



Office of the State Actuary

"Securing tomorrow's pensions today."

September 14, 2009

Steve Nelsen, Executive Director
Law Enforcement Officers' and Fire Fighters' Plan 2 Retirement Board
P.O. Box 40918
Olympia, Washington 98504-0918

Dear Steve:

The Office of the State Actuary (OSA) prepared reports on the financial condition and long-term economic assumptions of the Law Enforcement Officers' and Fire Fighters' Retirement System, Plan 2 (LEOFF 2). The Report on Long-Term Economic Assumptions includes our recommended assumptions. We attached both reports to this letter.

We provide this information to assist you in evaluating whether to adopt changes to the long-term economic assumptions identified in RCW 41.45.035.

Executive Summary

Over the past two years, LEOFF 2 experienced a significant decline in health due to investment losses, delayed contributions, and increased benefits. This decline in health adds upward pressure to future contribution requirements. We project contribution rates will increase by 5 percent above the highest levels ever collected, and we estimate a significant risk they could remain above these levels for up to ten years.

Two years ago we recommended a change in the current long-term economic assumptions, but concluded the assumptions at that time, while not our best estimate, were reasonable. After completing this economic experience study, we conclude the current assumptions remain reasonable, but not representative of our best estimate. In our opinion, changing the assumptions today would strengthen the long-term health of the plan, but if done in isolation of other risk management exercises would make shorter-term health risks worse.

Addressing the financial condition and the long-term economic assumptions of LEOFF 2 will require coordinated planning and further study. We recommend a shift in focus to identifying, measuring, and managing retirement system risks. With a plan to manage these risks, LEOFF 2 will be well positioned to remain healthy well into the future.



Summary of Financial Condition

Thirty to Forty Percent Drop in Funded Status Expected

A lot has changed over the past two years. Nearly all public pension plans experienced large investment losses, including Washington's. Investment returns for Washington's Commingled Trust Fund (CTF) for the fiscal years ending June 30, 2008, and June 30, 2009, were –1.2 percent and –22.8 percent, respectively. The assumed annual rate of investment return, set in state law, is 8.0 percent. In terms of actuarial funding, this means LEOFF 2 must recover from a 30-40 percent drop in funded status. We expect this recovery to occur over the next ten to twenty years.

Upward Pressure on Future Contribution Requirements

To make this recovery LEOFF 2 will require increases in future contributions. We project contributions from all employers and the state general fund (GF-S) to almost double over the next 12 years. The table below shows projected employer contributions for the next 12 fiscal years.

Projected Employer Contributions		
<i>(Dollars in Millions)</i>	GF-S	Total Employer
2009-11	\$106.4	\$266.0
2011-13	119.9	299.8
2013-15	114.6	286.0
2015-17	128.2	320.9
2017-19	166.8	417.1
2019-21	\$202.1	\$505.5

Future Investment Returns Unlikely to Prevent Increase in Contributions

The previous table shows projected, or what we call “expected,” contributions based on current assumptions. Employer contributions through the 2011-13 Biennium depend on the rate of return through June 30, 2009, and don't change when we vary future investment returns. Employer contributions in 2013-2015 and beyond will depend heavily on actual investment returns during 2009-2011 and beyond. The next table shows how our projections change under different investment scenarios.



Projected Employer Contributions Under Different Investment Scenarios						
(Dollars in Millions)	Pessimistic	Expected	Optimistic	Pessimistic	Expected	Optimistic
	GF-S			Total Employer		
2009-11	\$106.4	\$106.4	\$106.4	\$266.0	\$266.0	\$266.0
2011-13	119.9	119.9	119.9	299.8	299.8	299.8
2013-15	114.6	114.6	114.6	286.0	286.0	286.0
2015-17	144.2	128.2	128.2	360.1	320.9	320.9
2017-19	201.6	166.8	143.0	503.5	417.1	357.5
2019-21	\$254.7	\$202.1	\$160.0	\$637.3	\$505.5	\$399.8

Under an optimistic investment return scenario, biennial employer contributions could increase 50 percent over the next twelve years. Under a pessimistic scenario, biennial contributions could increase by nearly two and a half times over the next twelve years. More likely than not, future contributions will fall between the pessimistic and optimistic scenarios. Please see the attached Report on Financial Condition for more details about the different rate of return scenarios.

LEOFF 2 Remains Healthy Today

As a result of the large investment losses of the last two fiscal years, delayed contributions, and increased benefits, LEOFF 2 experienced a significant decline in health, but remains healthy today.

The table below summarizes today's health assessment for LEOFF 2 using "The Minimum Projected Funded Status." This measure represents the lowest funded status we observe when we project the current valuation results into the future using current assumptions. This table shows only the expected results.

Today's Health Assessment			
Plan	Funded Status*	Min. Projected Funded Status**	Health
LEOFF 2	133.9%	96.9%	Healthy

* Based on preliminary 2008 Actuarial Valuation Report.

** Based on current assumptions.

Today's Health Assessment Assumes Employers Make All Future Contributions

Alone, the table above does not tell the whole story. In making this health assessment, we assumed employers make all required contributions, regardless of their magnitude. We expect contribution rates in LEOFF 2 will increase above the maximum levels ever collected.



Employer Contribution Rates Projected to Increase Above Highest Levels Ever Collected

We estimate contribution rates in LEOFF 2 will increase above the maximum levels ever collected. The following table shows the number of years we expect the total employer contribution rates to remain above their historical maximums. The total employer contribution rate represents the sum of the local government and state contribution rates for LEOFF 2.

Years Total Employer Contribution Rates Exceed Historical Maximum			
System	First Year Above*	Total Years Above	Historical Maximum
LEOFF 2	2020	8	8.83%

*Fiscal Year Ending.

Please see the attached Report on Financial Condition for more details on projected employer contribution rates.

Plan Health Weakens if Employers Can't Make Contributions

The health of LEOFF 2 weakens if the state and local governments don't make the expected contributions. For example, we would likely downgrade LEOFF 2 from healthy to unhealthy in that situation.

Significant Chance Contribution Rates Could Increase Even More

We estimate a 50 percent chance maximum contribution rates will fall between the pessimistic and optimistic investment scenarios identified in the next table. For example, in LEOFF 2 there's a better than 25 percent chance total employer contribution rates may not exceed their current level of 8.45 percent. However, there's also a 25 percent chance LEOFF 2 employer contribution rates increase above 13.30 percent.

Maximum Total Employer Contribution Rates				
System	Pessimistic / Year*	Expected / Year*	Optimistic / Year*	Historical Maximum
LEOFF 2	13.30% / 2040	9.23% / 2022	8.45% / 2009	8.83%

*Fiscal Year Ending.

Note: The year shown represents the peak in projected total employer contribution rates. The rate shown equals the rate collected in the year the rates peak.



Some Funding Policies Designed to Improve Health of Plans

The LEOFF Plan 2 Retirement Board (the Board) and the Legislature made some changes in the plan's funding policy during the last decade designed to stabilize or improve the health of LEOFF 2. In 2003, the Board and Legislature adopted a change to the plan's asset valuation, or smoothing method, to reduce the impact of short-term market swings on contribution rates. In 2006, the Legislature first adopted minimum contribution rates for many of the plans to help maintain an adequate and stable level of funding over the long-term. The Board adopted a higher minimum contribution rate policy for LEOFF 2 and recently adopted contribution rates above that minimum contribution rate policy for 2009-11 Biennium.

The Board adopted mortality assumptions for LEOFF 2, recognizing projected improvements in future life spans in 2008. The contribution rates the Legislature adopted for 2009-2011 for all other plans did not reflect these assumptions. Recognizing these future improvements in life expectancy, before they appear in the plan's experience, provides an opportunity to prefund those liabilities instead of realizing repeated losses.

Finally, the Legislature lowered the general salary increase assumption from 4.50 to 4.00 percent for all plans but LEOFF 2 during the 2009 Legislative Session. All else being equal, this serves to lower required plan contributions. The Board retained the 4.50 percent assumption for LEOFF 2.

However, these funding policies alone will not fully address LEOFF 2's current financial condition.

Opportunity to Address Financial Condition Using Risk Analysis and Planning

Given the results of this health assessment, we recommend the Board develop a plan to manage the future health of LEOFF 2. We suggest the following process:

- ❖ Clearly identify the health risks to LEOFF 2.
- ❖ Establish a process for measuring these risks.
- ❖ Analyze the risks using risk measures.
- ❖ Develop recommendations to manage the risks.

We suggest completing this work before the 2011 Legislative Session. Please see the enclosed Primer on Risk Analysis and Risk Measures for additional details on this recommendation.

Since many of the risks facing LEOFF 2 apply to all the retirement systems, the LEOFF 2 Board might consider coordinating this analysis with the governing bodies of the other systems. OSA has special expertise in measuring and analyzing retirement system risk and we're available to assist policy makers.



Please see the attached Report on Financial Condition for more details on this health assessment.

Summary of Long-Term Economic Assumptions

According to RCW 41.45.030(2), by October 31, 2007, and every two years thereafter, the Pension Funding Council (PFC) may adopt changes to the long-term economic assumptions for all plans except LEOFF 2. The Board has the authority to adopt long-term economic assumptions for LEOFF 2 and typically follows the same two-year cycle as the PFC.

Guided by applicable actuarial standards of practice, we performed an economic experience study to develop a best-estimate range for each long-term economic assumption. The recommended assumptions represent our best estimate from within each range. We developed them as a consistent set of economic assumptions and advise you to review them as a set of assumptions.

Changes Recommended for Long-Term Economic Assumptions

The table below summarizes the current and recommended long-term economic assumptions.

Assumption	Current	Recommended
Inflation	3.50%	3.25%
General salary growth	4.50%	4.25%
Annual investment return	8.00%	7.50%
Growth in system membership	1.25%	1.75%

We consider all current economic assumptions reasonable, but not representative of our best estimate. We recommend decreasing the current inflation assumption from 3.50 percent to 3.25 percent. To retain consistency with the underlying inflation assumption, we recommend decreasing the current general salary growth assumption from 4.50 to 4.25 percent. We also recommend decreasing the annual investment return assumption from 8.00 percent to 7.50 percent.

Assumption Changes Help in Long Run, Worsen Short-Term Health

Changing the assumptions today strengthens the long-term health of LEOFF 2 by improving the plan’s funded status, lowering future contribution rates, and reducing the impact of rate of return volatility. But if done in isolation of other risk management exercises, adopting the recommended assumptions makes shorter-term health risks worse.

Please see the enclosed Report on Long-Term Economic Assumptions for details and supporting data.



Addressing the financial condition and the long-term economic assumptions of LEOFF 2 will require coordinated planning and further study. We recommend a shift in focus to identifying, measuring, and managing retirement system risks. With a plan to manage these risks, LEOFF 2 will be well positioned to remain healthy into the future.

We look forward to working with you and offer the expertise of our office to assist in your efforts to address the needs of LEOFF 2. We hope you find this information useful during your deliberations.

Sincerely,

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

Chris Jasperson, ASA, MAAA
Associate Pension Actuary

Enclosures

Primer on Risk Analysis and Risk Measures

Attachments

2009 LEOFF 2 Report on Financial Condition

LEOFF 2 Report on Long-Term Economic Assumptions

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Primer on Risk Analysis and Risk Measures

We intend the following primer to supplement and be used with the 2009 Report on Financial Condition. It provides a high-level overview of how general actuarial practice evolved over time in response to public pension plan sponsors increasing risk in their investment portfolios. The primer also describes how to apply the proposed risk analysis process from the letter above in Washington. For more information please see the Report on Financial Condition or contact the Office of the State Actuary.

Actuarial Practice Continues to Evolve

Actuarial practice evolved as investment policies changed. The first public pension funds relied heavily on fixed income securities. In general, returns on fixed income investments vary less than returns on equity investments. As a result, actuaries could more easily estimate future pension costs, and their models and assumptions required less sophistication.

Traditional Actuarial Models: Using Best-Estimate Assumptions

Traditional actuarial models projected a pension plan's future benefit payments and discounted those payments to the valuation date. Actuaries used the plan's expected rate of investment return to determine the "present value" or today's value of all future pension payments. The resulting contribution rate, and underlying obligation, represented a single number actuaries updated every year.

Projected Valuation Results: Using Best-Estimate Assumptions

As pension benefits became a larger percent of government payrolls, plan sponsors began to invest more aggressively to lower the expected financing costs. Over time the single "snap shot" valuations became less effective at showing how future costs could change. The volatility of future contribution requirements became a larger concern for plan sponsors. Actuaries responded by giving more information or "risk analysis" using their traditional models. By projecting valuation results into the future, actuaries showed how future contribution requirements could change.

Projected Valuation Results: Using Scenario-Based Assumptions

The next evolution in actuarial practice added risk analysis around the actuary's best-estimate assumptions. Projected valuation results were helpful, but traditional projections still relied on the results of the latest "snap shot" valuation and projected those results forward only using best-estimate assumptions. To improve the relevance of their work, actuaries responded by projecting valuations using different assumptions or scenarios (i.e., pessimistic, optimistic, and expected). These results provided plan sponsors with a better idea of how widely plan costs could vary. Understanding the risk and how much the results can vary, is especially important considering today's asset allocations that invest more



heavily in volatile investment vehicles with higher expected returns (i.e., stocks and private equity).

Projected Valuation Results: Using Simulated Assumptions

The latest developments in actuarial practice take scenario-based projections to the next level. Since the assumed level of future investment return is by far the most important variable in pension funding, many actuaries let their investment return assumption vary using probability distributions. The mid-point of the distribution may represent an actuary's best estimate of future investment return. By using the distribution and underlying variance from the average, an actuary can communicate the chance that future plan costs will reach certain levels.

Proposed Risk Analysis and Risk Measures

To identify solutions to manage the future health of Washington's public pension plans, the state actuary recommends performing risk analysis using the latest advancements in actuarial practices. We suggest the following process:

- ❖ Clearly identify the health risks to the retirement systems.
- ❖ Establish a process for measuring these risks.
- ❖ Analyze the risks using risk measures.
- ❖ Develop recommendations to the Legislature for managing the risks.

Identifying Risks

Identifying risks is the most important step in this process, requiring input from all stakeholders. You'll need to answer key questions. For example:

- ❖ What's failure for the pension systems?
- ❖ What level of cost is unaffordable for employers and Plan 2 members?
- ❖ What level of funding is unacceptable?
- ❖ What level of contribution volatility is unacceptable for government budgeting?

Analyzing Risks with Risk Measures

After you've identified the risks and unacceptable outcomes for the plans, the next step is to measure and analyze those risks. For example, you could determine the chances that:

- ❖ Plans 1 run out of money.
- ❖ Plans 2/3 drop below a certain funded status (i.e., 80 percent).



- ❖ Contribution rates increase above a certain level (i.e., historical maximum).
- ❖ Contributions increase by more than a certain percent from one biennium to the next (i.e. 20 percent).

Identifying Ways to Manage Risks

After you've identified, measured, and analyzed the risks, the final step is to identify options to manage those risks. For example, what's the retirement systems' tolerance for future benefit improvements? How would a new funding or investment policy impact these risk measures? How much short-term flexibility in funding policy can the systems withstand? How would the creation of new benefit structures impact these risk measures? What about a combination of several changes?

Following this process can help educate all stakeholders about the current risks in our state retirement systems. Working together to identify ways to manage these risks improves the health of the state's retirement systems and creates shared ownership.



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2009 LEOFF 2 Report on Financial Condition



Prepared for the Law Enforcement Officers' and Fire Fighters'
Plan 2 Retirement Board

September 14, 2009



Office of the State Actuary

"Securing tomorrow's pensions today."

Report prepared by the Office of the State Actuary

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Additional Assistance Provided by

Washington State Investment Board



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Office of the State Actuary

"Securing tomorrow's pensions today."

Letter of Introduction

2009 LEOFF 2 Report on Financial Condition

September 14, 2009

This report documents an actuarial assessment of the financial condition of the Law Enforcement Officers' and Fire Fighters' Retirement System Plan 2 (LEOFF 2).

The primary purpose of this assessment is to assist the LEOFF Plan 2 Retirement Board in evaluating whether to adopt changes to the long-term economic assumptions identified in RCW 41.45.035. Please see the Actuarial Certification for additional information concerning the development, purpose, and use of this assessment.

We encourage you to submit any questions you might have concerning this report to our mailing address or our e-mail address at actuary.state@leg.wa.gov. We also invite you to visit our website, at the address below, for further information regarding the actuarial funding of the LEOFF Plan 2 retirement system.

Sincerely,

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

Chris Jasperson, ASA, MAAA
Associate Pension Actuary

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2009 LEOFF 2 Report on Financial Condition

RCW 41.45.030 requires us to submit information to the Pension Funding Council (PFC) about the financial condition of the state retirement systems. We submit similar information to the Law Enforcement Officers' and Fire Fighters' Plan 2 (LEOFF 2) Retirement Board (the Board) to support their assumption setting process. The full report for LEOFF 2 follows.

Introduction

It's important to review the relevant history of LEOFF 2 and its prognosis for the future before we assess the financial condition or health. We start with a review of the factors that caused the recent decline in plan health.

Many factors combine to cause the current decline in the financial condition of LEOFF 2. These factors include:

- ❖ Large investment losses throughout the last decade.
- ❖ Delayed contributions.
- ❖ Increased benefits.

These factors combined to cause the health of LEOFF 2 to weaken, putting upward pressure on future contribution rates. Recent action of the Board and the Legislature lessened that upward pressure on contribution rates and delayed some of the deterioration of plan health.

Key Changes Since Last Report

Since we produced the last report in 2007, several events impacted the health of LEOFF 2. These events include:

- ❖ During 2008-2009 the economy entered a recession, causing pension plan assets to drop by nearly 25 percent.
- ❖ During the 2007-09 Biennium LEOFF 2 contribution rates increased to their highest levels ever, 8.83 percent, completing a four-year phase-in.
- ❖ In 2007 the Board adopted minimum contribution rates, first effective in the 2009-11 Biennium.
- ❖ In 2008 the Board recognized improvements in future life spans by adopting projected mortality assumptions.
- ❖ In 2008 the Board adopted a fixed contribution rate for the 2009-11 and 2011-13 Biennia above the level required by their

underlying funding method – and minimum contribution rate – equal to the expected long-term cost of their plan. The 2009 Legislature did not revise these contribution rates.

We discuss the impacts of these changes, and review some of the changes that occurred prior to 2007, in more detail below.

Factors Leading to the Decline of the Plan's Health

Several factors caused the health of LEOFF 2 to decline. This weakening of the plan health puts upward pressure on future contribution rates. We will discuss each of the following factors in more detail:

- ❖ Large investment losses throughout the last decade.
- ❖ Delayed contributions.
- ❖ Increased benefits.

Investment Losses

In 2001, anticipating higher future rates of investment return, the Legislature increased the assumed rate of return for purposes of financing plan benefits from 7.5 percent to its current level of 8.0 percent. Along with the increase in the assumed rate of return came a corresponding decrease in required LEOFF 2 contributions. What followed was one of the worst decades of investment performance on record.

The compound annual rate of return over the ten fiscal years ending from 2000-2009, equaled 3.95 percent. By law, we assume an 8.00 percent annual rate of return over the same period. Only the 1930s yields a lower return over a decade. The compound annual rate of return for that ten-year period dropped to 3.56 percent. The largest single year loss since 1931 occurred in 2009 when the plans' assets fell -22.84 percent. This loss overshadows the five previous years of gains.

The reduction in contributions from the Legislature's increase in the assumed rate of investment return in 2001 and the significant investment losses from 2000-2009 contributed to the declining health of LEOFF 2.

Delayed Contributions

Delayed contributions over the last decade also contributed to the declining health of the retirement plans. Short-term actuarial funding policy during the last decade produced historically low and unsustainable contributions rates. For example, member contribution rates fell to as low as 4.39 percent on May 1, 2002. In comparison, the member contribution rate on September 1, 1997, was 8.48 percent. Allowing the contribution rates to drop to unsustainably low levels effectively delayed required plan funding.

Contributions were also delayed when the costs of material liabilities were not recognized until after they occurred. For example, projected improvements in mortality were not funded when the liabilities were first recognized. The LEOFF 2 Board adopted contribution rates in 2004 for the 2007-09 Biennium. The contribution rates adopted in 2004 were higher than those the Board reviewed in 2006 without recognizing projected improvements in mortality, but slightly lower than the rates from 2006 including the mortality assumption change. Overall, since the Board did not adjust the rates they adopted in 2004, only a modest amount of prefunding was delayed.

The recent four-year phase-in represents an example of how contribution rates can be delayed without hurting a plan's health. In 2004, when contribution rates started to rise and return to historical levels, the Board phased-in the increases over a four-year period. In this case the Board structured the phase-in to ensure all required contributions eventually got paid – with contributions *less* than actuarially required during 2005 and 2007 and *more* than required in 2006 and 2008. The success of this phase-in relied on the recovery of the delayed contributions in the second half of each of the 2005-07 and 2007-09 Biennia.

Increased Benefits

Certain benefit improvements also contributed to the declining health of LEOFF 2. Benefit improvements increase the liabilities of the plan. Adding adequately funded liabilities to a plan does not necessarily decrease a plan's health. However, some benefit improvements pose a greater risk of not being adequately funded over the long-term, hurting the health of the plan. These include benefit improvements that are not fully funded, either when enacted or over the working lifetimes of members, and benefit improvements granted when contribution rates are at unsustainably low levels. Failure to adequately fund benefit improvements puts upward pressure on contribution rates and weakens the health of the plan.

In 2000 the Legislature lowered the LEOFF 2 retirement age from 55 to 53 and introduced the subsidized early retirement reduction factors for members retiring between ages 50 and 53 with at least 20 years of service. The decrease in retirement age and the subsidized retirement benefits increased the costs of the plans in two ways: they provide an incentive for retiring earlier and they pay larger benefits. These benefits apply to all service credit for current members. As a result, these benefit improvements won't be funded over the working lifetimes of the current members closest to retirement.

Furthermore, the Legislature provided these benefits at a time when contribution rates were well below their expected long-term levels. Employers must now pay for these improved benefits at the same time contribution rates for all other benefits return to their expected long-term levels. In combination with the investment losses and deferred funding, the granting of benefit improvements puts additional pressure on contribution rates to increase above their maximum historical levels.

Some Funding Policies Designed to Improve Health of Plans

The Legislature and the Board made some changes in the plan's funding policy during the last decade designed to stabilize or improve the health of LEOFF 2. In 2003, the Legislature adopted a change to the asset valuation, or smoothing method, to reduce the impact of short-term market swings on contribution rates. In 2007, the Board adopted minimum contribution rates to help maintain an adequate and stable level of funding over the long-term. These rates became effective in the 2009-11 Biennium. However, the rates adopted by the Board that became effective in 2009 are higher than required by the minimum contribution rates. Along with minimum contribution rates, the new asset valuation method should help eliminate some of the contribution rate volatility we've seen in the recent past.

The Board adopted mortality assumptions recognizing projected improvements in future life spans in 2008. Recognizing these future improvements in life expectancy before they appear in the plan's experience provides an opportunity to prefund those liabilities instead of realizing repeated losses.

Changes in funding policies alone may not fully address the plan's current financial condition.

Projected Contribution Rates

We reviewed the relevant history of LEOFF 2 and explored the factors contributing to the recent decline in health. Now we address how this decline in health will affect future contribution requirements. Since many of the improvements in funding policy just went into effect, they will not suffice to overcome the other factors contributing to the deterioration of plan health. Consequently, we project contribution rates will rise to historically high levels over the next five to six biennia. Not coincidentally this peaking of contribution rates coincides with the complete recognition of the investment losses from 2008 and 2009. We expect total employer contribution rates will exceed their previous historical maximums by about 5 percent. The total employer contribution rate represents the sum of the local government and State contribution rates for LEOFF 2.

The following table shows the:

- ❖ Maximum total employer contribution rates we project the plan to pay over the next 15 years using the current assumptions.
- ❖ Current and historical maximum total employer contribution rates.
- ❖ Highest rates we expect employers to pay in the future.
- ❖ Percent we expect the projected rates to exceed the current rates and their historical maximums.

Total Employer* Contribution Rates					
System	Current	Projected Max	Historical Max	% Over Current	% Over Historical Max
LEOFF 2	8.45%	9.23%	8.83%	9.23%	5%

*Represents the sum of the local government and state contribution rates.

These increases in contribution rates are not permanent. If all contributions can be made and future experience matches what we assume, contribution rates will return to and eventually drop below the historical maximum. We expect this could take over 15 years. The following table shows the number of years we expect total employer contribution rates to remain above the historical maximum.

Years Above Historical Maximum		
Total Employer* Contribution Rates		
System	First Year Above**	Number of Years Above
LEOFF 2	2020	8

*Represents the sum of the local government and state contribution rates.

**Fiscal Year Ending.

Projected Employer Contributions

We expect contributions, in dollar terms, to increase faster than contribution rates. Contribution rates are a percent of salary. Even if the rates remained constant from year to year, the contribution dollars would increase as salaries increase. In general, the increase in contribution dollars would increase at the rate of general salary growth and system growth each year. Using the current assumptions we expect contribution dollars to grow at about 6.1 percent per year (“one plus the general salary growth assumption” multiplied by “one plus system growth assumption”).

When contribution rates increase, we expect contribution dollars to increase more than 6.1 percent per year. The following table compares the biennium to biennium increases of the GF-S and Total Employer contribution dollars we expect using the current economic assumptions.

<i>(Dollars in Millions)</i>	Projected Dollar Contributions		Biennial Percent Increase		
	Biennium	GF-S	Total Employer	GF-S	Total Employer
2009-11	\$106.4	\$266.0			
2011-13	119.9	299.8	12.7%	12.7%	
2013-15	114.6	286.0	(4.5%)	(4.6%)	
2015-17	128.2	320.9	11.9%	12.2%	
2017-19	166.8	417.1	30.1%	30.0%	
2019-21	202.1	505.5	21.1%	21.2%	
2021-23	227.2	568.4	12.4%	12.4%	
2023-25	251.2	627.2	10.5%	10.3%	
2025-27	274.1	685.7	9.1%	9.3%	
2027-29	299.2	747.1	9.1%	9.0%	
2029-31	324.2	811.4	8.4%	8.6%	
2031-33	\$351.1	\$878.3	8.3%	8.2%	

The Board adopted fixed contribution rates for the 2009-11 and 2011-13 Biennia. As a result we see the percent increase in contributions increase at slightly more than the expected rate of 6.1 percent per year. After the four-year period with fixed contribution rates, we assumed the Board would set contribution rates according to their adopted funding method, which includes the minimum contribution rates at 90 percent of the long-term expected cost of the plan. As a result the contribution rates drop in the 2013-15 Biennium and remain essentially constant for two biennia as the 2008 and 2009 investment losses flow through the asset smoothing method. Then contribution rates increase faster than system and salary growth until the 2019-21 Biennium, where they level off before decreasing. The continued growth in dollars below the 6.1 percent per year expected growth reflects LEOFF 2 contribution rates decreasing back to their long-term expected level.

How Projections Change Under Different Investment Return Scenarios

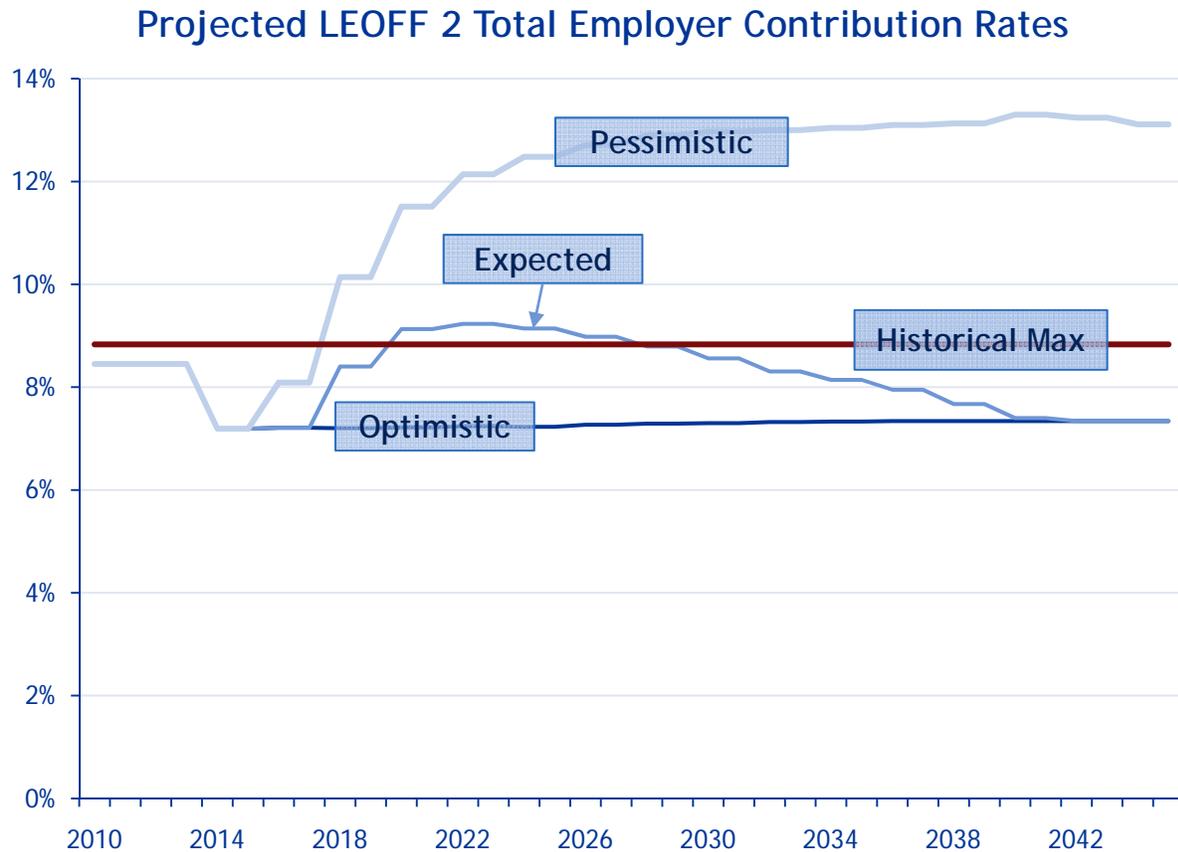
Knowing how our expectation can vary provides just as much data as the expectation itself. When average returns exceed what we expect, contribution rates decrease, and when average returns don't meet our expectations, contribution rates increase. The table below shows contribution dollars under scenarios with the same likelihood of investments returning more or less than assumed. In general, the chance of getting outcomes above or below the median is equal, but the impact on contribution rates and dollars is not. Usually the increase in contribution dollars when average returns are low is much larger than the decrease in contribution dollars when average returns are high. The risk is not symmetric around the 50th percentile, or median.

In LEOFF 2, the minimum contribution rate policy is set at a level where this asymmetry is not as apparent. For example, in the 2019-21 Biennium the optimistic projections would require about \$42.1 million fewer GF-S contributions. The pessimistic projections would require about \$52.6 million more GF-S contributions, or about 25 percent more than the difference between expected and optimistic. In good investment return times the contribution rates drop almost immediately to the floors, which stay relatively constant over time. Thus we see a large number of simulations pegged at the minimum contribution rates. If the minimum contribution rates were not in place we would see contribution rates decreasing more and the asymmetry of the risk would be more apparent.

<i>(Dollars in Millions)</i>	Pessimistic	Expected	Optimistic	Pessimistic	Expected	Optimistic
	GF-S			Total Employer		
09-11	\$106.4	\$106.4	\$106.4	\$266.0	\$266.0	\$266.0
11-13	119.9	119.9	119.9	299.8	299.8	299.8
13-15	114.6	114.6	114.6	286.0	286.0	286.0
15-17	144.2	128.2	128.2	360.1	320.9	320.9
17-19	201.6	166.8	143.0	503.5	417.1	357.5
19-21	\$254.7	\$202.1	\$160.0	\$637.3	\$505.5	\$399.8

In the table above, and throughout this report, we show pessimistic and optimistic scenarios along with our expected numbers. Half of our simulations fall below the expected numbers and the other half above the expected. The expected column represents the median, or mid-point, of the simulations. To demonstrate how results could change around our expectation, we show what’s called the “inter quartile range.” This range represents the number of simulations that fall between the pessimistic and optimistic scenarios. Half of the simulations fall within the inter quartile range. That’s why we say actual results will “more likely than not” fall between the pessimistic and optimistic scenarios. However, that does not mean that better or worse case scenarios may not occur. In terms of projected contributions, 25 percent of our simulations produce contributions below the optimistic scenario and 25 percent of simulations produce contributions above the pessimistic scenario.

The chart below compares the total employer contribution rates under pessimistic, expected, and optimistic scenarios.



Today's Health Assessment

We reviewed the relevant history of LEOFF 2 and the prognosis for future contributions. We now turn to today's health assessment of LEOFF 2. When we evaluate the health of the pension plan, we look at a number of different factors. We use the most current and relevant data we have, including participant data through June 30, 2008, and asset returns through June 30, 2009. We look at the current and projected levels of the funded status and contribution rates. We look at how the funded status behaves over time. For example, with the large asset losses in 2009, we expect the funded status to decrease by around 30 to 40 percent over the next ten years, and then slowly increase over time. We also expect contribution rates to increase over the same ten- to twelve-year period, and then slowly decrease over time. Depending on the health of a plan prior to 2009, the large loss in 2009 will have different implications for future health.

The following table describes how we define the different levels of health of a pension plan based on its funded status.

Health Level	Funded Status
Healthy	Above 85%
Borderline Unhealthy	80-85%
Unhealthy	65-80%
Borderline At-Risk	60-65%
At-Risk	Below 60%

Just because a plan's funded status falls within one of the ranges above does not mean we automatically assign that health status to the plan. We also consider other factors when assessing the health of a plan, such as the maturity of the plan, amount of risk in the investment portfolio, and the likelihood of future required contributions being made.

The table below summarizes our assessment of the current health of LEOFF 2. It also looks forward in our projections of the current valuation results, and finds the lowest funded status we expect. Based on those minimum projected funded statuses we show how we rate the health of LEOFF 2 today.

Today's Health Assessment				
Plan	Funded Status*	Current Health	Min Projected Funded Status**	Expected Health
LEOFF 2	133.9%	Healthy	96.9%	Healthy

* Based on preliminary 2008 Actuarial Valuation Report.

** Based on current assumptions.

In LEOFF 2, despite the funded status dropping below 100 percent, the plan remains healthy.

In assessing the health of the plan, we assumed no future benefit improvements and that the employers will make all required future contributions under current funding policy. If there are future benefit improvements with associated unfunded liability or if employers can't afford future contribution requirements, it becomes much more likely that LEOFF 2 would receive a downgrade in health status. For more information on the projected contribution rates, see that section above.

Opportunity to Improve Financial Condition Using Risk Analysis and Planning

Given the results of this health assessment, we recommend the Board develop a plan to maintain the current and improve the future health of LEOFF 2. We suggest the following process:

- ❖ Clearly identify the health risks to LEOFF 2.
- ❖ Establish a process for measuring these risks.
- ❖ Analyze the risks using risk measures.
- ❖ Develop recommendations to manage the risks.

We suggest completing this work before the 2011 Legislative Session. Please see the Primer on Risk Analysis and Risk Measures enclosed with the Transmittal Letter for additional explanation on this recommendation.

Since many of the risks facing LEOFF 2 apply to all the retirement systems, the Board might consider coordinating this analysis with the governing bodies of the other systems. The OSA has special expertise in measuring and analyzing retirement system risk and we're available to assist policy makers.

Some of the areas we suggest you pay special attention to include:

- ❖ Short to medium-term affordability concerns caused by projected increases in contribution rates.
- ❖ Unbalanced risk of higher future contribution requirements and how the current minimum contribution rate policy interacts with this risk.

We have concerns about the affordability of future contributions due to the increase in contribution rates we expect over the next 15 years. By coordinating risk management efforts you can (1) address the short- to medium-term funding pressures on the plan and (2) change the long-term economic assumptions. By addressing these items you will improve the long-term affordability of the plan.

We also have concerns associated with the unbalanced nature of the risk around the expected contribution rates. When assets earn more or less than we expect the plans will not face identical changes in contribution rates. When assets earn more than expected contribution rates decline, but the decline is small relative to the increases in contribution rates when assets earn less than expected. Some of this risk can be managed in the future by reconsidering how funding and benefit policies are best coordinated with the asset allocation policy of the commingled trust fund.

Addressing the financial condition and the long-term economic assumptions of LEOFF 2 will require coordinated planning and further study. We recommend a shift in focus to identifying, measuring, and managing retirement system risks. With a plan to manage these risks, LEOFF 2 will be well positioned to remain healthy into the future.

Please see the executive summary contained in the Transmittal Letter for comments concerning the coordination of this report with the LEOFF 2 Economic Experience Study report.

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Actuarial Certification

2009 LEOFF 2 Report on Financial Condition

September 14, 2009

This report documents the results of an actuarial assessment of the financial condition of the retirement plans defined under Chapter 41.26 (excluding Plan 1) of the Revised Code of Washington. The primary purpose of this assessment is to assist the Law Enforcement Officers' and Fire Fighters' Plan 2 (LEOFF 2) Retirement Board (the Board) in evaluating whether to adopt changes to the long-term economic assumptions identified in RCW 41.45.035. We understand the report may be used for other purposes, including a preliminary identification of the health risks facing the retirement plan. However, this report does not represent a complete risk analysis of this retirement plan. Please replace this report in the future when the results of a more recent health assessment become available.

This health assessment involved a projection of future actuarial valuation results using simulated rates of future investment return and projected new entrants. Please see the 2007 Actuarial Valuation Report (AVR) for the data, assumptions, and methods used in determining the initial actuarial valuation results for this projection. Please see the Actuarial Certification in the 2007 AVR for additional information concerning the development, purpose, and use of the 2007 actuarial valuation results.

We updated the results of the 2007 AVR to reflect the most recent and available plan provisions and participant and asset data. Plan provisions reflect changes from the 2008 Legislative Session. We did not include supplemental contribution rates from the 2009 Legislative Session. Participant data reflects preliminary retirement system census data through June 30, 2008. Asset data reflects preliminary returns through June 30, 2009.

The Department of Retirement Systems provided preliminary 2008 member and beneficiary data to us. We checked the data for reasonableness as appropriate based on the purpose of this assessment. The Washington State Investment Board (WSIB) provided preliminary asset information as of June 30, 2009. An audit of the financial and participant data was not performed. 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 assessment.



We relied on the capital market assumptions (CMAs) from the WSIB to perform our asset projections. We reviewed the CMAs for reasonableness as appropriate based on the purpose of this assessment.

The health assessment summarized in this report involves the interpretation of many factors and the application of professional judgment. We believe that the data, assumptions, and methods used in the underlying assessment are reasonable and appropriate for the primary purpose stated above. The use of another set of data, assumptions, and methods, however, could also be reasonable and could produce materially different results. Another actuary may review the results of this analysis and reach different conclusions.

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

The undersigned, with actuarial credentials, meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein.

Sincerely,

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

Chris Jaspersen, ASA, MAAA
Associate Pension Actuary

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Appendix A

How We Developed and Varied Our Projections

To produce the projections used in this report, we relied on the preliminary results of the 2008 Actuarial Valuation Report (AVR). We also relied on the Washington State Investment Board (WSIB) Capital Market Assumptions (CMAs) and reported returns through June 30, 2009.

“Our projections” refers to the projections we produce by taking the most recent AVR and projecting it forward 50 years. For each future year, we look at the data, assets, and liabilities as though we were producing a new AVR in that year. The data reflects the current population and includes new entrants. From the group of members currently active, we expect some to remain active, some to retire, some to quit and terminate service, etc. When members leave the active workforce, we replace them with new entrants. We assume future new entrants will have the same demographics as recent new entrants. Over time those new entrants also leave active status, and the cycle continues for each projected year. The result is a 50-year projection of valuation results that we use to generate future contribution rates.

Aside from the characteristics of new entrants, we made other assumptions to produce our projections. We assume no new benefit improvements throughout the projection. We assume all required member and employer contributions get made, regardless of their amounts. We assume no changes in WSIB asset allocation or CMAs.

Since the future is uncertain and rates of return cause most of the variation we see in contribution rates, we vary the rate of return earned on plan assets in each year of our projections. This gives us a good idea of the range of results we can expect based on the current asset allocation. We adjusted WSIB’s CMAs for the time horizon of the pension systems (see the LEOFF 2 Report On Long-Term Economic Assumptions for more detail about how we adjusted the CMAs). Using these assumptions we produced a distribution of annual asset returns that could arise given the asset allocation targets of the current WSIB Comingled Trust Fund (CTF) portfolio.

When we vary the annual rates of return earned by the plan, our projections produce different contribution rates. We generated and compared the results of over ten thousand scenarios. In theory each simulation has an equally likely chance of occurring. We relied on this fact to sort and compare the results.

For each scenario we randomly selected a rate of return for each year of the projection. Since each scenario used 50 random returns, we saw some scenarios with very high returns and some with very low returns. Since we looked at a very large number of scenarios, we feel confident that the spectrum of results represents the possible futures. We looked at the 25th, 50th, and 75th percentile of possible future scenarios. The 50th percentile represents the expected future. In this report, we based all projected contribution rates and associated contribution dollars labeled “Expected” on the 50th percentile of the distribution of

scenarios. Similarly, we based all projected results labeled Pessimistic and Optimistic on the 25th and 75th percentiles respectively, of the distribution

Unless otherwise stated in the report, all other data, methods, and assumptions are consistent with the AVR. Plan provisions reflect all changes through the 2008 Legislative Session. We did not include the supplemental rates from the 2009 Legislative Session. We will not publish the final AVR until later this year. As a result we expect the results of this report to be slightly different than if we'd used the final results of the AVR. However, we expect these differences would not be material and would not change our findings and recommendations.

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LEOFF 2 Report on Long-Term Economic Assumptions



Prepared for the Law Enforcement Officers' and Fire Fighters'
Plan 2 Retirement Board

September 14, 2009



Office of the State Actuary

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Report prepared by the Office of the State Actuary

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Additional Assistance Provided by

Washington State Investment Board



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Office of the State Actuary

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Letter of Introduction

LEOFF 2 Report on Long-Term Economic Assumptions

September 14, 2009

This report documents the results of an economic experience study of the Law Enforcement Officers' and Fire Fighters' Retirement System Plan 2 (LEOFF 2).

The primary purpose of this report is to assist the LEOFF Plan 2 Retirement Board in evaluating whether to adopt changes to the long-term economic assumptions identified in RCW 41.45.035. Please see the Actuarial Certification for additional information concerning the development, purpose, and use of this experience study. We organized the report in the following general order:

- ❖ Summary of Recommendations and Key Findings.
- ❖ Background and General Approach to Setting Economic Assumptions.
- ❖ Appendices.

The Summary of Recommendations and Key Findings section provides a high-level summary of the recommendations and key findings of the economic experience study. The Background and General Approach to Setting Economic Assumptions section of the report details the experience study results for each underlying economic assumption. The Appendices contain most of the data supporting our analysis of this experience study.

We encourage you to submit any questions you might have concerning this report to our regular address or our e-mail address at actuary.state@leg.wa.gov. We also invite you to visit our website, at the address below, for further information regarding the actuarial funding of the LEOFF Plan 2 retirement system.

Sincerely,

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

Chris Jasperson, ASA, MAAA
Associate Pension Actuary

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Section I

Summary of Key Results



LEOFF 2 Report On Long-Term Economic Assumptions

RCW 41.45.030 requires us to submit information to the Pension Funding Council (PFC) about the economic experience of the state retirement systems and recommend long-term economic assumptions. We submit similar information to the Law Enforcement Officers' and Fire Fighters' Plan 2 (LEOFF 2) Retirement Board (the Board) to support their assumption setting process. The full report for LEOFF 2 follows.

Summary of Recommendations

We consider all current economic assumptions reasonable, but not representative of our best estimate. The table below shows our recommended economic assumptions.

Assumption	Current	Recommended
Inflation	3.50%	3.25%
General salary growth	4.50%	4.25%
Annual investment return	8.00%	7.50%
Growth in system membership	1.25%	1.75%

Key Findings

Not surprisingly, we've determined the assumed rate of return on investments is the most important economic assumption for funding LEOFF 2. Therefore, reducing the interest rate assumption is the most significant recommendation we make in this report. We also recommend reducing the assumed rate of inflation, decreasing the general salary growth assumption slightly, and increasing the system growth assumption. Changes in these assumptions have far less impact on plan funding than the recommended change in the rate of return assumption.

Based on the Washington State Investment Board's (WSIB) Capital Market Assumptions (CMAs, described in more detail in Appendix H), we feel the current assumed rate of investment earnings is too optimistic in the long-term, given the current target asset allocation. We feel that over time the retirement systems would experience more actuarial losses than gains. This will continually put pressure on contribution rates to increase. See the 2009 LEOFF 2 Report on Financial Condition for more information on the current financial condition of the plans.

We feel that assuming a rate of return on the high end of the best estimate range, such as 8 percent, does not help improve the long-term health of the plans. However, this recommended assumption change, if done in isolation of other risk management exercises, would make shorter-term health risks worse. Adopting a lower interest rate assumption will increase pension costs in the short to medium term. As discussed in the 2009 LEOFF 2 Report on the Financial Condition, contribution rates will increase throughout this period

whether the rate of return assumption changes or not. However, if contributions can be made at the required level using the recommended interest rate assumption, the long-term health of the plans will be improved.

Please see the Executive Summary contained in the Transmittal Letter for comments concerning the coordination of this report with the 2009 LEOFF 2 Report on the Financial Condition.

The Cycle of the Interest Rate Assumption

Using a statutorily assumed rate of return starts a circular process that includes the WSIB asset allocation and our actuarial recommendations.

The cycle repeats as follows:

- ❖ The Legislature (or the Board) mandates a rate of return assumption.
- ❖ The WSIB adopts an asset allocation to attempt to reach the mandated rate of return assumption while taking a prudent level of risk (per their statutory mandate).
- ❖ The state actuary recommends a rate of return assumption for the Board and Legislature to adopt, based on the WSIB's asset allocation and CMAs.

The statutory mandate for the WSIB is “to maximize returns at a prudent level of risk.” We believe the statutory investment return assumption for funding the retirement systems sets a benchmark rate of return the WSIB strives to reach within their statutory mandate. Over time WSIB changed their asset allocations. We believe one reason they changed their asset allocation has been to achieve the statutorily prescribed interest rate. To earn a higher return they have to invest more heavily in asset classes with a higher level of risk. Over time, the return WSIB expects to earn on investments has increased in relation to the risk of their portfolio. However, portfolios with greater levels of risk, and greater expected returns, will usually have greater volatility in returns.

WSIB's current CMAs, adjusted to fit the time horizon of the pension systems, gives them a 41 percent chance of getting or exceeding the 8 percent annual return over the next 50 years. It also gives them a 21 percent chance of returning less than 6 percent annually. Although the current statutory target equals 8 percent (and has since 2001), WSIB's CMAs have never predicted a median return that exceeds 8 percent.

We use the WSIB's CMAs to recommend what we feel the rate of return assumption should be. For example, if the WSIB lowered the level of risk in the Commingled Trust Fund's portfolio, it would flow through the CMAs and result in a lower median rate of return. We would then recommend a lower assumption for the rate of return. And the cycle continues.

Decreasing the risk in the portfolio leads to lower expected annual returns. Lower expected annual returns lead to lower recommended rate of return assumptions.

An example of the Cycle in Action since 2001

In 2001, the Legislature adopted a higher rate of return assumption, increasing the assumption from 7.50 percent to 8.00 percent. Since 1999 the level of risk in the WSIB portfolio increased to produce an expected return close to the statutorily assumed rate. Over that time, the standard deviation around the expected return resulting from the target asset allocation of the portfolio increased from 13.27 percent to 13.89 percent. Since the 2004 CMAs, the median return has increased from about 7.40 percent to a high of about 7.80 percent in 2008. Based on the CMAs we're using, the median return equals 7.56 percent. In 2007, our recommended rate of 7.75 percent coordinated with the 2007 CMAs. Now, with the decrease in expected return of private equities over public equities of 1.00 percent per year, and 25.00 percent of the target asset allocation in private equities, we lower our assumption by 0.25 percent to 7.50 percent.

Risk Measures

We began our analysis by looking at what happens to the funded status and contribution rates in the future using the current assumptions. We looked at changes in these "risk measures" based on possible rate of return scenarios produced by the current asset allocations. For each risk measure we look at three different scenarios. The expected scenario corresponds to the median, or mid-point, rate of return scenario. The pessimistic scenario corresponds to the 25th percentile of returns and the optimistic scenario corresponds to the 75th percentile of returns.

In the table below, we show the following three risk measures for LEOFF 2:

- ❖ **Min Funded Status** represents the lowest funded status we saw in any future year for the given scenario.
- ❖ **Max Total Employer Contribution Rate** represents the sum of the local government and State contribution rates for LEOFF 2. This rate equals the member contribution rate. The measure shown represents the highest level that the total employer contribution rate climbs to in our projections.
- ❖ **Max Ever Paid by Employers** compares the previous measure to the historical maximum.

We calculated the measures shown below using the current assumptions. See the 2009 LEOFF 2 Report on Financial Condition for more information on the outlook of the plans using the current assumptions.

Risk Measure	Pessimistic	Expected	Optimistic
LEOFF 2 Min Funded Status	79.6%	96.9%	111.8%
LEOFF 2 Max Total Employer Contribution Rate	13.30%	9.23%	8.45%
LEOFF 2 Max Ever Paid by Employers		8.83%	

After completing the economic experience study and selecting recommended assumptions, we calculated the same risk measures using the recommended assumptions. The following table shows those results.

Risk Measure	Pessimistic	Expected	Optimistic
LEOFF 2 Min Funded Status	81.3%	93.3%	106.1%
LEOFF 2 Max Total Employer Contribution Rate	13.11%	10.46%	8.45%
LEOFF 2 Max Ever Paid by Employers		8.83%	

As shown in the table things generally get worse before they get better. The funded statuses drop lower and contribution rates increase higher in the short-term, before these measures improve in the long-run. This result highlights the funding challenges facing LEOFF 2 in the short-term. Therefore, we recommend a shift in focus to identifying, measuring, and managing retirement system risks. With a plan to manage these risks, LEOFF 2 will be well positioned to remain healthy well into the future.

Actual costs will ultimately follow from the difference between (1) actual benefits paid by the system and (2) the contributions collected plus the actual investment earnings. The economic assumptions impact the estimated amount of benefits LEOFF 2 will pay and the timing of the funding. Using a lower investment return assumption puts more money in earlier and less money in later. If actual rates of return fall below expected, LEOFF 2 will require more contributions whether funding occurred at a higher or a lower assumed interest rate. Since we don't know how future investments will fair, funding at an appropriately conservative interest rate improves the long-term health of the plan.

For more information on the budget impacts of adopting the recommendations see the Budget Impact of Adopting the Recommended Assumptions section at the end of this report.

Section II

Economic Experience Study



Background and General Approach to Setting Economic Assumptions

Actuarial Standard of Practice Number 27 (ASOP 27), titled Selection of Economic Assumptions for Measuring Pension Obligations, identifies the following process for selecting economic assumptions:

- ❖ Identify components, if any, of each assumption and evaluate relevant data.
- ❖ Develop a best-estimate range for each economic assumption.
- ❖ Select a specific point estimate within the best-estimate range.
- ❖ Review the set of assumptions for consistency.

For each economic assumption, the best-estimate range is “the narrowest range within which the actuary reasonably anticipates that the actual results, compounded over the measurement period, are more likely than not to fall.” The measurement period is the time period after the valuation date when a particular economic assumption will apply. Pension funding occurs over long time periods; therefore, the measurement period for economic assumptions can easily exceed 50 years.

One acceptable approach for setting economic assumptions identified in ASOP 27 is the “building block” method. Using this method, the actuary determines individual components for each assumption. Then the actuary may combine estimates for each component to arrive at a best-estimate range for the given assumption. We used the building block approach for developing the following assumptions:

- ❖ Inflation.
- ❖ General salary growth.
- ❖ Annual rate of investment return.

Experience Study and Recommended Assumptions

For each assumption we studied we will identify:

- ❖ How we use the assumption for funding in our model.
- ❖ The best-estimate range.
- ❖ The single-point best estimate.
- ❖ The data we studied and how we analyzed it.

Inflation

For funding purposes, we primarily use the inflation assumption to model post-retirement Cost-Of-Living-Adjustments (COLAs). We also use the inflation assumption as a building-block component of the nominal investment return assumption and the general salary growth assumption. Since we use inflation for different purposes, we studied three different measures of inflation and how they compare to each other: broad economic inflation, national price inflation, and regional price inflation.

One readily available measure of inflation is the Gross Domestic Product (GDP) deflator. We studied the GDP deflator produced by the Federal Bureau of Economic Analysis. The GDP deflator measures the changes in both price and quantity of the goods produced in a country. This measure generally provides a good measure of broad economic inflation because it does not react solely to changes in price. The GDP deflator reflects changes in consumption habits that occur when prices of goods rise, such as reduced consumption and the substitution of lower priced goods. Because the GDP represents a measure of total economic productivity in a given country, the GDP deflator reflects a changing basket of goods. In general the GDP deflator provides a good indication of whether an economy is growing or shrinking.

The Consumer Price Index (CPI) provides another measure of inflation. The Federal Bureau of Labor and Statistics (BLS) produces the CPIs we studied. BLS produces different CPIs based on different baskets of goods, for different regions of the country, or both. A CPI strictly measures price inflation. It measures changes in price for a fixed basket of goods. It does not take into account changes in consumption habits. State law requires the LEOFF 2 to pay post-retirement COLAs based on changes in the CPI for Urban Wage Earners and Clerical Workers (CPI-W) for Seattle, Tacoma, Bremerton (STB).

We studied both the national CPI-W and the CPI-W STB and reviewed how they compared to the GDP deflator. We built our inflation assumption by adding adjustments for both the national and regional CPI-W to broad economic inflation as measured by the GDP deflator.

Best-Estimate Range:

Broad Economic Inflation
1.25 percent to 3.25 percent

National CPI–W Adjustment
0.25 percent to 0.75 percent

Seattle, Tacoma, Bremerton CPI-W Adjustment
0.00 percent to 0.25 percent

Total Inflation
1.50 percent to 4.25 percent

Recommendation:

Broad Economic Inflation
2.50 percent

National CPI–W Adjustment
0.50 percent

Seattle, Tacoma, Bremerton CPI-W Adjustment
0.25 percent

Total Inflation
3.25 percent

Current Assumption:

3.50 percent

Data:

Inflation Data (**Appendix A**)

Analysis:

We reviewed the indices provided in Appendix A from 1950 to 2008. We used the GDP Deflator for Personal Consumption Expenditures as a proxy for broad economic inflation. The low end of the best estimate range corresponds to the low and high estimates of the GDP deflator in the 2009 Report of the Trustees on the Financial Condition of OASDI. For the remainder of this report we will refer to this as the Social Security Report (SSR).

The high end of the range is slightly lower than the data shown in Appendix A for the entire period. The low end of the range is slightly lower than the GDP deflator forecasts done by GlobalInsight and the Congressional Budget Office. The best-estimate single-point assumption for broad economic inflation, 2.50 percent per year, corresponds with the average of the data shown in Appendix A over the last 20 years and with the Intermediate assumptions in the SSR. Furthermore this equals the level of inflation assumed in the WSIB capital market assumptions.

We based the National CPI-W adjustment on the average difference between that index and the GDP deflator over the last 30 years. Similarly, we based the STB CPI-W adjustment on the average difference between that index and National CPI-W over the last 25 years. The best-estimate single-point assumption for total inflation, 3.25 percent per year, corresponds with the average of the CPI-W STB since 1983. This date generally corresponds to the implementation of the strict monetary policy that kept inflation low over the past 25 years.

Despite the impact of strict monetary policy, we see a mixed outlook for future inflation given the status of the Social Security Program. The actuaries who produce the SSR project annual Social Security costs will exceed tax income starting in 2016. When that occurs, the SSA will cover the annual gap by redeeming special obligations of the Treasury. This scenario may limit the effectiveness of current monetary policy as a means of managing future inflation.

In recognition of the persistently low inflation for the past 20 years and the risk of increasing inflation in the future, I'm recommending a modest reduction in the current inflation assumption from 3.5 percent to 3.25 percent. However, the current, legislatively prescribed, inflation assumption of 3.5 percent falls within the best-estimate range and is reasonable.

General Salary Growth

We use this assumption to project salaries to determine future retirement benefits and contribution rates as a percent of payroll. Generally, a participant's salary will change over the long term in accordance with inflation, productivity growth, merit or longevity increases, and promotional increases.

Our actuarial model assumes two separate sources of salary increases: general salary growth; and merit or longevity increases. Because we use the building block method, we model general salary growth as long-term inflation plus productivity growth. ASOP 27 defines productivity growth as "the rates of change in a group's compensation attributable to the change in real value of goods or services per unit of work." Merit or longevity increases are defined as "the rates of change in an individual's compensation attributable to personal performance, promotion, seniority, or other individual factors." In other words, general salary growth applies broadly to many different groups, while merit or longevity increases apply to specific groups and individuals.

Because we apply the assumptions in different ways, we study the two sources of salary increases separately. We review general salary growth as part of the economic experience study when we look at broad trends. We typically study merit or longevity increases as part of the demographic experience study process when we focus more on trends within individual plans. Ideally, the combination of the two assumptions would model total salary growth.

For this experience study we studied general salary growth. To develop this assumption, we reviewed growth in salaries for active members, growth in total and average salaries for each plan, and average salary growth for full-time members.

Best-Estimate Range:

3.50 percent to 4.75 percent

Recommendation:

4.25 percent

Current Assumption:

4.50 percent

Data:

Growth in Salaries for Members Active in Three Years in a Row (**Appendix B**)

Growth in Total and Average Salaries for All Members (**Appendix C**)

Growth in Average Salary for Full-Time Members (**Appendix D**)

Analysis:

When we studied the general salary growth assumption we focused on the Washington State retirement system and plan specific data. Since LEOFF 2's active population represents a relatively small percent of all active members, we included data from all the retirement systems in our study. To set the recommended assumption we considered LEOFF 2 data both separately from the other systems and how it compares to the other systems.

We provide the growth in average annual salary for each retirement system in Appendix B. These data represent the total growth in salaries from all sources from 1984 to 2008. We only included members in this data if they had three consecutive years of service. As a result, the beginning and end of year salaries are for the same group. That ensures we don't see any salary growth due to changes in the population – current members leaving or new members entering the system. The change in salaries from the beginning to the end of each year represents total salary growth in a closed group. It provides a measure of general salary growth and merit or longevity increases combined. This data shows a downward trend over the last 20 years, with total salary growth decreasing from averaging over 5.30 percent in the last 20 years to averaging 5.00 percent over the last ten years.

In Appendix C we provide the change in total and average system salaries from year to year. This measure of salary growth includes members coming and going. When we divide the total salary in a given year by the number of active members covered by the plan in the same year we get a measure of average salary growth. This measure provides a good proxy for general salary growth. This measure includes all active members, both full and part-time employees.

When we combine all plans, we see annual salary growth averaged slightly above 3.5 percent since 1982. We see similar results when we look at PERS, SERS, and PSERS combined. LEOFF 2's annual salary growth over the period averaged about 4.4 percent. When we look at all plans except LEOFF 2, we see the average drop to slightly below 3.5 percent. Looking at how the data changes with and without LEOFF 2 included gives us a sense of the relative weight of LEOFF 2 compared to all systems combined.

In Appendix D we show general salary growth for full-time members of each system. We consider a member full time in a given year if they receive a full year of retirement system service credit. We found that full-time members of both LEOFF and PERS had general salary growth of about 4.00 percent. TRS and SERS had general salary growth of about 3.75 percent. General salary growth in WSPRS, with a much smaller sample of members, averaged about 4.50 percent. We considered this data heavily when setting the general salary growth assumption. This data coordinates well with our model and merit scale assumption. Our model projects all members as though they were full time. Also this data comes from the method we use to set the merit scales.

Total annual salary growth from all sources has declined over the last ten years. However, total annual salary growth exceeded the current 4.0 percent general salary growth assumption (4.50 percent for LEOFF 2) over the period of 1984 through 2008 due to the impact of merit or longevity increases. Over this period, the data suggest about 1.00 percent annual average growth for merit or longevity increases ($5\% - 4\% = 1\%$). Since we combined all data together for this measure, we do not have LEOFF 2 specific results.

The data in Appendices C and D suggest the current general salary growth assumption of 4.50 percent may be too conservative for LEOFF 2. We do not think the productivity assumption for LEOFF 2 should change; we feel that 1.00 percent is reasonable. We feel lowering the assumption to 4.25 percent would maintain the consistency with the building block method and balance the conservatism of the current assumption and the data from the other plans.

We're recommending a modest reduction in the current general salary growth assumption from 4.50 percent to 4.25 percent. However, the current, legislatively prescribed, general salary growth assumption of 4.50 percent falls within the best-estimate range and is reasonable.

Annual Rate of Investment Return

This assumption reflects anticipated returns on the retirement plan's current and future assets - net of expenses. ASOP 27 identifies two methods for setting the rate of return assumption. We described the first method, the building block method in the Background section of this report. ASOP 27 also describes the "cash-flow matching" method for setting the rate of return assumption. Under this method, a well diversified bond portfolio is used to closely match expected benefit payments with income from the bond portfolio. Due to the asset allocation of the CTF, this option is not a reasonable method for setting the rate of return assumption.

In addition to the items discussed in the general economic assumption selection process, we consider several key factors when selecting this assumption, namely – the:

- ❖ Purpose of measurement (i.e. on-going plan valuation, plan termination, etc).

- ❖ Measurement period.
- ❖ Investment policy.

We assumed the primary purpose of the measurement is to set contribution rates for the ongoing retirement systems. Setting contribution rates requires us to value the liabilities and salaries in today's dollars. We determine today's value using an assumed rate of future investment returns.

The recommended rate of return assumption represents a single rate that applies to all plans invested in the Commingled Trust Fund (CTF). We base that rate on the average measurement period for all plans combined. Because not all plans in the CTF have equivalent measurement periods, the rate of return assumption could vary on an individual plan basis. We considered making this change for LEOFF 2, but do not recommend a plan specific rate of return assumption for LEOFF 2 at this time.

The liabilities of the Plans 1 show less sensitivity to the investment return assumption than the liabilities of the Plans 2/3. This occurs because the Plans 1 have been closed to new entrants since 1977 and all the benefits will be paid well before the last Plans 2/3 benefits. As a result, we say the Plan 1 liabilities have a shorter duration than the liabilities of the Plans 2/3 and would require a shorter measurement period. However, the Plans 2/3 have members who just entered the system and will remain members for a long time. The liabilities for these plans show much more sensitivity to the interest rate assumption. The liabilities of the Plans 2/3 have long durations and require long measurement periods.

Ideally, the rate of return assumption would be coordinated with the WSIB's current asset allocation policy, or targets, for the CTF. As of the date of this communication, the WSIB reviewed their asset allocation policy and decided not to make significant changes. We based the recommendation on the current asset allocation policy. Future changes to the CTF asset allocation policy may require a new recommendation for the rate of return assumption.

Best-Estimate Range:

6.25 percent to 8.875 percent

Recommendation:

7.50 percent

Current Assumption:

8.00 percent

Data:

Historical Plan Performance (**Appendix E**)

Historical Investment Data - Current Allocations (**Appendix F**)

Historical Investment Data - Alternate Allocations (**Appendix G**)

Simulated Future Returns based on WSIB capital market assumptions (**Appendix H**)

Analysis:

We reviewed the experience data provided in Appendices E-G and relied upon the capital market assumptions provided by the Washington State Investment Board (WSIB). We used the capital market assumptions (CMAs) to determine rate of return simulations. We used those simulated returns to set the best-estimate range and the recommended rate of return assumption.

The CMAs include three pieces of information for each class of assets the WSIB might choose to invest in, - the:

- ❖ Expected annual return.
- ❖ Standard deviation of the annual return.
- ❖ Correlations between the annual returns of each asset class with every other asset class.

The WSIB set the 2009 CMAs with a 15-year time horizon. Due to the large loss in 2009, the assumed rates of return include some reversion to the mean. That is, they were set higher to reflect short-term expectations.

In consultation with the WSIB staff, we used the following changes to the CMAs. We used the rates of return from the 2008 CMAs. These assumptions equal the 2009 rates of return with the reversion to the mean removed. We felt this was reasonable since the time horizon for the pension plans is much longer than 15 years. WSIB staff suggested one change to the 2008 rates of return, lower the expected premium on private equity above public equity from 4 percent to 3 percent, consistent with the 2009 expectations. Otherwise we used the 2009 standard deviations and correlations.

We set the best-estimate range equal to the 75th and 25th percentile of the simulated 50-year compound annual rate of return distribution. We selected the best estimate as approximately equal to the median of the simulated returns. As described in the Inflation section, the rate of return assumption uses broad economic inflation as its base building block. Since the best estimate for that assumption equals 2.5 percent, the remaining building block, the real rate of investment return, equals 5.0 percent.

However, the current, legislatively prescribed, rate of return assumption of 8 percent falls within the best-estimate range and is reasonable.

Growth in System Membership

We use this assumption in the valuation in the amortization of Plan 1 UAAL. The UAAL in PERS and TRS Plan 1 must be amortized over a rolling ten-year period, as a percentage of projected payrolls. The projected payroll includes pay from PERS, SERS, TRS Plans 2/3,

and PSERS Plan 2 as well as projected payroll from future new members. We use the growth in system membership assumption to estimate the payroll for future new members. Because LEOFF Plan 1 does not currently have a UAAL, this assumption does not affect the annual valuations for LEOFF 2.

Best-Estimate Range:

1.00 percent to 2.25 percent

Recommendation:

1.75 percent

Current Assumption:

1.25 percent

Data:

Growth in System Membership Data (**Appendix I**)
Growth in Washington State Population (**Appendix J**)

Analysis:

We based the best-estimate ranges on actual retirement system membership growth since 1982. System growth in all plans declined from an average of just over 2.5 percent since 1982, to an average of just over 1.0 percent over the last five years. When we look at LEOFF separate from the other systems we see a similar pattern, but with a much slower decrease in growth. Average annual LEOFF system growth only drops below 2 percent when we look at the last five years.

We also reviewed historical data from the Office of Financial Management (OFM) for state population, state FTE counts, and K-12 and Higher Education enrollment counts. OFM projects declining state population growth – leveling off at 0.90 percent per year in 2030. The combined retirement system growth and the growth of the state population show a correlation of about 0.98. A correlation of zero indicates no correlation; whereas a correlation of one indicates a perfect correlation. For more data from OFM, please visit their website at www.ofm.wa.gov.

While the current data suggests keeping the long-term system growth assumption higher for LEOFF than the other systems, we recognize that this relationship could not hold indefinitely. Historically the population of LEOFF has been between 7 and 9 percent of the combined PERS, SERS, and PSERS populations. In the 2008 data the LEOFF population equaled 7.84 percent of the combined populations. If the pattern of recommended system growth holds constant indefinitely, 1.15 percent in PERS, SERS, and PSERS and 1.75 percent in LEOFF, the percent of LEOFF to PERS members goes above its historical maximum, 8.69 percent, after 43 years. We will continue to monitor this ratio in the upcoming years.

We recommend increasing the assumption from 1.25 percent in LEOFF 2 to 1.75 percent. However, the current, legislatively prescribed assumption falls within the best-estimate ranges and is reasonable.

Budget Impact of Adopting the Recommended Assumptions

We developed projected contribution rates based on both the current and recommended set of economic assumptions. Since the general salary and system growth assumptions impact actual future salaries, we applied both sets of contribution rates to salaries projected using the recommended general salary and system growth assumptions.

In the short- to medium-term, adopting the recommended assumptions would increase required contributions relative to the contributions required under the current assumptions. In the long-term adopting the recommended assumptions decreases the required contributions relative to the contributions required under the current assumptions. The contributions shown below clearly demonstrate the first comparison. The second point is not clearly shown. In the long-term, the contribution rates fall below the minimum contribution rates. Using the recommended assumptions results in higher minimum contribution rates than those calculated using the current assumptions. Because of the higher minimum contribution rates, the long-term savings caused by using the recommended assumptions does not show up in the summarized contribution dollars. Instead, LEOFF 2 retains the long-term savings and shows healthier funded statuses. The table below shows the additional contributions required to fund the plans using the recommended assumptions.

GF-S and Total Employer Contributions (\$ in Millions)	
09-11 Biennium	LEOFF
GF-S	\$0.0
Total Employer	0.0
<hr/>	
11-13 Biennium	
GF-S	0.0
Total Employer	0.0
<hr/>	
50 Year Totals	
GF-S	1,048.8
Total Employer	\$2,621.9

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LEOFF 2 Report on Long-Term Economic Assumptions

September 14, 2009

This report documents the results of an economic experience study of the retirement plans defined under Chapters 41.26 (excluding Plan 1) of the Revised Code of Washington (RCW). The primary purpose of this report is to assist the Law Enforcement Officers' and Fire Fighters' Plan 2 Retirement Board in evaluating whether to adopt changes to the long-term economic assumptions identified in RCW 41.45.035. This report should not be used for other purposes.

An economic experience study involves comparing actual economic experience with the assumptions we made for applicable experience study periods. We also review other relevant data to form expectations for the future. The analysis concludes with the selection of a recommended set of economic assumptions. We use Actuarial Standard of Practice Number 27 (ASOP 27), titled Selection of Economic Assumptions for Measuring Pension Obligations, to guide our work in this area.

This economic experience study includes the most recent and available plan provisions and participant and asset data. Plan provisions reflect changes from the 2008 Legislative Session. We did not include supplemental contribution rates from the 2009 Legislative Session. Participant data reflects preliminary retirement system census data through June 30, 2008. Asset data reflects preliminary returns through June 30, 2009.

The Department of Retirement Systems provided preliminary 2008 member and beneficiary data to us. We checked the data for reasonableness as appropriate based on the purpose of this experience study. The Washington State Investment Board (WSIB) provided preliminary asset information as of June 30, 2009. An audit of the financial and participant data was not performed. 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 experience study.

We relied on the capital market assumptions (CMAs) from the WSIB to formulate expectations for future rates of investment return. We reviewed the CMAs for reasonableness as appropriate based on the purpose of this experience study.

The recommendations in this experience study involve the interpretation of many factors and the application of professional judgment. We believe that the data,



assumptions, and methods used in the underlying experience study are reasonable and appropriate for the primary purpose stated above. The use of another set of data, assumptions, and methods, however, could also be reasonable and could produce materially different results. Another actuary may review the results of this analysis and reach different conclusions.

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

The undersigned, with actuarial credentials, meets the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein.

Sincerely,

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

Chris Jasperson, ASA, MAAA
Associate Pension Actuary

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Section III

Appendices



Appendices

The data and information contained in the following appendices supports the analysis in the previous report. Since we intended for readers to use this report in its entirety, this data should not be used or distributed independent of this analysis.

Appendix A

Inflation Data						
Year	Seattle-Tacoma-Bremerton, WA CPI-W	U.S. City Average CPI-W	GDP Deflator for Personal Consumption Expenditures	Annual % Change		
				Seattle CPI-W	U.S. CPI-W	GDP PCE
1950	70.3	72.1	16.675	1.44%	0.98%	1.22%
1951	75.7	77.8	17.805	7.68%	7.91%	6.78%
1952	77.6	79.5	18.169	2.51%	2.19%	2.04%
1953	78.6	80.1	18.416	1.29%	0.75%	1.36%
1954	78.6	80.5	18.585	0.00%	0.50%	0.92%
1955	79.0	80.2	18.676	0.51%	(0.37%)	0.49%
1956	80.0	81.4	19.059	1.27%	1.50%	2.05%
1957	83.3	84.3	19.639	4.13%	3.56%	3.04%
1958	85.2	86.6	20.117	2.28%	2.73%	2.43%
1959	86.8	87.3	20.432	1.88%	0.81%	1.57%
1960	87.9	88.7	20.767	1.27%	1.60%	1.64%
1961	89.3	89.6	20.985	1.59%	1.01%	1.05%
1962	90.6	90.6	21.232	1.46%	1.12%	1.18%
1963	92.1	91.7	21.479	1.66%	1.21%	1.16%
1964	93.4	92.9	21.786	1.41%	1.31%	1.43%
1965	94.5	94.5	22.103	1.18%	1.72%	1.46%
1966	97.1	97.2	22.662	2.75%	2.86%	2.53%
1967	100.0	100.0	23.237	2.99%	2.88%	2.54%
1968	104.1	104.2	24.151	4.10%	4.20%	3.93%
1969	109.2	109.8	25.255	4.90%	5.37%	4.57%
1970	114.0	116.3	26.448	4.40%	5.92%	4.72%
1971	116.4	121.3	27.574	2.11%	4.30%	4.26%
1972	119.7	125.3	28.528	2.84%	3.30%	3.46%
1973	127.5	133.1	30.081	6.52%	6.23%	5.44%
1974	141.5	147.7	33.191	10.98%	10.97%	10.34%
1975	155.8	161.2	35.955	10.11%	9.14%	8.33%
1976	164.5	170.5	37.948	5.58%	5.77%	5.54%
1977	177.6	181.5	40.410	7.96%	6.45%	6.49%
1978	193.8	195.3	43.248	9.12%	7.60%	7.02%
1979	214.6	217.7	47.059	10.73%	11.47%	8.81%
1980	249.1	247.0	52.078	16.08%	13.46%	10.67%
1981	276.1	272.3	56.720	10.84%	10.24%	8.91%
1982	294.0	288.6	59.859	6.48%	5.99%	5.53%

Inflation Data						
Year	Seattle-Tacoma-Bremerton, WA CPI-W	U.S. City Average CPI-W	GDP Deflator for Personal Consumption Expenditures	Annual % Change		
				Seattle CPI-W	U.S. CPI-W	GDP PCE
1983	293.2	297.4	62.436	(0.27%)	3.05%	4.31%
1984	302.8	307.6	64.795	3.27%	3.43%	3.78%
1985	309.1	318.5	66.936	2.08%	3.54%	3.30%
1986	311.3	323.4	68.569	0.71%	1.54%	2.44%
1987	318.6	335.0	70.947	2.35%	3.59%	3.47%
1988	329.1	348.4	73.755	3.30%	4.00%	3.96%
1989	344.5	365.2	76.972	4.68%	4.82%	4.36%
1990	369.0	384.4	80.498	7.11%	5.26%	4.58%
1991	389.4	399.9	83.419	5.53%	4.03%	3.63%
1992	403.2	411.5	85.824	3.54%	2.90%	2.88%
1993	415.2	423.1	87.804	2.98%	2.82%	2.31%
1994	430.4	433.8	89.654	3.66%	2.53%	2.11%
1995	442.9	446.1	91.577	2.90%	2.84%	2.14%
1996	457.5	459.1	93.547	3.30%	2.91%	2.15%
1997	471.7	469.3	95.124	3.10%	2.22%	1.69%
1998	484.1	475.6	95.978	2.63%	1.34%	0.90%
1999	499.1	486.2	97.575	3.10%	2.23%	1.66%
2000	517.8	503.1	100.000	3.75%	3.48%	2.49%
2001	536.2	516.8	102.094	3.55%	2.72%	2.09%
2002	545.9	523.9	103.542	1.81%	1.37%	1.42%
2003	553.6	535.6	105.597	1.41%	2.23%	1.98%
2004	562.3	549.5	108.373	1.57%	2.60%	2.63%
2005	579.3	568.9	111.493	3.02%	3.53%	2.88%
2006	600.9	587.2	114.552	3.73%	3.22%	2.74%
2007	623.7	604.0	117.625	3.79%	2.86%	2.68%
2008	651.6	628.7	121.559	4.48%	4.09%	3.34%
Geometric Averages						
All years				3.87%	3.76%	3.45%
Last 30 years				4.12%	3.97%	3.50%
Last 25 years				3.25%	3.04%	2.70%
Last 20 years				3.47%	3.00%	2.53%
Last 10 years				3.02%	2.83%	2.39%

Data sources: Department of Labor, Bureau of Labor Statistics (BLS) and Department of Commerce, Bureau of Economic Analysis (BEA).

Appendix B

Growth in Salaries*									
Year	Plan 1			Plans 2/3			All Plans		
	Average Salary		%	Average Salary		%	Average Salary		%
	BOY	EOY	Change	BOY	EOY	Change	BOY	EOY	Change
1984	23,621	25,191	6.65%	19,134	20,793	8.67%	23,621	25,191	6.65%
1985	25,094	26,825	6.90%	19,994	22,010	10.08%	25,094	26,825	6.90%
1986	26,741	27,832	4.08%	21,348	22,815	6.87%	26,741	27,832	4.08%
1987	27,754	28,780	3.70%	22,281	23,971	7.58%	27,754	28,780	3.70%
1988	28,681	30,094	4.93%	23,458	24,865	6.00%	28,681	30,094	4.93%
1989	29,989	31,610	5.41%	24,307	26,033	7.10%	29,989	31,610	5.41%
1990	31,458	33,619	6.87%	25,499	27,835	9.16%	31,458	33,619	6.87%
1991	33,563	36,712	9.38%	27,200	29,934	10.05%	33,563	36,712	9.38%
1992	36,611	38,706	5.72%	29,109	30,891	6.12%	36,611	38,706	5.72%
1993	38,415	40,430	5.25%	29,942	31,976	6.79%	38,415	40,430	5.25%
1994	40,140	40,942	2.00%	31,297	32,540	3.97%	40,140	40,942	2.00%
1995	40,823	41,995	2.87%	32,079	33,568	4.64%	40,823	41,995	2.87%
1996	41,884	43,737	4.42%	33,074	34,956	5.69%	41,884	43,737	4.42%
1997	43,614	44,709	2.51%	34,508	35,993	4.30%	43,614	44,709	2.51%
1998	44,500	46,304	4.05%	35,481	37,107	4.58%	44,500	46,304	4.05%
1999	46,067	47,492	3.09%	36,545	38,310	4.83%	46,067	47,492	3.09%
2000	47,207	49,733	5.35%	37,680	40,045	6.28%	47,207	49,733	5.35%
2001	48,941	50,977	4.16%	39,259	41,152	4.82%	48,941	50,977	4.16%
2002	50,508	52,925	4.79%	40,370	42,897	6.26%	50,508	52,925	4.79%
2003	52,466	54,330	3.55%	42,370	44,451	4.91%	52,466	54,330	3.55%
2004	53,811	54,835	1.90%	43,917	45,494	3.59%	53,811	54,835	1.90%
2005	54,389	55,749	2.50%	45,136	46,998	4.13%	54,389	55,749	2.50%
2006	55,231	57,460	4.04%	46,442	48,827	5.14%	55,231	57,460	4.04%
2007	56,826	58,868	3.59%	48,089	50,286	4.57%	56,826	58,868	3.59%
2008	58,706	62,280	6.09%	49,672	53,435	7.58%	58,706	62,280	6.09%
Geometric Averages									
	Plan 1			Plans 2/3			All Plans		
Total Period	4.54%			6.13%			5.48%		
Last 20 Years	4.36%			5.71%			5.32%		
Last 15 Years	3.65%			5.01%			4.71%		
Last 10 Years	3.90%			5.20%			5.00%		
Last 5 Years	3.61%			4.99%			4.83%		

*Among those members active at least three years in a row. Excludes first year salary increase.

Note: BOY stands for Beginning of Year; EOY stands for End of Year.

Appendix C

Growth in Salaries*				
PERS - All plans				
Salaries				
Year	Count	Total	Average	% Change*
1982	103,284	\$1,922,009,071	\$18,609	
1983	107,777	\$2,083,987,099	\$19,336	3.91%
1984	112,740	\$2,263,886,046	\$20,081	3.85%
1985	117,112	\$2,523,732,620	\$21,550	7.32%
1986	119,469	\$2,668,215,867	\$22,334	3.64%
1987	125,581	\$2,930,318,938	\$23,334	4.48%
1988	133,210	\$3,184,848,016	\$23,908	2.46%
1989	139,146	\$3,453,163,306	\$24,817	3.80%
1990	150,241	\$3,910,916,032	\$26,031	4.89%
1991	165,008	\$4,597,812,925	\$27,864	7.04%
1992	171,947	\$4,905,538,244	\$28,529	2.39%
1993	174,576	\$5,196,025,639	\$29,764	4.33%
1994	177,456	\$5,327,554,117	\$30,022	0.87%
1995	178,833	\$5,525,275,211	\$30,896	2.91%
1996	182,603	\$5,817,349,997	\$31,858	3.11%
1997	186,440	\$6,078,153,763	\$32,601	2.33%
1998	191,850	\$6,364,569,143	\$33,175	1.76%
1999	196,382	\$6,730,408,684	\$34,272	3.31%
2000	152,261	\$6,096,351,570	\$40,039	16.83%**
2001	152,936	\$6,333,889,555	\$41,415	3.44%
2002	154,185	\$6,683,833,053	\$43,349	4.67%
2003	154,550	\$6,874,132,701	\$44,478	2.60%
2004	156,256	\$7,083,167,802	\$45,331	1.92%
2005	155,578	\$7,230,590,053	\$46,476	2.53%
2006	155,027	\$7,496,020,876	\$48,353	4.04%**
2007	158,022	\$7,832,992,303	\$49,569	2.51%
2008	161,668	\$8,507,753,236	\$52,625	6.16%
Geometric Averages				
				PERS
Total Period				4.08%
Last 20 Years				4.02%
Last 15 Years				3.87%
Last 10 Years				4.72%
Last 5 Years				3.42%

* % Change in Average Salaries.

** New System Created.

Growth in Salaries*				
SERS - All plans				
Salaries				
Year	Count	Total	Average	% Change*
2000	47,725	\$1,012,130,843	\$21,208	
2001	48,347	\$1,003,737,911	\$20,761	(2.11%)
2002	49,791	\$1,085,774,473	\$21,807	5.04%
2003	49,214	\$1,132,618,032	\$23,014	5.54%
2004	49,854	\$1,168,251,347	\$23,433	1.82%
2005	50,350	\$1,201,321,625	\$23,859	1.82%
2006	50,818	\$1,242,883,648	\$24,458	2.51%
2007	50,825	\$1,282,739,869	\$25,238	3.19%
2008	51,774	\$1,379,480,319	\$26,644	5.57%
Geometric Averages:				
				SERS
Total Period				2.89%
Last 20 Years				NA
Last 15 Years				NA
Last 10 Years				NA
Last 5 Years				2.97%

* % Change in Average Salaries.

Growth in Salaries*				
PSERS - All plans				
Salaries				
Year	Count	Total	Average	% Change*
2006	2,073	\$103,056,513	\$49,714	
2007	2,755	\$134,195,429	\$48,710	(2.02%)
2008	3,981	\$199,968,558	\$50,231	3.12%
Geometric Averages				
				PSERS
Total Period				0.52%
Last 20 Years				NA
Last 15 Years				NA
Last 10 Years				NA
Last 5 Years				NA

* % Change in Average Salaries.

Growth in Salaries*				
TRS - All plans				
Salaries				
Year	Count	Total	Average	% Change*
1982	44,408	\$1,099,192,895	\$24,752	
1983	43,449	\$1,072,053,504	\$24,674	(0.32%)
1984	44,817	\$1,177,491,105	\$26,273	6.48%
1985	45,687	\$1,254,539,625	\$27,459	4.51%
1986	46,489	\$1,317,903,232	\$28,349	3.24%
1987	47,210	\$1,362,294,360	\$28,856	1.79%
1988	48,355	\$1,458,307,972	\$30,158	4.51%
1989	49,189	\$1,562,003,993	\$31,755	5.29%
1990	51,323	\$1,717,585,470	\$33,466	5.39%
1991	52,779	\$1,932,854,682	\$36,622	9.43%
1992	55,276	\$2,118,834,558	\$38,332	4.67%
1993	56,571	\$2,288,712,468	\$40,457	5.54%
1994	57,731	\$2,349,973,752	\$40,706	0.61%
1995	59,103	\$2,437,088,503	\$41,235	1.30%
1996	59,425	\$2,561,961,042	\$43,113	4.55%
1997	60,815	\$2,632,238,663	\$43,283	0.39%
1998	61,828	\$2,754,452,811	\$44,550	2.93%
1999	62,684	\$2,803,036,295	\$44,717	0.37%
2000	63,858	\$3,000,553,335	\$46,988	5.08%
2001	66,220	\$3,152,203,993	\$47,602	1.31%
2002	66,063	\$3,263,893,154	\$49,406	3.79%
2003	66,075	\$3,415,392,955	\$51,690	4.62%
2004	66,634	\$3,493,972,824	\$52,435	1.44%
2005	67,270	\$3,604,284,885	\$53,579	2.18%
2006	67,736	\$3,703,519,435	\$54,676	2.05%
2007	64,939	\$3,743,844,133	\$57,652	5.44%
2008	66,524	\$4,053,847,954	\$60,938	5.70%
Geometric Averages				
				TRS
Total Period				3.53%
Last 20 Years				3.58%
Last 15 Years				2.77%
Last 10 Years				3.18%
Last 5 Years				3.35%

* % Change in Average Salaries.

Growth in Salaries*				
LEOFF - All plans				
Salaries				
Year	Count	Total	Average	% Change*
1982	8,975	\$235,978,892	\$26,293	
1983	9,187	\$256,387,286	\$27,908	6.14%
1984	9,374	\$276,133,441	\$29,457	5.55%
1985	9,599	\$294,702,177	\$30,701	4.22%
1986	9,720	\$313,948,627	\$32,299	5.20%
1987	10,015	\$327,536,134	\$32,705	1.25%
1988	10,454	\$363,161,671	\$34,739	6.22%
1989	10,785	\$384,702,575	\$35,670	2.68%
1990	11,260	\$428,874,768	\$38,088	6.78%
1991	11,736	\$467,926,848	\$39,871	4.68%
1992	11,979	\$506,563,882	\$42,288	6.06%
1993	12,255	\$545,894,511	\$44,545	5.34%
1994	12,725	\$591,694,565	\$46,499	4.39%
1995	13,125	\$635,768,105	\$48,439	4.17%
1996	13,420	\$675,684,696	\$50,349	3.94%
1997	13,714	\$719,113,751	\$52,436	4.15%
1998	13,856	\$766,141,882	\$55,293	5.45%
1999	14,456	\$830,801,430	\$57,471	3.94%
2000	14,632	\$875,118,695	\$59,809	4.07%
2001	14,900	\$917,312,451	\$61,565	2.94%
2002	15,158	\$981,473,315	\$64,750	5.17%
2003	15,551	\$1,037,889,562	\$66,741	3.08%
2004	15,602	\$1,083,253,110	\$69,430	4.03%
2005	15,891	\$1,148,099,507	\$72,248	4.06%
2006	16,314	\$1,220,018,724	\$74,784	3.51%
2007	16,612	\$1,276,412,477	\$76,837	2.75%
2008	17,047	\$1,381,930,351	\$81,066	5.50%
Geometric Averages				LEOFF
Total Period				4.43%
Last 20 Years				4.33%
Last 15 Years				4.07%
Last 10 Years				3.90%
Last 5 Years				3.97%

* % Change in Average Salaries.

Growth in Salaries*				
WSPRS - All plans				
Salaries				
Year	Count	Total	Average	% Change*
1982	740	\$21,882,563	\$29,571	
1983	772	\$22,042,620	\$28,553	(3.44%)
1984	742	\$23,880,828	\$32,184	12.72%
1985	728	\$24,030,731	\$33,009	2.56%
1986	815	\$25,589,960	\$31,399	(4.88%)
1987	844	\$27,978,176	\$33,149	5.58%
1988	860	\$29,138,186	\$33,882	2.21%
1989	866	\$30,552,770	\$35,280	4.13%
1990	897	\$32,971,640	\$36,758	4.19%
1991	993	\$40,108,046	\$40,391	9.88%
1992	1,012	\$41,966,154	\$41,469	2.67%
1993	976	\$41,971,127	\$43,003	3.70%
1994	958	\$42,027,517	\$43,870	2.02%
1995	901	\$41,447,306	\$46,001	4.86%
1996	917	\$44,407,961	\$48,427	5.27%
1997	927	\$48,421,776	\$52,235	7.86%
1998	929	\$50,948,202	\$54,842	4.99%
1999	968	\$55,655,807	\$57,496	4.84%
2000	1,013	\$58,495,331	\$57,745	0.43%
2001	1,027	\$60,215,883	\$58,633	1.54%
2002	1,035	\$62,536,583	\$60,422	3.05%
2003	1,079	\$66,025,472	\$61,191	1.27%
2004	1,057	\$64,507,991	\$61,029	(0.26%)
2005	1,022	\$65,312,340	\$63,906	4.71%
2006	1,022	\$69,127,265	\$67,639	5.84%
2007	1,037	\$71,870,152	\$69,306	2.46%
2008	1,085	\$78,707,738	\$72,542	4.67%
Geometric Averages				
				WSPRS
Total Period				3.51%
Last 20 Years				3.88%
Last 15 Years				3.55%
Last 10 Years				2.84%
Last 5 Years				3.46%

* % Change in Average Salaries.

Growth in Salaries*				
Year	All Systems - All plans			
	Salaries			
	Count	Total	Average	% Change*
1982	157,407	\$3,279,063,421	\$20,832	
1983	161,185	\$3,434,470,509	\$21,308	2.28%
1984	167,673	\$3,741,391,420	\$22,314	4.72%
1985	173,126	\$4,097,005,153	\$23,665	6.06%
1986	176,493	\$4,325,657,686	\$24,509	3.57%
1987	183,650	\$4,648,127,608	\$25,310	3.27%
1988	192,879	\$5,035,455,845	\$26,107	3.15%
1989	199,986	\$5,430,422,644	\$27,154	4.01%
1990	213,721	\$6,090,347,910	\$28,497	4.94%
1991	230,516	\$7,038,702,501	\$30,535	7.15%
1992	240,214	\$7,572,902,838	\$31,526	3.25%
1993	244,378	\$8,072,603,745	\$33,033	4.78%
1994	248,870	\$8,311,249,951	\$33,396	1.10%
1995	251,962	\$8,639,579,125	\$34,289	2.67%
1996	256,365	\$9,099,403,696	\$35,494	3.51%
1997	261,896	\$9,477,927,953	\$36,190	1.96%
1998	268,463	\$9,936,112,038	\$37,011	2.27%
1999	274,490	\$10,419,902,216	\$37,961	2.57%
2000	279,489	\$11,042,649,774	\$39,510	4.08%
2001	283,430	\$11,467,359,793	\$40,459	2.40%
2002	286,232	\$12,077,510,578	\$42,195	4.29%
2003	286,469	\$12,526,058,722	\$43,726	3.63%
2004	289,403	\$12,893,153,074	\$44,551	1.89%
2005	290,111	\$13,249,608,410	\$45,671	2.51%
2006	292,990	\$13,834,626,461	\$47,219	3.39%
2007	294,190	\$14,342,054,363	\$48,751	3.24%
2008	302,079	\$15,601,688,156	\$51,648	5.94%
Geometric Averages				
	All Systems			
Total Period	3.55%			
Last 20 Years	3.47%			
Last 15 Years	3.02%			
Last 10 Years	3.39%			
Last 5 Years	3.39%			

* % Change in Average Salaries.

Growth in Salaries*				
All Systems except LEOFF - All plans				
Salaries				
Year	Count	Total	Average	% Change*
1982	154,654	\$3,214,952,212	\$20,788	
1983	157,931	\$3,352,551,322	\$21,228	2.12%
1984	164,019	\$3,643,038,597	\$22,211	4.63%
1985	169,023	\$3,980,613,166	\$23,551	6.03%
1986	171,984	\$4,189,536,920	\$24,360	3.44%
1987	178,708	\$4,494,538,331	\$25,150	3.24%
1988	187,288	\$4,851,492,502	\$25,904	3.00%
1989	193,828	\$5,220,895,816	\$26,936	3.98%
1990	206,824	\$5,837,498,115	\$28,224	4.78%
1991	222,842	\$6,744,134,001	\$30,264	7.23%
1992	232,020	\$7,237,596,173	\$31,194	3.07%
1993	235,599	\$7,691,265,828	\$32,646	4.65%
1994	239,330	\$7,876,655,802	\$32,911	0.81%
1995	241,763	\$8,154,162,230	\$33,728	2.48%
1996	245,538	\$8,561,237,438	\$34,867	3.38%
1997	250,495	\$8,886,832,302	\$35,477	1.75%
1998	256,593	\$9,286,827,854	\$36,193	2.02%
1999	261,777	\$9,694,870,528	\$37,035	2.33%
2000	266,356	\$10,262,412,249	\$38,529	4.03%
2001	269,845	\$10,636,782,868	\$39,418	2.31%
2002	272,221	\$11,175,945,329	\$41,055	4.15%
2003	271,909	\$11,559,445,436	\$42,512	3.55%
2004	274,649	\$11,873,687,999	\$43,232	1.69%
2005	274,943	\$12,157,280,062	\$44,217	2.28%
2006	277,272	\$12,662,663,156	\$45,669	3.28%
2007	278,091	\$13,108,355,357	\$47,137	3.21%
2008	285,453	\$14,256,835,454	\$49,945	5.96%
Geometric Averages:				
				All Systems Except LEOFF
Total Period				3.43%
Last 20 Years				3.34%
Last 15 Years				2.88%
Last 10 Years				3.27%
Last 5 Years				3.27%

* % Change in Average Salaries.

Growth in Salaries*				
PERS, SERS, PSERS - All plans				
Salaries				
Year	Count	Total	Average	% Change*
1982	103,284	\$1,922,009,071	\$18,609	
1983	107,777	\$2,083,987,099	\$19,336	3.91%
1984	112,740	\$2,263,886,046	\$20,081	3.85%
1985	117,112	\$2,523,732,620	\$21,550	7.32%
1986	119,469	\$2,668,215,867	\$22,334	3.64%
1987	125,581	\$2,930,318,938	\$23,334	4.48%
1988	133,210	\$3,184,848,016	\$23,908	2.46%
1989	139,146	\$3,453,163,306	\$24,817	3.80%
1990	150,241	\$3,910,916,032	\$26,031	4.89%
1991	165,008	\$4,597,812,925	\$27,864	7.04%
1992	171,947	\$4,905,538,244	\$28,529	2.39%
1993	174,576	\$5,196,025,639	\$29,764	4.33%
1994	177,456	\$5,327,554,117	\$30,022	0.87%
1995	178,833	\$5,525,275,211	\$30,896	2.91%
1996	182,603	\$5,817,349,997	\$31,858	3.11%
1997	186,440	\$6,078,153,763	\$32,601	2.33%
1998	191,850	\$6,364,569,143	\$33,175	1.76%
1999	196,382	\$6,730,408,684	\$34,272	3.31%
2000	199,986	\$7,108,482,413	\$35,545	3.71%
2001	201,283	\$7,337,627,466	\$36,454	2.56%
2002	203,976	\$7,769,607,526	\$38,091	4.49%
2003	203,764	\$8,006,750,733	\$39,294	3.16%
2004	206,110	\$8,251,419,149	\$40,034	1.88%
2005	205,928	\$8,431,911,678	\$40,946	2.28%
2006	207,918	\$8,841,961,037	\$42,526	3.86%
2007	211,602	\$9,249,927,601	\$43,714	2.79%
2008	217,423	\$10,087,202,113	\$46,394	6.13%
Geometric Averages				
				PERS, SERS, & PSERS
Total Period				3.58%
Last 20 Years				3.37%
Last 15 Years				3.00%
Last 10 Years				3.41%
Last 5 Years				3.38%

* % Change in Average Salaries.

Appendix D

System Specific General Salary Growth*	
System	General Salary Growth
PERS	4.01%
TRS	3.75%
SERS	3.76%
LEOFF	3.98%
WSPRS	4.54%

Note: Not enough data for PSERS.

**Produced using method used to develop the Merit Scales,
includes only members who earn full-time service credit.*

Appendix E

Historical Plan Performance		
Fiscal Year Ending June 30	Investment Return	
1982	2.50%	
1983	47.30%	
1984	(0.03%)	
1985	29.80%	
1986	26.90%	
1987	16.90%	
1988	4.20%	
1989	13.50%	
1990	8.30%	
1991	9.50%	
1992	8.20%	
1993	13.07%	
1994	2.10%	
1995	16.24%	
1996	16.49%	
1997	20.18%	
1998	17.12%	
1999	11.76%	
2000	13.56%	
2001	(6.75%)	
2002	(5.15%)	
2003	3.02%	
2004	16.72%	
2005	13.05%	
2006	16.70%	
2007	21.33%	
2008	(1.22%)	
2009	(22.84%)	
Geometric Averages	2007	2009
Total Period	12.42%	10.40%
Last 20 Years	10.38%	7.99%
Last 10 Years	9.73%	3.95%

Source: Washington State Investment Board Returns restated for 1993 and beyond.

Appendix F

Historical Investment Data							
Year	Investment Return	Year	Investment Return	Year	Investment Return	Year	Investment Return
1926	7.25%	1947	1.40%	1968	13.52%	1989	13.50%
1927	22.51%	1948	2.94%	1969	(11.91%)	1990	8.30%
1928	26.62%	1949	13.74%	1970	2.92%	1991	9.50%
1929	(14.68%)	1950	21.83%	1971	14.03%	1992	8.20%
1930	(16.35%)	1951	9.58%	1972	10.59%	1993	13.07%
1931	(29.83%)	1952	8.44%	1973	(13.14%)	1994	2.10%
1932	0.88%	1953	(0.65%)	1974	(14.54%)	1995	16.24%
1933	57.65%	1954	37.00%	1975	31.50%	1996	16.49%
1934	10.06%	1955	16.63%	1976	29.89%	1997	20.18%
1935	30.46%	1956	1.14%	1977	3.88%	1998	17.12%
1936	31.46%	1957	(4.56%)	1978	8.05%	1999	11.76%
1937	(26.90%)	1958	30.69%	1979	16.66%	2000	13.56%
1938	21.93%	1959	7.91%	1980	20.69%	2001	(6.75%)
1939	1.82%	1960	3.69%	1981	1.77%	2002	(5.15%)
1940	(3.11%)	1961	19.07%	1982	2.50%	2003	3.02%
1941	(5.84%)	1962	(3.39%)	1983	47.30%	2004	16.72%
1942	19.76%	1963	14.97%	1984	(0.03%)	2005	13.05%
1943	32.61%	1964	13.55%	1985	29.80%	2006	16.70%
1944	22.17%	1965	15.09%	1986	26.90%	2007	21.33%
1945	34.70%	1966	(4.74%)	1987	16.90%	2008	(1.22%)
1946	(5.59%)	1967	27.08%	1988	4.20%	2009	(22.84%)

Actual investment return for fiscal years ending June 30, 1982, and thereafter. Returns restated for 1993 and beyond. Estimated investment return prior to 1982.

Geometric Averages	2007		2009	
	Total Period	9.66%	9.29%	
Last 60 years	10.51%	9.89%		
Last 50 years	10.50%	9.46%		
Last 40 years	10.36%	9.81%		
Last 30 years	12.13%	10.43%		

Rolling 30-year Averages*	
Minimum	7.85%
Maximum	12.69%
Average	10.28%

* Starting in 1926. Last period ending 2009.

Assumptions*	Allocation		Return
	2007	2009	
Asset Class			
U.S. Equity	23%	37%**	S&P 500.
Non-U.S. Equity	23%	0%	S&P 500.
Fixed Income	25%	25%	Average of long-term corporate and government bond index.
Private Equity	17%	25%	U.S. small cap stock index.
Real Estate	12%	13%	Average of long-term corporate and government bond index.

*Constant asset allocation from 1926 through 1981. Based on Washington State Investment Board's asset allocation for the given year.

** Global Equity.

Appendix G

Historical Investment Data							
Year	Investment Return	Year	Investment Return	Year	Investment Return	Year	Investment Return
1926	10.00%	1947	2.43%	1968	7.10%	1989	13.50%
1927	25.77%	1948	4.81%	1969	(7.73%)	1990	8.30%
1928	26.75%	1949	13.23%	1970	8.50%	1991	9.50%
1929	(3.71%)	1950	19.46%	1971	13.43%	1992	8.20%
1930	(12.41%)	1951	13.09%	1972	13.98%	1993	13.07%
1931	(27.44%)	1952	11.96%	1973	(8.79%)	1994	2.10%
1932	0.62%	1953	0.82%	1974	(15.62%)	1995	16.24%
1933	34.46%	1954	34.09%	1975	27.09%	1996	16.49%
1934	3.91%	1955	18.77%	1976	21.38%	1997	20.18%
1935	31.52%	1956	1.46%	1977	(4.10%)	1998	17.12%
1936	23.20%	1957	(3.23%)	1978	3.69%	1999	11.76%
1937	(20.42%)	1958	24.35%	1979	9.98%	2000	13.56%
1938	21.00%	1959	6.53%	1980	18.11%	2001	(6.75%)
1939	1.74%	1960	4.85%	1981	(2.82%)	2002	(5.15%)
1940	(3.97%)	1961	17.29%	1982	2.50%	2003	3.02%
1941	(6.22%)	1962	(2.27%)	1983	47.30%	2004	16.72%
1942	13.37%	1963	14.36%	1984	(0.03%)	2005	13.05%
1943	16.52%	1964	11.54%	1985	29.80%	2006	16.70%
1944	13.36%	1965	7.52%	1986	26.90%	2007	21.33%
1945	24.83%	1966	(5.27%)	1987	16.90%	2008	(1.22%)
1946	(4.52%)	1967	11.56%	1988	4.20%	2009	(22.84%)

Actual investment return for fiscal years ending June 30, 1982 and thereafter. Returns restated for 1993 and beyond. Estimated investment return prior to 1982.

Geometric Averages		
	2007	2009
Total Period	8.93%	8.36%
Last 60 years	9.86%	9.06%
Last 50 years	9.65%	8.44%
Last 40 years	9.88%	9.17%
Last 30 years	11.67%	10.18%

Rolling 30-Year Averages*:	
Minimum	7.04%
Maximum	11.67%
Average	8.95%

* Starting in 1926. Last period ending 2009.

Assumptions*		
Asset Class	Allocation	Return
Equity	60%	S&P 500
Fixed Income	40%	Average of long-term corporate and government bond index

*Constant asset allocation from 1926 through 1981. Based on Washington State Investment Board's 2004 asset allocation.

Appendix H

WSIB Simulated Future Returns			
Portfolio Statistics & Capital Market Assumptions			
2009 Asset Class	Target Allocation	Expected 1-Year Return	Standard Deviation
Global Equity	37%	8.50%	16.90%
U.S. Equity	0%	8.50%	17.00%
Non-U.S. Equity	0%	8.50%	19.00%
Tangible Assets	5%	6.50%	8.00%
Fixed Income	20%	5.25%	4.75%
Private Equity	25%	11.50%	29.00%
Real Estate	13%	8.00%	15.00%
Cash	0%	3.50%	1.50%
Total 2009 Target CTF	100%		
2007			
U.S. Equity	23%	8.50%	17.00%
Non-U.S. Equity	23%	8.50%	18.25%
Fixed Income	25%	5.25%	5.00%
Private Equity	17%	12.50%	31.00%
Real Estate	12%	8.50%	14.50%
Cash	0%	3.75%	1.50%
Total 2007 Target CTF	100%		
Simulated Future Returns			
2009	Measurement Period		
	20 Years	50 Years	
75th percentile	9.65%	8.87%	
60th percentile	8.34%	8.05%	
55th percentile	7.94%	7.80%	
Expected Return	7.60%	7.57%	
45th percentile	7.17%	7.31%	
40th percentile	6.78%	7.07%	
25th percentile	5.51%	6.25%	
2007	Measurement Period		
	20 Years	50 Years	
75th percentile	9.56%	8.83%	
60th percentile	8.32%	8.05%	
55th percentile	7.95%	7.81%	
Expected Return	7.62%	7.60%	
45th percentile	7.22%	7.35%	
40th percentile	6.85%	7.12%	
25th percentile	5.64%	6.35%	

Source: Washington State Investment Board.

Appendix I

Growth in System Membership Data				
	LEOFF		PERS	
Year	# of Active Members	Annual Growth	# of Active Members	Annual Growth
1980	8,813		110,744	
1981	8,912	1.12%	106,125	(4.17%)
1982	8,975	0.71%	103,284	(2.68%)
1983	9,187	2.36%	107,777	4.35%
1984	9,374	2.04%	112,740	4.60%
1985	9,599	2.40%	117,112	3.88%
1986	9,720	1.26%	119,469	2.01%
1987	10,015	3.03%	125,581	5.12%
1988	10,454	4.38%	133,210	6.07%
1989	10,785	3.17%	139,146	4.46%
1990	11,260	4.40%	150,241	7.97%
1991	11,736	4.23%	165,008	9.83%
1992	11,979	2.07%	171,947	4.21%
1993	12,255	2.30%	174,576	1.53%
1994	12,725	3.84%	177,456	1.65%
1995	13,125	3.14%	178,833	0.78%
1996	13,420	2.25%	182,603	2.11%
1997	13,714	2.19%	186,440	2.10%
1998	13,856	1.04%	191,850	2.90%
1999	14,456	4.33%	196,382	2.36%
2000	14,632	1.22%	152,261	(22.47%)*
2001	14,900	1.83%	152,936	0.44%
2002	15,158	1.73%	154,185	0.82%
2003	15,551	2.59%	154,550	0.24%
2004	15,602	0.33%	156,256	1.10%
2005	15,891	1.85%	155,578	(0.43%)
2006	16,314	2.66%	155,027	(0.35%)*
2007	16,612	1.83%	158,022	1.93%
2008	17,047	2.62%	161,668	2.31%
Geometric Averages				
	All Years			2.38%
	Since 1982			2.50%
	Last 20 Years			2.48%
	Last 15 Years			2.22%
	Last 10 Years			2.09%
	Last 5 Years			1.85%

* New System created.

Growth in System Membership Data				
	SERS		PSERS	
Year	# of Active Members	Annual Growth	# of Active Members	Annual Growth
2000	47,725			
2001	48,347	1.30%		
2002	49,791	2.99%		
2003	49,214	(1.16%)		
2004	49,854	1.30%		
2005	50,350	0.99%		
2006	50,818	0.93%	2,073	
2007	50,825	0.01%	2,755	32.90%
2008	51,774	1.87%	3,981	44.50%

Growth in System Membership Data				
	PERS+SERS+PSERS		TRS	
Year	# of Active Members	Annual Growth	# of Active Members	Annual Growth
1980	110,744		46,247	
1981	106,125	(4.17%)	46,197	(0.11%)
1982	103,284	(2.68%)	44,408	(3.87%)
1983	107,777	4.35%	43,449	(2.16%)
1984	112,740	4.60%	44,817	3.15%
1985	117,112	3.88%	45,687	1.94%
1986	119,469	2.01%	46,489	1.76%
1987	125,581	5.12%	47,210	1.55%
1988	133,210	6.07%	48,355	2.43%
1989	139,146	4.46%	49,189	1.72%
1990	150,241	7.97%	51,323	4.34%
1991	165,008	9.83%	52,779	2.84%
1992	171,947	4.21%	55,276	4.73%
1993	174,576	1.53%	56,571	2.34%
1994	177,456	1.65%	57,731	2.05%
1995	178,833	0.78%	59,103	2.38%
1996	182,603	2.11%	59,425	0.54%
1997	186,440	2.10%	60,815	2.34%
1998	191,850	2.90%	61,828	1.67%
1999	196,382	2.36%	62,684	1.38%
2000	199,986	1.84%	63,858	1.87%
2001	201,283	0.65%	66,220	3.70%
2002	203,976	1.34%	66,063	(0.24%)
2003	203,764	(0.10%)	66,075	0.02%
2004	206,110	1.15%	66,634	0.85%
2005	205,928	(0.09%)	67,270	0.95%
2006	207,918	0.97%	67,736	0.69%
2007	211,602	1.77%	64,939	(4.13%)
2008	217,423	2.75%	66,524	2.44%
Geometric Averages				
All Years		2.44%		1.31%
Since 1982		2.90%		1.57%
Last 20 Years		2.48%		1.61%
Last 15 Years		1.47%		1.09%
Last 10 Years		1.26%		0.73%
Last 5 Years		1.31%		0.14%

Appendix J

Growth in Washington State Population - Historical and Projected*								
Historical Growth			Projected Growth					
Year	Count	Annual Growth	Year	Count	Annual Growth	Geometric Averages	2007	2009
1980	4,132,156		2010	6,776,595	1.32%	All years	1.49%	1.46%
1981	4,229,278	2.35%	2011	6,870,767	1.39%	Last 25 years	1.66%	1.73%
1982	4,276,549	1.12%	2012	6,971,766	1.47%	Last 20 years	1.80%	1.75%
1983	4,307,247	0.72%	2013	7,073,088	1.45%	Last 15 years		1.48%
1984	4,354,067	1.09%	2014	7,173,618	1.42%	Last 10 years	1.36%	1.38%
1985	4,415,785	1.42%	2015	7,270,329	1.35%	Last 5 years	1.31%	1.63%
1986	4,462,212	1.05%	2016	7,362,889	1.27%	Next 5 years	1.81%	1.41%
1987	4,527,098	1.45%	2017	7,453,679	1.23%	Next 10 years	1.58%	1.33%
1988	4,616,886	1.98%	2018	7,543,650	1.21%	Next 15 years		1.26%
1989	4,728,077	2.41%	2019	7,633,082	1.19%	Next 20 years	1.34%	1.19%
1990	4,866,692	2.93%	2020	7,721,792	1.16%	Next 21 years		1.17%
1991	5,021,335	3.18%	2021	7,809,512	1.14%			
1992	5,141,177	2.39%	2022	7,896,168	1.11%			
1993	5,265,688	2.42%	2023	7,981,701	1.08%			
1994	5,364,338	1.87%	2024	8,066,064	1.06%			
1995	5,470,104	1.97%	2025	8,149,189	1.03%			
1996	5,567,764	1.79%	2026	8,230,930	1.00%			
1997	5,663,763	1.72%	2027	8,311,360	0.98%			
1998	5,750,033	1.52%	2028	8,390,547	0.95%			
1999	5,830,835	1.41%	2029	8,468,520	0.93%			
2000	5,894,121	1.09%	2030	8,545,391	0.91%			
2001	5,974,910	1.37%						
2002	6,041,710	1.12%						
2003	6,098,300	0.94%						
2004	6,167,800	1.14%						
2005	6,256,400	1.44%						
2006	6,375,600	1.91%						
2007	6,488,000	1.76%						
2008	6,587,600	1.54%						
2009	6,688,300	1.53%						

*Source: Office of Financial Management. Additional computations have been performed to summarize data.

Appendix K

Historical Economic Assumptions for Washington State Pension Systems				
Valuation Years	Investment Return	General Salary Growth	Inflation	System Growth
1974 - 1978	9% in 1975 grading to 6.5% in 1980	7% in 1975 grading to 5% in 1980	7% in 1975 grading to 3.5% in 1980	0% TRS, 1% PERS
1979 - 1984	10% in 1980 grading to 6.5% in 1990	10% in 1980 grading to 5% in 1990	10% in 1980 grading to 5% in 1990	0% TRS, 0% PERS
1985 - 1988	10% in 1985 grading to 7.0% in 1990	5.25%	4.00%	1% TRS, 1% PERS
1989 - 1994	7.50%	5.50%	5.00%	0.75% TRS, 1.25% PERS
1995 - 1997	7.50%	5.00%	4.25%	0.9% TRS, 1.25% all Others
1998 - 1999	7.50%	4.00%	3.50%	0.9% TRS, 1.25% all Others
2000 - 2008	8.00%	4.50%	3.50%	0.9% TRS, 1.25% all Others
2009 - Present	8.00%	4.00%	3.50%	0.9% TRS, 1.25% all Others

Appendix L

How We Developed and Varied Our Projections

To produce the projections used in this report, we relied on the preliminary results of the 2008 Actuarial Valuation Report (AVR). We also relied on the Washington State Investment Board (WSIB) Capital Market Assumptions (CMAs) and reported returns through June 30, 2009.

“Our projections” refers to the projections we produce by taking the most recent AVR and projecting it forward 50 years. For each future year, we look at the data, assets, and liabilities as though we were producing a new AVR in that year. The data reflects the current population and includes new entrants. From the group of members currently active, we expect some to remain active, some to retire, some to quit and terminate service, etc. When members leave the active workforce, we replace them with new entrants. We assume future new entrants will have the same demographics as recent new entrants. Over time those new entrants also leave active status, and the cycle continues for each projected year. The result is a 50-year projection of valuation results that we use to generate future contribution rates.

Aside from the characteristics of new entrants, we made other assumptions to produce our projections. We assume no new benefit improvements throughout the projection. We assume all required member and employer contributions get made, regardless of their amounts. We assume no changes in WSIB asset allocation or CMAs.

Since the future is uncertain and rates of return cause most of the variation we see in contribution rates, we vary the rate of return earned on plan assets in each year of our projections. This gives us a good idea of the range of results we can expect based on the current asset allocation. We adjusted WSIB’s CMAs for the time horizon of the pension systems (see the Report On Long-Term Economic Assumptions for more detail about how we adjusted the CMAs). Using these assumptions we produced a distribution of annual asset returns that could arise given the asset allocation targets of the current WSIB Comingled Trust Fund (CTF) portfolio.

When we vary the annual rates of return earned by the plan, our projections produce different contribution rates. We generated and compared the results of over ten thousand scenarios. In theory each simulation has an equally likely chance of occurring. We relied on this fact to sort and compare the results.

For each scenario we randomly selected a rate of return for each year of the projection. Since each scenario used 50 random returns, we saw some scenarios with very high returns and some with very low returns. Since we looked at a very large number of scenarios, we feel confident that the spectrum of results represents the possible futures. We looked at the 25th, 50th, and 75th percentile of possible future scenarios. The 50th percentile represents the expected future. In this report, we based all projected contribution rates and associated contribution dollars labeled “Expected” on the 50th percentile of the distribution of scenarios. Similarly, we based all projected results labeled Pessimistic and Optimistic on the 25th and 75th percentiles respectively, of the distribution

Unless otherwise stated in the report, all other data, methods, and assumptions are consistent with the AVR. Plan provisions reflect all changes through the 2008 Legislative Session. We did not include the supplemental rates from the 2009 Legislative Session. We will not publish the final AVR until later this year. As a result we expect the results of this report to be slightly different than if we'd used the final results of the AVR. However, we expect these differences would not be material and would not change our findings and recommendations.

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