014	$ 34,610	$ 36,079	$ (1,469)	104.2%	$ 97,677
06/30/2015	74,656	71,318	3,338	95.5%	185,403
06/30/2016	121,458	108,244	13,214	89.1%	185,620
06/30/2017	175,080	161,513	13,567	92.3%	201,531
06/30/2018	220,475	196,321	24,154	89.0%	208,272

Risk Analysis

- **Future Investment Return Scenarios**
- **Discount Rate Sensitivity**
- **Mortality Rate Sensitivity**
- **Inflation Rate Sensitivity**
- **Maturity Measures**
- **Hypothetical Termination Liability**

Future Investment Return Scenarios

Analysis was performed to determine the effects of various future investment returns on required employer contributions. The projections below provide a range of results based on five investment return scenarios assumed to occur during the next four fiscal years (2018-19, 2019-20, 2020-21 and 2021-22). The projections also assume that all other actuarial assumptions will be realized and that no further changes to assumptions, contributions, benefits, or funding will occur.

For fiscal years 2018-19, 2019-20, 2020-21, and 2021-22, each scenario assumes an alternate fixed annual return. The fixed return assumptions for the five scenarios are 1.0 percent, 4.0 percent, 7.0 percent, 9.0 percent and 12.0 percent.

These alternate investment returns were chosen based on stochastic analysis of possible future investment returns over the four-year period ending June 30, 2022. Using the expected returns and volatility of the asset classes in which the funds are invested, we produced five thousand stochastic outcomes for this period based on the most recently completed Asset Liability Management process. We then selected annual returns that approximate the 5th, 25th, 50th, 75th, and 95th percentiles for these outcomes. For example, of all the 4-year outcomes generated in the stochastic analysis, approximately 25 percent of them had an average annual return of 4.0 percent or less.

Required contributions outside of this range are also possible. In particular, whereas it is unlikely that investment returns will average less than 1.0 percent or greater than 12.0 percent over this four-year period, the possibility of a single investment return less than 1.0 percent or greater than 12.0 percent in any given year is much greater.

Assumed Annual Return From 2019-20 through 2021-22	Projected Employer Contributions			
	2021-22	2022-23	2023-24	2024-25
1.0%				
Normal Cost	13.0%	13.0%	13.0%	13.0%
UAL Contribution	$3,200	$3,300	$4,600	$6,100
4.0%				
Normal Cost	13.0%	13.0%	13.0%	13.0%
UAL Contribution	$3,100	$2,800	$3,700	$4,700
7.0%				
Normal Cost	13.0%	13.0%	13.0%	13.0%
UAL Contribution	$2,900	$2,400	$2,800	$3,200
9.0%				
Normal Cost	13.4%	13.7%	14.0%	13.6%
UAL Contribution	$2,900	$2,200	$2,500	$2,600
12.0%				
Normal Cost	13.4%	13.7%	14.0%	13.6%
UAL Contribution	$2,700	$1,800	$1,500	$0

In addition, the projections above reflect the recent changes to the new amortization policy effective with the June 30, 2019 valuation. The projections above incorporate the impact of the CalPERS risk mitigation policy which reduces the discount rate when investment returns are above specified trigger points.

Discount Rate Sensitivity

Shown below are various valuation results as of June 30, 2018 assuming alternate discount rates. Results are shown using the current discount rate of 7.0 percent as well as alternate discount rates of 6.0 percent and 8.0 percent. The rates of 6.0 percent and 8.0 percent were selected since they illustrate the impact of a 1 percent increase or decrease to the 7.0 percent assumption. This analysis shows the potential plan impacts if the PERF were to realize investment returns of 6.0 percent or 8.0 percent over the long-term.

This type of analysis gives the reader a sense of the long-term risk to required contributions. For a measure of funded status that is appropriate for assessing the sufficiency of plan assets to cover estimated termination liabilities, please see "Hypothetical Termination Liability" at the end of this section.

Sensitivity Analysis				
As of June 30, 2018	**Plan's Total Normal Cost**	**Accrued Liability**	**Unfunded Accrued Liability**	**Funded Status**
7.0% (current discount rate)	26.044%	$220,475	$24,154	89.0%
6.0%	32.461%	$259,188	$62,867	75.7%
8.0%	21.147%	$189,817	$(6,504)	103.4%

Mortality Rate Sensitivity

The following table looks at the change in the June 30, 2018 plan costs and funded ratio under two different longevity scenarios, namely assuming post-retirement rates of mortality are 10 percent lower or 10 percent higher than our current mortality assumptions adopted in 2017. This type of analysis highlights the impact on the plan of improving or worsening mortality over the long-term.

As of June 30, 2018	**Current Mortality**	**10% Lower Mortality Rates**	**10% Higher Mortality Rates**
a) Accrued Liability	$220,475	$224,981	$216,293
b) Market Value of Assets	$196,321	$196,321	$196,321
c) Unfunded Liability (Surplus) [(a)-(b)]	$24,154	$28,660	$19,972
d) Funded Status	89.0%	87.3%	90.8%

A 10 percent increase (decrease) in assumed mortality rates over the long-term would result in approximately a 1.8 percent increase (decrease) to the funded ratio.

Inflation Rate Sensitivity

The following analysis looks at the change in the June 30, 2018 plan costs and funded ratio under two different inflation rate scenarios, namely assuming the liability inflation rate is 1 percent lower or 1 percent higher than the current valuation inflation rate assumption of 2.50%, while holding the discount rate fixed at 7.0%. This type of analysis highlights the impact on the plan of increased or decreased inflation of active salaries and retiree COLAs over the long-term.

As of June 30, 2018	Current Inflation Rate	-1% Inflation Rate	+1% Inflation Rate
a) Accrued Liability	$220,475	$201,627	$236,755
b) Market Value of Assets	$196,321	$196,321	$196,321
c) Unfunded Liability (Surplus) [(a)-(b)]	$24,154	$5,306	$40,434
d) Funded Status	89.0%	97.4%	82.9%

A decrease of 1 percent in the liability inflation rate (2.50 percent to 1.50 percent) reduces the Accrued Liability by 8.5 percent. However, a 1 percent increase in the liability inflation rate (2.50 percent to 3.50 percent) increases the Accrued Liability by 7.4 percent.

Maturity Measures

As pension plans mature they become much more sensitive to risks than plans that are less mature. Understanding plan maturity and how it affects the ability of a pension plan to tolerate risk is important in understanding how the plan is impacted by investment return volatility, other economic variables and changes in longevity or other demographic assumptions. One way to look at the maturity level of CalPERS and its plans is to look at the ratio of a plan's retiree liability to its total liability. A pension plan in its infancy will have a very low ratio of retiree liability to total liability. As the plan matures, the ratio starts increasing. A mature plan will often have a ratio above 0.60 to 0.65. For both CalPERS and other retirement systems in the United States, these ratios have been steadily increasing in recent years.

Ratio of Retiree Accrued Liability to Total Accrued Liability	June 30, 2017	June 30, 2018
1. Retired Accrued Liability	0	0
2. Total Accrued Liability	175,080	220,475
3. Ratio of Retiree AL to Total AL [(1) / (2)]	0.00	0.00

Another way to look at the maturity level of CalPERS and its plans is to look at the ratio of actives to retirees. A pension plan in its infancy will have a very high ratio of active to retired members. As the plan matures, and members retire, the ratio starts declining. A mature plan will often have a ratio near or below one. The average support ratio for CalPERS public agency plans is 1.25.

Support Ratio	June 30, 2017	June 30, 2018
1. Number of Actives	2	2
2. Number of Retirees	0	0
3. Support Ratio [(1) / (2)]	N/A	N/A

Actuarial calculations are based on a number of assumptions about long-term demographic and economic behavior. Unless these assumptions (e.g., terminations, deaths, disabilities, retirements, salary growth, and investment return) are exactly realized each year, there will be differences on a year-to-year basis. The year-to-year differences between actual experience and the assumptions are called actuarial gains and losses and serve to lower or raise required employer contributions from one year to the next. Therefore, employer contributions will inevitably fluctuate, especially due to the ups and downs of investment returns.

Asset Volatility Ratio (AVR)

Plans that have higher asset-to-payroll ratios experience more volatile employer contributions (as a percentage of payroll) due to investment return. For example, a plan with an asset-to-payroll ratio of 8 may experience twice the contribution volatility due to investment return volatility than a plan with an asset-to-payroll ratio of 4. Shown below is the asset volatility ratio, a measure of the plan's current contribution volatility. It should be noted that this ratio is a measure of the current situation. It increases over time but generally tends to stabilize as the plan matures.

Liability Volatility Ratio (LVR)

Plans that have higher liability-to-payroll ratios experience more volatile employer contributions (as a percentage of payroll) due to investment return and changes in liability. For example, a plan with a liability-to-payroll ratio of 8 is expected to have twice the contribution volatility of a plan with a liability-to-payroll ratio of 4. The liability volatility ratio is also shown in the table below. It should be noted that this ratio indicates a longer-term potential for contribution volatility. The asset volatility ratio, described above, will tend to move closer to the liability volatility ratio as the plan matures.

Contribution Volatility		**June 30, 2017**		**June 30, 2018**
1. Market Value of Assets	$	161,513	$	196,321
2. Payroll		201,531		208,272
3. Asset Volatility Ratio (AVR) [(1) / (2)]		0.8		0.9
4. Accrued Liability	$	175,080	$	220,475
5. Liability Volatility Ratio (LVR) [(4) / (2)]		0.9		1.1
6. Accrued Liability (7.00% discount rate)		180,775		220,475
7. Projected Liability Volatility Ratio [(6) / (2)]		0.9		1.1

Hypothetical Termination Liability

The hypothetical termination liability is an estimate of the financial position of the plan had the contract with CalPERS been terminated as of June 30, 2018. The plan liability on a termination basis is calculated differently compared to the plan's ongoing funding liability. For the hypothetical termination liability calculation, both compensation and service are frozen as of the valuation date and no future pay increases or service accruals are assumed. This measure of funded status is not appropriate for assessing the need for future employer contributions in the case of an ongoing plan, that is, for an employer that continues to provide CalPERS retirement benefits to active employees.

A more conservative investment policy and asset allocation strategy was adopted by the CalPERS Board for the Terminated Agency Pool. The Terminated Agency Pool has limited funding sources since no future employer contributions will be made. Therefore, expected benefit payments are secured by risk-free assets and benefit security for members is increased while funding risk is limited. However, this asset allocation has a lower expected rate of return than the PERF and consequently, a lower discount rate is assumed. The lower discount rate for the Terminated Agency Pool results in higher liabilities for terminated plans.

The effective termination discount rate will depend on actual market rates of return for risk-free securities on the date of termination. As market discount rates are variable, the table below shows a range for the hypothetical termination liability based on the lowest and highest interest rates observed during an approximate 2-year period centered around the valuation date.

Market Value of Assets (MVA)	Hypothetical Termination Liability[1,2] @ 2.50%	Funded Status	Unfunded Termination Liability @ 2.50%	Hypothetical Termination Liability[1,2] @ 3.25%	Funded Status	Unfunded Termination Liability @ 3.25%
$196,321	$482,816	40.7%	$286,496	$431,839	45.5%	$235,518

[1] The hypothetical liabilities calculated above include a 5 percent mortality contingency load in accordance with Board policy. Other actuarial assumptions can be found in Appendix A of the Section 2 report.

[2] The current discount rate assumption used for termination valuations is a weighted average of the 10-year and 30-year U.S. Treasury yields where the weights are based on matching asset and liability durations as of the termination date. The discount rates used in the table are based on 20-year Treasury bonds, rounded to the nearest quarter percentage point, which is a good proxy for most plans. The 20-year Treasury yield was 2.91 percent on June 30, 2018, and was 2.83 percent on January 31, 2019.

In order to terminate the plan, you must first contact our Retirement Services Contract Unit to initiate a Resolution of Intent to Terminate. The completed Resolution will allow the plan actuary to give you a preliminary termination valuation with a more up-to-date estimate of the plan liabilities. CalPERS advises you to consult with the plan actuary before beginning this process.

Participant Data

The table below shows a summary of your plan's member data upon which this valuation is based:

		June 30, 2017		June 30, 2018
Reported Payroll	$	201,531	$	208,272
Projected Payroll for Contribution Purposes	$	219,418	$	225,931
Number of Members				
Active		2		2
Transferred		0		1
Separated		1		1
Retired		0		0

List of Class 1 Benefit Provisions

This plan has the additional Class 1 Benefit Provisions:

- None

Plan's Major Benefit Options

Shown below is a summary of the major optional benefits for which your agency has contracted. A description of principal standard and optional plan provisions is in the following section of this Appendix.

	Benefit Group	
Member Category	Police	
Demographics		
Actives	Yes	
Transfers/Separated	Yes	
Receiving	No	
Benefit Provision		
Benefit Formula	2.7% @ 57	
Social Security Coverage	No	
Full/Modified	Full	
Employee Contribution Rate	12.00%	
Final Average Compensation Period	Three Year	
Sick Leave Credit	Yes	
Non-Industrial Disability	Standard	
Industrial Disability	Standard	
Pre-Retirement Death Benefits		
Optional Settlement 2	Yes	
1959 Survivor Benefit Level	Level 4	
Special	Yes	
Alternate (firefighters)	No	
Post-Retirement Death Benefits		
Lump Sum	$500	
Survivor Allowance (PRSA)	No	
COLA	2%	

PEPRA Member Contribution Rates

The table below shows the determination of the PEPRA Member contribution rates based on 50 percent of the Total Normal Cost for each respective plan on June 30, 2018. Assembly Bill (AB) 340 created PEPRA that implemented new benefit formulas and a final compensation period as well as new contribution requirements for new employees. In accordance with Section Code 7522.30(b), "new members … shall have an initial contribution rate of at least 50 percent of the normal cost rate." The normal cost for the plan is dependent on the benefit levels, actuarial assumptions and demographics of the plan particularly the entry age into the plan. Should the total normal cost of the plan change by one percent or more from the base total normal cost established for the plan, the new member rate shall be 50 percent of the new normal cost rounded to the nearest quarter percent.

		Basis for Current Rate		Rates Effective July 1, 2020			
Rate Plan Identifier	**Benefit Group Name**	**Total Normal Cost**	**Member Rate**	**Total Normal Cost**	**Change**	**Change Needed**	**Member Rate**
25551	Safety Police PEPRA Level	24.141%	12.000%	26.044%	1.903%	Yes	13.000%

Section 2

CALIFORNIA PUBLIC EMPLOYEES' RETIREMENT SYSTEM

Section 2 may be found on the CalPERS website (www.calpers.ca.gov) in the Forms and Publications section