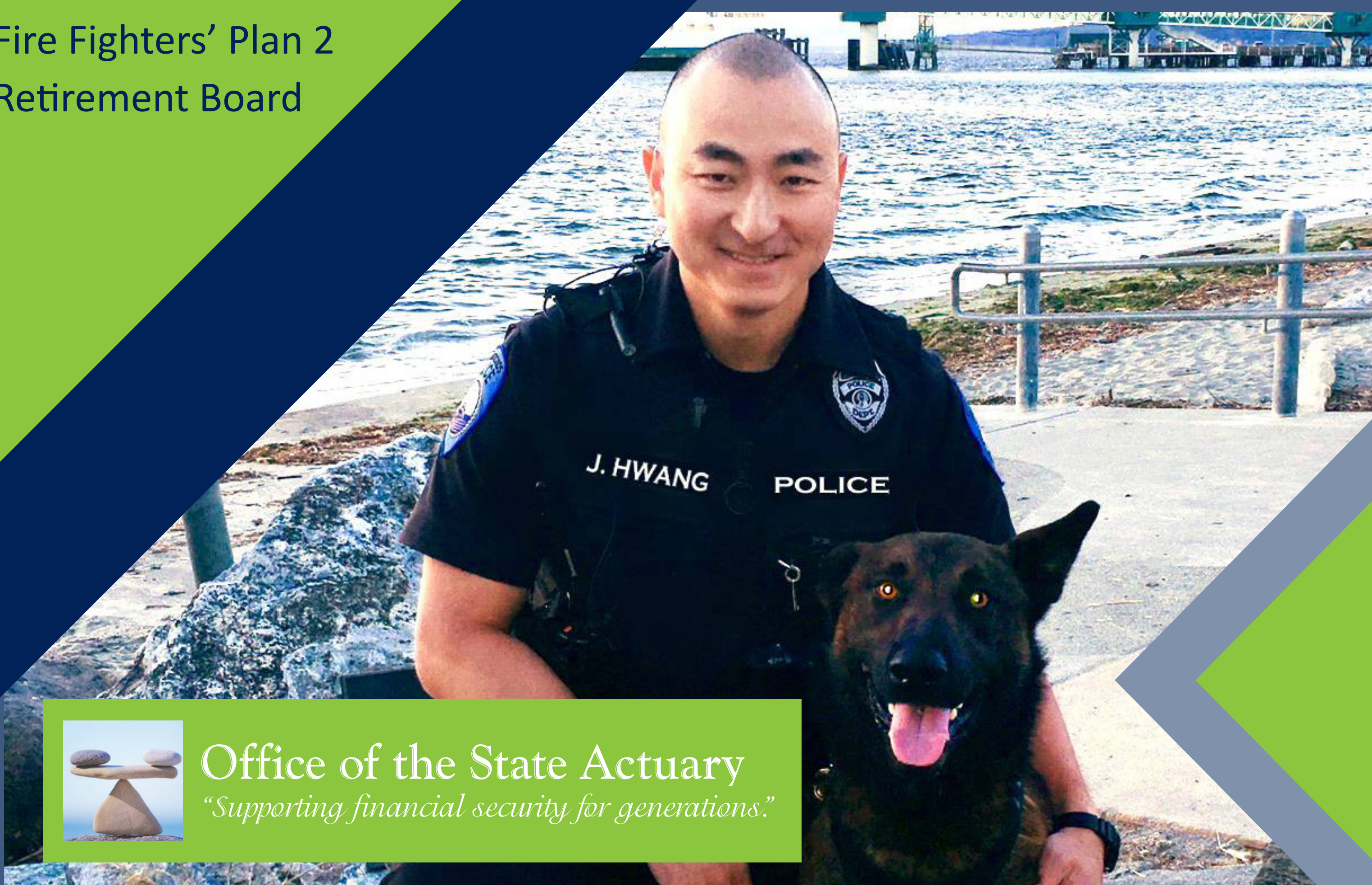
2017 ACTUARIAL VALUATION REPORT

Law Enforcement Officers' and Fire Fighters' Plan 2 Retirement Board



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Letter of Introduction

Law Enforcement Officers' and Fire Fighters' Retirement System Plan 2 Actuarial Valuation Report As of June 30, 2017

November 2018

As required under Chapter 41.45 RCW, this report documents the results of an actuarial valuation of the Law Enforcement Officers' and Fire Fighters' Retirement System Plan 2 (LEOFF 2).

The primary purpose of this valuation is to determine contribution requirements for LEOFF 2 for the 2019-21 Biennium based on a June 30, 2017, measurement date and under the funding policy established by the LEOFF 2 Retirement Board. This valuation also provides information on the funding progress and developments in the plan over the past year.

This report is organized into four sections.

- Summary of Key Results.
- Actuarial Exhibits.
- Participant Data.
- Appendices.

The Summary of Key Results section provides a high-level summary of the valuation results for LEOFF 2. The next two sections of the report provide detailed actuarial asset and liability information and participant data. The Appendices provide access to a summary of the principal actuarial assumptions and methods, a summary of the major plan provisions, and additional information used to prepare this valuation.

The LEOFF 2 Retirement Board has received the 2017 Recognition Award For Funding from the Public Pension Coordinating Council (PPCC). The PPCC is a coalition of three national retirement associations, which establish Public Pension Standards that reflect minimum expectations for public retirement system management, administration, and funding.

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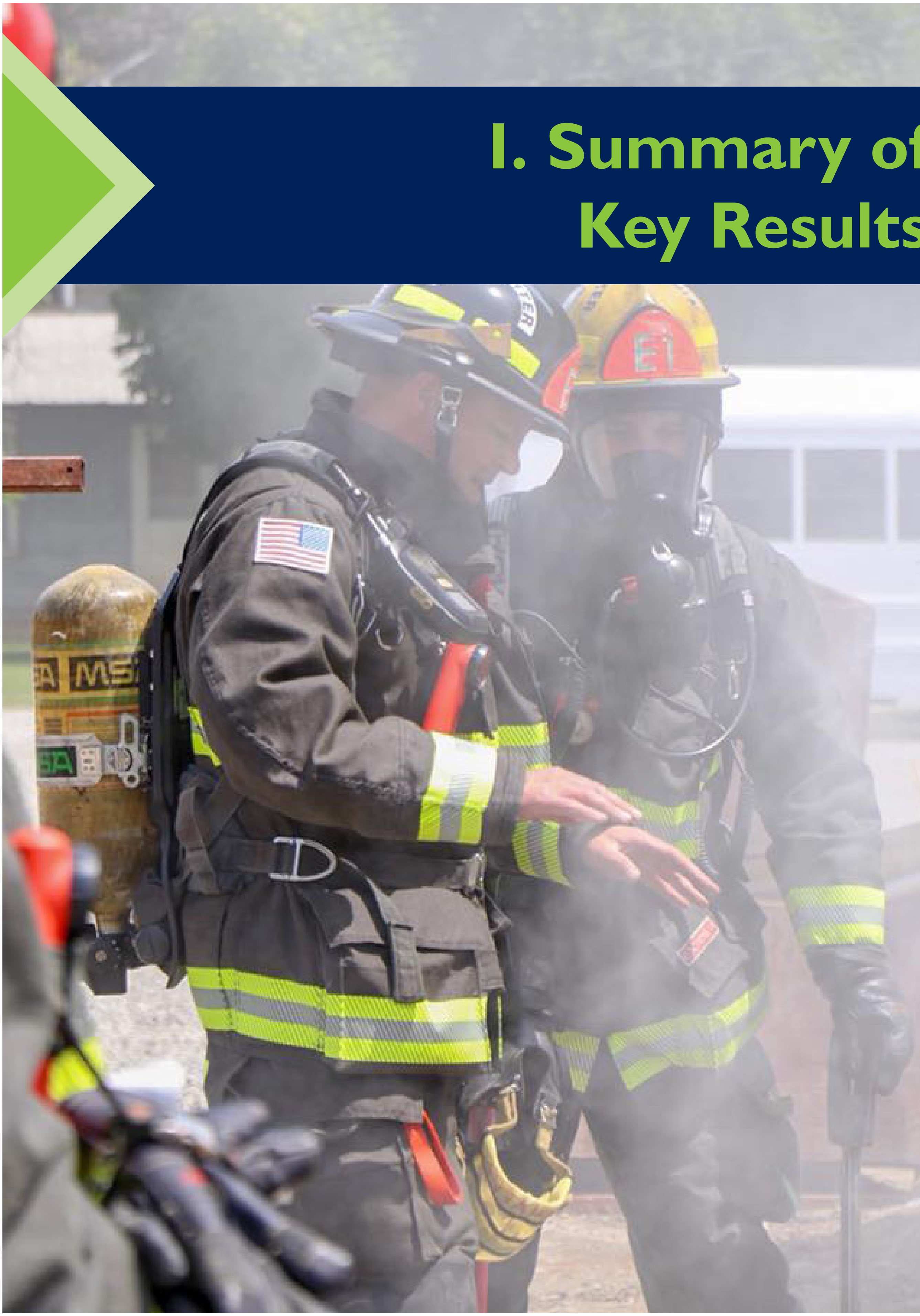
We encourage you to submit any questions you might have concerning this report to our mailing address or our e-mail address at state.actuary@leg.wa.gov. We also invite you to visit our website (leg.wa.gov/osa), for further information regarding the actuarial funding of the Washington State retirement systems.

Sincerely,

Matthew M. Smith, FCA, EA, MAAA	Frank Serra
State Actuary	Actuarial Analyst

I. Summary of Key Results



INTENDED USE

The purpose of this report is to develop contribution rates required to fund the Law Enforcement Officers' and Fire Fighters' Retirement System (LEOFF) Plan 2 for the 2019-21 Biennium based on the June 30, 2017, measurement date and based on the funding policies described in this section. This report provides information on the contribution rates, funding progress, and developments in the plan over the past year. This report also discloses the data, assumptions, and methods we used to develop the contribution rates. This report is not intended to satisfy the accounting requirements under the Governmental Accounting Standards Board rules.

CONTRIBUTION RATES

We determine the member, employer, and state contribution rates as a percentage of salary based on the long-term funding policy adopted by the LEOFF 2 Retirement Board (the Board). The following summary table shows contribution rates based on the 2017 valuation along with rates from the previous valuation. Throughout this report, we reconcile how plan experience compared to our assumptions over the valuation year. In doing so, we compare the contribution rates calculated under this valuation against those rates calculated under the 2016 valuation. Please note, however, that the contribution rates expressed for the 2016 valuation were not collected, as that was not a rate-setting year under the current contribution rate-settting cycle. The Actuarial Exhibits section of this report shows how we developed the contribution rates for 2017.

Calculated Contribution Rates		
	2017	2016
Member	8.59%	7.91%
Employer*	5.15%	4.75%
State	3.44%	3.16%

**Excludes administrative expense rate.*

In addition to calculating contribution rates in this report, we also estimate contribution rates for future biennia based upon projected assets and liabilities. These projected rates can be found on our website, but please note that these rates are subject to change based on modifications to plan provisions, assumptions, and the actuarial experience of the plan.

CONTRIBUTION RATE-SETTING CYCLE

Under current Washington State law, in July of even-numbered years, the Board reviews the basic contribution rates calculated by the Board-retained actuary based on an actuarial valuation performed on asset, participant, and plan information compiled in odd-numbered years. In calculating basic contribution rates, the Board-retained actuary applies the statutory funding policies described in this section. The Board then adopts contribution rates for LEOFF 2 as provided under RCW 41.26.720(1)(a). The adopted rates remain in place for the ensuing biennium, subject to revision by the Legislature.

Contribution Rates			
	2017-19 Adopted	2019-21 Calculated	2019-21 Adopted*
Member	8.75%	8.59%	8.59%
Employer**	5.25%	5.15%	5.15%
State	3.50%	3.44%	3.44%

**Adopted for period 2019-23.*

***Excludes administrative expense rate.*

RCW 41.45.070 requires that a temporary and supplemental contribution rate increase be charged to fund the cost of benefit enhancements enacted following the adoption of the basic rates. Supplemental contribution rates are included in the basic rates at the beginning of the next contribution rate-setting cycle.

FUNDING POLICY

Washington State relies on systematic actuarial funding to finance the on-going cost of the state retirement systems. Under this financing approach, we reduce the cost of future pension payments by the expected long-term return on invested contributions. The LEOFF 2 funding policy splits the required contribution rate by 50 percent for members, 30 percent for employers, and 20 percent for the state.

The state's funding policy is found in RCW 41.45 — Actuarial Funding of State Retirement Systems. It includes the following goals:

- Provide a dependable and systematic process for funding the benefits to members and retirees of the Washington State Retirement Systems.
- Fully amortize the total cost of LEOFF Plan 1 not later than June 30, 2024.
- Continue to fully fund LEOFF 2 as provided by law.
- Establish long-term employer contribution rates that will remain a relatively predictable proportion of future state budgets.
- Fund, to the extent feasible, all benefits over the working lives of those members so that the taxpayers who receive the benefit of those members' service pay the cost of those benefits.

In July 2018, the Board adopted a new long-term funding policy which raises the LEOFF 2 minimum contribution rates from 90 percent to 100 percent of the normal cost rate calculated under the Entry Age Normal (EAN) actuarial cost method. This change now aligns the Board's long-term funding policy with their short-term funding policy. This policy change is reflected in the calculated rates for this report.

If all actuarial assumptions are realized and all future contributions required under this funding policy are made, we expect the funding policy to accumulate sufficient assets to provide for all future benefits for current members when due.

The Washington State Investment Board (WSIB) directs the investment of retirement system contributions. RCW 43.33A.110 requires WSIB to maximize investment returns at a prudent level of risk.

COMMENTS ON 2017 RESULTS

Many factors can influence how actuarial valuation results change from one measurement date to the next. Those factors include changes in the covered population, changes in plan provisions, assumptions, methods, and experience that varies from our expectations.

For this valuation, we changed our economic assumptions, consistent with the assumptions adopted by the Board.

- We lowered the valuation interest rate from 7.50 percent to 7.40 percent.
- We lowered the assumed general salary growth from 3.75 percent to 3.50 percent.
- We lowered the assumed inflation from 3.00 percent to 2.75 percent.

While we made no significant changes to our actuarial methods, there was one LEOFF 2 benefit provision change that had a material impact on the valuation – the addition of Post-Traumatic Stress Disorder to the list of occupational diseases. See the Summary of Plan Provisions section of this report for more details.

The calculated rates in this valuation reflect the Board's July 2018 funding policy decision to set the plan's minimum contribution rates equal to 100 percent of the normal cost rate calculated under the EAN actuarial cost method.

In terms of annual plan experience, the actual rate of investment return on the Market Value of Assets (MVA) was 13.44 percent, which was above the assumed rate. The rate of investment return on the Actuarial (or smoothed) Value of Assets (AVA) was 8.92 percent, which was also higher than expected for the valuation year. We also observed lower than expected salary growth for the year when estimating plan liabilities and the present value of future salaries.

Detailed gain and loss information by system can be found in the Actuarial Exhibits section of this report. Please see the Actuarial Certification Letter for additional comments on the 2017 valuation results.

ACTUARIAL LIABILITIES

The following table summarizes key measures of actuarial liability along with the liabilities from last year's valuation. The Future Value of Fully Projected Benefits represents the total expected value of all future benefit payments for all members as of the valuation date. The Present Value of Fully Projected Benefits represents today's value of the Future Value of Fully Projected Benefits when we discount future benefit payments with the valuation interest rate. In other words, if we invest the Present Value of Fully Projected Benefits as a lump sum amount at the valuation date and earn the currently assumed valuation interest rate each year, we expect there would be enough money to pay all future benefit payments for current members.

The Actuarial Accrued Liability identifies the portion of the present value of future benefits that has been accrued as of the valuation date based on the EAN actuarial cost method.

See the Actuarial Exhibits section of this report for a summary of actuarial liabilities. For projected benefit payments by year, please visit the Interactive Reports page on our website. Also, see the Glossary on our website for brief explanations of the actuarial terms.

Actuarial Liabilities

(Dollars in Millions)	2017	2016
Future Value of Fully Projected Benefits	$100,995	$101,327
Present Value of Fully Projected Benefits	$13,689	$13,013
Present Value of Accrued Benefits*	$10,160	$9,571
Valuation Interest Rate	7.40%	7.50%

**Calculated using Entry Age Normal (EAN) cost method.*

ASSETS

The following table shows the MVA and AVA along with approximate rates of investment return.

To limit the volatility in contribution rates and funded status due to short-term market fluctuations, we smooth (or defer recognition of) the difference between actual and expected annual investment returns over a period not to exceed eight years. The number of years over which we smooth is dependent on the magnitude of the gain or loss. The AVA equals the MVA less the Total Deferred Investment Gains and (Losses) at the valuation date. The AVA can never be less than 70 percent or greater than 130 percent of the MVA.

See the Actuarial Exhibits section of this report for additional information on the plan's assets and for the development of the AVA.

Assets		
(Dollars in Millions)	**2017**	**2016**
Market Value of Assets (MVA)	$11,758	$10,194
Actuarial Value of Assets (AVA)	11,037	10,021
Contributions[1]	316	304
Disbursements	229	208
Investment Return	1,446	244
Other[2]	$30	$22
MVA Return[3]	13.44%	2.65%
AVA Return[4]	8.92%	6.21%

[1] Employee and Employer.

[2] Includes transfers, restorations, payables, etc.

[3] Time-weighted rate of return on the MVA, net of expenses.

[4] The AVA is used in determining contribution rates.

FUNDED STATUS

The funded status helps readers evaluate the health of a pension plan. A history of funded status measured consistently over a defined period helps readers evaluate a plan's funding progress over time. The funded status represents the portion of the actuarial accrued liability covered by today's actuarial assets. A plan with a 100 percent funded status has one dollar in actuarial assets for each dollar of accrued liability at the valuation date. A plan with a funded status of at least 100 percent is generally considered to be on target with its financing plan. However, a plan more/less than 100 percent funded is not automatically considered over-funded/at-risk. The following table displays the funded status for LEOFF 2.

Funded Status		
(Dollars in Millions)	**2017**	**2016**
a. Entry Age Normal Accrued Liability	$10,160	$9,571
b. Market Value of Assets	11,758	10,194
c. Deferred Gains/(Losses)	720	173
d. Actuarial Value of Assets (b - c)	11,037	10,021
Unfunded Liability - Entry Age Normal (a - d)	($878)	($450)
Entry Age Normal Funded Ratio (d / a)	**109%**	**105%**

Note: Totals may not agree due to rounding.

PARTICIPANT DATA

The following table summarizes the participant data used in the actuarial valuation for the plan year ending June 30, 2017, along with information from last year's valuation. See the Participant Data section of this report for additional information.

Participant Data	2017	2016
Active Members		
Number	17,694	17,186
Total Salaries (in Millions)	$1,879	$1,786
Average Annual Salary	$106,169	$103,947
Average Attained Age	43.2	43.5
Average Service	14.2	14.5
Retirees and Beneficiaries		
Number	4,851	4,259
Average Annual Benefit	$46,727	$44,711
Terminated Members		
Number Vested	863	953
Number Non-Vested*	1,917	1,806

Members who are terminated non-vested and whose contributions remain in the trust fund.

KEY ASSUMPTIONS

The following table displays key economic assumptions used in the actuarial valuation. With this valuation, we lowered the assumed valuation interest rate from 7.50 percent to 7.40 percent. We also lowered the assumed general salary growth from 3.75 percent to 3.50 percent and lowered the assumed inflation from 3.00 percent to 2.75 percent. These changes are consistent with the economic assumptions adopted by the Board during the 2017 Interim.

Key Assumptions	
Valuation Interest Rate	7.40%
Salary Increase	3.50%
Inflation	2.75%
Growth in Membership*	1.25%

Applies to the LEOFF 1 funding method only.

II. Actuarial Exhibits

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Actuarial Certification Letter

Law Enforcement Officers' and Fire Fighters'
Retirement System Plan 2
Actuarial Valuation Report
As of June 30, 2017

November 2018

This report documents the results of an actuarial valuation of the Law Enforcement Officers' and Fire Fighters' Retirement System Plan 2 (LEOFF 2) as defined under Chapter 41.26 of the Revised Code of Washington. The primary purpose of this valuation is to determine contribution requirements for the retirement plan for the 2019-21 Biennium based on a June 30, 2017, measurement date, consistent with the prescribed funding policy established by the LEOFF 2 Retirement Board (the Board). This valuation also provides information on the funding progress and developments in the plan over the past year. This valuation report should not be used for other purposes. Please replace this report with a more recent report when available.

Future actuarial measurements may differ significantly from the current measurements presented in this report if plan experience differs from that anticipated by the assumptions or changes occur in the methods, assumptions, plan provisions, or applicable law. We have not performed analysis of the potential range of such future measurements for the purposes of this valuation. Please see the Risk Assessment page of our website for stochastic analysis of possible future outcomes.

The valuation results summarized in this report involve calculations that require assumptions about future economic and demographic events. We believe that the assumptions and methods used in the underlying valuation are reasonable and appropriate for the primary purpose stated above. The use of another set of assumptions and methods, however, could also be reasonable and could produce materially different results. Actual results may vary from our expectations.

The assumptions used in this valuation for investment return, inflation, and salary growth were adopted by the Board in the 2017 Interim. The membership growth assumption was prescribed by the Legislature. Please see our latest Economic Experience Study report for further information on the economic assumptions. We developed the demographic assumptions used in this valuation during the 2007-2012 Demographic Experience Study. The Legislature prescribed the actuarial cost and asset valuation

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methods. In our opinion, all methods, assumptions, and calculations are reasonable and are in conformity with generally accepted actuarial principles and standards of practice as of the date of this publication.

The Department of Retirement Systems (DRS) provided us with audited member and beneficiary data. We checked the data for reasonableness as appropriate based on the purpose of the valuation. The Washington State Investment Board (WSIB) and DRS provided audited financial and asset information. We relied on all the information provided as complete and accurate. In our opinion, this information is adequate and substantially complete for purposes of this valuation.

The asset smoothing method adopted during the 2003 Legislative Session (Chapter 11, Laws of 2003, E1) was intended to address the volatility of contribution rates under the aggregate funding method when used in combination with the existing asset allocation policy of WSIB. The combination of the current asset smoothing method with any other funding method or asset allocation policy may not be appropriate.

The Board's rate adoption for 2019-23 represents a continuation of their funding policy that produces stable contribution rates, measured at June 30, 2017, that exceed the requirements under the aggregate actuarial cost method. In our opinion, this funding policy is reasonable and consistent with the Board's goals of risk management and stable contribution rates. The adoption of contribution rates below the rates adopted by the Board for 2019-23 could also be reasonable, but potentially inconsistent with the Board's goals.

The undersigned, with actuarial credentials, meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein. While this report is intended to be complete, we are available to offer extra advice and explanations as needed.

Sincerely,

Matthew M. Smith, FCA, EA, MAAA
State Actuary

Luke Masselink, ASA, EA, MAAA
Senior Actuary

CONTRIBUTION RATES

Member and Employer Rate Summary		
	2017	2016
Member	8.59%	7.91%
Employer*	5.15%	4.75%
State (Normal Cost)	3.44%	3.16%
State (Plan 1 UAAL)	0.00%	0.00%
Total State	3.44%	3.16%

**Excludes administrative expense rate.*

Development of Employer/State Rates	
a. Total Normal Cost	17.18%
b. Member Normal Cost (a x 50%)	8.59%
c. Total Employer/State Normal Cost (a - b)	**8.59%**
d. State Normal Cost (a x 20%)	3.44%
e. Employer Normal Cost (c - d)*	5.15%
f. Cost to Amortize UAAL	0.00%
g. Total Employer Contribution Rate (e + f)**	**5.15%**

**Excludes administrative expense rate.*
***The State pays 20% of the total normal cost for LEOFF 2. This reduces the total employer contribution rate from 8.59% to 5.15%.*

The following tables show the development of the normal cost rates. Consistent with the Law Enforcement Officers' and Fire Fighters' (LEOFF) Plan 2 Retirement Board's (the Board) funding policy, the normal cost rates include minimum contribution rates to provide stable and adequate contribution rates over time. The minimum rates are 100 percent of the normal cost calculated under the Entry Age Normal (EAN) funding method. Please see the Glossary for a more detailed explanation of EAN.

We include information for LEOFF Plan 1 because the prior funding policy required the state to amortize any LEOFF 1 Unfunded Actuarial Accrued Liability (UAAL) not later than June 30, 2024, using projected salaries of both LEOFF 1 and LEOFF 2 members. If a positive UAAL in LEOFF 1 re-emerges, future funding policy may vary from the past funding policy.

II. Actuarial Exhibits

We provide additional contribution rate calculations on the Interactive Reports page of our website. This interactive report caclulates member and employer contribution rates that vary based on the asset valuation method and discount rate that the user selects. The state's funding policy, defined under Chapter 41.45 RCW, does not vary based on these selections.

Development of Normal Cost Rates		
(Dollars in Millions)		
1. Calculation of Member Normal Cost Rate		
a.	Future Value of Fully Projected Benefits	$100,995
b.	Present Value of Fully Projected Benefits	13,672
c.	Valuation Assets	11,037
d.	Unfunded Fully Projected Benefits (b - c)	2,635
e.	Plan 1 Present Value of Future Salaries (PVS)	N/A
f.	Plan 2 PVS	20,614
g.	Weighted PVS (2e + 2f)	$41,227
h.	Member Normal Cost (d / g)	6.39%
i.	Member Minimum Contribution Rate	8.54%
j.	Member Contribution Rate with Minimum	8.54%
k.	Change In Plan Provisions (Laws of 2018)	0.05%
l.	Calculated Member Contribution Rate (j + k)	8.59%
2. Calculation of Employer/State Normal Cost Rate		
a.	Present Value of Fully Projected Benefits	$13,672
b.	Valuation Assets	11,037
c.	Unfunded Fully Projected Benefits (a - b)	2,635
d.	Present Value of Member Contributions	1,317
e.	Employer/State Responsibility (c - d)	$1,317
f.	Plan 2 PVS	$20,614
g.	Employer/State Normal Cost (e / f)	6.39%
h.	Employer/State Minimum Contribution Rate	8.54%
i.	Employer/State Contribution Rate with Minimum	8.54%
j.	Change In Plan Provisions (Laws of 2018)	0.05%
k.	Calculated Total Employer/State Contribution Rate (i + j)	8.59%
3. Adopted Contribution Rates for 2019-23		
a.	Member Contribution Rate*	8.59%
b.	Employer Contribution Rate (a - c)*	5.15%
c.	State Contribution Rate*	3.44%
d.	**Total Contribution Rate (a + b + c)**	**17.18%**

Note: Totals may not agree due to rounding.

**LEOFF 2 rate: 50% Employee, 30% Employer, 20% State.*

Amortization of the Plan 1 Unfunded Actuarial Accrued Liability (UAAL)	
(Dollars in Millions)	
a. Future Value of Fully Projected Benefits	$9,449
b. Present Value of Fully Projected Benefits (PVFB)	4,124
c Valuation Assets	5,403
d. Actuarial Present Value of Future Normal Costs	0
e. UAAL (b - c - d)	(1,280)
f. Amortization Date	6/30/2024
g. Present Value of Projected Salaries beyond 2017	$8,673
h. Preliminary Contribution Rate (e / g)*	(14.76%)
i. Change In Plan Provisions (Laws of 2018)	0.00%
j. Contribution Rate to Amortize the UAAL (h + i)*	(14.76%)

Note: Totals may not agree due to rounding.
**No LEOFF 1 UAAL contributions are required when the plan is fully funded under current funding methods and assumptions.*

ACTUARIAL LIABILITIES

Present Value of Fully Projected Benefits	
(Dollars in Millions)	
Active Members	
Retirement	$8,911
Termination	160
Death	126
Disability	413
ROC* on Termination	108
ROC* on Death	156
Total Active	**$9,873**
Inactive Members	
Terminated	$221
Service Retired	3,241
Disability Retired	203
Survivors	135
Total Inactive	**$3,799**
Laws of 2018	**17**
2017 Total	**$13,689**
2016 Total	**$13,013**

Note: Totals may not agree due to rounding.
**Return of Contributions.*

Entry Age Normal Accrued Liability*	
(Dollars in Millions)	
Active Members	
Retirement	$5,994
Termination	31
Death	44
Disability	226
ROC** on Termination	(30)
ROC** on Death	95
Total Active	**$6,360**
Inactive Members	
Terminated	$221
Service Retired	3,241
Disability Retired	203
Survivors	135
Total Inactive	**$3,799**
Laws of 2018	**1**
2017 Total	**$10,160**
2016 Total	**$9,571**

Note: Totals may not agree due to rounding.

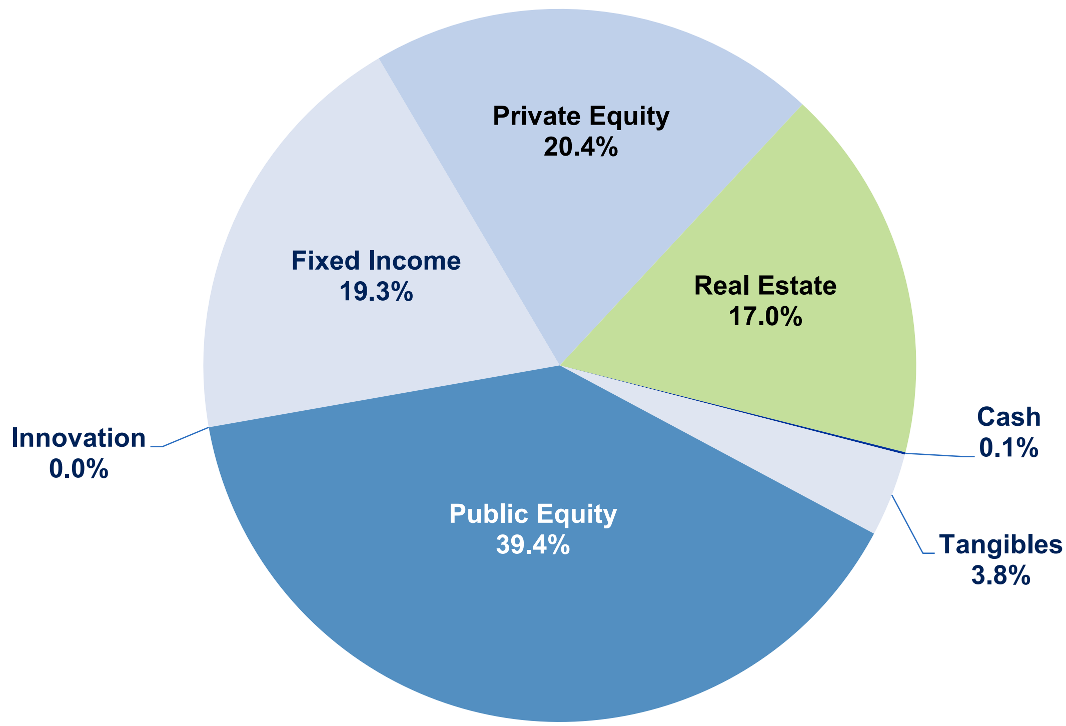
**Calculated using the Entry Age Normal (EAN) cost method. This method was not used to determine contribution requirements.*

***Return of Contributions.*

We report expected projected benefit payments, as well as the present value of these payments, on our website by year under the statutorily assumed interest rate. We also show supplementary benefit payment projections that vary by hypothetical interest rate assumptions. For more information or to view projected benefit payments, please visit the Interactive Reports page of our website.

PLAN ASSETS

Retirement Commingled Trust Fund (CTF) Asset Allocation



Note: Innovation allocation was 0.03%.
Source: Washington State Investment Board.

Cash: Highly liquid, very safe investments that can be easily converted into cash, such as Treasury Bills and money-market funds.

Fixed Income: Securities representing debt obligations and usually having fixed payments and maturities. Different types of fixed income securities include government and corporate bonds, mortgage-backed securities, asset-backed securities, convertible issues, and may also include money-market instruments.

Innovation: Fund that provides the ability to invest in a broad range of assets that fall outside the traditional asset classes or management style of existing asset classes.

Public Equity: Shares of U.S. and non-U.S. corporations that trade on public exchanges or "over-the-counter." The ownership of a corporation is represented by shares that are claimed on the corporation's earnings and assets.

Private Equity: The infusion of equity capital into a private company (one that is not available on the public markets). Private equity investments include securities that are not listed on a public exchange and are not easily accessible to most individuals. These investments range from initial capital in start-up enterprises to leveraged buyouts of mature corporations.

Real Estate: An externally-managed selection of partnership investments with the majority of the partnerships invested in high-quality real estate leased to third parties.

Tangibles: The tangible asset portfolio invests in sectors such as infrastructure, timber, agriculture, natural resources, commodities, or other sectors consistent with the goals of the asset class.

Change in Market Value of Assets	
(Dollars in Millions)	
2016 Market Value	**$10,194**
Revenue	
Contributions	
Member	158
Employer/State	158
Total Contributions	316
Investment Return	1,446
Restorations*	30
Transfers In	0
Miscellaneous	0
Total Revenue	**$1,792**
Disbursements	
Monthly Benefits	220
Refunds	7
Total Benefits	227
Transfers Out	0
Expenses	2
Total Disbursements	**$229**
Payables	$0
2017 Market Value (MV)**	$11,758
2017 Actuarial Value (AV)**	$11,037
Ratio (AV/MV)	**94%**

Note: Totals may not agree due to rounding.

**Includes additional annuity purchases and service credit purchases.*

***2017 MV and AV excludes $18.4 million held in the LEOFF 2 Benefit Improvement Account.*

Calculation of Actuarial Value of Assets			
(Dollars in Millions)			
a. Market Value at 6/30/2017			$11,758
Deferred Gains and (Losses)			
Plan Year Ending	**Smoothing Period**	**Years Remaining**	
6/30/2017	7	6	581
6/30/2016	6	4	(331)
6/30/2015	3	0	0
6/30/2014	8	4	439
6/30/2013	5	0	0
6/30/2012	7	1	(56)
6/30/2011	8	1	87
b. Total Deferral			**$720**
c. Market Value less Deferral (a - b)			$11,037
d. 70% of Market Value of Assets			$8,230
e. 130% of Market Value of Assets			$15,285
f. Actuarial Value of Assets*			**$11,037**

Note: Totals may not agree due to rounding.

**Actuarial Value of Assets can never be less than 70% or greater than 130% of the Market Value of Assets.*

Investment Gains and (Losses) for Prior Year	
(Dollars in Millions)	
a. 2016 Market Value*	$10,162
b. Total Cash Flow	113
c. 2017 Market Value*	11,720
d. Actual Return (c - b - a)	$1,445
e. Weighted Asset Amount	$10,219
f. Expected Return (7.5% x e)	766
g. Investment Gain/(Loss) for Prior Year (d - f)	678
h. Dollar-Weighted Rate of Return*	14.14%

Note: Totals may not agree due to rounding.

**Source: Washington State Investment Board.*

FUNDED STATUS

In our actuarial valuation report, we calculate a plan's funded status by comparing (a) the plan's current assets, determined under an asset valuation method, to (b) the actuarial accrued liability of its members calculated under an actuarial cost method. Funded status can vary significantly depending on the purpose of the measurement and the assumptions and methods used to determine the funded status.

Based on the purpose of the measurement, actuaries can select from several acceptable actuarial cost methods when measuring a plan's funded status. The cost methods vary in the manner they allocate benefits to past and future time periods. Generally speaking, benefits allocated to past service are considered accrued (or earned). Please see the Glossary on our website for an explanation of the actuarial cost methods we use in this actuarial valuation.

Consistent with financial reporting under Governmental Accounting Standards Board (GASB) requirements, we report funded status using the EAN actuarial cost method. However, the funded status measures we share in this report may still vary from those presented in the Department of Retirement Systems *Comprehensive Annual Financial Report*. These differences occur because the assumptions and methods that apply for determining contribution requirements (under a funding valuation) may not apply for financial reporting under GASB accounting standards (an accounting valuation). Put another way, these measurements still represent distinct measurements for distinct purposes and the results may vary between the two reports.

To determine the present value (today's value) of accrued benefits we discount future benefits to the valuation date using the valuation interest rate. The valuation interest rate is adopted by the Board and is intended to be consistent with the long-term expected return under the plan's funding policy. (Note: This discount rate may vary from the rate used for financial reporting under GASB accounting standards.)

In addition to the valuation interest rate, we use the same long-term assumptions to develop the funded status measure in this report as we use for determining the contribution requirements of the plan. We don't expect the assumptions to match actual experience over short-term periods. However, we do expect these assumptions to reasonably approximate average annual experience over long-term periods. This measure of funded status is consistent with the state's current funding policy and financing plan for future retirement benefits.

For reporting funded status and calculating contribution requirements, we also use an asset valuation method to determine the Actuarial Value of Assets (AVA). This asset valuation method smooths the inherent volatility in the Market Value of Assets (MVA) by deferring a portion of annual investment gains or losses for a certain number of years. Investment gains and losses occur when the annual return on investments varies from the long-term assumed rate. To determine the 2017 investment gains or losses, we used an investment return assumption of 7.50 percent. The AVA provides a more stable measure of the plan's assets on an ongoing basis.

With this background in mind, we display the funded status on an "actuarial value" basis. For the actuarial basis, we use the assumed long-term rate of return and AVA consistent with the plan's funding policy.

It's also reasonable and acceptable to report funded status using other assumptions and methods. The resulting funded status will change with the use of assumptions and methods that vary from what we present in this report. Please visit the Interactive Reports page of our website for funded status measures that vary by interest rate assumptions and asset valuation methods.

We include information for LEOFF Plan 1 because the prior funding policy required the state to amortize any LEOFF 1 UAAL not later than June 30, 2024, using projected salaries of both LEOFF 1 and LEOFF 2 members.

Generally speaking, under current funding policy, when a plan is less/more than 100 percent funded, we expect higher/lower contribution requirements in the near term to return to a 100 percent funded status over time. A plan with a funded status above 100 percent will require future contributions if the plan has not yet accumulated sufficient assets to pay both the expected cost of benefits that have been earned today and the expected cost of benefits that will be earned by current members in the future. As of the valuation date, and under the data, assumptions and methods used for this actuarial valuation, only LEOFF Plan 1 has sufficient assets to cease ongoing contributions.

The funded status measures presented in this report are not sufficient to determine whether a plan has enough assets to terminate or settle the plan obligations.

Funded Status on an Actuarial Value Basis*

(Dollars in Millions)	LEOFF 1	LEOFF 2
EAN Accrued Liability	$4,121	$10,160
Valuation Assets	$5,403	$11,037
Unfunded Liability	($1,282)	($878)
Funded Ratio		
2017	**131%**	**109%**
2016	126%	105%
2015	125%	105%
2014	127%	107%

**Liabilities valued using the EAN cost method at an interest rate of 7.5% LEOFF 1 and 7.4% for LEOFF 2. All assets have been valued under the actuarial asset method.*

ACTUARIAL GAIN/LOSS

The following table displays actuarial gains and losses, expressed as contribution rate changes. Actuaries use gain/loss analysis to compare actual changes to assumed changes from various sources. These sources include assets, liabilities, and salaries. We also use this analysis to determine:

- The accuracy of our valuation model and annual processing.

- Why contribution rates changed.
- The reasonableness of the actuarial assumptions.

Actuarial gains will reduce contribution rates; actuarial losses will increase contribution rates. Under a reasonable set of actuarial assumptions, actuarial gains and losses will offset over long-term experience periods.

Change in State Contribution Rate by Source		
Change in Rate	**LEOFF 1[1]**	**LEOFF 2[2]**
2016 Rate Before Laws of 2017	**(13.30%)**	**3.16%**
Remove Rate Floor	0.00%	(0.11%)
Fixed Amortization Date Adjustment[3]	0.33%	N/A
2016 Adjusted Rate	**(12.97%)**	**3.05%**
Liabilities		
Salaries	0.02%	(0.10%)
Termination	0.00%	0.00%
Retirement	0.01%	0.01%
Disability	0.00%	0.00%
Mortality	(0.04%)	0.00%
Return to Work	0.00%	0.36%
Inflation (CPI)	(0.33%)	N/A[4]
Other Liabilities	0.23%	0.01%
Total Liability Gains/Losses	**(0.11%)**	**0.28%**
Assets[5]		
Contributions	(0.02%)	(0.06%)
Disbursements	0.00%	(0.01%)
Investment Returns	(1.09%)	(0.15%)
Asset Gains/Losses	**(1.11%)**	**(0.22%)**
Incremental Changes		
Plan Change	0.00%	0.00%
Method Change	0.00%	0.00%
Assumption Change	0.00%	0.00%
Correction Change	0.00%	0.00%
Experience Study Change	(0.24%)	(0.30%)
Total Incremental Changes Gains/Losses	**(0.24%)**	**(0.30%)**
Present Value of Future Salaries Gains/Losses	**0.02%**	**(0.24%)**
Other Gains/Losses	**(0.35%)**	**(0.01%)**
Total Change	**(1.79%)**	**(0.49%)**
2017 Preliminary Rate	**(14.76%)**	**2.56%**
Increase from Applied Rate Floor	N/A	0.86%
Laws of 2018	0.00%	0.02%
2017 Adjusted Rate	**(14.76%)**	**3.44%**

[1] The contribution rate is the UAAL rate for plan 1. No contributions are required under current law when the plan remains fully funded.

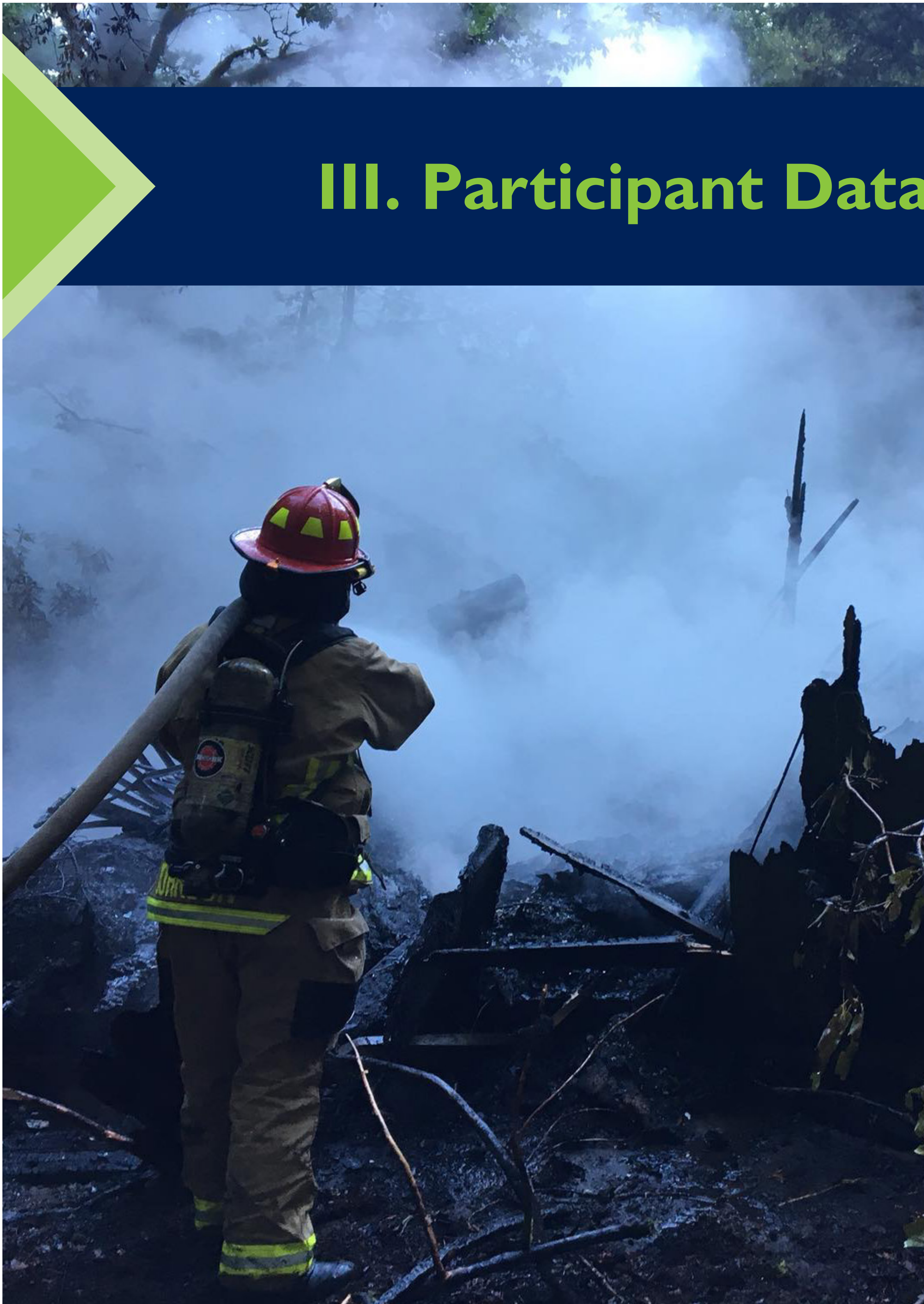
[2] The State contribution rate to LEOFF 2 is 20% of the Normal Cost.

[3] Fixed amortization date is 6/30/2024.

[4] Inflation Gains/Losses included in Other Liabilities for LEOFF 2.

[5] Asset Gain/Loss performed on AVA not MVA.

III. Participant Data



OVERVIEW OF SYSTEM MEMBERSHIP

LEOFF 2 membership includes fire fighters; emergency medical technicians; law enforcement officers including sheriffs; university, port, and city police officers; and Department of Fish and Wildlife enforcement officers.

Active Membership By Employer as of June 30, 2017	
State Agencies	134
Higher Education	118
Community Colleges	0
K-12	0
Counties	2,889
County Sub Divisions	290
First Class Cities	5,235
Other Cities	4,921
Ports	189
Education Service District	0
Fire Districts	3,918
Public Utility District	0
Water Districts	0
Energy Northwest	0
Unions	0
TOTAL	**17,694**

The following table summarizes participant data changes from last year's valuation to this year's valuation. We divide the participant data into two main categories:

- Actives – members accruing benefits in the plan.
- Annuitants – members and beneficiaries receiving benefits from the plan.

Reconciliation of Active and Annuitant Data	
2016 Actives	**17,186**
Transfers	0
Hires/Rehires	1,372
New Retirees	(518)
Deaths	(17)
Terminations	(329)
2017 Actives	**17,694**
2016 Annuitants	4,259
New Retirees*	603
Annuitant Deaths	(26)
New Survivors	24
Other	(9)
2017 Annuitants	**4,851**
Ratio of Actives to Annuitant	**3.65**

**Includes service and disability retirees.*

SUMMARY OF PLAN PARTICIPANTS

Summary of Plan Participants	2017	2016
Active Members		
Number	17,694	17,186
Total Salaries (Millions)	$1,879	$1,786
Average Age	43.2	43.5
Average Service	14.2	14.5
Average Salary	$106,169	$103,947
Terminated Members		
Vested	863	953
Non-Vested*	1,917	1,806
Total Terminated	**2,780**	**2,759**
Annuitants		
Service Retired**	4,200	3,660
Disability Retired	409	379
Survivors	242	220
Total Annuitants	**4,851**	**4,259**
Average Monthly Benefit, All Annuitants	$3,894	$3,726
Number of New Service Retirees	572	523
Average Monthly Benefit, New Service Retirees	$4,798	$4,632

**Members who are terminated non-vested and whose contributions remain in the trust*
***Includes retirements from active and terminated with vested status.*

The following table contains the average age at entry, in addition to the average age and service at member retirement, for both law enforcement officers and fire fighters. Final Average Salary information for members who retired within this valuation year with between 21 and 25 years of service is also included.

Additional Plan Participant Information	2017	2016
All Law Enforcement Officers		
Average Entry Age	33.0	32.9
Average Age at Retirement	55.7	55.6
Average Service at Retirement	22.7	22.7
All Fire Fighters		
Average Entry Age	32.1	32.0
Average Age at Retirement	56.8	56.6
Average Service at Retirement	24.6	24.6
All Members who Retired in the Last Year (with 21-25 Years of Service)		
Average Monthly Final Average Salary	$8,720	$8,542

IV. Appendices

ACTUARIAL METHODS AND ASSUMPTIONS

To calculate the contribution rates necessary to pre-fund a plan's benefits, an actuary uses an actuarial cost method, an asset valuation method, and assumptions. This section, together with the web pages linked below, list the actuarial methods and assumptions used for this valuation.

ACTUARIAL METHODS

Please see the Actuarial Methods web page for descriptions of the actuarial cost methods and asset valuation method we use for this valuation.

ACTUARIAL ASSUMPTIONS

We make an assumption to help us project the value of accumulated employee contributions with interest if a member elects a refund of contributions instead of a deferred retirement allowance upon termination. For this valuation year, we used a Law Enforcement Officers' and Fire Fighters' Plan 2 (LEOFF 2) member contribution rate for savings fund accruals of 8.79 percent.

For a list of additional actuarial assumptions that we used in developing this valuation, please see the Actuarial Assumptions web page of our website.

CHANGES IN METHODS AND ASSUMPTIONS SINCE THE LAST VALUATION

- We updated our economic assumptions to be consistent with the assumptions adopted by the LEOFF 2 Retirement Board (the Board).
  - We lowered the valuation interest rate from 7.50 percent to 7.40 percent.
  - We lowered the assumed general salary growth from 3.75 percent to 3.50 percent.
  - We lowered the assumed inflation from 3.00 percent to 2.75 percent.
- We modified how our valuation software calculates benefits paid to remarried duty-related death survivors. We also updated the Cost-of-Living-Adjustment (COLA) tied to this benefit to reflect the new general salary growth assumption.
- We updated the trend that our valuation software uses to project medical inflation for survivors of a duty-related death, and for certain medical-related duty disability benefits. For additional information on this medical trend, see our *2017 Other Post-Employment Benefits Actuarial Valuation Report*.

SUMMARY OF PLAN PROVISIONS

The summary of key plan provisions used in the actuarial valuation are provided in two sets of tables. The table below contains plan provisions that can change frequently, while the provisions that change less frequently can be found on the Summary of General Plan Provisions page of our website.

These tables present high-level summaries and are not meant to be exhaustive lists. The table below, for instance, only shows plan provision changes that passed during the 2018 Legislative Session and had a material rate impact on the valuation. For complete details of plan provisions, please refer to the statutes governing the retirement systems or contact the plan administrator, Department of Retirement Systems. In the unlikely event that information contained in these summary tables conflicts with state law, the law takes precedence.

Summary of Frequently Changing Plan Provisions

	LEOFF 1	LEOFF 2
COLA	Full CPI*	Lesser of CPI* or 3%
Changes in Plan Provisions Since Last Valuation	None	PTSD Occupational Disease (C 264 L 18)

**CPI: Urban Wage Earners & Clerical Workers, Seattle-Tacoma-Bremerton, WA - All Items.*

THE OFFICE OF THE STATE ACTUARY'S (OSA) WEBSITE

Our website (leg.wa.gov/osa) contains additional information and educational material not included in this report. The site also contains an archive of other recent studies that OSA has produced. The following is a list of materials found on our website that could be useful to the reader.

GLOSSARY

Definitions for frequently used actuarial and pension terms.

AGE DISTRIBUTIONS

Tables summarizing valuation statistics by member/annuitant age.

HISTORICAL DATA

Table summarizing valuation statistics by valuation period.

2017 REPORT ON FINANCIAL CONDITION AND ECONOMIC EXPERIENCE STUDY

Report examining the financial health of the retirement systems and long-term economic assumptions.

2007-2012 DEMOGRAPHIC EXPERIENCE STUDY

Most recent report examining demographic behavior.

2016 RISK ASSESSMENT

Information examining the effect of unexpected experience on the retirement plan.

CONTRIBUTION RATE PROJECTIONS

Forecasts for future contribution rates based on projected assets and liabilities.

INTERACTIVE REPORTS

Set of reports displaying funded status, projected benefit payments, and contribution rates that vary by key inputs the user selects.

2017 ACTUARIAL VALUATION REPORT

Law Enforcement Officers' and Fire Fighters' Plan 2 Retirement Board

Office of the State Actuary

"Supporting financial security for generations."