



2019

TACOMA EMPLOYEES' RETIREMENT SYSTEM

COMPREHENSIVE ANNUAL FINANCIAL REPORT

A pension trust fund of the
City of Tacoma, Washington
For the Year Ended
December 31, 2019

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A pension trust fund of the City of Tacoma, Washington
For the Year Ended December 31, 2019

Tim Allen, Retirement Director/CIO
3628 South 35th Street
Tacoma, Washington 98409
www.cityoftacoma.org/retirement

2019 KEY STATISTICS

Active Members		3,076
Benefit Recipients		2,617
Terminated Vested and Other Terminated Participants		745
Fiduciary Net Position (at Fair Value of Assets)	\$	1,876,095,355
Benefits Paid	\$	86,488,222
Refund of Contributions	\$	2,604,072
Administrative Expenses	\$	1,789,700
Member Contributions	\$	26,303,297
Employer Contributions	\$	30,239,417
Funded Ratio (at Actuarial Value of Assets)		98.0%
Funded Ratio (at Fair Value of Assets)		101.1%
Investment Rate of Return (time-weighted, net of fees)		16.8%

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ADMINISTRATIVE ORGANIZATION

BOARD OF ADMINISTRATION

As of December 31, 2019

Victoria Woodards	Mayor and Chair
Andrew Cherullo	Director of Finance and Board Secretary/Treasurer
Tadd Wille	Assistant City Manager/Designee of the City Manager
James Sant, CPA	TPU Deputy Director/Designee of TPU Director
Gordon Cavanaugh	Employee Representative
Samuel Bencoter	Employee Representative
Jonathan Schlaudraff	Employee Representative
Kim Moore	Retiree Representative
Matthew M. Hedges, CFA, CAIA	Citizen Representative
Wayne Reed	Alternate Board Member

INVESTMENT ADVISORY COMMITTEE

Dr. Alva Butcher	Professor	University of Puget Sound
Dr. Lynda Livingston, CFA	Professor	University of Puget Sound
Dr. Kevin K. Boeh	Faculty	University of Washington
Geoffrey Curran, CPA, CFP, CFA	Advisor	Merriman Wealth Management, LLC
Michael Thomas, CFA	Retired CIO	America's Institutional-Russell Investments

ADMINISTRATIVE STAFF

Tim Allen, CFA	Retirement Director/CIO
Catherine Marx, MAcc	Assistant Retirement Director
Trina Ealey	Senior Accountant
Linh Nguyen	Accountant
Kathleen Mason	Administrative Assistant, Board Recording Secretary
Melanie Panui	Retirement Specialist
Marni Moore	Retirement Specialist
Cecilia Grey	Retirement Specialist

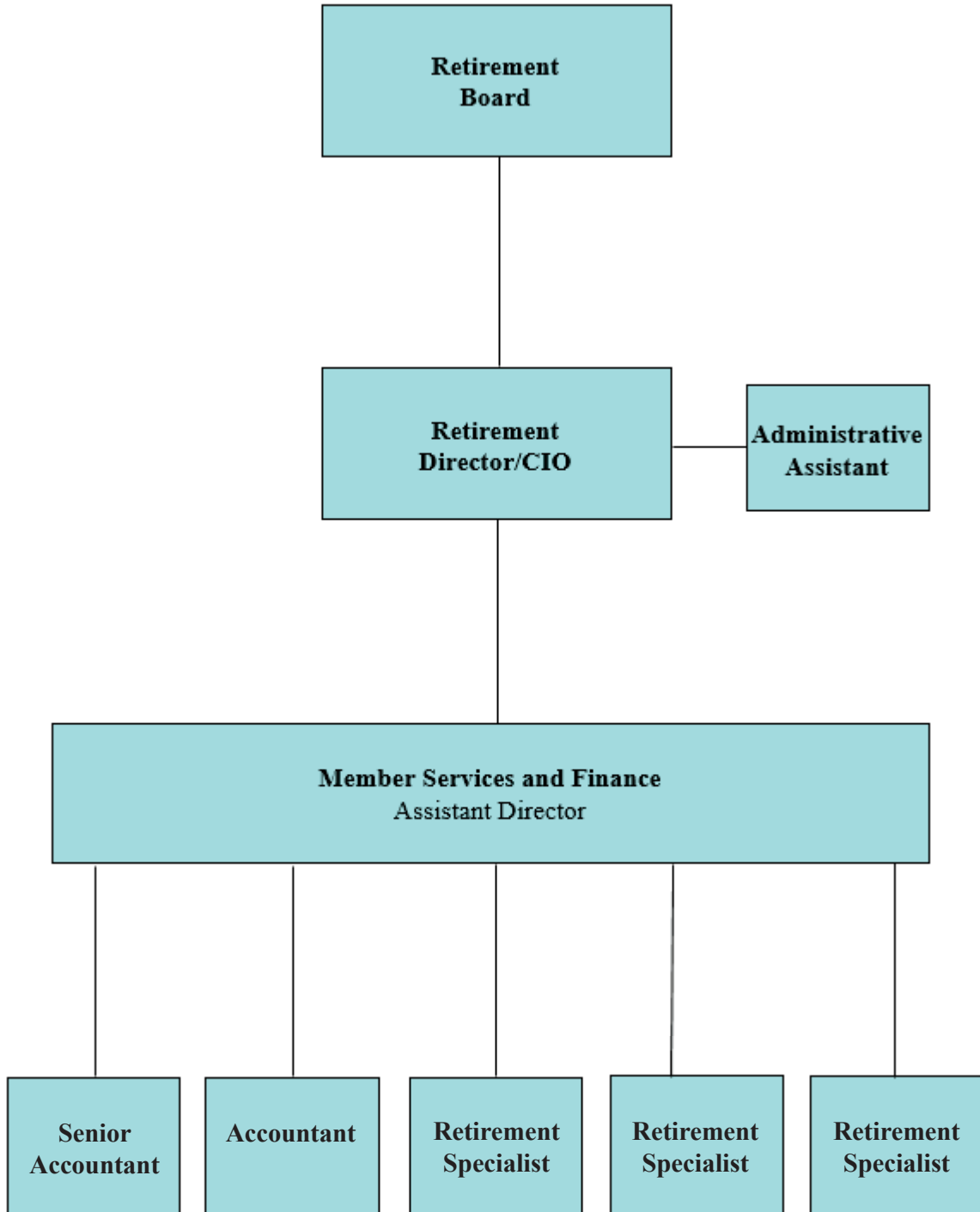
PROFESSIONAL CONSULTANTS

Davis Wright Tremaine, LLP	Legal Consultant
Milliman	Consulting Actuary
The Northern Trust Company	Custodian Bank
Wilshire Associates	Investment Consultant
Adelante Capital Management	Investment Manager
BlackRock	Investment Manager
Dimensional Fund Advisors	Investment Manager
Eaton Vance Management	Investment Manager
Hamilton Lane	Investment Manager
HarbourVest Partners	Investment Manager
INTECH	Investment Manager
INVESCO	Investment Manager
Metropolitan West Asset Management/TCW	Investment Manager
Neuberger Berman	Investment Manager
Northern Trust Global Investments	Investment Manager
Pantheon	Investment Manager
PIMCO/Research Affiliates	Investment Manager
Prudential Trust Company	Investment Manager
Tortoise Capital Advisors	Investment Manager

Information regarding investment expenses can be found on page 2-34 of the Financial Section and on page 3-9 of the Investment Section.

In addition, information on brokerage commissions can be found on page 3-10 of the Investment Section.

Tacoma Employees' Retirement System Organization Chart



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Government Finance Officers Association

Certificate of
Achievement
for Excellence
in Financial
Reporting

Presented to

Tacoma Employees' Retirement System
Washington

For its Comprehensive Annual
Financial Report
for the Fiscal Year Ended

December 31, 2018

Christopher P. Morill

Executive Director/CEO

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This Certificate of Transparency is awarded to the

Tacoma Employees' Retirement System

for its participation in the *2019 NCPERS Public Retirement Systems Study*, which seeks to further open disclosure, data collection, and encourage the public's understanding of public retirement systems.

Hank Kim, Esq.
Executive Director & Counsel

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City of Tacoma
Tacoma Employees' Retirement System

Letter of Transmittal

June 25, 2020

To the Honorable Mayor and
City of Tacoma Council
Tacoma, Washington

The comprehensive annual financial report (CAFR) of the Tacoma Employees' Retirement System (TERS), for the calendar year ended December 31, 2019, is hereby submitted. Responsibility for both the accuracy of the data and the completeness and fairness of the presentation, including all disclosures, rests with the management of the Retirement System. To the best of our knowledge and belief, the enclosed annual report is accurate in all material respects and is reported in a manner designed to present fairly the financial position and results of operation of the Tacoma Employees' Retirement System.

This report fulfills the requirement in Section 1.30.440 of the Tacoma Municipal Code that the Board of Administration transmit an annual report of the financial condition of the Retirement System to the City Council.

This letter of transmittal is designed to be read in conjunction with the Management's Discussion and Analysis (MD&A). The MD&A can be found in the financial section immediately following the report of the State Auditor.

PLAN HISTORY

The Retirement System was created and established, effective January 1, 1941, by Ordinance 11870 of the City of Tacoma, to be known thereafter as the Tacoma Employees' Retirement System, for the purpose of providing retirement income to maintain the quality of life of its former employees. The year 2019 concludes our 79th year of operation. The summary of the plan provisions is provided in the notes to the financial statements of the financial section of this report.

FINANCIAL INFORMATION

The City of Tacoma is responsible for establishing and maintaining an internal control structure to ensure that the assets of the City are protected from loss, theft, or misuse and generate accounting information to prepare financial statements in conformity with generally accepted accounting principles. The internal control structure is designed to provide reasonable assurance, while recognizing that the cost of a control should not exceed the benefits likely to be derived. The evaluation of the cost and benefits requires judgments by management.

The City of Tacoma is required to undergo an independent, annual single audit in conformity with the provisions in accordance with Title 2 U.S. Code of Federal Regulations (CFR) Part 200, Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards (Uniform Guidance). Such audit has been performed by the Washington State Auditors' Office, which meets the requirements of the Revised

Code of Washington 43.09.260. The auditor's report on our general purpose financial statements is included in the financial section of this report.

This report has been prepared in accordance with the principles of governmental accounting and reporting pronounced by the Governmental Accounting Standards Board.

The accrual basis of accounting is used to record assets, liabilities, revenues and expenses.

FUNDING

A sustainable pension plan is able to pay the promised benefits to its participants. The Board of Administration strives to maintain sufficient assets in trust to pay the benefits of the System, and to establish contribution rates that will be relatively stable over time.

Milliman, the consulting actuary for the Tacoma Employees' Retirement System, has completed the actuarial valuation as of January 1, 2020.

The following bullets summarize the most important points from the valuation as of January 1, 2020.

- The System's actuarial assets funded ratio is 98.0%, whereas the fair value of assets funded ratio is 101.1%.
- The current total contribution rate of 21.00% is greater than the normal cost rate of 18.59%, which is consistent with the Board's long-term goal of maintaining a contribution rate that is greater than or equal to the normal cost rate.

INVESTMENT OVERVIEW

The assets of the Tacoma Employees' Retirement System are invested consistent with the "prudent person rule". The prudent person standard states that fiduciaries shall discharge their duties solely in the interest of the fund participants and beneficiaries, and with the degree of diligence, care, and skill that a prudent person would ordinarily exercise under similar circumstances in a like position.

The Board of Administration has adopted an Investment Policy Statement, which incorporates key policies, including the strategic asset allocation and main investment responsibilities of the Board, staff and professional investment advisors. The policy allows for the delegation of investment authority to professional investment advisors. Investment advisors are required to execute their duties in accordance with the statutory authority, the Board policy and their respective guidelines, but are to use full discretion within the policy and their specific investment guidelines. The System maintains a well-diversified investment portfolio that consists of global equities, fixed income investments (including TIPS, investment grade bonds, high yield, and emerging market debt), real estate, private equity, and real assets. Investment income is expected to represent a significant source of revenue to the System.

Charles Dickens' classic novel, *A Tale of Two Cities*, begins: "It was the best of times, it was the worst of times..."

This phrase is particularly relevant in the current conditions. Let us start with the best of times: TERS posted a 16.8% net-of-fee return for calendar year 2019, the strongest annual return since 2009. All asset classes delivered positive results, with most exceeding 10% for the year.

Private equity produced 15.1% returns, but lagged the return observed in Minimum Volatility public equity of 21.6% and the return in Cap Weighted Public Equity of more than 25%. Real assets contributed to a lesser degree, posting a 6.5% return over 2019. TERS' real estate investments added 15.6%. Fixed income asset classes contributed to overall 2019 TERS returns to varying degrees. TIPS posted an 8.4% return, Core fixed income delivered 9.1%, while High Yield generated 12.2% and Emerging Market Debt was the best fixed income performer with returns of 15.6%.

While TERS posted a fourth quartile return in 2019 versus peers, the System produced top quartile results over the trailing ten-year period.

However, we would be remiss if we did not mention, “the worst of times,” which occurred after the close of these 2019 financial statements, over the first quarter of 2020. The onslaught of COVID-19 brought the ten-year bull market to an abrupt halt, with volatile trading producing one of the fastest stock market corrections in history. The price of crude oil fell 66% during the quarter due to sharply slowing economic activity around the globe and a price war initiated by two of the major producers. Corporate fixed income bond prices fell abruptly and trading liquidity evaporated. Yields on U.S. Treasuries fell to record lows because of investor panic and a flight-to-quality.

While it is still too early to determine how calendar year 2020 investment returns will play out, the magnitude of the market movements early in the year necessitates some mention in this report, which is designed to summarize 2019 results.

Despite near-term volatile market conditions, the Board’s asset allocation decisions and investment discipline have served the System well over time and will continue to do so into the future.

ACKNOWLEDGMENT

The compilation of this report reflects the combined effort of the staff under the leadership of the Board. It is intended to provide complete and reliable information as a basis for making management decisions, as a means of determining compliance with legal provisions, as a means for determining responsible stewardship for the assets of the System, and to provide information to the members and other interested parties.

The report will be posted on the System’s website at www.cityoftacoma.org/retirement to make it available to all members and City departments, as well as the public.

I would like to take this opportunity to express my gratitude to the staff, the advisors, and to the many people who have worked so diligently to ensure the successful operation of the System.

Respectfully submitted,

Tim Allen, CFA
Retirement Director/CIO

cc: TERS Board of Administration

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**Office of the Washington State Auditor
Pat McCarthy**

INDEPENDENT AUDITOR'S REPORT ON FINANCIAL STATEMENTS

June 23, 2020

The Honorable Mayor and Members of the Board of Administration
Tacoma Employees' Retirement System
Tacoma, Washington

REPORT ON THE FINANCIAL STATEMENTS

We have audited the accompanying financial statements of the Tacoma Employees' Retirement System, a fiduciary fund of the City of Tacoma, Washington, as of and for the year ended December 31, 2019, and the related notes to the financial statements, which collectively comprise the Retirement System's basic financial statements as listed in the table of contents.

Management's Responsibility for the Financial Statements

Management is responsible for the preparation and fair presentation of these financial statements in accordance with accounting principles generally accepted in the United States of America; this includes the design, implementation, and maintenance of internal control relevant to the preparation and fair presentation of financial statements that are free from material misstatement, whether due to fraud or error.

Auditor's Responsibility

Our responsibility is to express an opinion on these financial statements based on our audit. We conducted our audit in accordance with auditing standards generally accepted in the United States of America and the standards applicable to financial audits contained in *Government Auditing Standards*, issued by the Comptroller General of the United States. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial statements. The procedures selected depend on the auditor's judgment, including the assessment of the risks of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to the Retirement

System's preparation and fair presentation of the financial statements in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the Retirement System's internal control. Accordingly, we express no such opinion. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of significant accounting estimates made by management, as well as evaluating the overall presentation of the financial statements.

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.

Opinion

In our opinion, the financial statements referred to above present fairly, in all material respects, the financial position of the Tacoma Employees' Retirement System, as of December 31, 2019, and the changes in financial position thereof for the year then ended in accordance with accounting principles generally accepted in the United States of America.

Matters of Emphasis

As discussed in Note 1 to the financial statements, the financial statements present only the Tacoma Employees' Retirement System and do not purport to, and do not, present fairly the financial position of the City of Tacoma, Washington, as of December 31, 2019, the changes in its financial position, or, where applicable, its cash flows for the year then ended in conformity with accounting principles generally accepted in the United States of America. Our opinion is not modified with respect to this matter.

As explained in Note 2 to the financial statements, the financial statements include pension trust fund investments valued at \$1.87 billion, which comprise 96.2 percent of total assets and 99.6 percent of net position restricted for pensions. The fair values of these investments have been estimated by management in the absence of readily determinable fair values. Management's estimates are based on information provided by the fund managers or, in the case of investments in partnerships, the general partners. Our opinion is not modified with respect to this matter.

As discussed in Note 10 to the financial statements, in February 2020, a state of emergency was declared that could have a negative financial effect on the Retirement System. Our opinion is not modified with respect to this matter.

Other Matters

Prior-Year Comparative Information

The financial statements include partial prior year comparative information. Such information does not include all of the information required for a presentation in conformity with accounting principles generally accepted in the United States of America. Accordingly, such information should be read in conjunction with the Retirement System's financial statements for the year ended December 31, 2018, from which such partial information was derived. We have previously audited the Retirement System's 2018 financial statements and we expressed an unmodified opinion in our report dated June 13, 2019. In our opinion, the partial comparative information presented herein as of and for the year ended December 31, 2018, is consistent, in all material respects, with the audited financial statements from which it has been derived.

Required Supplementary Information

Accounting principles generally accepted in the United States of America require that the management's discussion and analysis and required supplementary information listed in the table of contents be presented to supplement the basic financial statements. Such information, although not a part of the basic financial statements, is required by the Governmental Accounting Standards Board who considers it to be an essential part of financial reporting for placing the basic financial statements in an appropriate operational, economic or historical context. We have applied certain limited procedures to the required supplementary information in accordance with auditing standards generally accepted in the United States of America, which consisted of inquiries of management about the methods of preparing the information and comparing the information for consistency with management's responses to our inquiries, the basic financial statements, and other knowledge we obtained during our audit of the basic financial statements. We do not express an opinion or provide any assurance on the information because the limited procedures do not provide us with sufficient evidence to express an opinion or provide any assurance.

Supplementary and Other Information

Our audit was conducted for the purpose of forming an opinion on the financial statements that collectively comprise the Retirement System's basic financial statements as a whole. The Schedule of Administrative Expenses, Schedule of Payments to Consultants, Schedule of Investment Expenses, and Schedule of Proportionate Share by Employer are presented for the purposes of additional analysis and are not a required part of the basic financial statements. Such information is the responsibility of management and was derived from and relates directly to the underlying accounting and other records used to prepare the financial statements. This information has been subjected to auditing procedures applied in the audit of the basic financial statements and certain additional procedures, including comparing and reconciling such information directly to the underlying accounting and other records used to prepare the financial statements or to the financial statements themselves, and other additional procedures in accordance with auditing standards generally accepted in the United States of America. In

our opinion, the information is fairly stated, in all material respects, in relation to the basic financial statements taken as a whole.

The information identified in the table of contents as the Introductory, Investment, Actuarial, and Statistical Sections, and the letter entitled Management's Responsibility for Financial Reporting are presented for purposes of additional analysis and are not a required part of the basic financial statements of the Retirement System. Such information has not been subjected to the auditing procedures applied in the audit of the basic financial statements and, accordingly, we do not express an opinion or provide any assurance on it.

OTHER REPORTING REQUIRED BY GOVERNMENT AUDITING STANDARDS

In accordance with *Government Auditing Standards*, we will also issue our report dated June 23, 2020, on our consideration of the Retirement System's internal control over financial reporting and on our tests of its compliance with certain provisions of laws, regulations, contracts and grant agreements and other matters. The purpose of that report is to describe the scope of our testing of internal control over financial reporting and compliance and the results of that testing, and not to provide an opinion on internal control over financial reporting or on compliance. That report is an integral part of an audit performed in accordance with *Government Auditing Standards* in considering the System's internal control over financial reporting and compliance.

Sincerely,



Pat McCarthy
State Auditor
Olympia, WA

MANAGEMENT'S RESPONSIBILITY FOR FINANCIAL REPORTING

December 31, 2019

Management has prepared the basic financial statements of the Tacoma Employees' Retirement System (the System or TERS), and is responsible for the integrity and fairness of the information presented. Some amounts included in the financial statements may be based on estimates and judgments. These estimates and judgments were made utilizing the best business practices available. The accounting policies followed in the preparation of these basic financial statements conform to the generally accepted accounting principles in the United States of America. Financial information presented throughout the annual report is consistent with the basic financial statements.

Ultimate responsibility for the basic financial statements and annual report rests with the Board of Administration. The Director and the rest of the System's staff assist the Board in its responsibilities. Internal controls and supporting procedures are maintained to provide assurance that transactions are authorized, assets are safeguarded, and proper records are maintained. These controls include communication of policies and procedures to TERS and related City departments, standards in hiring and training of employees, and segregation of duties and responsibilities.

The System's external auditors, the Washington State Auditor's Office, have conducted an independent audit of the basic financial statements in accordance with auditing standards generally accepted in the United States of America. This audit is described in their Independent Audit Report on the preceding pages. Management has provided the external auditors with full and unrestricted access to the System's staff to discuss their audit and related findings as to the integrity of the System's financial reporting and the adequacy of internal controls for the preparation of financial statements.

Tim Allen, CFA
Retirement Director/CIO

MANAGEMENT'S DISCUSSION AND ANALYSIS

The discussion and analysis of the Tacoma Employees' Retirement System (TERS) financial condition provides an overview of the financial activities and funding conditions for the calendar years ended December 31, 2019, 2018 and 2017. The intent of this discussion and analysis is to give a narrative overview and analysis of the System's financial performance as a whole. For more detailed information, readers should also review the financial statements, notes to the financial statements, and required supplementary information in order to enhance their understanding of the System's financial performance.

Overview of Financial Statements

TERS' financial statements were prepared in conformity with GASB Statement No. 67, *Financial Reporting for Pension Plans*, and are comprised of the following components:

1. Statement of Fiduciary Net Position,
2. Statement of Changes in Fiduciary Net Position,
3. Notes to the Basic Financial Statements,
4. Required Supplementary Information, and
5. Other Supplementary Information

Statement of Fiduciary Net Position. The Statement of Fiduciary Net Position provides information about the System's assets, liabilities and net position. It is a snapshot of the financial position of the System as of the end of the year 2019.

Statement of Changes in Fiduciary Net Position. The Statement of Changes in Fiduciary Net Position illustrates how TERS' net position changed during the calendar year, reflecting contributions accrued, benefit payments made, investment returns earned, and expenses paid to administer the System.

Notes to the Basic Financial Statements. The Notes to the Basic Financial Statements provide additional information that is essential to a complete understanding of the data provided in the Basic Financial Statements.

Required Supplementary Information. The Required Supplementary Information consists of schedules of changes in net pension liability or asset of employers, employers' net pension liability or asset, employers' contributions, contribution rates, proportionate share by employers and the money-weighted long-term rate of investment return for TERS.

Other Supplementary Information. The Other Supplementary Information includes details on administrative expenses, payments to consultants, and investment-related expenses.

Summary of Statement of Fiduciary Net Position

The table below provides a summary of assets and current liabilities for the years ended December 31.

	2019	2018	2017	2019-2018 Percentage Change	2018-2017 Percentage Change
Cash and short-term investments	\$ 12,062,873	\$ 17,508,429	\$ 35,448,884	(31.10) %	(50.61) %
Receivables	9,110,764	4,516,642	5,323,232	101.72	(15.15)
Investments	1,868,002,580	1,628,186,781	1,727,359,837	14.73	(5.74)
Securities lending collateral	52,384,912	21,575,741	41,989,985	142.80	(48.62)
Capital assets, net of accumulated depreciation	8,441	9,285	10,129	(9.09)	(8.33)
Total assets	1,941,569,570	1,671,796,878	1,810,132,067	16.14	(7.64)
Accounts payable and other liabilities	1,479,371	1,937,311	1,999,360	(23.64)	(3.10)
Investment purchases	11,609,932	13,263,445	42,893,200	(12.47)	(69.08)
Securities lending collateral	52,384,912	21,575,741	41,989,985	142.80	(48.62)
Total liabilities	65,474,215	36,776,497	86,882,545	78.03	(57.67)
Net position restricted for pensions	\$1,876,095,355	\$1,635,020,381	\$1,723,249,522	14.74	(5.12)

In 2019, the overall financial position of the System reflects an increase in fiduciary net position in comparison to the prior years due to the 16.8% net-of-fee return, the strongest annual return since 2009. However, following the closing of the 2019 financial statements, the spread of the COVID-19 coronavirus led to a sharp global economic slowdown and volatility in the financial markets. Substantive precautionary measures designed to slow the spread of the virus have been ordered around the world, including closing schools, colleges and universities, cancelling public events, prohibiting public and private gatherings, and requiring people to stay home unless they are performing an essential function. The duration of these measures is unknown at this time, as is the impact they will ultimately have on TERS.

The System has no long-term liabilities. The bulk of the liabilities at year-end are related to investment purchases that did not settle until early 2020, accrued administrative and investment expenses and securities lending collateral.

Summary of Statement of Changes in Fiduciary Net Position

The table below provides a summary of the changes in fiduciary net position and reflects the activities of the System for the years ended December 31.

	2019	2018	2017	2019-2018 Percentage Change	2018-2017 Percentage Change
Total contributions	\$ 56,542,714	\$ 53,780,971	\$ 49,100,277	5.14 %	9.53 %
Net investment income (loss)	275,414,254	(58,085,821)	205,616,277	(574.15)	(128.25)
Total additions (deductions)	331,956,968	(4,304,850)	254,716,554	(7811.23)	(101.69)
Benefits and refunds of contributions	89,092,294	82,233,426	77,467,644	8.34	6.15
Administrative expenses	1,789,700	1,690,865	1,663,105	5.85	1.67
Total deductions	90,881,994	83,924,291	79,130,749	8.29	6.06
Net increase (decrease)	241,074,974	(88,229,141)	175,585,805	(373.24)	(150.25)
Net position beginning of year	1,635,020,381	1,723,249,522	1,547,663,717	(5.12)	11.35
Net position end of year	\$ 1,876,095,355	\$ 1,635,020,381	\$ 1,723,249,522	14.74	(5.12)

Additions to Fiduciary Net Position consist of employer and employee contributions, investment income, and net realized and unrealized gains/losses on investments. For calendar year 2019, the total additions to the fiduciary net position rose from negative \$4.3 million in 2018 to positive \$332.0 million in 2019 due to significant investment gains. The details of the investment performance are located in the Investment Section of this report.

Deductions to Fiduciary Net Position consist of benefit payments, refunds, and administrative expenses. During 2019, benefits and refunds were 8.3% higher than 2018 - the major cause of the increase is attributable to a significant number of members exiting the System prior to updated actuarial factor changes that took effect in 2020. The total administrative expenses of approximately \$1.79 million represent approximately 2% of total deductions for the year.

Contacting Tacoma Employees' Retirement System

This financial report is intended to provide its readers with a general overview of the System's finances and to demonstrate accountability for funds, revenues and distributions. If you have questions about this report or need additional information, please contact us at:

Tacoma Employees' Retirement System
 Tacoma Public Utilities, Administration Building North
 3628 South 35th Street
 Tacoma, Washington 98409
 Email: tersretirement@cityoftacoma.org
 Telephone: (253) 502-8200/ 1-888-404-3787/Fax: (253) 502-8660

Statement of Fiduciary Net Position
As of December 31, 2019 and December 31, 2018

	2019	2018
Assets		
Cash and short-term investments	\$ 12,062,873	\$ 17,508,429
Receivables		
Contributions and other receivables	\$ 1,570,157	\$ 1,138,483
Interest and dividends	2,836,842	2,795,911
Investment sales	4,703,765	582,248
Total receivables	<u>\$ 9,110,764</u>	<u>\$ 4,516,642</u>
Investments, at fair value		
Equities	\$ 964,057,034	\$ 823,620,805
Fixed income	639,305,114	576,714,257
Real estate	81,145,679	76,859,020
Venture capital and partnerships	183,494,753	150,992,698
Total investments	<u>\$ 1,868,002,580</u>	<u>\$ 1,628,186,781</u>
Securities lending collateral	52,384,912	21,575,741
Capital assets, net of accumulated depreciation	8,441	9,285
Total assets	<u><u>\$ 1,941,569,570</u></u>	<u><u>\$ 1,671,796,878</u></u>
Liabilities		
Accounts payable and other liabilities	\$ 1,479,371	\$ 1,937,311
Investment purchases	11,609,932	13,263,445
Securities lending collateral	52,384,912	21,575,741
Total liabilities	<u><u>\$ 65,474,215</u></u>	<u><u>\$ 36,776,497</u></u>
Net position restricted for pensions	<u><u>\$ 1,876,095,355</u></u>	<u><u>\$ 1,635,020,381</u></u>

See accompanying Notes to the Financial Statements.

Statement of Changes in Fiduciary Net Position
For the Years Ended December 31, 2019 and 2018

	2019	2018
Additions		
Contributions		
Employer	\$ 30,239,417	\$ 28,587,937
Plan member	26,303,297	25,193,034
Total contributions	<u>\$ 56,542,714</u>	<u>\$ 53,780,971</u>
Investment income		
Net appreciation (depreciation) in fair value of investments	\$ 245,750,862	\$ (86,231,014)
Interest & dividends	37,864,244	35,751,087
Investment management fees	(7,053,157)	(6,625,351)
Securities lending - agent fees	(65,873)	(58,548)
Securities lending - broker rebates	(1,081,822)	(921,994)
Net investment income	<u>\$ 275,414,254</u>	<u>\$ (58,085,821)</u>
Total additions	\$ 331,956,968	\$ (4,304,850)
Deductions		
Benefits	\$ 86,488,222	\$ 80,034,214
Refunds of contributions	2,604,072	2,199,211
Administrative expenses	1,789,700	1,690,865
Total deductions	<u>\$ 90,881,994</u>	<u>\$ 83,924,291</u>
Net increase (decrease)	241,074,974	(88,229,141)
Net position restricted for pensions		
Beginning of year	<u>1,635,020,381</u>	<u>1,723,249,522</u>
End of year	<u><u>\$ 1,876,095,355</u></u>	<u><u>\$ 1,635,020,381</u></u>

See accompanying Notes to the Financial Statements.

Notes to the Basic Financial Statements
December 31, 2019

NOTE 1 SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES

(a) Plan Provisions

Description: The Tacoma Employees' Retirement System (the System) is a cost-sharing, multiple-employer defined benefit public employee pension plan, covering a majority of the employees of the City of Tacoma, and three Member Public Agencies. It has been administered in accordance with Tacoma Municipal Code Chapter 1.30 and the Revised Code of Washington Chapter 41.28.

The System is included in the Pension and Other Employee Benefit Trust Funds section of the City's Comprehensive Annual Financial Report (CAFR).

Administration: At the direction of the City Council, the System is administered by the Board of Administration (the Board) consisting of nine regular members and one alternate member. The members of the Board are: the Mayor, who serves as Chair; the Director of Finance; the City Manager (or designee); the Public Utilities Director (or designee); three elected employee representatives; one elected retired representative; and one City resident (not employed by the City) elected by the other eight members. The nine Board members appoint a TERS member, either active or retired, as an alternate Board member. The Board is required by the Tacoma Municipal Code to make annual reports to the City Council on the financial condition of the Retirement System. The Board, subject to City Council approval, appoints the Director who is responsible for managing the daily operations of the System.

Membership: Substantially all employees of the City of Tacoma are members of the System, with the exception of police officers, firefighters, and Tacoma Rail employees, who are covered by state or federal retirement plans. Other members include employees of the Tacoma-Pierce County Health Department, and certain employees of the Pierce Transit and the South Sound 911 (formerly known as Law Enforcement Support Agency) who established membership in the System when these agencies were still City of Tacoma departments. The breakdown of membership as of December 31, 2019 is as follows:

Retirees and beneficiaries currently receiving benefits	2,617
Terminated vested and other terminated participants	745
Active members:	
City of Tacoma	2,791
Pierce Transit	9
South Sound 911	2
Tacoma-Pierce County Health Department	274
Total active members	3,076
Total membership	<u>6,438</u>

NOTE 1 **SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES** continued

Benefits: There are two formulas to calculate the retirement benefits. The benefit paid will be based on the formula which provides the higher benefit. The most commonly applied formula, “service retirement”, is a product of the member’s highest average monthly salary for a consecutive 24-month period, the number of years of membership credit (30 years maximum), and a percentage factor (2% maximum) that is based on the member’s age and years of service. The other formula is an annuity based on member contributions. There are several options available for the retiree to provide for their beneficiaries. The System also provides death, disability and deferred or postponed retirement for those former members who separated and retire later under the retirement eligibility requirements similar to immediate retirement. Additionally, the System provides cost of living adjustment (COLA) increases up to 2.125% as of July 1st of each year; the actual COLA granted is dependent on the change in the Consumer Price Index (Seattle Area - all items) over the preceding calendar year.

Any active member who has not retired, and has five or more years of service as a member may purchase up to five additional years of service at the time of retirement. Total service including service purchased cannot exceed 30 years.

The System participates in the portability of public retirement benefits in Washington State public retirement. As provided under Chapter 41.54 of the RCW, this allows a member to use all years of service with qualified Washington systems to determine retirement eligibility and percentage factor for benefits under the System.

Funding Policy: The participating employers are responsible for funding the System at a level sufficient to pay obligations and ensure the actuarial and financial soundness of the System. Contribution rates for the employer and the employee are recommended by the Board of Administration and final approval rests with the Tacoma City Council. Currently, the required contribution rate for employees is 9.66% of their regular gross pay; the employer contributes 11.34%, for a combined total of 21.00%, which is sufficient to amortize the Unfunded Actuarial Accrued Liability (UAAL) of the System if future experience follows all actuarial assumptions. Changes to the contribution rate are subject to Sections 1.30.340 and 1.30.360 of the Tacoma Municipal Code.

(b) Method of Accounting

The System maintains records and accounts, and prepares financial statements using fund accounting principles and the accrual basis of accounting, under which benefits and expenses are recognized when due and payable and revenues are recorded in the accounting period in which they are earned and become measurable in accordance with the terms of the System.

For financial reporting purposes, TERS adheres to accounting principles that are generally accepted in the United States of America. The System applies all applicable pronouncements of the Governmental Accounting Standards Board (GASB).

GASB Statement No. 67, *Financial Reporting for Pensions*, addresses accounting and financial reporting requirements for pension plans. Significant requirements include an actuarial calculation of total and net pension liability. It also includes comprehensive footnote disclosure regarding the pension liability, the sensitivity of the net pension liability to the discount rate, and increased investment activity disclosures. The total pension liability, determined in accordance with GASB Statement No. 67, is presented in Note 2 and in the Required Supplementary Information.

NOTE 1 SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES continued

GASB Statement No. 72, *Fair Value Measurement and Application*, addresses accounting and reporting issues related to fair value measurements. This Statement requires disclosures to be made about fair value measurements, the level of fair value hierarchy, and valuation techniques. Comprehensive footnote disclosure regarding this Statement is found in Note 2.

GASB Statement No. 82, *Pension Issues*, requires the presentation of “covered payroll” as pensionable payroll. Statement No. 82 also clarifies that payments made by employers to satisfy “plan member contribution requirements” should be classified as “plan member contributions”. The commonly known practice “pick-up”, which means that the employer pays the employee portion of the contribution does not apply to TERS because plan members have always paid the employee required contributions, not the employer. There has been a long-standing practice that TERS members contribute 46% of the total contribution rate with the employers contributing 54%.

(c) Administrative Expenses

The Tacoma City Council, with the recommendation from the Board, adopts the operating budget for the administration of the System each biennium. The administrative expenses are financed from contributions and investment earnings of the System. The operating budget may include allocations for capital assets, which are capitalized upon purchase and expensed over their useful lives.

(d) Investments

Investment policy: The System’s policy in regard to the allocation of invested assets is established and may be amended by the Board. TERS’ assets are managed on a total return basis with a long-term objective of achieving and maintaining a fully funded status for the benefits provided through the System.

The following was the TERS actual asset allocation as of December 31, 2019:

Asset Class	Actual Allocation
Global equity	32.3 %
Minimum volatility equity	9.5
Core fixed income	15.2
TIPS	4.8
High yield / bank loans	8.8
Emerging market debt	5.4
Real estate	8.8
Private equity	9.7
Real assets	5.2
Short term fund	0.3
Total	<u>100.0 %</u>

NOTE 1 SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES continued

Equity securities, fixed income securities, private equity, real estate, and short-term investments are all reported on a trade date basis, at fair value. Fair value for public market managers was determined by the custodian bank utilizing standard industry practices. Private investments are reported by the managers subject to their fair value policies. No investment in any one corporation exceeded 5% of net position available for benefits.

(e) Use of Estimates

The preparation of financial statements in conformity with accounting principles generally accepted in the United States requires management to make estimates and assumptions that affect certain reported amounts and disclosures. Actual results could differ from the estimated amount.

NOTE 2 FAIR VALUE MEASUREMENT

The System categorizes the fair value measurements within the fair value hierarchy established by generally accepted accounting principles. The categorization of investments within the hierarchy is based upon the valuation transparency of the instrument as of the measurement date.

Level 1: Investments classified as Level 1 are based on unadjusted quoted prices in active markets for identical assets at the end of each reporting period.

Level 2: Investments classified as Level 2 are based on identical publicly traded securities and exchange-traded securities traded in inactive markets, quoted prices for similar instruments in active markets, or model-derived valuations in which all significant inputs are observable.

Level 3: Investments classified as Level 3 are primarily composed of investments whose valuations are derived from valuation techniques in which significant inputs are unobservable and require judgment and estimation.

Net Asset Value (NAV): The fair values of investments that are measured at fair value using NAV as a practical expedient are not classified in the fair value hierarchy.

The assessment of the significance of particular inputs to these fair value measurements requires consideration be given to factors specific to each asset or liability.

Cash and cash equivalents

Cash and cash equivalents include highly liquid investments, which include money market-type securities, foreign currencies and short-term investment funds. The short-term investment funds are valued at cost plus accrued interest, which approximates fair value. Accordingly, these investments are excluded from the fair value schedule.

The table below presents the fair value measurements within the hierarchy established by generally accepted accounting principles as of December 31, 2019 for the Tacoma Employees' Retirement System.

Investments Measured at Fair Value Level As of December 31, 2019	Fair Value	Inputs		
		Level 1	Level 2	Level 3
Asset Backed Securities	\$ 21,006,543		\$ 21,006,543	
Commercial Mortgage Backed	3,744,163		3,744,163	
Common Stock	230,837,442	\$ 230,837,442		
Corporate Bonds	94,719,623		94,719,623	
Government Agencies	91,300,793		91,300,793	
Government Bonds	67,688,150		67,688,150	
Government Mortgage Backed Securities	77,551,508		77,551,508	
Gov't-Issued Commercial Mortgage Backed	2,931,634		2,931,634	
Index Linked Government Bonds	7,886,845		7,886,845	
Municipal/Provincial Bonds	468,731		468,731	
Non-Government Backed C.M.O.S	8,233,282		8,233,282	
Total investments by fair value level	\$606,368,713	\$ 230,837,442	\$ 375,531,271	\$ -

NOTE 2 FAIR VALUE MEASUREMENT continued

The table below presents the fair value measurements using NAV as of December 31, 2019 for the Tacoma Employees' Retirement System.

Investments Measured at NAV* As of December 31, 2019	Fair Value	Unfunded Commitment	Redemption Frequency (If Currently Eligible)	Redemption Notification Period
Common Stock ⁽¹⁾	\$ 733,219,592	n/a	Daily, Monthly	Two to five business days prior to month-end
Fixed Income ⁽²⁾	263,773,843	n/a	Monthly	30 to 90 days
Private Equity ⁽³⁾	183,494,753	\$ 324,876,703	Illiquid	n/a
Real Estate ⁽⁴⁾	81,145,679	n/a	Quarterly, subject to market conditions	45 days prior to quarter- end
Total investments measured at the NAV	\$ 1,261,633,867	\$ 324,876,703		

Reconciliation to statement of fiduciary net position

Total investments by fair value level	\$ 606,368,713
Total investments measured at the NAV	<u>1,261,633,867</u>
Investments per statement of fiduciary net position	<u>\$ 1,868,002,580</u>

* In accordance with GASB 72, certain investments that were measured at NAV per share (or its equivalent) may not be classified in the fair value hierarchy. The fair value amounts presented in this table are intended to permit reconciliation of the fair value hierarchy to the line items presented in the statement of net position.

(1) Common Stock

Assets are held in limited liability companies or trusts with daily or monthly liquidity and a perpetual life.

(2) Fixed Income

Assets are held in limited liability companies and trusts with monthly liquidity and a perpetual life.

(3) Private Equity

Assets are held in limited partnerships with constrained liquidity and anticipated life of seven to ten years.

(4) Real Estate

Assets are held in a limited partnership with quarterly liquidity and a perpetual life.

NOTE 3 DEPOSIT AND INVESTMENT RISK DISCLOSURES

(a) Custodial Credit Risk – Cash and Investments

Custodial credit risk is the risk that in the event of the failure of a financial institution or a bank, the System will not be able to recover the value of its deposits or investments that are in the possession of an outside party. Cash and short term investments include securities with a maturity date of three months or less.

Cash balances represent both operating cash accounts held by the City Treasurer and investment cash on deposit with the investment custodian, The Northern Trust Company (Northern). Cash held by the City Treasurer is invested in accordance with the City of Tacoma's investment policy; cash invested with Northern is under the custody agreement which holds Northern responsible for the safekeeping of all securities and funds held on behalf of the System. All the remaining City securities are held by the City's third party custodial bank in the City's name. The investments of the System are invested in accordance with the "prudent person rule".

The System mitigates its custodial credit risk by having its investment securities held by the System's custodian (Northern) with the investments registered in the System's name. Also, in accordance with the System's Investment Policy Statement, each of the System's investment managers is provided with a set of investment guidelines. These guidelines specify eligible investments, minimum diversification standards and applicable investment restrictions necessary for diversification and risk control. Managers do not have the authority to depart from their guidelines.

As of December 31, 2019, 100% of the System's cash and investments were held in the System's name and, therefore, the System has no custodial credit risk exposure.

(b) Concentration of Credit Risk

Concentration of credit risk is the risk of loss attributed to the magnitude of an entity's exposure in a single issuer. This disclosure requirement does not apply to investments issued or explicitly guaranteed by the U.S. government and investments in mutual funds, external investment pools, and other pooled investments. The System does not have any investments from a single issuer (excluding pooled investments or explicitly guaranteed governments) that represent more than 5% of the System's assets. In accordance with the System's Investment Policy Statement, credit risk is mitigated by agreeing to a set of investment guidelines with the investment manager. These guidelines specify eligible investments, minimum diversification standards and applicable investment restrictions necessary for diversification and risk control. Managers do not have the authority to depart from their guidelines.

(c) Credit Risk

Credit risk is the financial risk that an issuer or other counterparty will not fulfill its obligation to TERS. Each of the fixed income investment managers consistently monitor the risk associated with their portfolios. The System does not have a formal policy to limit credit risk. However, the firms/funds adhere to investment guidelines that have been reviewed by TERS staff, and regularly report on their positions relative to the benchmark.

NOTE 3 DEPOSIT AND INVESTMENT RISK DISCLOSURES continued

The table below discloses the credit ratings for the System's investments in debt securities using Standard and Poor's credit ratings.

Quality Ratings	Fair Value
AAA	\$ 262,328,918
AA	44,857,959
A	11,409,058
BBB	39,261,610
BB	126,101,564
B	155,044,154
CCC	301,851
Total fixed income securities	<u>\$ 639,305,114</u>

(d) Interest Rate Risk

Interest rate risk is the risk that changes in interest rates over time will adversely affect the fair value of an investment. Market or interest rate risk is one of the greatest risks faced by an investor in the debt securities market. The price of a debt security typically moves in the opposite direction of the change in interest rates. The interest rate risk is mitigated by providing each investment manager with a set of investment guidelines. These guidelines specify eligible investments, minimum diversification standards and applicable investment restrictions necessary for diversification and risk control. Managers do not have the authority to depart from their guidelines. Weighted average maturity is the measure of a debt investment's exposure to fair value changes arising from changes in interest rates.

As of December 31, 2019, the System had the following debt investments:

Investment Type	Fair Value December 31, 2019	Weighted Average Maturity
Asset backed securities	\$ 21,006,543	27.32
Commercial mortgage backed	3,744,163	19.92
Corporate bonds	206,356,398	8.42
Government agencies	91,300,793	16.21
Government bonds	67,688,150	8.88
Government mortgage backed securities	77,551,508	22.03
Gov't-issued commercial mortgage backed	2,931,634	10.95
Index linked government bonds	7,886,845	12.01
Municipal/provincial bonds	468,731	14.51
Non-government backed C.M.O.S	8,233,282	18.16
Other fixed income	152,137,068	7.46
Total fixed income securities	<u>\$ 639,305,114</u>	

NOTE 3 DEPOSIT AND INVESTMENT RISK DISCLOSURES continued

(e) Foreign Currency Risk

Foreign currency risk is the risk that changes in exchange rates will adversely impact the fair value of an investment or deposit. The System does not have a formal policy to limit foreign currency risk. TERS manages their exposure to fair value loss by requiring their international securities investment managers to maintain diversified portfolios to limit foreign currency and security risk. The System's currency risk exposures, or exchange rate risks, primarily reside within the venture capital and partnerships investment holdings.

The table below represents securities held in a foreign currency as of December 31, 2019.

Currency Name	Cash and Cash Equivalents	Equities	Venture Capital and Partnerships	Total Fair Value
Australian dollar	\$ 39	\$ 1,829		\$ 1,868
Euro	142,003		\$ 6,371,141	6,513,144
New Israeli shekel	2,895			2,895
Total	\$ 144,937	\$ 1,829	\$ 6,371,141	\$ 6,517,907

NOTE 4 DERIVATIVES

Derivative instruments are financial contracts whose value depends on the values of underlying assets, reference rates, or financial indices. They include futures contracts, swap contracts, credit-linked notes and forward foreign currency exchange. As of December 31, 2019, the derivative instruments held by the System are considered investments and not hedges for accounting purposes. The gains and losses arising from this activity are recognized in the Statement of Changes in Plan Net Position.

The System's investment managers, as permitted by their specific investment guidelines and consistent with the System's Investment Policy Statement, may enter into transactions involving derivative financial instruments. These instruments include futures, options, swaps, forwards, warrants and rights. In accordance with Board policy, these investments may not be used to leverage the System's portfolio, i.e., use derivatives to increase the portfolio's notional exposure to any given asset class. These instruments are used in an attempt to enhance the portfolio's performance and/or reduce the portfolio's risk. All investment derivatives discussed below are addressed in the Portfolio Risk discussion, which precedes this section. Investment derivative instruments are disclosed separately to provide a comprehensive and distinct view of this activity and its impact on the overall investment portfolio.

The table below provides a summary of the derivative instruments outstanding as of December 31, 2019.

Classification	Fair Value	Changes in Fair Value	Notional Fair Value
Forwards	\$ (1,587,384)	\$ (1,587,384)	
Futures			\$ 33,891,594
Total	\$ (1,587,384)	\$ (1,587,384)	\$ 33,891,594

The derivative instruments that are not exchange traded, such as credit default swaps and interest rate swaps, are valued using quoted market prices

NOTE 4 DERIVATIVES continued

Credit default swaps (CDS) are contracts and agreements in which the protection buyer of the CDS makes a series of payments to the protection seller and, in exchange, receives a payoff if a credit instrument (typically a bond or loan) experiences a credit event.

Futures contracts are financial instruments that derive their value from underlying indices or reference rates and are marked-to-market at the end of each trading day. Daily settlement of gains and losses occur on the following business day. Daily settlement of gains and losses is a risk control measure to limit counterparty credit risk. Futures variation margin amounts are settled each trading day and recognized in the financial statements under net appreciation (depreciation) in fair value of investments as they are incurred.

An option is a contract that gives the buyer the right, but not the obligation, to buy or sell an underlying asset at a specific price on or before a certain date.

Rights/warrants are issued by corporations and provide the holder with the right, but not the obligation, to buy a company's common stock at a predetermined price - the subscription price. The right is good until its expiration date, which is usually four to six weeks after its issue.

Foreign currency forward contracts are obligations to buy or sell a currency at a specified exchange rate and quantity on a specific future date. The fair value of the foreign currency forwards is the unrealized gain or loss calculated based on the difference between the specified exchange rate and the closing exchange rate at December 31, 2019.

(a) Derivative Custodial Credit Risk

The custodial credit risk disclosure for exchange traded derivative instruments is made in accordance with the custodial credit risk disclosure requirements of GASB Statement 40, *Deposit and Investment Risk Disclosures*. At December 31, 2019, all of the System's investments in derivative instruments were held in the System's name and were not exposed to custodial credit risk.

(b) Derivative Interest Rate Risk

At December 31, 2019, the System was exposed to interest rate risk on its derivative investments. The table below illustrates the maturity periods of these derivative instruments.

Classification	Investment Maturities 3 months or less
Forwards	\$ <u>(1,587,384)</u>

(c) Derivative Contingent Features

As of December 31, 2019, the System did not hold any positions in derivatives containing contingent features.

NOTE 4 DERIVATIVES continued

(d) Derivative Foreign Currency Risk

At December 31, 2019, the System was exposed to foreign currency risk on its derivative investments, as shown in the table below:

Currency Name	Forwards
Australian dollar	\$ (122,713)
British pound sterling	(410,190)
Canadian dollar	(169,135)
Danish krone	(24,792)
Euro	(484,361)
Hong Kong dollar	(509)
Japanese yen	(180,754)
New Israeli shekel	(3,937)
New Zealand dollar	(4,179)
Norwegian krone	(13,142)
Singapore dollar	(13,684)
Swedish krona	(20,981)
Swiss franc	(139,005)
Total	<u>\$ (1,587,384)</u>

NOTE 5 SECURITIES LENDING

In accordance with the policies of the Board of Administration, the System lends its securities (i.e., U.S. Treasury bonds, U.S. equities and corporate bonds) to broker-dealers with an agreement to return in the future the collateral received for the securities. The System's Custodian (Northern) is authorized to lend available securities to authorized broker-dealers subject to the receipt of acceptable collateral. The System accepts collateral in the form of cash and U.S. government and agencies securities.

The System does not have the ability to pledge or sell non-cash collateral unless the borrower defaults. All securities loaned can be terminated on demand by either the lender or the borrower.

The Custodian provides for full indemnification to the System for any losses that might occur in the Securities Lending program due to the failure of a broker to return a borrowed security (and if the collateral is inadequate to replace the lent securities) or failure to pay the System for income from the securities while on loan. Additionally, the Custodian's responsibilities include performing appropriate borrower and collateral investment credit analyses, demanding adequate types of collateral, and complying with applicable regulations concerning securities lending.

Gross securities lending income during 2019 was \$1,301,455 and security lending agent fees and rebates were \$1,147,695 resulting in net security lending income of \$153,760. The fair value of loaned securities collateralized by cash collateral at December 31, 2019 was \$52,384,912.

Cash collateral is invested in a short-term investment pool. Cash collateral may also be invested separately in "term loans" in which case the investments match the loan term. These loans can be terminated on demand by either lender or borrower.

There were no violations of legal or contractual provisions or borrower or lending agent default losses known to the securities lending agent.

NOTE 6 PENSION VALUATION

As a result of Governmental Accounting Standard Board (GASB) Statement No. 67, *Financial Reporting for Pension Plans*, and Statement 68, *Accounting and Financial Reporting for Pensions*, TERS has separate valuations performed for financial reporting and funding purposes.

(a) Pension System Funding Valuations

The purpose of the actuarial valuation is to determine whether the scheduled contributions in combination with the future net investment earnings, and invested assets are projected to be sufficient to finance future member benefits.

An actuarial valuation of the System's assets and liabilities is performed annually. The January 1, 2020 actuarial funded ratio, which represents the ratio of the Actuarial Value of Assets (AVA) to the Actuarial Accrued Liability (AAL), was 98.0%, slightly up from 97.3% from the January 1, 2019 valuation. This is based on the AVA as of December 31, 2019, which uses smoothing on gains and losses of investments over four years. The Funding Ratio based on Fair Value of Assets (FVA) increased from 92.8% at January 1, 2019 to 101.1% at January 1, 2020 due to the positive 16.83% net-of-fee return in 2019.

(b) Financial Reporting Valuation

The actuarial valuation for financial reporting emphasizes the obligation an employer incurs to pay for the benefit, as promised. The primary purpose of the valuation for financial reporting is to provide a consistent, standardized methodology that allows comparability of data and increased transparency of the pension liability across plans. To do so, GASB requires a different approach for determining the reported Net Pension Liability or Asset (NPL or NPA), as compared to the previously disclosed Unfunded Actuarial Accrued Liability (UAAL). The UAAL mirrored the Unfunded Actuarial Accrued Obligation calculated by TERS' external actuary for funding purposes and represented the excess of the Actuarial Accrued Liability (AAL) over the Actuarial Value of Assets (AVA). Under GASB 67, the UAAL has been replaced by the NPL, which represents the excess of the Total Pension Liability (TPL) over fiduciary net position.

There are considerable differences between the UAAL and the NPL. Conceptually, the UAAL is the actuary's measure of the additional amount of assets needed to pay all benefits earned to date by current plan members, while the NPL is an accrual calculation that reflects future benefits earned by plan members in excess of the System's fiduciary net position.

Per the Board's decision, the System is reporting an Actuarially Determined Contribution (ADC). The ADC for the period ended December 31, 2016 is based on a 30-year amortization of the UAAL based on the AVA, or the current employer contribution rate if that is greater. In July 2016, the Board changed the ADC to be based on a 25-year amortization of UAAL. This was reflected in the January 1, 2017 actuarial valuation, which will be used to calculate the ADC for the year beginning January 1, 2018 reporting date for the employer.

TERS has a NPA and, therefore, did not have to calculate a blended rate of return. Instead, TERS discounted all future obligations using the long-term expected rate of return on plan assets, which is currently 7.0%. This rate is net of investment expenses and gross of administrative expenses. Based on that assumption, TERS has a NPA of \$20.1 million as of December 31, 2019.

NOTE 7 NET PENSION LIABILITY OR ASSET OF EMPLOYERS

The Net Pension Liability or Asset (NPL or NPA) (i.e., the System's liability is determined in accordance with GASB No. 67, *Financial Reporting for Pension Plans*, less the fiduciary net position) as of December 31, 2019, is shown below.

Net Pension Liability (Asset)	2019
Total pension liability	\$ 1,855,959,386
Fiduciary net position	1,876,095,355
Net pension liability (asset)	<u>\$ (20,135,969)</u>
Fiduciary net position as of % of total pension liability	101.08%
Covered payroll	\$ 266,661,526
Net pension liability as a percentage of covered payroll	-7.55%

Actuarial valuation of the System involves estimates of the reported amounts and assumptions about probability of occurrence of events far into the future. For example, assumptions about future employment, mortality and future salary increases. Amounts determined regarding the net pension liability or asset are subject to continual revision as actual results are compared with past expectations and new estimates are made about the future. The last Experience Study was performed in 2016 and the next Experience Study is scheduled to be conducted in 2020. The Schedule of Employers' Net Pension Liability or Asset presents multi-year trend information about whether the plan fiduciary net position is increasing or decreasing over time relative to the total pension liability. These schedules are presented in the Required Supplementary Information section. The Total Pension Liability as of December 31, 2019, is based on the results of an actuarial valuation date as of January 1, 2020 using the generally accepted actuarial procedures.

NOTE 7 NET PENSION LIABILITY OR ASSET OF EMPLOYERS continued

(a) Actuarial Assumptions

A summary of the actuarial assumptions used for funding and GASB 67, *Financial Reporting for Pension Plans*, reporting valuation in the latest actuarial valuation is shown below.

Valuation Date	January 1, 2020
Actuarial Cost Method	Entry Age Normal
Amortization Method	Funding is based on statutory contribution rate. This amount is compared to a 25-year amortization for the purposes of calculating the Actuarially Determined Contribution. The amortization method for the ADC is as follows*:
Level percent or level dollar:	Level percent
Closed, open, or layered periods:	Open
Amortization period:	25 years*
Amortization growth rate:	3.75%
Asset Valuation Method	
Smoothing period:	4 years
Corridor:	None
Inflation	2.75%
Salary Increases	Varies by service; details in funding valuation report.
Investment Rate of Return	7.00%
Cost of Living Adjustments	2.125%
Retirement Age	Varies by age, gender, eligibility; details in funding valuation report.
Turnover	Varies by service, gender; details in funding valuation report.
Mortality	RP- 2014 Mortality for Employees, Healthy and Disabled Annuitants. Generational improvements with projection scale based on Social Security Administration Data
Active Members:	RP-2014 Employee Mortality, sex-distinct. RP-2014 50% Blue Collar/50% White Collar
Male Inactive Members and Male Beneficiaries:	Mortality for Healthy Males, RP-2014 Disabled Mortality for males.
Female Inactive and Female Beneficiaries:	RP-2014 Blue Collar Mortality for Healthy Females, RP-2014 Disabled Mortality for females.

* The actual contribution is used if that rate is greater than the rate necessary to amortize the UAAL. Note that the UAAL amortization period is 30 years for years 2017 and earlier and 25 for years beginning January 1, 2018 and later.

NOTE 7 NET PENSION LIABILITY OR ASSET OF EMPLOYERS continued

(b) Target Allocations

The long-term expected rate of return is determined by adding expected inflation to expected long-term real returns and reflecting volatility and correlation. The capital market assumptions are per Milliman's (the System's actuary) investment consulting practice as of December 31, 2019. The target asset allocation is based on TERS Investment Policy Statement dated March 2019.

Asset Class	Target Allocation	Long-Term Expected Arithmetic Real Rate of Return
Investment grade fixed income	19.5 %	1.46 %
US bank/leveraged loans	3.0	2.69
US long government bonds	3.0	1.69
High yield bonds	6.0	3.08
Emerging market debt	5.0	3.31
Global equity	34.5	5.07
Private real estate	10.0	3.84
Private equity	10.0	9.47
Master limited partnerships	4.0	3.98
Timber	1.5	4.00
Infrastructure	2.0	4.79
Agriculture	1.5	4.49
Assumed inflation- mean		2.75
Assumed inflation- standard deviation		1.65
Portfolio arithmetic real mean return		4.23
Portfolio median nominal geometric return		6.54
Portfolio standard deviation		9.81
Long-term expected rate of return, net of investment expenses		7.00

(c) Sensitivity Analysis

The following presents the NPL of the plan, calculated using the discount rate of 7.00%, as well as what the System's NPL would be if it were calculated using a discount rate that is 1 percentage point lower (6.00%) or 1 percentage point higher (8.00%) than the current rate.

	1% Decrease 6%	Current Discount Rate 7%	1% Increase 8%
Total pension liability	\$ 2,091,597,831	\$ 1,855,959,386	\$ 1,659,035,010
Fiduciary net position	1,876,095,355	1,876,095,355	1,876,095,355
Net pension liability (asset)	\$ 215,502,476	\$ (20,135,969)	\$ (217,060,345)

NOTE 8 OTHER POSTEMPLOYMENT BENEFITS (OPEB)

The System does not have any OPEB related costs for the year ending December 31, 2019. The City of Tacoma reports OPEB information related to TERS members in its financial reporting.

NOTE 9 OTHER MATTERS

No investments were made in loans to, or leases with, any Tacoma Employees' Retirement System official, governmental employer official, party related to a Tacoma Employees' Retirement System official or governmental employer official, non-employer contributor, or organization included in the reporting entity of our participating employers.

The Board of Administration of the Tacoma Employees' Retirement System administers the System. Any risk of loss would be based upon how the System was administered and would be covered through a fiduciary liability policy for the Board or would be paid from plan resources.

There were no material violations of financial related legal and contractual provisions.

NOTE 10 SUBSEQUENT EVENTS

For calendar year 2019, TERS posted a 16.8% net-of-fee return, the strongest annual return since 2009. However, following the closing of the 2019 financial statements, the spread of the COVID-19 coronavirus led to a sharp global economic slowdown and volatility in the financial markets. Substantive precautionary measures designed to slow the spread of the virus have been ordered around the world, including closing schools, colleges and universities, cancelling public events, prohibiting public and private gatherings, and requiring people to stay home unless they are performing an essential function. The duration of these measures is unknown at this time, as is the impact they will ultimately have on TERS.

Required Supplementary Information

1. Schedule of Changes in Net Pension Liability or Asset of Employers and Related Ratios

Total Pension Liability	2019	2018	2017	2016	2015	2014
Service cost	\$ 42,475,779	\$ 40,686,863	\$ 40,301,955	\$ 42,533,534	\$ 39,962,780	\$ 38,484,316
Interest on total pension liability	123,223,858	117,668,963	115,522,246	115,288,127	105,422,784	100,571,822
Effect of plan changes	-	-	(36,833,135)	-	-	-
Effect of economical/demographic gains or losses	17,694,256	4,815,762	(8,898,349)	(20,746,776)	(2,708,626)	(6,285,151)
Effect of assumptions changes or inputs	-	-	-	40,767,283	-	-
Benefit payments/refunds of contributions	(89,092,294)	(82,233,425)	(77,467,644)	(71,996,054)	(68,607,774)	(64,636,634)
Net change in total pension liability	94,301,599	80,938,163	32,625,073	105,846,114	74,069,164	68,134,353
Total pension liability, beginning	1,761,657,787	1,680,719,624	1,648,094,551	1,542,248,437	1,468,179,273	1,400,044,920
Total pension liability, ending (a)	1,855,959,386	1,761,657,787	1,680,719,624	1,648,094,551	1,542,248,437	1,468,179,273
Fiduciary Net Position						
Employer contributions	30,239,417	28,587,937	26,091,331	25,536,034	24,557,390	23,903,892
Member contributions	26,303,297	25,193,034	23,008,946	22,407,327	21,258,474	20,698,886
Investment income net of investment expenses	275,414,254	(58,085,821)	205,616,277	124,939,177	(5,292,224)	111,425,834
Benefit payments/refunds of contributions	(89,092,294)	(82,233,425)	(77,467,644)	(71,996,054)	(68,607,774)	(64,636,634)
Administrative expenses	(1,789,700)	(1,690,865)	(1,663,105)	(1,917,955)	(1,691,339)	(1,716,124)
Net change in plan fiduciary net position	241,074,974	(88,229,141)	175,585,805	98,968,529	(29,775,473)	89,675,854
Fiduciary net position, beginning	1,635,020,381	1,723,249,522	1,547,663,717	1,448,695,188	1,478,546,808	1,388,670,954
Fiduciary net position, ending (b)	1,876,095,355	1,635,020,381	1,723,249,522	1,547,663,717	1,448,771,335	1,478,546,808
Net position liability (asset), ending = (a) - (b)	(20,135,969)	126,637,406	(42,529,898)	100,430,834	93,477,102	(10,367,535)
Fiduciary net position as a percentage of total pension liability	101.08%	92.81%	102.53%	93.91%	93.94%	100.71%
Covered payroll	266,661,526	252,789,412	241,586,398	236,444,759	227,383,241	221,332,333
Net pension liability as a percentage of covered payroll	-7.55%	50.10%	-17.60%	42.48%	41.11%	-4.68%

Note: This schedule is to be built prospectively until it contains ten years of data.

2. Schedule of Net Pension Liability or Asset of Employers

The System's fiduciary net position, along with the expected future contributions, was projected to be available to make all projected future benefit payments of current active and inactive employees. Therefore, the discount rate for calculating the total pension liability is equal to the long-term expected rate of return of 7.25% in 2014 through 2016 and 7.00% in 2017 and in future years.

(All Amounts in millions)

Net Pension Liability (Asset)	2019	2018	2017	2016	2015	2014	2013
Total pension liability	\$ 1,856.0	\$ 1,761.7	\$ 1,680.7	\$ 1,648.1	\$ 1,542.2	\$ 1,468.2	\$ 1,400.0
Fiduciary net position	1,876.1	1,635.0	1,723.2	1,547.7	1,448.8	1,478.5	1,388.9
Net pension liability	\$ (20.10)	\$ 126.70	\$ (42.53)	\$ 100.43	\$ 93.48	\$ (10.37)	\$ 11.17
Fiduciary net position as a % of total pension liability	101.08%	92.81%	102.53%	93.91%	93.94%	100.71%	99.20%
Covered payroll	2,667	2,528	2,416	2,364	2,274	2,213	2,138
Net pension liability as a % of covered payroll	-7.55%	50.10%	-17.60%	42.48%	41.11%	-4.68%	5.23%

Note: This schedule is to be built prospectively until it contains ten years of data.

3. Schedule of Employers' Contributions

In April 2014, the Board adopted an ADC. The ADC for the period ended December 31, 2016 is based on a 30-year amortization of the UAAL based on the AVA, or the current employer contribution rate if that is greater. At the July 2016 Board meeting, the Board changed the ADC to be based on a 25-year amortization of the UAAL. This was reflected in the January 1, 2017 actuarial valuation, which will be used to calculate the ADC for the year beginning on or after January 1, 2018.

Fiscal Year Ending December 31	Actuarially Determined Contribution*	Actual Employer Contribution	Contribution Deficiency (Excess)	Covered Payroll**	Employer Contribution as a % of Covered Payroll
2010	\$ 21,300,000	\$ 21,300,000	-	\$ 219,600,000	9.72 %
2011	22,500,000	22,500,000	-	219,400,000	10.26
2012	22,700,000	22,700,000	-	210,600,000	10.80
2013	23,600,000	23,100,000	\$ 500,000	213,800,000	10.80
2014	26,100,000	23,900,000	2,200,000	221,300,000	10.80
2015	27,800,000	24,600,000	3,200,000	227,400,000	10.80
2016	26,500,000	25,500,000	1,000,000	236,400,000	10.80
2017	26,100,000	26,100,000	-	241,600,000	10.80
2018	28,600,000	28,600,000	-	252,800,000	11.31
2019	30,200,000	30,200,000	-	266,700,000	11.34

*The 21% contribution rate, which is split 11.34% paid by the employer and 9.66% by the member, is consistent with the goal of being greater than or equal to the normal cost rate.

**Covered payroll listed is pensionable payroll.

4. Schedule of Contribution Rates

Per the Tacoma Municipal Code sections 1.30.350 and 1.30.360, the current contribution rate is 21.00%, split 11.34% to the employers and 9.66% to the member. Contributions made by the employers and the members were in accordance with actuarially computed funding requirements. The following chart shows the history of the contribution rates since 1980.

Applicable Period	Rate as % of Payroll		
	Employer	Employee	Total Rate
1/1/1980 to 12/31/1996	10.44 %	8.89 %	19.33 %
1/1/1997 to 12/31/2000	9.02	7.68	16.70
1/1/2001 to 1/31/2009	7.56	6.44	14.00
2/1/2009 to 12/31/2009	8.64	7.36	16.00
1/1/2010 to 12/31/2010	9.72	8.28	18.00
1/1/2011 to 12/31/2011	10.26	8.74	19.00
1/1/2012 to 1/31/2018	10.80	9.20	20.00
2/1/2018 onward	11.34	9.66	21.00

5. Schedule of Investment Returns

The following is the schedule of the System's annual money-weighted rate of return. The performance calculations were prepared by Wilshire Consulting using the internal rate of return, net of investment expenses and adjusted for the changing amounts actually invested.

2019	2018	2017	2016	2015	2014	2013	2012	2011	2010
Percentage									
18.16	(3.81)	14.34	9.25	(0.67)	8.33	17.25	15.17	0.75	15.38

Notes to Required Supplementary Information

1. Schedule of Net Pension Liability or Asset of Employers

The total pension liability contained in this schedule was provided by the System's actuary, Milliman. The net pension liability or asset is measured as the total pension liability less the amount of the System's fiduciary net position. The System's fiduciary net position, along with the expected future contributions, was projected to be available to make all projected future benefit payments of current active and inactive members. Therefore, the discount rate for calculating the total pension liability is equal to the long-term expected rate of return of 7.25% in 2014 through 2016 and 7.00% in 2017 and in future years.

2. Schedule of Employers' Contributions

The required employers' contributions and percent of those contributions actually made are presented in the schedule.

3. Actuarial Assumptions

The information presented in the required supplementary schedules was used in the actuarial valuation for purposes of determining the actuarially determined contribution rate. The assumptions and methods used for this actuarial valuation were recommended by the actuary and adopted by the Board.

Other Supplementary Information

**1. Schedule of Administrative Expenses
For the Year Ended December 31, 2019 and 2018**

	2019	2018
Personnel services		
Salaries and wages	\$ 655,760	\$ 620,544
Personnel benefits	240,646	245,167
Total personnel services	<u>\$ 896,406</u>	<u>\$ 865,711</u>
 Maintenance and operations		
Communications	\$ 24,783	\$ 24,311
General government allocation	112,780	96,128
Information technology	69,975	120,628
Insurance	59,924	59,208
Miscellaneous	6,030	4,850
Office supplies and expenses	21,989	21,084
Professional services	509,001	402,234
Rentals	73,393	75,532
Travel and training	15,419	21,179
Total maintenance and operation	<u>\$ 893,294</u>	<u>\$ 825,154</u>
Total administrative expenses *	<u>\$ 1,789,700</u>	<u>\$ 1,690,865</u>

* Does not include investment management expenses.

2. Schedule of Payments to Consultants For the Year Ended December 31, 2019

Type	Amount
Custodial bank services	
The Northern Trust Company	\$ 43,352
Actuarial services	
Milliman Consultants and Actuaries	145,895
GRS (Actuarial Audit)	58,500
Pension and investment consulting services	
Wilshire Associates	206,846
Other services (type)	
Davis Wright Tremaine, LLP & Others (Legal)	2,378
K&L Gates (Legal)	20,095
Investment Advisory Committee (Citizen Advisory)	1,500
Small World Solutions (Death Audit)	800
Washington State Auditor's Office (Financial Audit)	29,635
	<u>54,408</u>
Total consultant fees*	<u><u>\$ 509,001</u></u>

* Does not include investment management expenses.

Information regarding investment management fees can be found on page 3-9 of the Investment Section.

3. Schedule of Investment Expenses For the Year Ended December 31, 2019

Type	Amount
Investment management fees	\$ 7,053,157
Securities lending fees*	1,147,695
Total investment expenses	\$ 8,200,852

* Securities lending fees include broker rebates and the lending agent's fees.

Information regarding investment management fees can be found on page 3-9 of the Investment Section.

4. Schedule of Proportionate Share by Employer

TERS is a cost-sharing multiple employer plan. The System's actuary had calculated the pension expense for 2019, NPL and deferred outflows/inflows of resources as of December 31, 2019. These accounting metrics must be allocated to the various participating employers. The allocation method relies on a determination of a proportion attributable to each employer. This proportion is then applied to the relevant aggregate plan figures to determine the proportionate share of the pension expense, NPL and deferred outflows/inflows of resources each employer must recognize. GASB 68, *Accounting and Financial Reporting for Pensions*, requires that the proportion share for each employer must be consistent with the determination of the plan contributions. The standard encourages the use of the "projected long-term contribution effort" of each employer to the plan. Because each employer in TERS contributes at the same rate of payroll, using the actual contributions for the year provides a reasonable basis for each employer's projected long-term contribution effort.

Employer	Proportionate Share		Net Pension Liability		Deferred Outflows of Resources			Deferred Inflows of Resources			Pension Expense				
	2019 Employer Contributions	Rounded Percentage of Total Contributions	Beginning Net Pension Liability*	Ending Net Pension Liability**	Differences Between Expected and Actual Experience	Changes in Assumptions	Net Difference Between Projected And Actual Investment Earnings	Changes in Employer Proportion	Differences Between Expected and Actual Experience	Changes in Assumptions	Net Difference Between Projected And Actual Investment Earnings	Changes in Employer Proportion	Proportionate Share** of 2019 Collective Pension Expense	Net Amortization of Deferred Amounts from Changes in Proportion***	Total Employer Pension Expense
City of Tacoma	\$ 27,942,195	92.40322%	\$ 117,009,191	\$ (18,606,284)	\$ 16,291,070	\$ 10,273,714	\$ -	\$ 1,203	\$ (9,350,707)	\$ -	\$ (61,541,209)	\$ (12,951)	\$ 31,832,868	\$ 3,848	\$ 31,836,716
South Sound 911	26,629	0.08806%	109,348	(17,732)	15,525	9,791	-	344	(8,911)	-	(58,649)	(11,250)	30,337	(4,270)	26,067
Pierce Transit	80,250	0.26538%	294,290	(53,437)	46,788	29,506	-	10,658	(26,855)	-	(176,746)	(1,229)	91,424	3,698	95,122
TPCHD	2,190,343	7.24334%	9,224,577	(1,458,516)	1,277,030	805,340	-	21,163	(732,987)	-	(4,824,115)	(7,938)	2,495,326	(3,276)	2,492,050
Grand Total	\$ 30,239,417	100.00000%	\$ 126,637,406	\$ (20,135,969)	\$ 17,630,413	\$ 11,118,351	\$ -	\$ 33,368	\$ (10,119,460)	\$ -	\$ (66,600,719)	\$ (33,368)	\$ 34,449,955	\$ -	\$ 34,449,955

*Based on unrounded contributions from 2018.

** Based on unrounded contributions from 2019.

***Equal to the sum of all years by employer in the final column of page 19, based on unrounded amounts.

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Andrew Junkin, CFA, CAIA
President, Wilshire Consulting

April 7, 2020

Mr. Tim Allen
Retirement System Director
Tacoma Employees' Retirement System
3628 South 35th street
Tacoma, WA 98409

Re: 2019 Performance Results

Dear Mr. Allen:

The purpose of this letter is to review the 2019 investment performance results of the Tacoma Employees' Retirement System (hereby referred to as "TERS" or "the System").

For investors, 2019 was a sensational year, as all major asset classes increased and most produced double-digit returns. U.S. equities were as strong as they have been in six years – while international equities produced returns below the U.S. but were still double-digit. U.S. core bonds were even more remarkable with returns not seen since 2002. The System finished 2019 up 16.83%¹ which was well ahead of its actuarial rate return but lower than its asset allocation policy benchmark return of 17.41%. The System's performance has lagged other public funds in the InvestmentMetrics All Public Plans Universe, where it ranked in the fourth quartile over calendar year 2019. This is most due to the conservative allocation of the System which limited its downside performance during the market drawdown over the first quarter of 2020. The universe rankings remain impressive over longer time periods, as the System continued to place in the second quartile for the five-year period and placed in the top quartile for the ten-year period.

In 2019, Global GDP and corporate earnings growth was at its weakest pace since the global financial crisis a decade ago. Rising trade barriers and associated uncertainty weighed on business sentiment and activity globally. In some cases (advanced economies and China), these developments magnified cyclical and structural slowdowns already under way. China and other Asian economies and capital markets were impacted by the spread of the Corona Virus that would soon affect every country. Overall, U.S. GDP slowed to 2.3% in 2019, hurt by decreases in private investment and geopolitical concerns. Inflation

¹ Performance calculations are consistent with the computations and methodologies approved by the CFA Institute and are based on a time-weight using monthly market values and flows using the modified BAI methodology. When a cash flow exceeds 7% of the beginning monthly market value, a daily time-weight is calculated around the cash flow date.



remained moderate and aligned with what was the Federal Reserve's plan to modestly increase interest rates. Commodities were positive for the year, rebounding from previous years. Crude Oil was generally lower in 2019 than the previous year, averaging \$64 a barrel for the year, ending 2019 at \$61.06.

Overall 2019 saw low equity volatility and positive investor sentiment. Thanks to a well-diversified investment structure, that includes global equities, core investment-grade bonds, TIPS, high yield fixed income, emerging markets debt, real estate (including public REITs and private real estate), private equity, and real assets; the System participated nicely during the bull market and maintained absolute and long-term relative results versus its policy benchmark. When looking at the segment level, all the System's composites ended the year with positive returns. The global equity composite had the best performance in the portfolio with a 25.07% return for 2019, led by INTECH's Global AC Enhanced product. Real assets appreciated by 6.48% in 2019 with muted inflationary pressures. This was the lowest return in the System's portfolio, reinforcing the strong 2019 results. Among the System's major segments, private equity remains one of the higher returning components with an annualized return above 10% over the last 5-years, while outperforming the composite's policy benchmark by 76 basis points over the same period.

The System undertook an asset allocation review in 2019 and identified several targeted adjustments to its asset allocation mix. These enhancements will be incorporated over time, as qualified mandates are identified and presented to the Board for their approval. These will include the introduction of long duration U.S. Treasuries, migration of public real estate holdings to a private real estate assignment and continued development of the System's real assets investments to provide further diversification benefit and an improved TERS' risk/return profile.

Once the transition to the new targets is completed, the strategic asset allocation targets will be as shown below:

<u>Asset Class</u>	<u>Allocation</u>
Global Equity	23.0%
Low Volatility Equity	11.5%
Core Fixed income	19.5%
High Yield Fixed Income	9.0%
Long Duration U.S. Treasuries	3.0%
Emerging Markets Debt	5.0%
Private Real Estate	10.0%
Private Equity	10.0%
Real Assets	9.0%



Wilshire annually publishes a research paper detailing our long-term nominal return forecast for the next ten years. Our geometric return forecasts are shown on the next page.

	TOTAL RETURN			RISK		
	DEC. 2018	DEC. 2019	CHANGE	DEC. 2018	DEC. 2019	CHANGE
INVESTMENT CATEGORIES						
US STOCK	7.00 %	5.75 %	-1.25 %	17.00 %	17.00 %	0.00 %
DEV EX-US STOCK (USD)	7.50	6.25	-1.25	18.00	18.00	0.00
EMERGING MARKET STOCK	7.50	6.25	-1.25	26.00	26.00	0.00
GLOBAL STOCK	7.45	6.20	-1.25	17.05	17.10	0.05
PRIVATE EQUITY	10.05	7.95	-2.10	28.00	28.00	0.00
CASH EQUIVALENTS	2.65	1.85	-0.80	1.25	1.25	0.00
CORE BOND	3.85	2.85	-1.00	5.15	5.15	0.00
LT CORE BOND	4.25	3.25	-1.00	9.85	9.85	0.00
US TIPS	3.00	2.15	-0.85	6.00	6.00	0.00
HIGH YIELD BOND	5.90	4.30	-1.60	10.00	10.00	0.00
NON-US BOND (HDG)	1.25	1.05	-0.20	3.50	3.50	0.00
US RE SECURITIES	5.65	5.00	-0.65	17.00	17.00	0.00
PRIVATE REAL ESTATE	6.65	6.60	-0.05	14.00	14.00	0.00
COMMODITIES	4.35	3.60	-0.75	15.00	15.00	0.00
REAL ASSET BASKET	6.40	5.90	-0.50	8.75	8.75	0.00
INFLATION	1.70	1.75	0.05	1.75	1.75	0.00
TOTAL RETURNS MINUS INFLATION						
U.S. STOCKS	5.30	4.00	-1.30			
U.S. BONDS	2.15	1.10	-1.05			
CASH EQUIVALENTS	0.95	0.10	-0.85			
STOCKS MINUS BONDS	3.15	2.90	-0.25			
BONDS MINUS CASH	1.20	1.00	-0.20			

As always, we thank you for the opportunity to be of service to TERS.

Sincerely,

Best regards,

Wilshire Associates

370 Interlocken Boulevard Suite 620 Broomfield, CO 80021 TEL 303.626.7444 FAX 303.466.1537
www.wilshire.com

Investment Goals and Policies

The overall goal of the Tacoma Employees' Retirement System (TERS) is to provide benefits to its participants and their beneficiaries through a carefully planned and executed investment program. The investment goal is to generate sufficient risk adjusted returns to meet future pension obligations. While preservation of capital is desirable, the Retirement Board recognizes that prudent investment risk taking is necessary to meet its goals.

The TERS Retirement Board's Investment Policy Statement provides the framework for the management of the TERS Plan assets, and outlines the target allocation and acceptable range for each permitted asset classes. The Investment Policy Statement is designed to allow for sufficient flexibility in the management process to capture investment opportunities as they may occur, yet provide reasonable parameters to ensure prudence and care in the execution of the investment program.

In developing the Investment Policy, the Board periodically requests asset allocation studies that consider the current and expected condition of the Plan, the expected long term capital market outlook, and the Plan's risk tolerance. The asset allocation study measures the potential impact on pension costs of alternative asset allocation policies based on various degrees of diversification in terms of risk and return and the existing and projected liability structure of the Plan. The Board will conduct an asset allocation study no less frequently than every five years, at which time it will determine (1) the asset classes to be included in the investment portfolio, (2) the targeted or normal commitments to each asset class to achieve the desired level of diversification and return (collectively, the Strategic Asset Allocation), and (3) the range in which the commitments are permitted to fluctuate.

The TERS Strategic Asset Allocation includes commitments to Global Equities, Domestic and Emerging Market Fixed Income, Public and Private Real Estate, Real Assets and Private Equity. Professional investment management firms, which are registered investment advisors and/or acknowledge co-fiduciary status, are retained to assist in managing TERS assets. Each investment manager functions under a formal contract that delineates its responsibilities and appropriate performance expectations. A set of administrative requirements for management of each portfolio is agreed to with each manager.

The Retirement Board reviews the investment performance of the total fund and asset classes on a regular basis, at least quarterly. The Investment Policy Statement outlines the benchmarks for the total fund and major categories of asset class. The individual managers are also reviewed quarterly, and evaluated relative to specific benchmarks that reflect the objectives and characteristics of the strategic role they play in the portfolio.

The Retirement Board uses the services of an investment consultant for the purpose of asset allocation studies, manager screening and selection, performance measurement and evaluation, and topical studies. The comments and recommendations of the consultant, in conjunction with the input of staff and other available information, are considered by the Retirement Board for the purpose of making informed and prudent decisions. The investment consultant acts in a fiduciary capacity providing investment advice to the Retirement Board.

Annualized Rates of Return For the Year Ended December 31, 2019

	1-Year	3-Year	5-Year
Total Fund	16.83%	8.63%	6.90%
<i>Custom Policy Benchmark Index</i>	17.41%	9.05%	6.91%
Global Equity	25.07%	11.51%	8.76%
<i>Custom Global Equity Index</i>	27.07%	12.59%	9.32%
Minimum Volatility Equity	21.57%	12.50%	#
<i>MSCI ACWI Min Volatility Index</i>	21.05%	12.01%	#
Core Fixed Income	9.07%	4.29%	3.20%
<i>Barclays U.S. Aggregate Index</i>	8.72%	4.03%	3.05%
TIPS	8.37%	3.30%	2.62%
<i>Barclays U.S. TIPS Index</i>	8.43%	3.32%	2.62%
High Yield / Bank Loans	12.17%	5.15%	4.97%
<i>Custom High Yield Index</i>	14.39%	6.31%	6.13%
Emerging Markets Debt	15.61%	7.35%	7.21%
<i>JPM EMBI Global Diversified Index</i>	15.04%	6.69%	6.24%
Real Estate	15.55%	8.02%	7.82%
<i>Custom Real Estate Index</i>	14.79%	7.08%	7.67%
Private Equity	15.14%	13.19%	10.12%
<i>Custom Private Equity Index</i>	10.02%	12.68%	9.36%
Real Assets	6.48%	-0.17%	-2.24%
<i>Custom Real Assets Index</i>	6.40%	0.64%	-4.78%

Additional Information:

= performance for full period not applicable

Note: performance calculations were prepared by Wilshire Consulting using fair value time-weighted rates of return.

Total returns include cash income plus gains and losses due to changes in fair value, whether realized or unrealized.

Supplemental Benchmark Information:

The Custom Total Fund Policy Benchmark Index at year-end 2018 was 34.5% Russell Global Equity Index (50% Hedged on Developed ex-U.S. Countries), 8.0% MSCI ACWI Minimum Volatility Index, 16.5% Barclays U.S. Aggregate Index, 5.0% Barclays U.S. TIPS Index, 9.0% Merrill Lynch High Yield Master II Constrained Index, 5.0% JP Morgan EMBI Global Diversified Index, 4.0% Wilshire REIT Index, 4.0% NCREIF ODCE Index, 2.0% Alerian MLP Index, 2.0% CPI+3%, and 10.0% Custom Private Equity Index.

The Global Equity Index is the Russell Global Equity Index (50% Hedged on Developed ex-U.S. Countries).

The Custom High Yield Index is Merrill Lynch High Yield Master II Constrained Index.

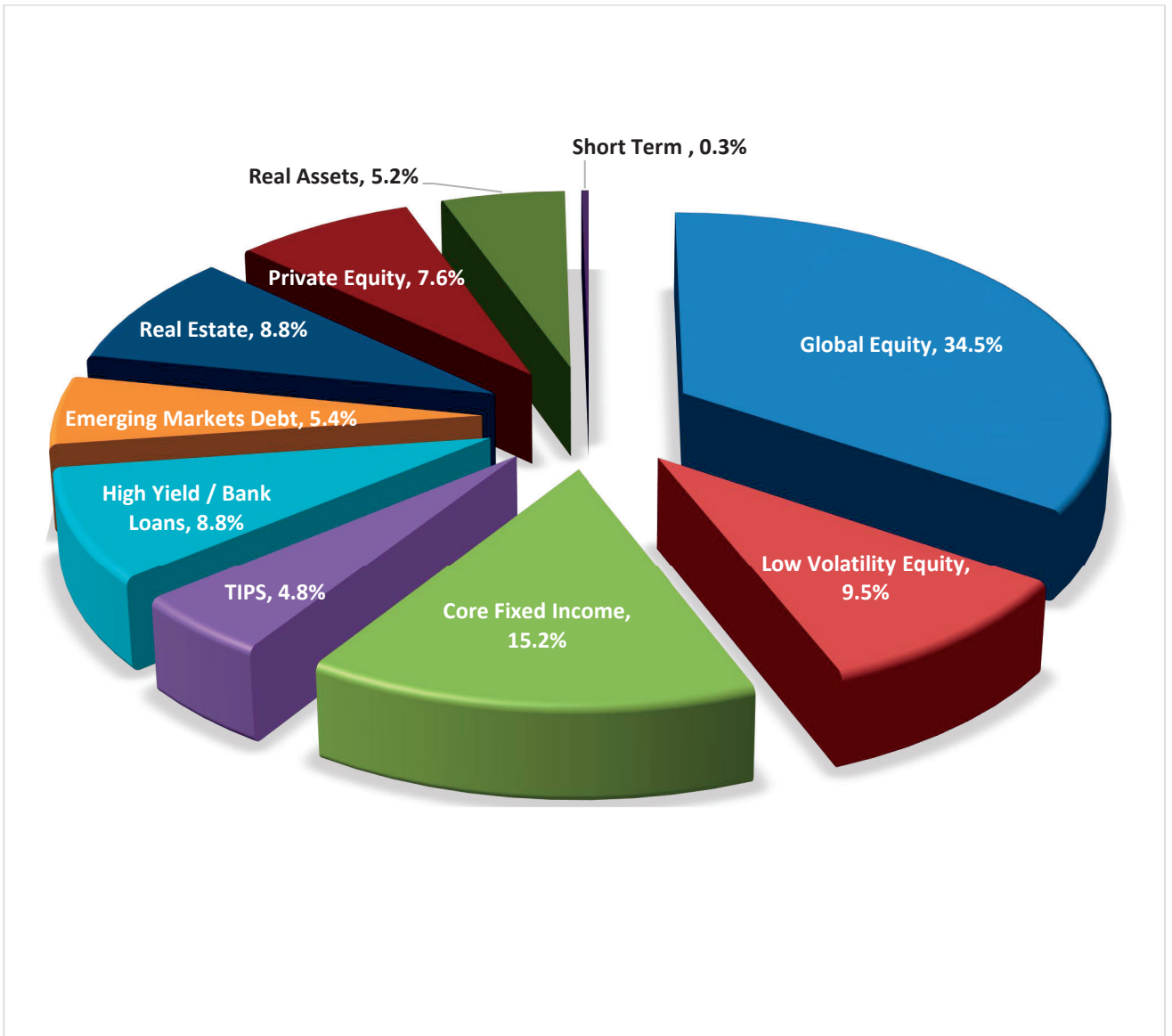
The Custom Real Estate Index is 50% NCREIF ODCE Index and 50% Wilshire REIT Index.

The Custom Private Equity Index is dynamically calculated based on the actual weights of the private equity investments and the private equity source fund.

To coincide with private equity investments reporting, 1-quarter lagged fair values are used for the private equity component in the custom benchmark calculation.

The Custom Real Assets Index from October 2015 is 50% Alerian MLP Index and 50% CPI+3%. Prior to that it was the Alerian MLP Index.

Actual Asset Allocation As of December 31, 2019



**Summary of Investment Holdings
For the Year Ended December 31, 2019**

Investment Type	Fair Value	Percentage of Total
Equities	\$ 964,057,034	49.94 %
Fixed income	639,305,114	33.12
Real estate	81,145,679	4.20
Venture capital and partnerships	183,494,753	9.50
Short-term investment funds	10,165,270	0.53
Securities lending collateral	52,384,912	2.71
Total investments owned	<u>\$ 1,930,552,762</u>	<u>100.00 %</u>
Reconciliation to statement of fiduciary net position		
Total portfolio value	\$ 1,930,552,762	
Less: amounts classified as short-term investments	10,165,270	
amounts classified as securities lending collateral	<u>52,384,912</u>	
Investments per statement of fiduciary net position	<u>\$ 1,868,002,580</u>	

**Schedule of Largest Holdings
As of December 31, 2019**

Equity	Fair Value
Northern Trust Collective All Country World Investable Market	\$ 308,322,115
Index CF BlackRock MSCI ACWI Minimum Volatility Index Fund	178,087,111
PIMCO RESEARCH Fundamental Global Fund Llc	171,988,836
MFO DFA Retirement Equity	89,733,551
CF Intech Global All Country Enhanced Index Fund LLC	74,821,530
MLP Enterprise Products Partners LP	6,102,385
MLP MPLX LP	6,009,833
MLP Energy Transfer LP	6,004,902
Prologis Inc	5,955,800
MLP Magellan Midstream Partners LP	5,933,482

Fixed Income	Fair Value
CF Neuberger Berman High Income Fund LLC	\$ 111,636,776
CF Prudential Emerging Market Debt Fund	100,266,362
CF BlackRock U.S. Treasury Inflation Protected Securities Non-Lendable Fund	90,351,319
CF BlackRock Debt Index Non-Lendable Fund	40,540,818
CF Eaton Vance Institutional Senior Loan Fund	40,522,850
United States Treasury Note 1.5% Due 11-30-2024	18,082,593
United States Treasury Note Due 5 Years	16,605,313
United States Treasury Note Due 2 Years	16,378,000
United States Treasury Bonds 2.375% Due 11-15-2049	12,333,734
United States Treasury Note 1.5% Due 10-31-2024	12,312,695

Note: A complete list of holdings is available upon request.

**Summary of Investment Holdings and Management Fees
For the Year Ended December 31, 2019**

Investment Type	Assets Under Management	Fees
Equities	\$ 964,057,034	\$ 2,280,196
Fixed income	639,305,114	1,965,941
Real estate	81,145,679	715,030
Venture capital and partnerships	183,494,753	2,091,991
Short-term investment funds	10,165,270	n/a
Securities lending collateral	52,384,912	n/a
Subtotal	\$ 1,930,552,762	\$ 7,053,157
Other investment services		
Securities lending		1,147,695
Total investment fees		\$ 8,200,852

**Brokerage Commissions
For the Year Ended December 31, 2019**

Rank	Broker's NAME	Commissions	Shares	Commissions Per Share
1	Loop Capital Markets LLC	\$ 14,728	368,195	\$ 0.0400
2	Weeden & Company	7,567	228,302	0.0331
3	Piper Jaffray & Company	6,713	335,625	0.0200
4	Citigroup Global Markets Inc.	6,608	238,087	0.0278
5	ISI Group Inc.	6,434	188,892	0.0341
6	Penserra Securities LLC	6,086	152,151	0.0400
7	Ivy Securities Inc.	3,600	90,005	0.0400
8	Wells Fargo Bank Minnesota	3,160	275,927	0.0115
9	Morgan Stanley & Company LLC	2,952	73,805	0.0400
10	Green Street Trading LLC	2,391	59,765	0.0400
11	Jonestrading Institutional Services, LLC	2,188	85,825	0.0255
12	MKM Partners LLC	2,163	54,065	0.0400
13	Raymond James & Associates, Inc.	1,957	48,921	0.0400
14	Barclays Bank PLC	1,655	219,214	0.0076
15	RBC Capital Markets, LLC	1,298	114,208	0.0114
16	J.P. Morgan Securities LLC	1,207	158,593	0.0076
17	BofA Securities Inc.	729	29,247	0.0249
18	Credit Suisse Securities (USA) LLC	651	66,991	0.0097
19	UBS Securities LLC	238	31,697	0.0075
20	Liquidnet Inc.	165	13,679	0.0121
21	Jefferies LLC	11	1,511	0.0075
Total		\$ 72,499	2,834,705	\$ 0.0256



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May 6, 2020

Retirement Board
Tacoma Employees' Retirement System
3628 South 35th Street
Tacoma, Washington 98409

Re: **January 1, 2020 Actuarial Valuation**

Dear Members of the Board:

As requested, we performed an actuarial valuation of the Tacoma Employees' Retirement System as of January 1, 2020. Our findings are set forth in this actuarial valuation. This report reflects the benefit provision and contribution rates currently in effect. Milliman has performed 27 actuarial valuations for the Tacoma Employees' Retirement System since January 1, 1976. Biennial valuations occurred from 1985 through 2011 and one additional valuation was performed in 1998. Beginning in 2012, annual actuarial valuations have been performed.

All of the exhibits in this valuation report were prepared by Milliman. Please see our table of contents for a list of the exhibits. In preparing this valuation report, we relied, without audit, on information (some oral and some in writing) supplied by the System's staff. This information includes, but is not limited to, statutory provisions, member census data, and financial information. We found this information to be reasonably consistent and comparable with information used for other purposes. The valuation results depend on the integrity of this information. If any of this information is inaccurate or incomplete, our results may be different and our calculations may need to be revised.

All costs, liabilities, rates of interest, and other factors for the System have been determined on the basis of actuarial assumptions and methods which are individually reasonable (taking into account the experience of the System and reasonable expectations) and which, in combination, offer our best estimate of anticipated experience affecting the System. Further, in our opinion, each actuarial assumption used is reasonably related to the experience of the Plan and to reasonable expectations which, in combination, represent our best estimate of anticipated experience under the System.

We hereby certify that, to the best of our knowledge, this report, including all costs and liabilities based on actuarial assumptions and method, is complete and accurate and determined in conformance with generally recognized and accepted actuarial principles, which are consistent with the Actuarial Standards of Practice promulgated by the Actuarial Standards Board and the Code of Professional Conduct and supporting Recommendations by the American Academy of Actuaries.



This valuation report is only an estimate of the System's financial condition as of a single date. It can neither predict the System's future condition nor guarantee future financial soundness. Actuarial valuations do not affect the ultimate cost of System benefits, only the timing of System contributions. While the valuation is based on an array of individually reasonable assumptions, other assumption sets may also be reasonable and valuation results based on those assumptions would be different. No one set of assumptions is uniquely correct. Determining results using alternative assumptions is outside the scope of our engagement.

Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the following: plan experience differing from that anticipated by the economic or demographic assumptions; changes in economic or demographic assumptions; increases or decreases expected as part of the natural operation of the methodology used for these measurements (such as the end of an amortization period or additional cost or contribution requirements based on the plan's funded status); and changes in plan provisions or applicable law. Due to the limited scope of our assignment, we did not perform an analysis of the potential range of future measurements. The Board of Trustees has the final decision regarding the appropriateness of the assumptions and adopted them as indicated in Appendix A.

Actuarial computations presented in this report are for purposes of determining the recommended funding amounts for the System. Actuarial computations presented for financial reporting in a separate report under GASB Statements No. 67 and 68 are for purposes of assisting the System and participating employers in fulfilling their financial accounting requirements. The computations prepared for these two purposes may differ as disclosed in our report. The calculations in the enclosed report have been made on a basis consistent with our understanding of the System's funding requirements and goals. Determinations for purposes other than meeting these requirements may be significantly different from the results contained in this report. Accordingly, additional determinations may be needed for other purposes.

Milliman's work is prepared solely for the use and benefit of the System and its Trustees and employees (for their use in administering the Fund). To the extent that Milliman's work is not subject to disclosure under applicable public records laws, Milliman's work may not be provided to third parties without Milliman's prior written consent. Milliman does not intend to benefit or create a legal duty to any third party recipient of its work product. Milliman's consent to release its work product to any third party may be conditioned on the third party signing a Release, subject to the following exceptions:

- a) The System may provide a copy of Milliman's work, in its entirety, to the System's professional service advisors who are subject to a duty of confidentiality and who agree to not use Milliman's work for any purpose other than to benefit the System.
- b) The System may provide a copy of Milliman's work, in its entirety, to other governmental entities, as required by law.

No third party recipient of Milliman's work product should rely upon Milliman's work product. Such recipients should engage qualified professionals for advice appropriate to their own specific needs.

The consultants who worked on this assignment are retirement actuaries. Milliman's advice is not intended to be a substitute for qualified legal or accounting counsel.



The signing actuaries are independent of the plan sponsor. We are not aware of any relationship that would impair the objectivity of our work.

On the basis of the foregoing, we hereby certify that, to the best of our knowledge and belief, this report is complete and accurate and has been prepared in accordance with generally recognized and accepted actuarial principles and practices. We are members of the American Academy of Actuaries and meet the Qualification Standards to render the actuarial opinion contained herein.

We would like to express our appreciation to Tim Allen, Retirement System Director, to Catherine Marx, Assistant Retirement Director, and to members of the staff who gave substantial assistance in supplying the data on which this report is based.

We respectfully submit the following report, and we look forward to discussing it with you.

Sincerely,

A handwritten signature in cursive script that reads 'Mark C. Olleman'.

Mark C. Olleman, FSA, EA, MAAA
Consulting Actuary

A handwritten signature in cursive script that reads 'Daniel R. Wade'.

Daniel R. Wade, FSA, EA, MAAA
Consulting Actuary

A handwritten signature in cursive script that reads 'Julie D. Smith'.

Julie D. Smith, FSA, EA, MAAA
Consulting Actuary

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1. Summary of the Findings

We have completed the actuarial valuation of the Tacoma Employees' Retirement System as of January 1, 2020. The actuarial valuation tests whether the scheduled contribution rates are sufficient to satisfy future obligations. The following chart summarizes the various metrics used to assist in making that determination. There is a relatively large difference between the 2019 and 2020 results based on the Fair Value of Assets, due to the 2019 return of 17.0%, which is 10.0% above the 7.0% assumption. Changes in the results based on Actuarial Value of Assets (AVA) are much smaller since they will smooth the 2019 asset gain over four years, while prior asset losses were recognized in the January 1, 2020 AVA. Results are shown for both the current and prior valuations.

Valuation Results (Dollars in Millions)		
	2020 Valuation	2019 Valuation
(A) Actuarial Accrued Liability	\$ 1,856.0	\$ 1,761.7
(B) Actuarial Assets (AVA)	1,818.7	1,713.9
(C) Fair Value of Assets (FVA)	1,876.1	1,635.0
Unfunded Actuarial Accrued Liability (UAAL)/(Funding Reserve)		
Actuarial Assets [A - B]	\$ 37.3	\$ 47.8
Fair Value of Assets [A - C]	\$ (20.1)	\$ 126.7
Actuarial Assets Funding Ratio [B ÷ A]	98.0%	97.3%
Fair Value of Assets Funding Ratio [C ÷ A]	101.1%	92.8%
Actuarial Asset Amortization Period	6.3 years	8.7 years
Fair Value of Asset Amortization Period	N/A ⁽¹⁾	31.7 years
25-Year Amortization of UAAL based on AVA, not less than the current contribution rate (Basis for Actuarially Determined Contribution)	21.00% of pay	21.00% of pay
25-Year Amortization of UAAL based on FVA, not less than the current contribution rate	21.00% of pay	21.43% of pay

1. The amortization period is not applicable on a Fair Value basis since there is no UAAL to amortize.

If only calculations using the Actuarial Value of Assets are used, the Funding Ratio of 98.0% is between 95% and 120%. Also, the current combined employer and employee contribution rate of 21% is equal to the Actuarially Determined Total Contribution of 21%, as the current contribution rate is projected to amortize the Unfunded Actuarial Accrued Liability (UAAL) in less than 25 years on an Actuarial Value of Assets basis. The Board's Funding and Benefits Policy, which provides guidelines for Board action, indicates that no action will be taken in this situation since the Funding Ratio is between 95% and 120% and the contribution rate is greater than or equal to the Actuarially Determined Total Contribution.

The Board's Funding and Benefits Policy states that calculations based on the Fair Value of Assets should also be considered, since measures based on actuarial assets and Fair Value of Assets can provide different interpretations of the System's funding. For the 2020 valuation, the Fair Value of Assets basis reaches the same conclusion as the actuarial assets. Using the Fair Value of Assets, the Funding Ratio of 101.1% is between 95% and 120%, there is no UAAL to amortize, and the contribution rate of 21% is equal to the Actuarially Determined Total Contribution of 21%. The Board's Funding and Benefits Policy states that no action needs to be taken in this situation. These calculations are based on the December 31, 2019 Fair Value of Assets and do not reflect any losses which may have occurred after that date.

Amortization Period

The AVA Funding Ratio of 98.0% is high relative to other public retirement systems. The UAAL amortization period of 6.3 years decreased from last year's amortization period of 8.7 years. This is primarily due to the asset return of 8.2% on an Actuarial Value of Assets basis being greater than the assumed asset return of 7.0%. Note that the asset return on a Fair Value of Assets basis was 17.0%.

The cushion between the contribution rate and the Normal Cost rate increased in 2018 due to the increased contribution rate from 20% of payroll to 21%. We incorporated this change in our January 1, 2018 actuarial valuation. The increase in the contribution rate beginning February 2018 makes the amortization period less sensitive than in prior years. While it is not as sensitive as it was in previous years, a 4.1% decline in the funding ratio would result in the current contribution rate being insufficient to amortize the UAAL over 25 years. As seen below, such a decline is not large by historical standards. In addition, the cushion itself is sensitive to the actuarial assumptions used to calculate the Normal Cost Rate. Based on the actuarial assumptions and the 21.00% of pay contribution rate, the amortization periods for different funding ratios vary as follows:

Funding Ratio	Length of Amortization
88.6% or lower	Never amortizes
93.9%	25 years
98.0% (current actuarial value)	6.3 years
100% or higher	No years

Normal Cost Rate

The Normal Cost Rate increased from 18.53% of pay to 18.59% of pay from the prior actuarial valuation. Therefore, the portion of the total 21.00% of pay contribution rate available to amortize the UAAL after Normal Costs are financed decreased from 2.47% of pay at January 1, 2019 (21.00% - 18.53%) to 2.41% of pay at January 1, 2019 (21.00% - 18.59%).

Actuarial Value of Assets

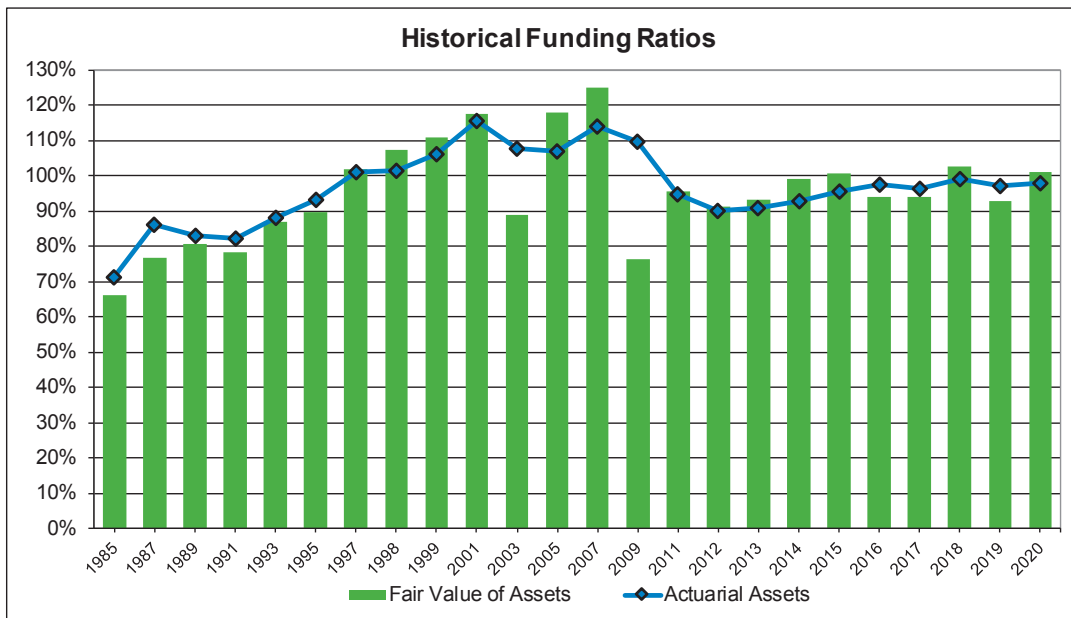
The \$1,818.7 million actuarial assets are currently 97% of the \$1,876.1 Fair Value of Assets. This difference is due to the actuarial assets' recognition of gains and losses over four years. This means only one fourth of the gain from 2019, two fourths of the loss from 2018, and three fourths of the gain from 2017 have been recognized in the actuarial assets as of January 1, 2020. Gains of \$57.4 million have not been recognized in the actuarial assets.

Funding Ratio

The funding ratio is a tool for measuring the Plan's progress toward funding goals. The funding ratio measure may not be appropriate for assessing the sufficiency of plan assets to cover the estimated cost of settling the Plan's benefit obligations if the plan were to be terminated.

Investment gains and losses can cause large fluctuations in the Funding Ratio in a single year, as shown by the System's history.

With the asset return greater than expected in the last year, the System's Funding Ratio increased on an actuarial-value basis as well as on a fair-value basis from 2019 to 2020. As shown in the graph below, the Funding Ratio based on Fair Value of Assets increased from 93% at January 1, 2019 to 101% at January 1, 2020 primarily due to the 17.0% return in 2019. The underlying numbers to the following graph can be seen in Exhibit D-3. The System's investment return history since 1980 can be seen in Exhibit 5.



Contribution Rates

As per sections 1.30.350 and 1.30.360 of the Tacoma Municipal Code, the current contribution rate was increased to 21.00% as of February 2018, split 11.34% to the employer and 9.66% to the member. The following chart shows the history of the contribution rates since 1980.

Actual Contribution Rates as a Percent of Member Pay (Set in Tacoma Municipal Code)			
	Employer	Member	Total
1980 - 1996	10.44%	8.89%	19.33%
1997 - 2000	9.02%	7.68%	16.70%
2001 - 2008	7.56%	6.44%	14.00%
2009	8.64%	7.36%	16.00%
2010	9.72%	8.28%	18.00%
2011	10.26%	8.74%	19.00%
2012 - 2017	10.80%	9.20%	20.00%
2018 and on	11.34%	9.66%	21.00%

Funding and Benefits Policy

Exhibit 2 is a copy of the Board's Funding and Benefits Policy, most recently updated at the January 2020 Board meeting. The objective of the Funding and Benefits Policy states in part, "The Funding & Benefits Policy is meant to assist in establishing a contribution rate which is relatively stable over the long term." That objective is reflected in the following interpretation of the valuation results using the guidance of the Funding and Benefits Policy.

- Funding Ratios from 95% to 120% suggest the Retirement Board maintain the current contribution rate unless it is less than the Actuarially Determined Contribution: The January 1, 2020 Funding Ratio is 98.0%. The current contribution rate is equal to the Actuarially Determined Contribution. These measures use the Actuarial Value of Assets. Therefore based on this criteria, the Board's Funding and Benefits Policy indicates no action is needed.
- Amortization Period: The Policy states, "Contribution increases should consider amortizing any Unfunded Actuarial Accrued Liability over a period of 25 years or less." On an actuarial-value basis, the UAAL is projected to be amortized over 6.3 years, and on a fair value basis there is no UAAL. Therefore, under either measure the Board does not need to consider increasing the 21% contribution rate. As noted previously in this report, the length of the amortization period is sensitive to changes in the UAAL since the contribution rate and Normal Cost rate are close to each other.
- 21% Contribution Rate is equal to the Actuarially Determined Total Contribution: The Policy states, "There is a long-term goal of maintaining a combined employer and employee contribution rate greater than or equal to the Actuarially Determined Total Contribution." The 21% of pay contribution rate is equal to the ADC since the ADC cannot be less than the actual contribution rate. The ADC uses the Actuarial Value of Assets. Therefore, a contribution rate increase does not need to be considered on this basis.
- Fair Value of Assets: The Policy states, "Calculations based on the Fair Value of Assets will be also considered." Based on the Fair Value of Assets at December 31, 2019, the Funding Ratio is 101.1%, there is no UAAL to amortize, and the current contribution rate is equal to the Actuarially Determined Contribution. Therefore, a contribution rate increase does not need to be considered on this basis. Note that the Fair Value of Assets can change rapidly as evidenced by most retirement systems which had large declines in the Fair Value of Assets in the first quarter of 2020.
- Long-term Funding Projections: The Policy states "Long-term funding projections will also be considered." The baseline in Projection 1 shown later in this summary demonstrates that if experience in all future years matches the actuarial assumptions, including 7.00% investment returns on the Fair Value of Assets, the contribution rate does not need to be increased to meet the goal of a 25-year amortization of the UAAL. This does not reflect any of the losses in the investment markets from the first part of 2020. An estimate of this scenario is shown in Projection 4.

Projection 2 provides a downside scenario showing that adverse investment experience similar to what the System experienced in 2006 to 2008 could require contribution rates to increase as high as 31.91% of pay to amortize the UAAL over 25 years. Projection 3 provides an upside scenario. Projection 4 provides an additional downside scenario with a negative 15% investment return in 2020 and then a 7.00% investment return in subsequent years. This scenario is to estimate the negative returns that retirement plans have experienced so far this year. The negative 15% used for 2020 is based on the most recent investment return available for TERS for the beginning of 2020 which includes experience through mid-April.

Projection 5 shows that 48% of the statistically generated return scenarios resulted in median contribution rates greater than 21% of pay after 10 years. This is lower than the 61% of the scenarios in last year's projection due primarily due to the impact of the 2019 asset returns. Note that none of the 2020 experience to date is considered in projection 5.

Note that a revision to the projection model was made this year to reflect increasing normal cost rates over time. Normal cost rates are expected to increase from year to year due primarily to generational mortality, which reflects longer expected lifespans for people with later years of birth. We modeled this by assuming that future hires would reflect the ages and sex composition of those hired in 2019. The impact of the increasing normal cost rate can be seen in the chart for Deterministic Projection 1b.

This update in methodology was made to all of the long-term funding projection models based on comments from Gabriel, Roeder, Smith & Company's audit of the January 1, 2019 actuarial valuation. Overall, this impacted the projection results, causing slightly increased projected contribution rates and slightly lower projected Funding Ratios at the end of the ten-year period of the stochastic projections.

Asset Gains and Losses

Although the System is funded over a long period of time, the measurement of the System's funding status can vary widely from year-to-year due to asset returns. The following chart summarizes the System's asset returns in recent years and compares the fair value gains and losses to the AAL at the following valuation date. Until 2013, the assumed returns were 7.75%, so the comparisons to expectations are based on that 7.75% assumption. Returns greater than the 7.75% actuarial assumption were gains; returns less than the 7.75% actuarial assumption were losses. In 2013 the assumption was 7.50%. In 2014 through 2016, the assumption was 7.25%. In 2017 and in future years, the assumption is 7.00%

Year	Fair Value % Return ⁽¹⁾	Fair Value \$ Gain / (Loss) compared to expected	End of Year Actuarial Accrued Liability (AAL)	Gain / (Loss) as a % of next AAL
2010	14.1 %	\$ 60,200,000	\$ 1,132,900,000	5.3 %
2011	1.3	(69,900,000)	1,185,500,000	(5.9)
2012	14.1	68,700,000	1,306,600,000	5.3
2013	15.8	100,000,000	1,400,000,000	7.1
2014	8.1	11,500,000	1,468,200,000	0.8
2015	(0.4)	(111,600,000)	1,542,200,000	(7.2)
2016	8.7	20,900,000	1,648,100,000	1.3
2017	13.4	98,300,000	1,680,700,000	5.8
2018	(3.4)	(177,700,000)	1,761,700,000	(10.1)
2019	17.0	162,200,000	1,856,000,000	8.7

1. The fair value returns shown above are net of investment expenses, but not administrative expenses. They are based on the System's annual financial statements, but may have some variance from calculations performed by other parties due to methodology.

The AVA recognizes these fair value gains and losses in four equal pieces starting at the end of the year in which they occur. Gains in good years are needed to offset losses in bad years.

Long-Term Funding Projections

The Funding and Benefits Policy states that "Long-term funding projections will also be considered." The future funding status of the System and any changes in future contribution rates will be determined by the System's experience. In the future, the System's actual investment returns, salary increases, and retirement, withdrawal, disability, and mortality rates will all impact the funding status of the System. Investment returns are expected to

cause the largest variation in the future funding status of the System. Therefore, the four deterministic projections on the following pages project the System's funding for 20 years based on four different investment return scenarios. All other experience is assumed to match the valuation assumptions.

The inputs at the bottom of each page show (a) investment returns; (b) the UAAL amortization period used to produce the "Calculated Total Contribution Rate" graph; and (c) the total contribution rate which is assumed to be paid 54% by the City and 46% by members. The inputs are shown for both the current bars in blue and the orange baseline.

Baseline: 7.00% Returns in All Future Years

The orange baseline is the same in all projections. It projects experience based on 7.00% investment returns in all years. The orange baseline shows that current contribution rates will not need to increase in order to meet the goal of amortizing the UAAL over 25 years under this scenario. The Funding Ratio on an Actuarial Value of Assets basis is projected to increase over the next three years as deferred asset gains are recognized.

Projection 1: 2020 Actuarial Valuation Assumption

Projection 1 is the same as the baseline.

Projection 2: Downside – Repeat of Returns from 2006 – 2008

Projection 2 demonstrates a potential downside based on the assumption that the System's actual returns from 2020 through 2022 match the actual returns from 2006 to 2008, followed by 7.00% in future years. It is estimated that, under these circumstances, total contributions would be required to grade up to 31.88% of pay if the UAAL were to be amortized over 25 years.

Projection 3: Upside – Repeat of Returns from 2003-2005

Projection 3 demonstrates an upside based on the assumption that the System's actual returns from 2020 through 2022 match the actual returns from 2003 to 2005. Once again, returns in years after 2022 are assumed to be 7.00%. It is estimated that under these circumstances the System would attain a Funding Ratio of 125.9% based on actuarial assets and 137.2% based on Fair Value of Assets at the end of the three-year period. A Funding Reserve is created and continues to grow throughout the projections. These projections demonstrate the sensitivity of the System's funding to investment returns.

Projection 4: Downside – Negative 2020 Return

Projection 4 demonstrates a potential downside based on the assumption that the System's actual return for 2020 is negative 15%, followed by 7.00% in future years. This scenario is based on an estimate of the current investment return for the System from January 1, 2020 through mid-April 2020, projected to remain unchanged through the end of the year. It is estimated that, under these circumstances, total contributions would be required to grade up to 26.98% of pay if the UAAL were to be amortized over 25 years.

Projection 5: Stochastic Projection

To give an idea of the potential range of future contribution rates and funding ratios, we ran a stochastic projection. This type of projection allows the assessment of the likelihood of certain events in the 1,000 scenarios modeled. The stochastic projection uses a random number generator, the System's asset allocation, and Milliman's capital market assumptions to generate a probability distribution of future contribution rates and funding ratios based on 1,000 random scenarios. For 2020, the expected nominal arithmetic average return used in the model was 6.99% with a standard deviation of 9.81%. Note that none of the 2020 experience to date is considered in projection 5.

The median is shown by a diamond. Half of the results are above the median, and half of the results are below the median. The top of the blue bars is the 95th percentile. The top of the green bars is the 75th percentile. The bottom of the yellow bars is the 25th percentile, and the bottom of the red bars is the 5th percentile. Based on the projection assumptions, there is a 25% chance of being above the green bars and another 25% chance of being below the yellow bars.

The projection shows that after 10 years the median contribution rate remains at 21.0%. Note that 48% of the scenarios resulted in contribution rates above 21% after 10 years in this year's projection. In last year's projections, 61% of the scenarios resulted in contribution rates above the current 21% contribution rate. The median funding ratio is 100% at the end of the projection period in the current projections. In last year's projections, the median funding ratio was 95% at the end of the projection period. The median results are informative; however, the extremes are just as important.

After 10 years, the projection shows:

- 5% of the scenarios had a contribution rate over 32%, which corresponded to a Funding Ratio of under 64%.
- 75% of the scenarios had a contribution rate below 26% of pay.
- 48% of the scenarios had a contribution rate above 21% of pay, 32% of the scenarios had a contribution rate below 21% of pay, and 20% of the scenarios still had a contribution rate of 21% of pay.
- The middle 50% of the scenarios had a Funding Ratio between 84% and 123%.

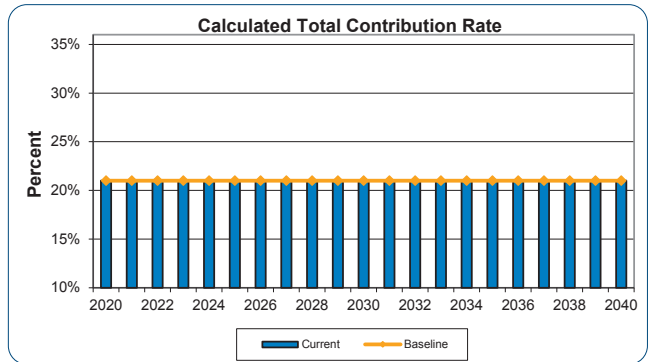
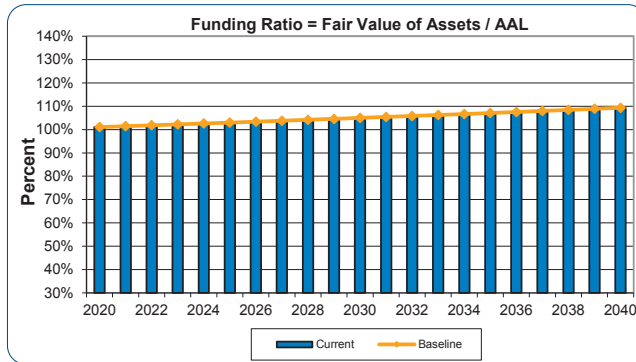
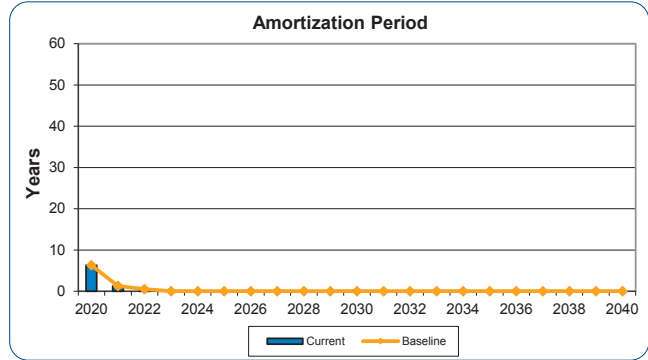
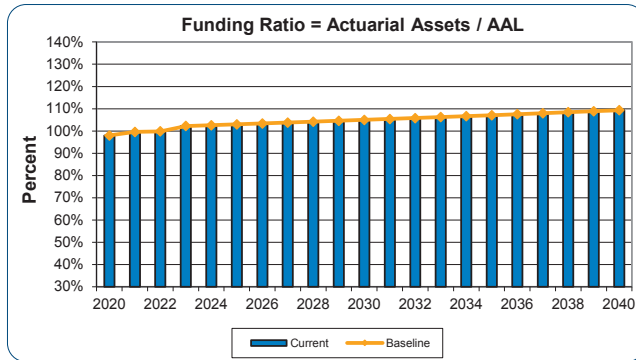
After 10 years, the above results are more favorable than the results from the projections last year, based primarily on the better than expected investment experience in 2019.

Future contribution rates and funding ratios are heavily dependent on the return on plan assets.

For the purpose of the stochastic projection, we used the following decision parameters to simulate the System's Funding and Benefits Policy:

- The contribution rate is only decreased if the funding ratio is over 120%.
- If the funding ratio is over 120%, the contribution rate is set equal to the normal cost rate.
- If the funding ratio is between 95% and 120%, there is no change to the contribution rate, unless the contribution rate is less than the Actuarially Determined Contribution, in which case the contribution rate is set to produce a 25-year amortization period based on the greater of Fair Value of Assets or actuarial assets.
- If the funding ratio is below 95% and the amortization period is over 25 years, the contribution rate is set to produce a 25-year amortization period based on the greater of Fair Value of Assets or actuarial assets.
- The 54%/46% employer/employee contribution rate split is maintained.
- The total employer plus employee contribution rate is never increased by more than 2% in one year.

Deterministic Projection 1 2020 Actuarial Valuation



Current Input	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Portfolio Actual Return	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
Actual Salary Increases	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
UAAL Amortization Period	25	25	25	25	25	25	25	25	25	25	25
Total Rate % (54% ER, 46% EE)	21.00	21.00	21.00	21.00	21.00	21.00	21.00	21.00	21.00	21.00	21.00

BASELINE NUMBERS BELOW HERE

Current Input	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Portfolio Actual Return	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
Actual Salary Increases	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
UAAL Amortization Period	25	25	25	25	25	25	25	25	25	25	25
Total Rate % (54% ER, 46% EE)	21.00	21.00	21.00	21.00	21.00	21.00	21.00	21.00	21.00	21.00	21.00

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Deterministic Projection 1b

Numerical Summary of Results

2020 Actuarial Valuation

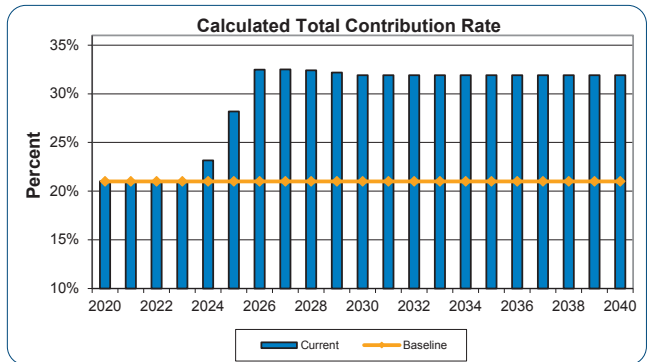
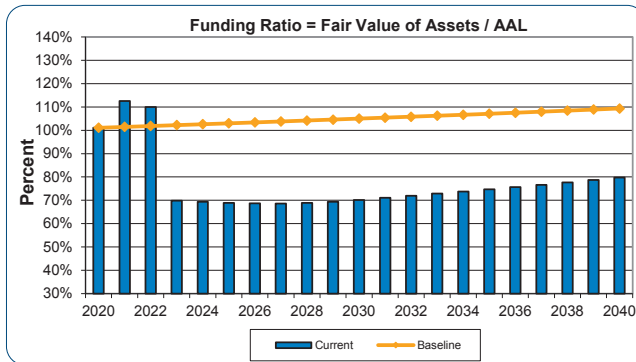
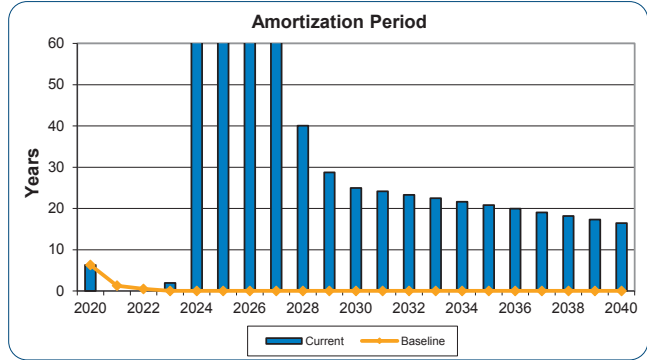
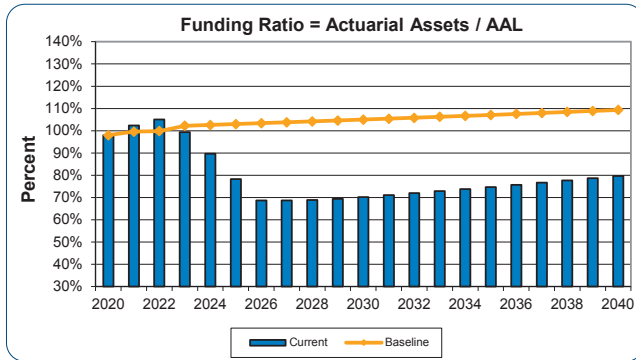
(Dollar Amounts in Millions)

Year	Actuarial Accrued Liability	Actuarial Value of Assets	Funding Ratio = AVA / AAL	Fair Value of Assets	Funding Ratio = FVA / AAL	Normal Cost Rate	Contribution Rate Minus Normal Cost Rate	Amortization Period	Current Rate	Greater of Current Rate or 25 Year Amort Rate
2020	\$1,856.0	\$1,818.7	98.0%	\$1,876.1	101.1%	18.59%	2.41%	6.3	21.00%	21.00%
2021	1,936.6	1,928.3	99.6%	1,965.0	101.5%	18.65%	2.35%	1.3	21.00%	21.00%
2022	2,020.3	2,017.1	99.8%	2,057.6	101.8%	18.70%	2.30%	0.5	21.00%	21.00%
2023	2,107.1	2,154.0	102.2%	2,154.0	102.2%	18.75%	2.25%	Rsrv Grows	21.00%	21.00%
2024	2,197.0	2,254.4	102.6%	2,254.4	102.6%	18.80%	2.20%	Rsrv Grows	21.00%	21.00%
2025	2,289.7	2,358.4	103.0%	2,358.4	103.0%	18.84%	2.16%	Rsrv Grows	21.00%	21.00%
2026	2,385.6	2,466.3	103.4%	2,466.3	103.4%	18.89%	2.11%	Rsrv Grows	21.00%	21.00%
2027	2,483.9	2,577.8	103.8%	2,577.8	103.8%	18.94%	2.06%	Rsrv Grows	21.00%	21.00%
2028	2,585.2	2,693.2	104.2%	2,693.2	104.2%	18.99%	2.01%	Rsrv Grows	21.00%	21.00%
2029	2,689.9	2,813.1	104.6%	2,813.1	104.6%	19.03%	1.97%	Rsrv Grows	21.00%	21.00%
2030	2,798.2	2,937.7	105.0%	2,937.7	105.0%	19.08%	1.92%	Rsrv Grows	21.00%	21.00%
2031	2,910.1	3,067.1	105.4%	3,067.1	105.4%	19.12%	1.88%	Rsrv Grows	21.00%	21.00%
2032	3,025.8	3,201.7	105.8%	3,201.7	105.8%	19.16%	1.84%	Rsrv Grows	21.00%	21.00%
2033	3,146.0	3,342.2	106.2%	3,342.2	106.2%	19.20%	1.80%	Rsrv Grows	21.00%	21.00%
2034	3,271.4	3,489.5	106.7%	3,489.5	106.7%	19.23%	1.77%	Rsrv Grows	21.00%	21.00%
2035	3,402.3	3,643.8	107.1%	3,643.8	107.1%	19.28%	1.72%	Rsrv Grows	21.00%	21.00%
2036	3,538.9	3,805.7	107.5%	3,805.7	107.5%	19.31%	1.69%	Rsrv Grows	21.00%	21.00%
2037	3,681.9	3,975.8	108.0%	3,975.8	108.0%	19.35%	1.65%	Rsrv Grows	21.00%	21.00%
2038	3,832.1	4,155.1	108.4%	4,155.1	108.4%	19.39%	1.61%	Rsrv Grows	21.00%	21.00%
2039	3,990.3	4,344.6	108.9%	4,344.6	108.9%	19.43%	1.57%	Rsrv Grows	21.00%	21.00%
2040	4,157.3	4,545.1	109.3%	4,545.1	109.3%	19.46%	1.54%	Rsrv Grows	21.00%	21.00%

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Deterministic Projection 2

Downside – Repeat of Returns from 2006-2008



Current Input	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Portfolio Actual Return	18.60	3.90	-32.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
Actual Salary Increases	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
UAAL Amortization Period	25	25	25	25	25	25	25	25	25	25	25
Total Rate % (54% ER, 46% EE)	21.00	21.00	21.00	21.00	21.00	23.00	25.00	27.00	29.00	31.00	31.91

BASELINE NUMBERS BELOW HERE

Current Input	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Portfolio Actual Return	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
Actual Salary Increases	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
UAAL Amortization Period	25	25	25	25	25	25	25	25	25	25	25
Total Rate % (54% ER, 46% EE)	21.00	21.00	21.00	21.00	21.00	21.00	21.00	21.00	21.00	21.00	21.00

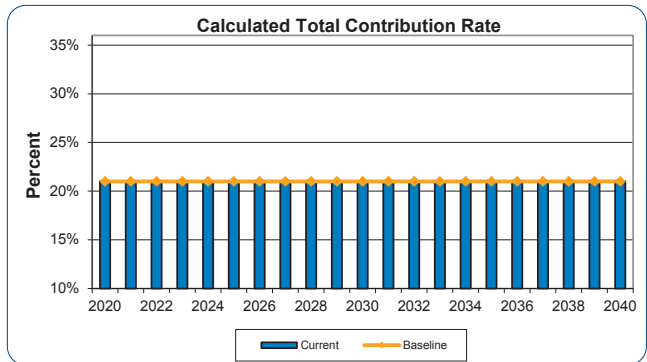
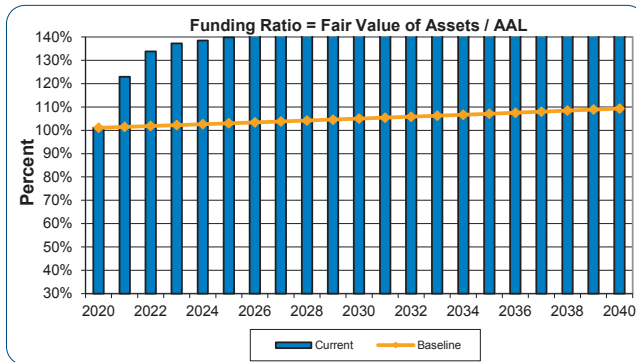
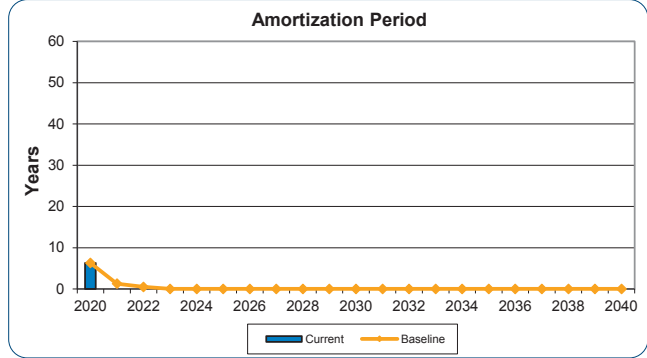
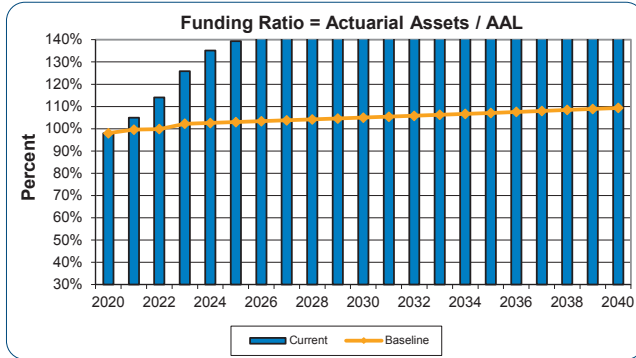
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Deterministic Projection 2b
Numerical Summary of Results
Downside – Repeat of Returns from 2006-2008
(Dollar Amounts in Millions)

Year	Actuarial Accrued Liability	Actuarial Value of Assets	Funding Ratio = AVA / AAL	Fair Value of Assets	Funding Ratio = FVA / AAL	Normal Cost Rate	Contribution Rate Minus Normal Cost Rate	Amortization Period	Current Rate	Greater of Current Rate or 25 Year Amort Rate
2020	\$1,856.0	\$1,818.7	98.0%	\$1,876.1	101.1%	18.59%	2.41%	6.3	21.00%	21.00%
2021	1,936.6	1,982.1	102.4%	2,180.4	112.6%	18.65%	2.35%	Rsrv Grows	21.00%	21.00%
2022	2,020.3	2,123.1	105.1%	2,221.1	109.9%	18.70%	2.30%	Rsrv Grows	21.00%	21.00%
2023	2,107.1	2,094.5	99.4%	1,472.4	69.9%	18.75%	2.25%	1.9	21.00%	21.00%
2024	2,197.0	1,970.1	89.7%	1,525.1	69.4%	18.80%	2.20%	UAAL Grows	21.00%	23.16%
2025	2,289.7	1,792.2	78.3%	1,578.0	68.9%	18.91%	4.09%	UAAL Grows	23.00%	28.20%
2026	2,385.8	1,638.1	68.7%	1,638.1	68.7%	19.02%	5.98%	UAAL Grows	25.00%	32.49%
2027	2,484.6	1,705.7	68.7%	1,705.7	68.7%	19.13%	7.87%	68.9	27.00%	32.51%
2028	2,586.7	1,782.0	68.9%	1,782.0	68.9%	19.25%	9.75%	40.1	29.00%	32.41%
2029	2,692.5	1,868.3	69.4%	1,868.3	69.4%	19.36%	11.64%	28.7	31.00%	32.19%
2030	2,802.2	1,966.0	70.2%	1,966.0	70.2%	19.43%	12.48%	25.0	31.91%	31.91%
2031	2,915.8	2,071.6	71.0%	2,071.6	71.0%	19.48%	12.43%	24.2	31.91%	31.91%
2032	3,033.5	2,182.3	71.9%	2,182.3	71.9%	19.51%	12.40%	23.3	31.91%	31.91%
2033	3,155.8	2,299.0	72.9%	2,299.0	72.9%	19.56%	12.35%	22.5	31.91%	31.91%
2034	3,283.4	2,422.4	73.8%	2,422.4	73.8%	19.60%	12.31%	21.6	31.91%	31.91%
2035	3,416.9	2,553.0	74.7%	2,553.0	74.7%	19.64%	12.27%	20.8	31.91%	31.91%
2036	3,556.3	2,691.2	75.7%	2,691.2	75.7%	19.68%	12.23%	19.9	31.91%	31.91%
2037	3,702.3	2,837.9	76.7%	2,837.9	76.7%	19.71%	12.20%	19.0	31.91%	31.91%
2038	3,855.8	2,994.1	77.7%	2,994.1	77.7%	19.75%	12.16%	18.2	31.91%	31.91%
2039	4,017.7	3,160.9	78.7%	3,160.9	78.7%	19.79%	12.12%	17.3	31.91%	31.91%
2040	4,188.5	3,339.1	79.7%	3,339.1	79.7%	19.83%	12.08%	16.4	31.91%	31.91%

Deterministic Projection 3

Upside – Repeat of Returns from 2003-2005



Current Input	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Portfolio Actual Return	29.40	15.50	8.70	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
Actual Salary Increases	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
UAAL Amortization Period	25	25	25	25	25	25	25	25	25	25	25
Total Rate % (54% ER, 46% EE)	21.00	21.00	21.00	21.00	21.00	21.00	21.00	21.00	21.00	21.00	21.00

BASELINE NUMBERS BELOW HERE

Current Input	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Portfolio Actual Return	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
Actual Salary Increases	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
UAAL Amortization Period	25	25	25	25	25	25	25	25	25	25	25
Total Rate % (54% ER, 46% EE)	21.00	21.00	21.00	21.00	21.00	21.00	21.00	21.00	21.00	21.00	21.00

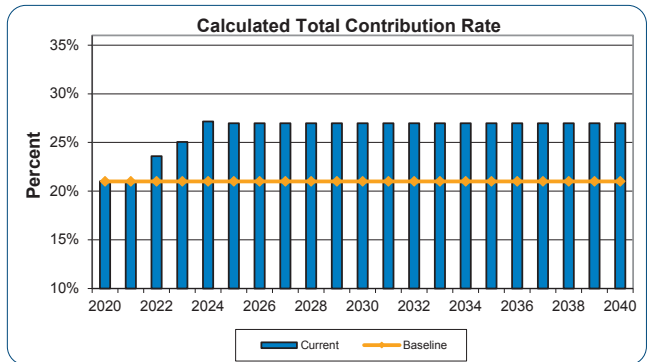
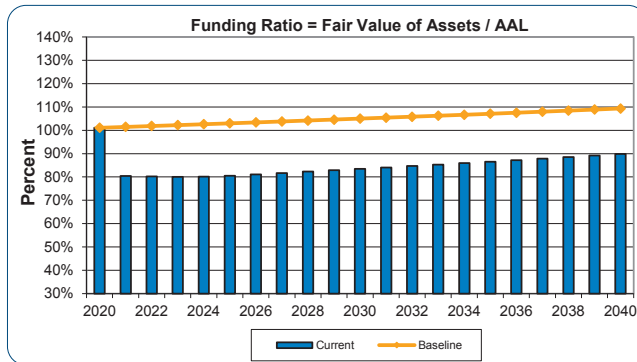
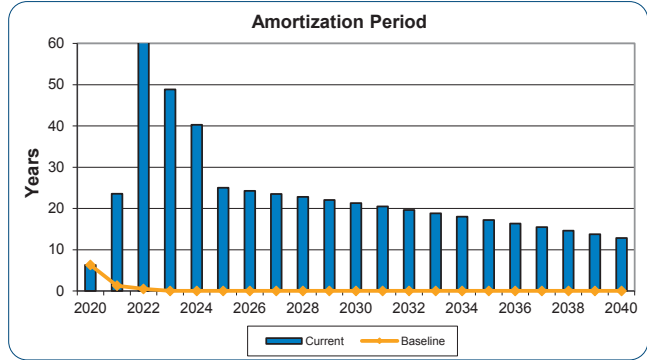
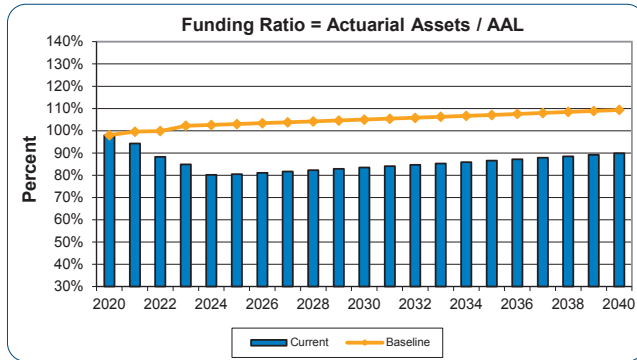
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Deterministic Projection 3b
Numerical Summary of Results
Upside – Repeat of Returns from 2003-2005
(Dollar Amounts in Millions)

Year	Actuarial Accrued Liability	Actuarial Value of Assets	Funding Ratio = AVA / AAL	Fair Value of Assets	Funding Ratio = FVA / AAL	Normal Cost Rate	Contribution Rate Minus Normal Cost Rate	Amortization Period	Current Rate	Greater of Current Rate or 25 Year Amort Rate
2020	\$1,856.0	\$1,818.7	98.0%	\$1,876.1	101.1%	18.59%	2.41%	6.3	21.00%	21.00%
2021	1,936.6	2,032.3	104.9%	2,381.0	122.9%	18.65%	2.35%	Rsrv Grows	21.00%	21.00%
2022	2,020.3	2,304.3	114.1%	2,703.4	133.8%	18.70%	2.30%	Rsrv Grows	21.00%	21.00%
2023	2,107.1	2,652.1	125.9%	2,890.6	137.2%	18.75%	2.25%	Rsrv Grows	21.00%	21.00%
2024	2,197.0	2,969.6	135.2%	3,042.5	138.5%	18.80%	2.20%	Rsrv Grows	21.00%	21.00%
2025	2,289.7	3,190.3	139.3%	3,201.7	139.8%	18.84%	2.16%	Rsrv Grows	21.00%	21.00%
2026	2,385.6	3,368.6	141.2%	3,368.6	141.2%	18.89%	2.11%	Rsrv Grows	21.00%	21.00%
2027	2,483.9	3,543.3	142.6%	3,543.3	142.6%	18.94%	2.06%	Rsrv Grows	21.00%	21.00%
2028	2,585.2	3,726.2	144.1%	3,726.2	144.1%	18.99%	2.01%	Rsrv Grows	21.00%	21.00%
2029	2,689.9	3,918.4	145.7%	3,918.4	145.7%	19.03%	1.97%	Rsrv Grows	21.00%	21.00%
2030	2,798.2	4,120.4	147.3%	4,120.4	147.3%	19.08%	1.92%	Rsrv Grows	21.00%	21.00%
2031	2,910.1	4,332.6	148.9%	4,332.6	148.9%	19.12%	1.88%	Rsrv Grows	21.00%	21.00%
2032	3,025.8	4,555.8	150.6%	4,555.8	150.6%	19.16%	1.84%	Rsrv Grows	21.00%	21.00%
2033	3,146.0	4,791.1	152.3%	4,791.1	152.3%	19.20%	1.80%	Rsrv Grows	21.00%	21.00%
2034	3,271.4	5,039.8	154.1%	5,039.8	154.1%	19.23%	1.77%	Rsrv Grows	21.00%	21.00%
2035	3,402.3	5,302.7	155.9%	5,302.7	155.9%	19.28%	1.72%	Rsrv Grows	21.00%	21.00%
2036	3,538.9	5,580.7	157.7%	5,580.7	157.7%	19.31%	1.69%	Rsrv Grows	21.00%	21.00%
2037	3,681.9	5,875.1	159.6%	5,875.1	159.6%	19.35%	1.65%	Rsrv Grows	21.00%	21.00%
2038	3,832.1	6,187.3	161.5%	6,187.3	161.5%	19.39%	1.61%	Rsrv Grows	21.00%	21.00%
2039	3,990.3	6,519.0	163.4%	6,519.0	163.4%	19.43%	1.57%	Rsrv Grows	21.00%	21.00%
2040	4,157.3	6,871.7	165.3%	6,871.7	165.3%	19.46%	1.54%	Rsrv Grows	21.00%	21.00%

This work product was prepared solely for the Tacoma Employees' Retirement System for the purposes described herein and may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work. Milliman recommends that third parties be aided by their own actuary or other qualified professional when reviewing the Milliman work product.

Deterministic Projection 4 Downside – Negative 2020 Return



Current Input	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Portfolio Actual Return	-15.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
Actual Salary Increases	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
UAAL Amortization Period	25	25	25	25	25	25	25	25	25	25	25
Total Rate % (54% ER, 46% EE)	21.00	21.00	21.00	23.00	25.00	26.98	26.98	26.98	26.98	26.98	26.98

BASELINE NUMBERS BELOW HERE

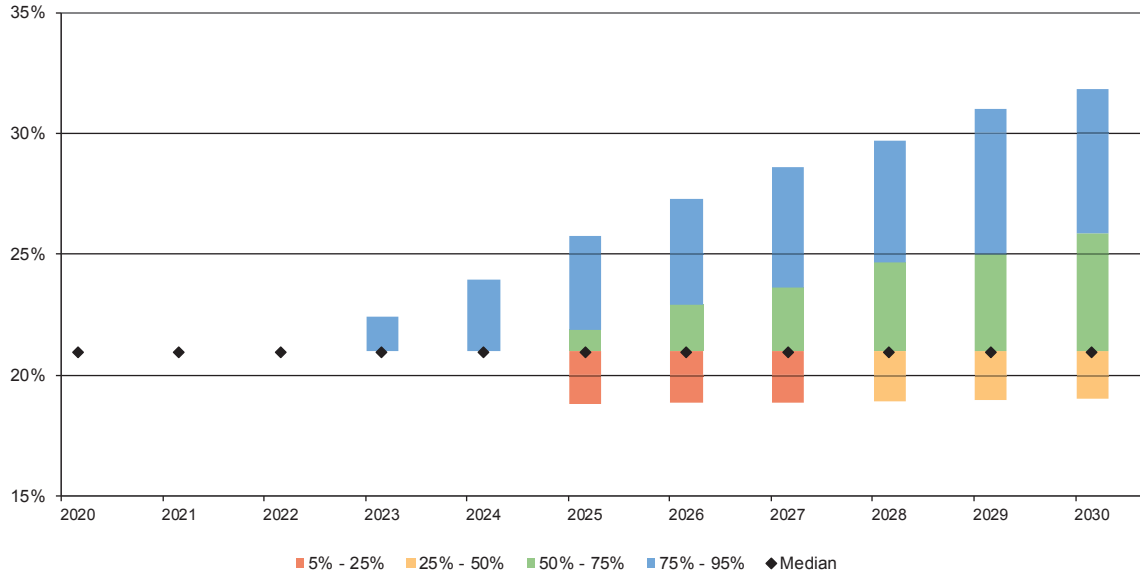
Current Input	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Portfolio Actual Return	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
Actual Salary Increases	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
UAAL Amortization Period	25	25	25	25	25	25	25	25	25	25	25
Total Rate % (54% ER, 46% EE)	21.00	21.00	21.00	21.00	21.00	21.00	21.00	21.00	21.00	21.00	21.00

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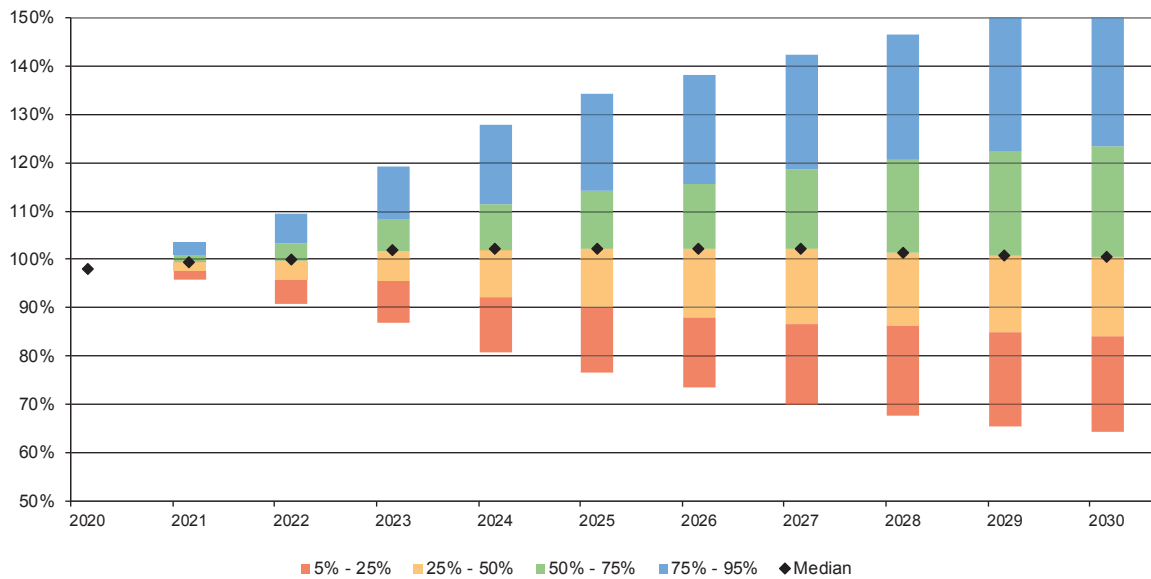
Deterministic Projection 4b
Numerical Summary of Results
Downside – Negative 2020 Return
(Dollar Amounts in Millions)

Year	Actuarial Accrued Liability	Actuarial Value of Assets	Funding Ratio = AVA / AAL	Fair Value of Assets	Funding Ratio = FVA / AAL	Normal Cost Rate	Contribution Rate Minus Normal Cost Rate	Amortization Period	Current Rate	Greater of Current Rate or 25 Year Amort Rate
2020	\$1,856.0	\$1,818.7	98.0%	\$1,876.1	101.1%	18.59%	2.41%	6.3	21.00%	21.00%
2021	1,936.6	1,826.3	94.3%	1,556.8	80.4%	18.65%	2.35%	23.5	21.00%	21.00%
2022	2,020.3	1,784.4	88.3%	1,620.9	80.2%	18.70%	2.30%	UAAL Grows	21.00%	23.58%
2023	2,107.1	1,788.8	84.9%	1,686.8	80.1%	18.81%	4.19%	48.8	23.00%	25.06%
2024	2,197.2	1,760.8	80.1%	1,760.8	80.1%	18.93%	6.07%	40.3	25.00%	27.15%
2025	2,290.4	1,843.3	80.5%	1,843.3	80.5%	19.04%	7.94%	25.0	26.98%	26.98%
2026	2,386.9	1,935.6	81.1%	1,935.6	81.1%	19.09%	7.89%	24.3	26.98%	26.98%
2027	2,486.1	2,031.0	81.7%	2,031.0	81.7%	19.13%	7.85%	23.5	26.98%	26.98%
2028	2,588.2	2,129.9	82.3%	2,129.9	82.3%	19.18%	7.80%	22.8	26.98%	26.98%
2029	2,693.9	2,233.0	82.9%	2,233.0	82.9%	19.23%	7.75%	22.1	26.98%	26.98%
2030	2,803.2	2,340.4	83.5%	2,340.4	83.5%	19.27%	7.71%	21.3	26.98%	26.98%
2031	2,916.2	2,452.3	84.1%	2,452.3	84.1%	19.32%	7.66%	20.5	26.98%	26.98%
2032	3,033.2	2,569.0	84.7%	2,569.0	84.7%	19.35%	7.63%	19.6	26.98%	26.98%
2033	3,154.8	2,691.2	85.3%	2,691.2	85.3%	19.39%	7.59%	18.8	26.98%	26.98%
2034	3,281.7	2,819.8	85.9%	2,819.8	85.9%	19.43%	7.55%	18.0	26.98%	26.98%
2035	3,414.3	2,955.3	86.6%	2,955.3	86.6%	19.48%	7.50%	17.2	26.98%	26.98%
2036	3,552.7	3,097.9	87.2%	3,097.9	87.2%	19.52%	7.46%	16.3	26.98%	26.98%
2037	3,697.7	3,248.3	87.8%	3,248.3	87.8%	19.55%	7.43%	15.5	26.98%	26.98%
2038	3,850.0	3,407.7	88.5%	3,407.7	88.5%	19.59%	7.39%	14.6	26.98%	26.98%
2039	4,010.6	3,577.0	89.2%	3,577.0	89.2%	19.63%	7.35%	13.7	26.98%	26.98%
2040	4,180.1	3,756.9	89.9%	3,756.9	89.9%	19.66%	7.32%	12.8	26.98%	26.98%

Projection 5
Stochastic Projection⁽¹⁾
Total Contribution Rate



Funding Ratio = AVA / AAL



1. Refer to pages [6-7](#) for a description of Projection 5.

Sensitivity to Assumptions

The valuation results are projections based on the actuarial assumptions. Actual experience will differ from these assumptions, either increasing or decreasing the ultimate cost. Of the assumptions, the investment return generally has the biggest impact. The following table provides an analysis on how the short-term costs are affected by the investment return assumption. Note that the long-term cost of the Plan will be largely driven by actual investment returns and other experience. The assumptions impact the timing of contributions, but the three scenarios below illustrate the ultimate long-term employer cost variance that depends on actual investment returns.

Investment Rate of Return Assumption:	6.00%	7.00%	8.00%
Normal Cost Rate:	23.25%	18.59%	15.04%
Actuarial Accrued Liability:	\$2,091.6M	\$1,856.0M	\$1,659.0M
Funding Ratio (AVA basis)	87.0%	98.0%	109.6%
Funding Ratio (FVA basis)	89.7%	101.1%	113.1%

Analysis of Change in Member Population

The following table summarizes the year-to-year change in member population.

	Active Contributing Members	Vested Terminated Members	Non-vested Terminated Members	Service Retirement Annuitants	Disabled Retirement Annuitants	Alternate Payees	Survivors Receiving Benefits	Total
As of December 31, 2018	2,989	557	190	2,101	27	47	299	6,210
New Members	340	4	17	-	-	3	21	385
Status Change:								
to Active	8	(6)	(2)	-	-	-	-	-
to Vested Terminated	(35)	41	(6)	-	-	-	-	-
to Non-vested Terminated	(26)	-	26	-	-	-	-	-
to Service Retirement	(152)	(35)	-	187	-	-	-	-
to Disabled Retirement	-	-	-	-	-	-	-	-
to Alternate Payee	-	-	-	-	-	-	-	-
to Survivor	-	-	-	-	-	-	-	-
Refunds	(47)	(8)	(30)	-	-	-	-	(85)
Expiration of benefits	-	-	-	-	-	-	(4)	(4)
Deaths	(1)	(2)	(1)	(42)	(1)	-	(21)	(68)
As of December 31, 2019	3,076	551	194	2,246	26	50	295	6,438

Conclusions

- The System's current Funding Ratio is 98.0% on an actuarial basis. The Board's Funding and Benefits policy, intended to provide guidance as to when adjustments to TERS contributions and benefits should be considered, states that there will be no action when the funding ratio is between 95% and 120% provided the combined employer and employee contribution rate is greater than or equal to the Actuarially Determined Total Contribution; if this condition is not met, then the Retirement Board will consider recommending an increase in the contribution rates. The combined employer and employee contribution

rate of 21.00% is equal to the Actuarially Determined Total Contribution Rate. Therefore, the policy says a contribution increase does not need to be considered on this actuarial basis.

- The Policy also states, "Contribution increases should consider amortizing any Unfunded Actuarial Accrued Liability over a period of 25 years or less" and "Calculations based on the Fair Value of Assets will also be considered." Based on the Fair Value of Assets at December 31, 2019, a contribution rate increase is not needed since the Funding Ratio of 101.1% is greater than 95% and there is no UAAL to be amortized. This does not take into account any losses in the Fair Value of Assets which may have occurred after December 31, 2019.
- The Policy also states, "Long-term funding projections will also be considered." Projection 5 shows that there is a 48% probability of contribution rates being above the current 21% of pay contribution rate 10 years from now. This is lower than the 61% of the scenarios in last year's projection due primarily to the impact of the 2019 asset returns. However, projection 4 implies that increases in the contribution rate may be necessary if the asset losses at the beginning of 2020 are not offset by future gains.
- It is expected that future experience such as investment returns above or below the 7.00% assumption will continue to have an important impact on the funding of the Retirement System.

The table on the following page summarizes the key valuation results. The complete Funding and Benefits Policy is on the page following the key valuations results.

Exhibit 1 Summary of Key Valuation Results

	2020 Valuation	2019 Valuation	Percentage Change
1. Total Membership			
A. Contributing Members	3,076	2,989	2.9 %
B. Annuitants Currently Receiving Benefits	2,617	2,474	5.8
C. Vested Terminated Members	551	557	(1.1)
D. Non-vested Terminated Members	<u>194</u>	<u>190</u>	2.1
E. Total Membership	6,438	6,210	3.7
2. Annual Salaries			
A. Annual Total (\$Thousands)	\$ 276,277	\$ 258,890	6.7
B. Annual Average per Active Member	89,817	86,614	3.7
3. Average Annual Allowance Payable			
A. Service Retirement	37,062	35,366	4.8
B. Disability Retirement	18,849	18,466	2.1
C. Survivors & Beneficiaries	21,232	20,064	5.8
D. All Payees	35,097	33,332	5.3
4. Actuarial Accrued Liability (\$Millions)			
A. Active Members	679.1	693.3	(2.0)
B. Terminated Members	98.8	103.9	(4.9)
C. Retired Members and Beneficiaries	<u>1,078.1</u>	<u>964.5</u>	11.8
D. Total AAL	1,856.0	1,761.7	5.4
5. Value of System Assets (\$Millions)			
A. Fair Value	1,876.1	1,635.0	14.7
B. Smoothing Unrecognized Loss / (Reserve)	<u>(57.4)</u>	<u>78.9</u>	
C. Actuarial Value	1,818.7	1,713.9	6.1
D. Ratio of Actuarial Value to Fair Value	96.9%	104.8%	
6. Funded Status (\$Millions)			
A. Funding Reserve or (Funding Shortfall) (5C - 4D)	\$ (37.3)	\$ (47.8)	
B. Actuarial Funding Ratio (5C ÷ 4D)	98.0%	97.3%	
C. Fair Value Funding Ratio (5A ÷ 4D)	101.1%	92.8%	
7. Contribution Rates (percent of salaries)			
A. Total Contribution Rate	21.00%	21.00%	
B. Normal Cost Rate	<u>18.59%</u>	<u>18.53%</u>	
C. Contribution Rate minus Normal Cost Rate (7A - 7B)	2.41%	2.47%	
D. Amortization Period (Period over which Funding Reserve is projected to be depleted or Funding Shortfall is projected to be depleted by the difference between the Contributions and the Normal Costs).	6.3 years	8.7 years	

Exhibit 2 TERS Retirement Board Funding and Benefits Policy

Objective

A sustainable pension plan is able to pay the promised benefits to members – now and in the future. This policy is intended to provide guidance as to when adjustments to TERS contributions and benefits should be considered. The Funding & Benefits Policy is meant to assist in establishing a contribution rate which is relatively stable over the long term while the System provides its members sustainable retirement income.

Policy

When the Funding Ratio is:

- a) Above 120% - Investment de-risking will be considered, and then the potential for recommendations to the City Council on contribution rate reductions and/or benefit improvements will be reviewed, provided the Retirement System's funding status is expected to remain stable after the changes.
- b) Between 95% and 120% - There will be no action, provided that the combined employer and employee contribution rate is greater than or equal to the Actuarially Determined Total Contribution; if this condition is not met, then the Retirement Board will consider recommending an increase in the contribution rates.
- c) Below 95% - The Retirement Board will consider recommending an increase in the contribution rates.

Additional Guidelines

- a) There is a long-term goal of maintaining a combined employer and employee contribution rate greater than or equal to the Actuarially Determined Total Contribution so that the System is appropriately funded.
- b) Increases in the contribution rate may be made in small increments.
- c) To the extent possible, ample notification regarding changes in the contribution rate should be provided to all parties to facilitate budgetary adjustments.
- d) Contribution rate increases should consider amortizing any Unfunded Actuarial Accrued Liability over a period of 25 years or less.
- e) Contribution holidays (i.e. intentional contribution of less than the Actuarially Determined Total Contribution) should be avoided.
- f) Calculations based on the Fair Value of Assets will also be considered.
- g) Long-term funding projections will also be considered.
- h) Funding Ratios between 100% and 120% should be viewed as desirable reserves to offset future adverse events and not as surplus funds.

Terminology

- a) The Funding Ratio is calculated by dividing the System's Actuarial Value of Assets by the Actuarial Accrued Liability.
- b) Unfunded Actuarial Accrued Liability is the dollar amount by which the System's Actuarial Accrued Liability exceeds the Actuarial Value of Assets.
- c) The Actuarially Determined Total Contribution is the greater of (1) the Normal Cost Rate or (2) the recommended combined employer and employee contribution for the reporting period that amortizes the UAAL (if any) over a maximum of 25 years, but will not be less than the actual contribution rate.

2. Scope of the Report

This report presents the actuarial valuation of the Tacoma Employees' Retirement System as of January 1, 2020.

A summary of the findings resulting from this valuation is presented in the previous section. Section 3 describes the assets of the System. Sections 3, 4, and 5 describe how the obligations of the System are to be met under the actuarial cost method in use. Section 6 provides analysis of actuarial gains and losses and the impact on the Unfunded Actuarial Accrued Liability. Section 7 provides a general discussion of potential risks to TERS' future funding levels. Section 8 provides supplemental information regarding funding progress and funding ratios.

The actuarial procedures and assumptions used in this valuation are presented in Appendix A. The current benefit structure, as determined by the provisions of the governing law on January 1, 2020, is summarized in Appendix B. Schedules of valuation data classifying the data used in the valuation by various categories of contributing members, former contributing members, and beneficiaries make up Appendix C. Appendix D provides a brief summary of the System's historical experience. Comparative statistics are presented on the System's membership, contribution rates, assets, and changes affecting actuarial valuations. Appendix E is a glossary of actuarial terms used in this valuation report.

3. Assets

In many respects, an actuarial valuation can be considered an inventory process. The inventory is taken as of the actuarial valuation date, which for this valuation is January 1, 2020. On that date, the assets available for the payment of benefits are appraised. These assets are compared with the actuarial liabilities, which are generally well in excess of the assets. The actuarial process thus leads to a method of determining what contributions by members and their employers are needed to strike a balance.

This section of the actuarial valuation report deals with the asset determination. In the next section, the actuarial liabilities will be discussed. Section 5 will deal with the process for determining required contributions based upon the relationship between the assets and actuarial liabilities.

Exhibit 3 summarizes the financial resources of the System on the valuation date. The fair value of net position available to pay pension benefits at the end of the last two years are compared and broken down by investment category.

Exhibit 4 summarizes the changes in the fair value of net position available to pay benefits. The System is mature. Benefits and administrative expenses are larger than contributions. The System must now rely on investment income to pay part of its benefits and expenses.

Exhibit 5 provides the historical returns since 1980 as calculated by Milliman on a fair-value basis.

Exhibit 6 summarizes the determination of the Actuarial Value of Assets. The actuarial asset method smoothes fair value gains and losses over a four-year period. It was adopted for the January 1, 1997 valuation, with the Actuarial Value of Assets set equal to the Fair Value of Assets at January 1, 1996. A complete description of the method is given in Appendix A.

Exhibit 3
Statement of Plan Net Position at Fair Value

	December 31, 2019	December 31, 2018
Assets		
Cash and short-term investments	\$ 12,062,873	\$ 17,508,429
Receivables		
Contributions and other receivables	1,570,157	1,138,483
Interest and dividends	2,836,842	2,795,911
Investment Sales	4,703,765	582,248
Total receivables	9,110,764	4,516,642
Investments, at fair value		
Equities	964,057,034	823,620,805
Fixed income	639,305,114	576,714,257
Real estate	81,145,679	76,859,020
Venture capital and partnerships	183,494,753	150,992,698
Total investments	1,868,002,580	1,628,186,781
Securities lending collateral	52,384,912	21,575,741
Capital assets, net of accumulated depreciation	8,441	9,285
Total assets	1,941,569,570	1,671,796,878
Liabilities		
Accounts payable and other liabilities	1,479,371	1,937,311
Investment purchases	11,609,932	13,263,445
Securities lending collateral	52,384,912	21,575,741
Total liabilities	65,474,215	36,776,497
Net position restricted for pensions	1,876,095,355	1,635,020,381

Note: Numbers may not sum to totals due to rounding

Exhibit 4 Statement of Changes in Plan Net Position

(Plan years ended December 31, 2019 and December 31, 2018)

	2019	2018
Additions		
Contributions		
Employer	\$ 30,239,417	\$ 28,587,937
Plan Member	26,303,297	25,193,034
	<hr/>	<hr/>
Total contributions	56,542,714	53,780,971
Investment income		
Net appreciation (depreciation) in fair value of investments	245,750,862	(86,231,014)
Interest & dividends	37,864,244	35,751,087
Investment management fees	(7,053,157)	(6,625,351)
Securities lending - agent fees	(65,873)	(58,548)
Securities lending - broker rebates	(1,081,822)	(921,994)
	<hr/>	<hr/>
Net investment income (loss)	275,414,254	(58,085,821)
Total additions (reductions)	331,956,968	(4,304,850)
Deductions		
Benefits	86,488,222	80,034,214
Refunds of contributions	2,604,072	2,199,211
Administrative expenses	1,789,700	1,690,865
	<hr/>	<hr/>
Total deductions	90,881,994	83,924,291
Net increase (decrease)	241,074,974	(88,229,141)
Net position restricted for pensions		
Beginning of year	1,635,020,381	1,723,249,522
End of year	<u>1,876,095,355</u>	<u>1,635,020,381</u>

Note: Numbers may not sum to totals due to rounding

Exhibit 5 Investment Return History

(TERS Investment Returns on Total Fund Calculated by Milliman)

Period Ended	1 Year	5 Years	10 Years	15 Years	Since 1980
12/31/2019	17.0	6.8	8.6	6.7	9.1
12/31/2018	-3.4	5.1	9.6	6.6	
12/31/2017	13.4	9.0	5.8	8.7	
12/31/2016	8.7	9.1	4.9	7.2	
12/31/2015	-0.4	7.6	5.8	6.4	
12/31/2014	8.1	10.5	6.7	6.7	
12/31/2013	15.8	14.2	7.4	7.2	
12/31/2012	14.1	2.7	8.6	6.8	
12/31/2011	1.3	0.8	6.2	6.8	
12/31/2010	14.1	4.0	5.8	7.3	
12/31/2009	27.3	3.0	4.8	8.0	
12/31/2008	-32.0	1.0	3.9	6.1	
12/31/2007	3.9	14.9	8.9	10.1	
12/31/2006	18.6	11.9	10.0	10.2	
12/31/2005	8.7	7.5	9.0	10.6	
12/31/2004	15.5	6.6	10.5	9.8	
12/31/2003	29.4	6.8	8.8	10.1	
12/31/2002	-8.9	3.2	7.8	8.8	
12/31/2001	-2.9	8.1	9.4	9.8	
12/31/2000	3.9	10.6	12.2	10.8	
12/31/1999	16.9	14.7	11.5	11.8	
12/31/1998	9.0	10.8	11.8	11.0	
12/31/1997	14.9	12.6	11.7	10.8	
12/31/1996	8.7	10.8	10.7	12.2	
12/31/1995	24.7	13.8	10.9	11.5	
12/31/1994	-1.6	8.4	10.4	10.5	
12/31/1993	18.2	12.7	11.1		
12/31/1992	5.7	10.9	10.0		
12/31/1991	24.4	10.5	12.9		
12/31/1990	-2.1	8.0	10.4		
12/31/1989	19.7	12.4	11.6		
12/31/1988	8.8	9.5			
12/31/1987	4.1	9.1			
12/31/1986	10.7	15.2			
12/31/1985	19.8	12.9			
12/31/1984	4.6	10.7			
12/31/1983	6.8				
12/31/1982	37.2				
12/31/1981	-0.1				
12/31/1980	8.8				

Exhibit 6 Actuarial Assets

(January 1, 2020)

Part A

Determination of Recognized Investment Gains and Losses - Four-Year Smoothing

A. Expected investment return	\$	113,249,552
B. Actual investment return		275,414,254
C. Gains/(losses) [B - A]		162,164,702
D. Gains/(losses) 2018		(177,658,271)
E. Gains/(losses) 2017		98,330,883
F. Gains/(losses) 2016		20,850,212
G. Gains/(losses) recognized at January 1, 2020 $[1/4C + 1/4D + 1/4E + 1/4F]^{(1)}$		25,921,880

Part B

Determination of Actuarial Assets

Actuarial value of assets January 1, 2019		\$	1,713,886,090
Net cash flow -- 2019	\$	(34,339,280)	
Expected investment return --2019		113,249,552	
Recognized investment gains(losses)		<u>25,921,880</u>	<u>104,832,152</u>
Actuarial value of assets January 1, 2020		\$	1,818,718,242

1. Includes rounding adjustment.

Note: The AVA is equal to the expected Fair Value of Assets plus a four-year smoothing of fair value gains and losses.

4. Actuarial Liabilities

In the previous section, an actuarial valuation was described as an inventory process, and an analysis was given of the inventory of assets of the System as of the valuation date. In this section, the discussion will focus on the commitments of the System, which are its actuarial liabilities.

Exhibit 7 contains an analysis of the actuarial present value of all future benefits for contributing members, for former contributing members, and for beneficiaries. The analysis is given by type of benefit.

The actuarial liabilities summarized in Exhibit 7 include the actuarial present value of all future benefits expected to be paid with respect to each member. For an active member, this value includes a measure of both benefits already earned and future benefits to be earned. Thus, for all members, active and retired, the value extends over benefits earnable and payable for the rest of their lives. If an optional benefit is chosen, the value even extends over the lives of the surviving beneficiaries.

Exhibit 7
Actuarial Present Value of Future Benefits for
Contributing Members, Former Contributing Members, and Their Survivors

(Dollar Amounts in Millions)

	January 1, 2020	January 1, 2019
Active participants		
Service and early retirement	\$ 1,034.8	\$ 1,016.9
Vested termination and return of member contributions	65.4	60.5
Disability retirement	7.5	6.9
Survivors' benefits	23.1	22.6
	<hr/>	<hr/>
Total	1,130.8	1,106.9
Inactive and retired participants and beneficiaries		
Service retirement	1,011.4	900.1
Disability retirement	5.5	5.7
Survivors' benefits	61.2	58.7
Terminated vested benefits	98.8	103.9
	<hr/>	<hr/>
Total	1,176.9	1,068.4
Grand Total	2,307.6	2,175.4

5. Employer Contributions

In an active system, there will always be a difference between the actuarial present value of future benefits and the assets. This difference has to be funded with future contributions. An actuarial valuation sets a schedule of future contributions that will deal with this funding in an orderly fashion.

The method used to determine the incidence of the contributions in various years is called the actuarial cost method. For this valuation, the entry age actuarial cost method has been used. Under this method, or essentially any actuarial cost method, the contributions required to meet the difference between current assets and present value of future benefits are allocated each year between two elements:

- A Normal Cost amount, which ideally is relatively stable as a percentage of salary over the years; and
- Whatever amount is left over, which is used to amortize what is called the Unfunded Actuarial Accrued Liability (UAAL).

The two items described above, Normal Cost and UAAL, are the keys to understanding the actuarial cost method.

The Normal Cost is the theoretical contribution rate that will meet the ongoing costs of a group of average new employees. Suppose that a group of new employees was covered under a separate fund from which all benefits and to which all contributions and associated investment return were paid. Under the entry age actuarial cost method, the Normal Cost contribution rate is that level percentage of pay which would be exactly right to maintain this fund on a stable basis. If experience were to follow the actuarial assumptions exactly, the fund would be completely liquidated with the last payment to the last survivor of the group.

We have determined the Normal Cost rates separately by type of employee and by type of benefit for the System. We have also determined the dollar amounts corresponding to the Normal Cost rates. These are summarized in Exhibit 8. We assume that the contributions will be paid with each pay period.

Exhibit 9 shows the development of the UAAL. Line A shows the actuarial present value of all future benefit payments for present and former members and their survivors. Line B shows the portion that is expected to be paid from future Normal Cost contributions, both employer and employee. The remainder, the AAL, is shown on Line C. Line D shows the AVA, \$1,818.7 million, to be smaller than the AAL on Line C, \$1,856.0 million. Consequently, the System has an UAAL.

Exhibit 10 shows that the total contribution rate, of 21.00% on Line C is 2.41% more than the total Normal Cost rate of 18.59% on Line D. Line F shows contributions are projected to amortize the UAAL over a 6.3-year period. Line G provides the contribution rate necessary to amortize the UAAL over a 25-year period, but not lower than the current contribution rate. Lines H and I provide information on a fair-value basis.

The assumptions used in this valuation were developed in 2016 based on the System's experience in the four years 2012-2015 and will be reviewed again in 2020.

The UAAL or Funding Reserve at any date after establishment of a system is affected by any actuarial gains or losses arising when the actual experience of the system varies from the experience anticipated by the actuarial assumptions used in the valuations. To the extent actual experience differs from the assumptions used, the actual emerging costs will differ from the estimated costs. An analysis of the System's experience is discussed in Section 6, Actuarial Gains or Losses.

Exhibit 8 Normal Cost Contribution Rates as Percentages of Salary

	January 1, 2020		January 1, 2019	
	Percentage	Dollar Amount in thousands	Percentage	Dollar Amount in thousands
Service and early retirement	14.37%	\$ 39,701	14.30%	\$ 37,021
Vested termination and return of member contributions	2.84	7,846	2.84	7,352
Disability retirement	0.19	525	0.19	492
Survivors' benefits	0.39	1,077	0.40	1,036
Administrative Expenses	<u>0.80</u>	<u>2,210</u>	<u>0.80</u>	<u>2,071</u>
Total	18.59	51,360	18.53	47,972

Exhibit 9 Unfunded Actuarial Accrued Liability / Funding Reserve

(Dollar Amounts in Millions)

	January 1, 2020	January 1, 2019
A. Actuarial present value of all future benefits for present and former members and their survivors (Exhibit 7)	\$ 2,307.6	\$ 2,175.4
B. Actuarial present value of total future normal costs for present members	451.6	413.7
C. Actuarial Accrued Liability [A - B]	1,856.0	1,761.7
D. Actuarial value of assets available for benefits (Exhibit 6)	1,818.7	1,713.9
E. Funding Reserve / (Unfunded Actuarial Accrued Liability) [D - C]	(37.3)	(47.8)
F. Funding ratio [D ÷ C]	98.0%	97.3%
Fair Value Calculations⁽¹⁾		
G. Fair value of assets	\$ 1,876.1	\$ 1,635.0
H. Fair value funding reserve / (Unfunded Actuarial Accrued Liability) [G - C]	20.1	(126.7)
I. Fair value funding ratio [G ÷ C]	101.1%	92.8%

1. The Retirement Board's Funding and Benefits Policy specifies that calculations based on the Fair Value of Assets should be considered as well as calculations based on the actuarial assets which smooth gains and losses over four years.

Exhibit 10 Contribution Rate Adequacy

	January 1, 2020	January 1, 2019
A. Employer contribution rate	11.34%	11.34%
B. Member contribution rate	<u>9.66%</u>	<u>9.66%</u>
C. Total contribution rate	21.00%	21.00%
D. Less total normal cost rate (Table 5)	<u>18.59%</u>	<u>18.53%</u>
E. Excess of contribution rate over normal cost rate [C - D]	2.41%	2.47%
F. Amortization period from Valuation Date	6.3 years	8.7 years
G. 25-Year Amortization of Funding Shortfall on an AVA Basis, not lower than the current contribution rate.	21.00%	21.00%
Fair Value Calculations⁽¹⁾		
H. Amortization period from Valuation Date	N/A ⁽²⁾	31.7 years
I. 25-Year Amortization of Funding Shortfall on an FVA Basis, not lower than the current contribution rate.	21.00%	21.43%

1. The Retirement Board's Funding and Benefits Policy specifies that calculations based on the Fair Value of Assets should be considered as well as calculations based on the actuarial assets, which smooth gains and losses over four years.

2. The amortization period on a Fair Value basis is not applicable since there is no UAAL to amortize.

6. Actuarial Gains or Losses

An analysis of actuarial gains or losses is performed in conjunction with all regularly scheduled valuations.

The results of our analysis of the financial experience of the System in the four recent regular actuarial valuations are presented in Exhibit 11. Each gain or loss shown represents our estimate of how much the given type of experience caused the UAAL or Funding Reserve to change in the period since the previous actuarial valuation.

Gains and losses shown due to demographic sources are approximate. Demographic experience is analyzed in greater detail in our periodic assumption studies.

Non-recurring gains and losses in the 2016 period were from changes in the actuarial assumptions due to the experience study. Those changes were reflected in the January 1, 2017 actuarial valuation. Non-recurring gains and losses in the 2017 period were from changes in the contribution rates in 2018 and changes in the annuity conversion rates in 2020 and beyond. These changes were reflected in the January 1, 2018 actuarial valuation.

Exhibit 12 provides an analysis of the change in the UAAL between the prior and current valuations. It shows the AAL, AVA and the difference between the UAAL. It shows the amounts at the prior valuation and the expected changes, including the impact of the Normal Cost, interest, contributions, benefit payments, and administrative expenses. It then shows the deviation from expectations based on gains and losses to the asset values and liability amounts.

Exhibit 11 Analysis of Actuarial Gains or Losses⁽¹⁾

(Dollar Amounts in Millions)

	Gain/(Loss) For Period			
	2016	2017	2018	2019
Investment Income				
Investment Income was greater (less) than expected. Based on actuarial value of assets.	\$ 5.1	\$ 2.2	\$ (38.6)	\$ 20.4
Pay Increases				
Pay increases were less (greater) than expected.	3.4	3.5	1.0	(2.9)
Age & Service Retirements				
Members retired at older (younger) ages or with less (greater) final average pay than expected.	4.2	-	(3.7)	(12.4)
Disability Retirements				
Disability claims were less (greater) than expected.	(0.2)	0.1	-	0.1
Death-in-Service Benefits				
Survivor claims were less (greater) than expected.	1.3	0.3	0.8	1.1
Withdrawal From Employment				
More (Less) reserve was released by withdrawals than expected.	1.8	1.6	(0.1)	0.6
Death After Retirement				
Retirees died younger (lived longer) than expected.	4.2	5.4	-	(3.0)
Other				
Miscellaneous gains and losses resulting from data adjustments.	-	-	(0.5)	1.6
Membership Growth				
(Additional) liability for new members.	<u>(1.5)</u>	<u>(1.9)</u>	<u>(2.3)</u>	<u>(2.8)</u>
Total Gain or (Loss) During Period From Financial Experience	18.3	11.2	(43.4)	2.7
Non-Recurring Items				
Changes in actuarial assumptions caused a gain (loss).	(40.8)	-	-	-
Changes in benefits caused a gain (loss). ⁽²⁾	<u>-</u>	<u>36.8</u>	<u>-</u>	<u>-</u>
Composite Gain (Loss) During Period	(22.5)	48.0	(43.4)	2.7

1. Effects related to losses are shown in parentheses. Numerical results are expressed as a decrease (increase) in the UAAL.

2. Changes in contribution rates in 2018 and annuity conversion rates in 2020 and beyond.

Exhibit 12 Analysis of Change in Unfunded Actuarial Accrued Liability

(Dollar Amounts in Millions)

	(a) Actuarial Accrued Liability	(b) Actuarial Value of Assets	(a) - (b) Unfunded Actuarial Accrued Liability
January 1, 2019 Actuarial Valuation	\$ 1,761.7	\$ 1,713.9	\$ 47.8
Normal Cost	42.5	-	42.5
Interest on Beginning of Year Amounts	126.3	120.0	6.3
Contributions	-	56.5	(56.5)
Benefit Payments (Includes Return of Contributions)	(89.1)	(89.1)	-
Administrative Expenses	-	(1.8)	1.8
Interest on Cash Flow Amounts	(3.1)	(1.2)	(1.9)
Expected January 1, 2020 Actuarial Valuation	1,838.3	1,798.3	40.0
Recognized Asset Gain/(Loss)			
Gain/(Loss) from 2016-2018	-	(20.1)	20.1
Gain/(Loss) from 2019	-	40.5	(40.5)
Total Asset Gain/(Loss)	-	20.4	(20.4)
Plan Change	-	-	-
Liability (Gain)/Loss	17.7	-	17.7
Actual January 1, 2020 Actuarial Valuation	1,856.0	1,818.7	37.3

7. Risk Disclosure

The purpose of this section is to identify, assess, and provide illustrations of risks that are significant to the Plan, and in some cases to the Plan's participants.

As plans mature, they accumulate larger pools of assets and liabilities. This increases the potential risk to plan funding and the finances of those who are responsible for plan funding. As shown by the Asset Volatility Ratio discussed later in this section, the System's assets are now much larger compared to payroll than in the past. The Asset Volatility Ratio example shows that because of this a 10% investment loss on assets today costs more than four times as much, when measured as a percent of payroll, than a 10% investment loss would have cost in 1976. Since pension plans make long-term promises and rely on long-term funding, it is important to consider how mature the plan is today, and how mature it may become in the future.

The results of any actuarial valuation are based on one set of assumptions. Although we believe the current assumptions for the System provide a reasonable estimate of future expectations, it is almost certain that future experience will differ from the assumptions to some extent. It is therefore important to consider the potential impacts of these potential differences between assumptions and experience when making decisions that may affect the future financial health of the Plan, or of the Plan's participants.

Actuarial Standard of Practice No. 51 (ASOP 51) addresses these issues by providing actuaries with guidance for assessing and disclosing the risk associated with measuring pension liabilities and the determination of pension plan contributions. Specifically, it directs the actuary to:

- Identify risks that may be significant to the plan.
- Assess the risks identified as significant to the plan. The assessment does not need to include numerical calculations.
- Disclose plan maturity measures and historical information that are significant to understanding the plan's risks.

ASOP 51 states that if in the actuary's professional judgment, a more detailed assessment would be significantly beneficial in helping the individuals responsible for the plan to understand the risks identified by the actuary, then the actuary should recommend that such an assessment be performed.

This Section uses the framework of ASOP 51 to communicate important information about significant risks to the System, the System's maturity, and relevant historical Plan data.

Identification of Risks

There are a number of factors that affect future valuation results. To the extent actual experience for these factors varies from the assumptions, this will likely cause either increases or decreases in the plan's future funding level and calculated contribution rates. Examples of factors that can have a significant impact on valuation results are:

- Investment return as this will impact the level of assets available to pay benefits
- Payroll variation as this will impact the ability to finance unfunded amounts as a percent of future pay
- Salary variation as this will impact the size of benefits members receive as a percent of final earnings
- Mortality as this will impact how long retirees receive benefits
- Service retirement as this will impact: how long retirees receive benefits, the size of retiree benefits, the amount of time to receive employer and employee contributions, and the amount of time for investment earnings to accumulate on those contributions
- Termination (members leaving active employment for reasons other than death, disability or service retirement) as this will impact the size of those members benefits

Investment Return

Of the factors listed above, we believe the factor with the greatest potential risk is future investment returns. For this reason, we studied this assumption in multiple ways in the executive summary of this report.

In projections 1-4, we performed deterministic projections to study the impact of various investment return scenarios on the funding ratios and contribution rates necessary to meet the plan's obligations.

In projection 5, to give an idea of the potential range of future contribution rates and funding ratios, we display the results of a stochastic projection. This type of projection allows the assessment of the likelihood of certain events in the 1,000 scenarios modeled. The stochastic projection uses a random number generator, the System's asset allocation, and Milliman's capital market assumptions to generate a probability distribution of future contribution rates and funding ratios based on 1,000 random scenarios.

Our last disclosure about investment returns in the executive summary is a sensitivity analysis where we show the impact on the Normal Cost rate, Actuarial Accrued Liability, and Funding Ratios of a one percent increase or decrease in assumed future investment returns.

Demographic Experience

While future investment returns will likely cause the greatest deviation from expected experience, there are many other assumptions made in an actuarial valuation. For these assumptions, differences between actual and assumed experience will also result in actuarial gains and losses. Exhibit 11 in Section 6 of this report provides a look at the impact in recent years of actual experience deviating from assumed.

Maturity Measures and Historical Information

The remainder of this section contains historical information concerning the System's Asset Volatility Ratio, Liability Volatility Ratio, and Cash Flows, as well as a 10-year projection of the System's cash flows. Additional historical information can be found in Section 8 (Supplemental Information), and Appendix D (Comparative Schedules). Some of the historical information in Section 8 and Appendix D also provides measures of the System's maturity including breakdowns of the System's liability and membership between active and inactive members.

Asset Volatility Ratios and Liability Volatility Ratios

The magnitude of any contribution rate increase or decrease is affected by the System's maturity level. As systems mature, they accumulate larger pools of assets. Gains and losses on these larger pools of assets create more volatility in the contributions needed to fund the system.

One indicator of this potential volatility is the Asset Volatility Ratio (AVR), which is equal to the Fair Value of Assets divided by total payroll. As assets grow compared to payroll, any percentage gain or loss on those assets will be larger compared to payroll. This causes any resulting changes in required contributions from those gains or losses to also be larger when measured as a percent of payroll. Therefore, plans with a high AVR will be subject to a greater level of volatility in required contributions. The AVR is a current measure since it is based on the current level of assets and will vary from year to year.

The current AVR for TERS is 6.8. The AVR grew from 1.4 in 1976 to a high of 6.9 in 2018. The first graph in Exhibit 13 shows historical AVRs for TERS.

The following table provides an illustration of how increases in the AVR increase the volatility of contributions from asset gains and losses. A return of negative 3.00% is a 10% loss for TERS because it is 10% below the 7.00% investment return assumption. As shown in the table, if a return of negative 3.00% is not offset by future gains and the AVR is 1.4, the loss is expected to increase contributions by 0.8% of pay if amortized over 25 years and 1.2% of pay if amortized over 15 years. However, with the AVR of 6.8, the same return is expected to increase contributions by 4.0% of payroll if amortized over 25 years and 5.7% of pay if amortized over 15 years. In both cases this assumes there is no buffer such as a reserve or an amortization period below 25 years to absorb some of the adverse experience.

Approximate eventual increases in contributions for an asset return 10% below the assumption if not offset by future gains⁽¹⁾		
Asset Volatility Ratio = Assets / Payroll	25-Year Amortization	15-Year Amortization
1.4 (1976)	0.8% of payroll	1.2% of payroll
6.8 (current)	4.0% of payroll	5.7% of payroll

1. Estimate does not reflect increased value of future refunds due to increase in member contribution rates. The total increases would be slightly larger after an adjustment for higher returns of member contributions.

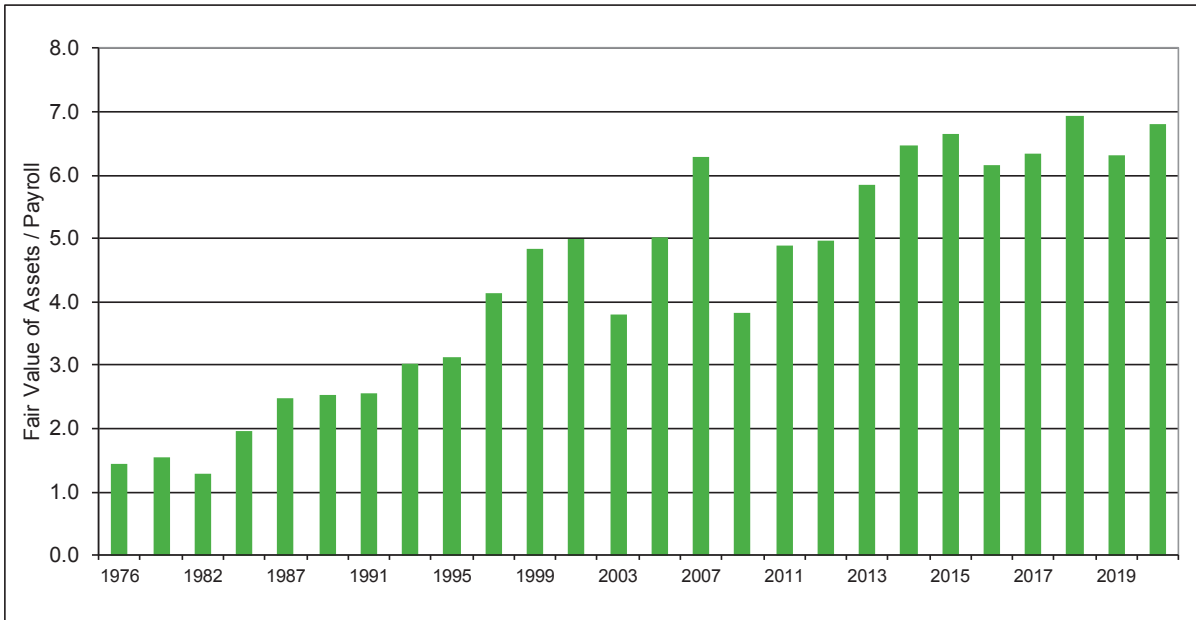
The graph at the top of Exhibit 13 shows how the System matured during the last 25 years of the 20th century, as represented by the increasing AVR.

Another measure of a system's maturity is the Liability Volatility Ratio (LVR), which is equal to the AAL divided by the total payroll. This ratio provides an indication of the longer-term potential for contribution volatility for any given level of investment volatility. In addition, this ratio provides an indication of the potential contribution volatility due to liability experience (gains and losses) and liability re-measurements (assumption changes). For TERS, the current LVR is 6.7.

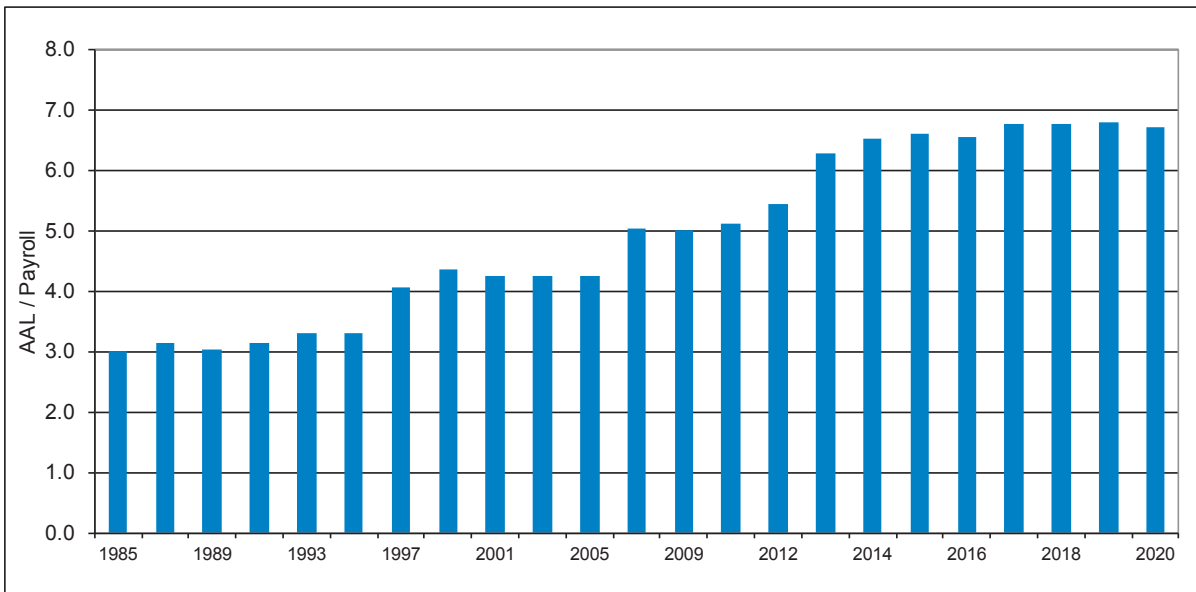
The graph at the bottom of Exhibit 13 shows the historical LVR since 1985. It is a similar pattern to the Asset Volatility Ratio, except the increase is more gradual and the year-to-year variance is significantly less.

Exhibit 13 Asset and Liability Volatility Ratios

Asset Volatility Ratios (Fair Value of Assets ÷ Payroll)



Liability Volatility Ratios (Actuarial Accrued Liability ÷ Payroll)



This work product was prepared solely for the Tacoma Employees' Retirement System for the purposes described herein and may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work. Milliman recommends that third parties be aided by their own actuary or other qualified professional when reviewing the Milliman work product.

Historical and Projected Cash Flows

One way to assess future risks is to look at historical measurements. Exhibit 14 summarizes the System's historical cash flows for the last 10 years and the projected cash flows for the next 10 years. The projected cash flows are based on the actuarial assumptions as stated in Appendix A. Contributions include both employer and member contributions. The total contribution rate increased to 21.00% of pay at February 2018, consistent with the Tacoma Municipal Code. The projections assume this rate continues throughout the projection period. Graphs of Exhibit 14 are on the facing page. Additional historical information can be found in Section 8 and Appendix D.

Exhibit 14 Cash Flow History and Projections

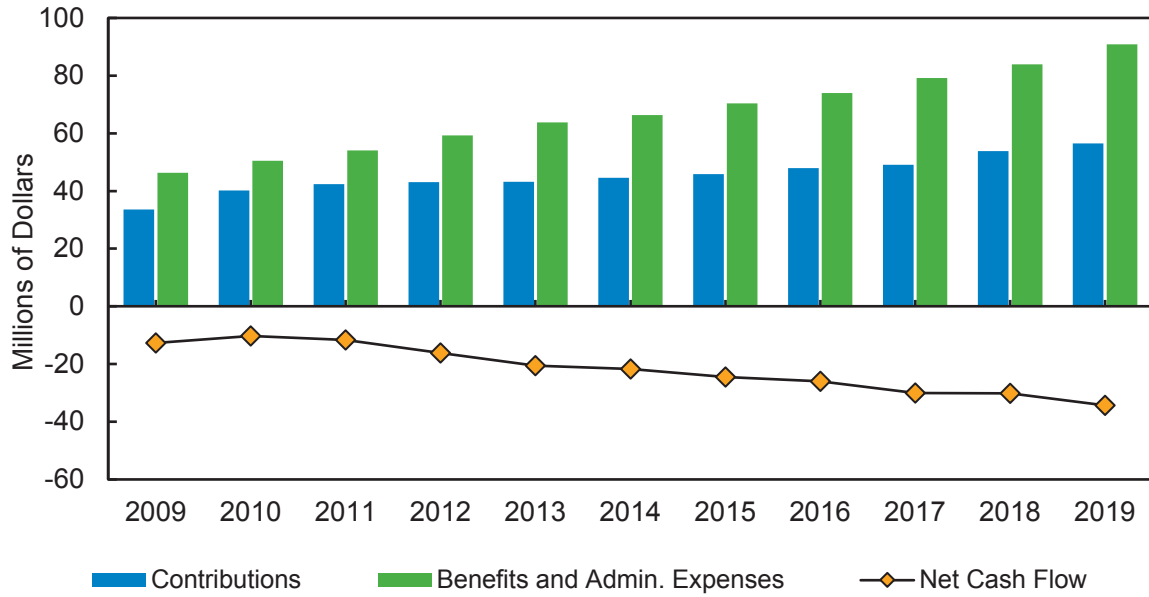
(Dollar Amounts in Millions)

Historical Cash Flows			
Year	<u>Contributions</u>	Benefits & Administrative <u>Expenses</u>	Net Cash Flow ⁽³⁾
2009	\$ 34	\$ 46	\$ (13)
2010	40	51	(10)
2011	42	54	(12)
2012	43	59	(16)
2013	43	64	(21)
2014	45	66	(22)
2015	46	70	(25)
2016	48	74	(26)
2017	49	79	(30)
2018	54	84	(30)
2019	57	91	(34)

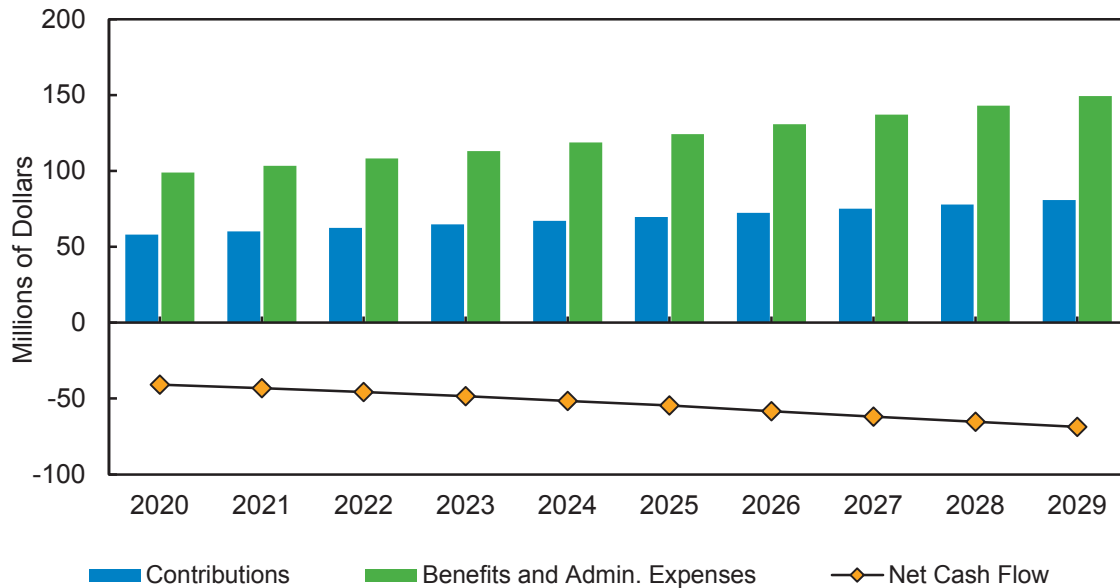
Projected Cash Flows			
Year	<u>Contributions⁽¹⁾</u>	Benefits & Administrative <u>Expenses⁽²⁾</u>	Net Cash Flow ⁽³⁾
2020	\$ 58	\$ 99	\$ (41)
2021	60	103	(43)
2022	62	108	(46)
2023	65	113	(48)
2024	67	119	(52)
2025	70	124	(55)
2026	72	131	(58)
2027	75	137	(62)
2028	78	143	(65)
2029	81	149	(69)

1. Contributions are based on the current total contribution rate of 21.00%.
2. Administrative expenses are based on the current actuarial assumption of 0.80% of pay.
3. Due to rounding, net cash flow may not match contributions minus disbursements.

Exhibit 14 Cash Flow History (continued)



Cash Flow Projections



8. Supplemental Information

Historical Funding Exhibits

The four exhibits in this section provide historical funding information. Exhibit 15, the Schedule of Funding Progress, and Exhibit 16, Funding Ratios, provide a history of the System's funding based on the Actuarial Value of Assets and the Actuarial Accrued Liability. Exhibit 17, Actuarial Present Value of Accumulated Vested Plan Benefits, provides a history of the System's funding based on the Actuarial Value of Assets and the Actuarial Present Value of Accumulated Plan Benefits. Exhibit 18 is a schedule of retirees and beneficiaries added to and removed from rolls.

**Milliman January 1, 2020 Actuarial Valuation
Tacoma Employees' Retirement System**
Supplemental Information
**Exhibit 15
Schedule of Funding Progress**

(Dollar Amounts in Millions)

Actuarial Valuation Date	Actuarial Value of Assets	Actuarial Accrued Liabilities (AAL) ⁽¹⁾	Unfunded Actuarial Accrued Liabilities (UAAL) ⁽²⁾	Funded Ratio	Funding Ratio Increase (Decrease) Over Prior Valuation	Covered Payroll ⁽³⁾	UAAL as a Percentage of Covered Payroll
January 1, 1997	\$ 482.7	\$ 477.9	\$ (4.8)	101.0 %	7.9 %	\$ 116.3	(4.1) %
January 1, 1998 ⁽⁴⁾	523.8	515.7	(8.1)	101.6	0.6	116.1	(7.0)
January 1, 1999 ⁽⁵⁾	570.7	536.9	(33.8)	106.3	4.7	122.3	(27.6)
January 1, 1999 ⁽⁶⁾	570.7	537.6	(33.1)	106.2	(0.1)	122.3	(27.1)
January 1, 2001	700.7	605.7	(95.0)	115.7	9.5	133.4	(71.2)
January 1, 2003	740.1	686.8	(53.3)	107.8	(7.9)	154.2	(34.6)
January 1, 2005	807.3	754.3	(53.0)	107.0	(0.8)	172.5	(30.7)
January 1, 2007	1,021.3	895.8	(125.5)	114.0	7.0	175.0	(71.7)
January 1, 2009	1,097.3	1,002.3	(95.0)	109.5	(4.5)	197.4	(48.1)
January 1, 2011	1,074.8	1,132.9	58.1	94.9	(14.6)	219.6	26.5
January 1, 2012	1,068.3	1,185.5	117.2	90.1	(4.8)	219.4	53.4
January 1, 2013	1,187.1	1,306.6	119.5	90.9	0.8	210.6	56.7
January 1, 2014	1,297.0	1,400.0	103.0	92.6	1.7	213.8	48.2
January 1, 2015	1,402.7	1,468.2	65.5	95.5	2.9	221.3	29.6
January 1, 2016	1,501.7	1,542.2	40.5	97.4	1.9	227.4	17.8
January 1, 2017	1,585.0	1,648.1	63.1	96.2	(1.2)	236.4	26.7
January 1, 2018	1,667.0	1,680.7	13.7	99.2	3.0	241.6	5.7
January 1, 2019	1,713.9	1,761.7	47.8	97.3	(1.9)	252.8	18.9
January 1, 2020	1,818.7	1,856.0	37.3	98.0	0.7	266.7	14.0

1. Actuarial present value of benefits less actuarial present value of future normal costs based on Entry Age Actuarial Cost Method.
2. Actuarial accrued liabilities less Actuarial Value of Assets.
3. Covered Payroll includes compensation paid to all active employees on which contributions were made in the year preceding the valuation date.
4. A special actuarial valuation was performed as of January 1, 1998.
5. Results of January 1, 1999 Actuarial Valuation.
6. January 1, 1999 results adjusted for inclusion of benefit percentage in portability, removal of overtime contributions and removal of 90-day waiting period.

**Milliman January 1, 2020 Actuarial Valuation
Tacoma Employees' Retirement System**
Supplemental Information
**Exhibit 16
Funding Ratios**

(Dollar Amounts in Millions)

Actuarial Valuation Date ⁽¹⁾	Actuarial Accrued Liabilities for				Actuarial Value of Assets	Portion of Actuarial Accrued Liabilities Covered by Assets			
	A	B	C	D		A	B	C	D
	Active Member Contribution	Inactives, Retirees and Beneficiaries	Active Members (Employer- Financed Portion)	Total					
January 1, 1997	\$ 136.3	\$ 184.8	\$ 156.8	\$ 477.9	\$ 482.7	100.0 %	100.0 %	100.0 %	101.0 %
January 1, 1998	133.5	252.5	129.7	515.7	523.8	100.0	100.0	100.0	101.6
January 1, 1999 ⁽²⁾	138.8	253.7	144.4	536.9	570.7	100.0	100.0	100.0	106.3
January 1, 1999 ⁽³⁾	138.8	253.7	145.1	537.6	570.7	100.0	100.0	100.0	106.2
January 1, 2001	165.0	268.2	172.5	605.7	700.7	100.0	100.0	100.0	115.7
January 1, 2003	186.1	296.1	204.6	686.8	740.1	100.0	100.0	100.0	107.8
January 1, 2005	204.2	325.4	224.7	754.3	807.3	100.0	100.0	100.0	107.0
January 1, 2007	194.1	427.2	274.5	895.8	1,021.3	100.0	100.0	100.0	114.0
January 1, 2009	207.1	497.6	297.6	1,002.3	1,097.3	100.0	100.0	100.0	109.5
January 1, 2011	236.4	569.8	326.7	1,132.9	1,074.8	100.0	100.0	82.2	94.9
January 1, 2012	246.7	612.2	326.6	1,185.5	1,068.3	100.0	100.0	64.1	90.1
January 1, 2013	240.7	734.2	331.7	1,306.6	1,187.1	100.0	100.0	64.0	90.9
January 1, 2014	261.4	768.3	370.3	1,400.0	1,297.0	100.0	100.0	72.2	92.6
January 1, 2015	272.6	813.6	382.0	1,468.2	1,402.7	100.0	100.0	82.9	95.5
January 1, 2016	283.4	863.2	395.6	1,542.2	1,501.7	100.0	100.0	89.8	97.4
January 1, 2017	291.8	936.9	419.4	1,648.1	1,585.0	100.0	100.0	85.0	96.2
January 1, 2018	297.1	993.8	389.8	1,680.7	1,667.0	100.0	100.0	96.5	99.2
January 1, 2019	302.4	1,068.4	390.9	1,761.7	1,713.9	100.0	100.0	87.8	97.3
January 1, 2020	293.7	1,176.9	385.4	1,856.0	1,818.7	100.0	100.0	90.3	98.0

1. See Exhibit D-5 for significant changes affecting the valuation results.

2. Results of January 1, 1999 Actuarial Valuation.

3. January 1, 1999 results adjusted for inclusion of benefit percentage in portability, removal of overtime contributions and removal of 90-day waiting period.

**Milliman January 1, 2020 Actuarial Valuation
Tacoma Employees' Retirement System**
Supplemental Information
**Exhibit 17
Actuarial Present Value of Accumulated Vested Plan Benefits**

(Dollar Amounts in Millions)

Actuarial Valuation Date ⁽¹⁾	Retired Members	Inactive Vested	Active Members			Actuarial Value of Assets	Portion of Accumulated Vested Plan Benefits Covered by Actuarial Assets
			Member Contributions	Employer- Financed Portion	Total		
January 1, 1997	\$ 179.1	\$ 5.7	\$ 136.3	\$ 109.6	\$ 430.7	\$ 482.7	112.1 %
January 1, 1998	246.5	6.0	133.5	93.2	479.2	523.8	109.3
January 1, 1999 ⁽²⁾	244.3	9.4	138.8	112.1	504.6	570.7	113.1
January 1, 1999 ⁽³⁾	244.3	9.4	138.8	115.1	507.6	570.7	112.4
January 1, 2001	250.3	17.8	165.0	123.0	556.1	700.7	126.0
January 1, 2003	274.8	21.3	186.1	143.1	625.3	740.1	118.4
January 1, 2005	303.0	22.4	204.2	170.6	700.2	807.3	115.3
January 1, 2007	377.6	49.6	194.1	213.4	834.7	1,021.3	122.4
January 1, 2009	438.5	59.1	207.1	226.9	931.6	1,097.3	117.8
January 1, 2011	500.0	69.8	236.4	236.9	1,043.1	1,074.8	103.0
January 1, 2012	538.1	74.1	246.7	239.0	1,097.9	1,068.3	97.3
January 1, 2013	648.7	85.5	240.7	256.0	1,230.9	1,187.1	96.4
January 1, 2014	677.9	90.4	261.4	299.9	1,329.6	1,297.0	97.5
January 1, 2015	717.2	96.4	272.6	307.8	1,394.0	1,402.7	100.6
January 1, 2016	763.4	99.8	283.4	314.4	1,461.0	1,501.7	102.8
January 1, 2017	835.6	101.3	291.8	334.5	1,563.2	1,585.0	101.4
January 1, 2018	897.0	96.8	297.1	362.8	1,653.7	1,667.0	100.8
January 1, 2019	964.5	103.9	302.4	360.2	1,731.0	1,713.9	99.0
January 1, 2020	1,078.1	98.8	293.7	348.2	1,818.8	1,818.7	100.0

1. See Exhibit D-5 for significant changes affecting the valuation results.

2. Results of January 1, 1999 Actuarial Valuation.

3. January 1, 1999 results adjusted for inclusion of benefit percentage in portability, removal of overtime contributions and removal of 90-day waiting period.

**Milliman January 1, 2020 Actuarial Valuation
Tacoma Employees' Retirement System**
Supplemental Information
**Exhibit 18
Schedule of Retirees and Beneficiaries Added to and Removed from Rolls**

Valuation Date January 1	Added to Rolls		Removed from Rolls		Rolls		Percent Increase in Annual Allowances	Average Annual Allowance	Percent Increase in Average Annual Allowances
	No.	Annual Allowances ⁽¹⁾	No.	Annual Allowances	No.	Annual Allowances			
1993					1,439	\$ 14,868,000	5.5%	\$ 10,332	5.0%
1995	128	\$ 2,430,000	129	\$ 929,000	1,438	16,369,000	4.9	11,383	5.0
1997	116	2,677,000	101	939,000	1,453	18,107,000	5.2	12,462	4.6
1999	269	6,700,000	100	943,000	1,622	23,864,000	14.8	14,713	8.7
2001	74	2,533,000	114	1,242,000	1,582	25,156,000	2.7	15,901	4.0
2003	133	4,057,000	116	1,535,000	1,599	27,677,000	4.9	17,309	4.3
2005	220	5,714,000	173	2,220,000	1,646	31,171,000	6.1	18,937	4.6
2007	236	7,271,000	148	1,964,000	1,734	36,478,000	8.2	21,037	5.4
2009	245	7,952,000	160	2,575,000	1,819	41,855,000	7.1	23,010	4.6
2011	233	8,061,000	158	2,473,000	1,894	47,443,000	6.5	25,049	4.3
2012	135	5,172,000	79	1,558,000	1,950	51,057,000	7.6	26,183	4.5
2013	227	8,224,000	71	1,461,000	2,106	57,820,000	13.2	27,455	4.9
2014	97	3,614,000	84	1,621,000	2,119	59,813,000	3.4	28,227	2.8
2015	136	5,437,000	88	1,758,000	2,167	63,492,000	6.2	29,300	3.8
2016	151	6,080,000	84	1,933,000	2,234	67,639,000	6.5	30,277	3.3
2017	156	6,010,000	87	2,121,000	2,303	71,528,000	5.7	31,059	2.6
2018	181	7,628,000	88	2,297,000	2,396	76,859,000	7.5	32,078	3.3
2019	166	7,706,000	88	2,101,000	2,474	82,464,000	7.3	33,332	3.9
2020	211	10,936,000	68	1,552,000	2,617	91,848,000	11.4	35,097	5.3

1. Includes postretirement increases.

Note: The numbers added to rolls and removed from rolls were for two-year periods for valuations dated 2011 and earlier, but for one-year periods for valuations dated after 2011.

Appendix A Actuarial Procedures and Assumptions

This section of the actuarial valuation report describes the actuarial procedures and assumptions used in this valuation.

The economic and non-economic assumptions were changed for the January 1, 2017 valuation. The changes in assumptions were discussed and approved by the Board in 2016 based on the System's experience in the four years, 2012-2015.

The actuarial assumptions used in the valuation are intended to estimate the future experience of the members of the System and of the System itself in areas that affect the projected benefit flow and anticipated investment earnings. Any variations in future experience from that expected from these assumptions will result in corresponding changes in the estimated costs of the System's benefits.

Exhibit A.2 presents expected annual rates of salary increases. The other exhibits in this section give probabilities of decrement. The probabilities of decrement are referred to in actuarial literature as the absolute rate of decrement or $q \times x$. Decrements are assumed to occur mid-year.

Actuarial Cost Method

The actuarial valuation was prepared using the entry age actuarial cost method. Under this method, the actuarial present value of the projected benefits of each individual included in the valuation is allocated as a level percentage of the individual's projected compensation between entry age and assumed exit. The portion of this actuarial present value allocated to a valuation year is called the Normal Cost. The portion of this actuarial present value not provided for at a valuation date by the sum of (a) the actuarial value of the assets and (b) the actuarial present value of future normal costs is called the UAAL. The UAAL is amortized as a level percentage of the projected salaries of present and future members of the System.

The Normal Cost for the valuation year was calculated separately for each individual, based on his or her age at entry into the System. The individual normal costs were then aggregated and divided by the total current compensation of the individuals included in the valuation to determine the Normal Cost rate as a percentage of compensation (adopted 1/1/1976).

Records and Data

The data used in the valuation consist of financial information and records of age, service, and income of contributing members, former contributing members, and their survivors. All of the data were supplied by the System and are accepted for valuation purposes without audit (adopted 1/1/1976).

Replacement of Terminated Members

The ages at entry and distribution by sex of future members are assumed to average the same as those of the present members they replace. If the number of active members should increase, it is further assumed that the average entry age of the larger group will be the same, from an actuarial standpoint, as that of the present group. Under these assumptions, the Normal Cost rates for active members will not vary with the termination of present members (adopted 1/1/1976).

Change in Membership

No change in the membership of the System is assumed (adopted 1/1/1985).

Employer Contributions

The Tacoma Municipal Code specifies a total employer contribution rate of 11.34% of members' salaries in 2018 and beyond.

Administrative Expenses

The annual contribution assumed to be necessary to meet administrative expenses of the System is 0.80% of members' salaries. This figure is included in the calculation of the Normal Cost rate (adopted 1/1/2017).

Valuation of Assets

Assets are valued based on their fair value, with a four-year smoothing of all fair value gains and losses. The expected return is determined for each year based on the beginning of year fair value and actual cash flows during the year. Any difference between the expected fair value return and the actual fair value return is recognized evenly over a period of four years. (The method used to value assets was adopted 1/1/1997).

Investment Earnings

The annual rate of investment earnings based on the actuarial value of the assets of the System are assumed to be 7.00% per year, compounded annually and net of investment expenses (adopted 1/1/2017).

Investment Expenses

It is assumed that future investment expenses will be funded by increased investment return of 0.35% on all assets of the fund (adopted 1/1/2009).

Postretirement Benefit Increases

It is assumed that the Consumer Price Index will continue to increase at a rate of 2.75% per year; thus, retirement allowances are assumed to increase at a rate of 2.125% per year plus an additional amount to bring the members' indexed benefits to at least 50% of original purchasing power as provided by the System (adopted 1/1/2017).

Future Salaries

Exhibit A.2 shows a portion of the scale of relative salary values, which is used to estimate future salaries for the purpose of the valuation. In addition to increases in salary due to promotion and longevity, this scale includes an annual rate of increase in the wage growth assumption of 3.75% (adopted 1/1/2017). Salaries are assumed to increase at year-end.

Service Retirement

Exhibit A.3 shows the assumed annual rates of retirement among members eligible for service retirement or reduced retirement (adopted 1/1/2017).

Disability

The rates of disability used in this valuation are illustrated in Exhibit A.4 (adopted 1/1/2017). The rates are for members with five or more years of service. Duty disabilities that occur for members with less than five years of service are recognized as they occur. No specific provision is made for these benefits, as none have occurred during the past 10 years.

Mortality

The mortality rates used in this valuation are illustrated in Exhibit A.5.

<i>Contributing Members</i>	RP-2014 Employee Tables for respective sexes, projected with a unisex table based on Social Security Administration data from the most recent 60 years available (adopted 1/1/2017).
<i>Inactive Members, Retired Members and Beneficiaries</i>	Males: RP-2014 Mortality Table for Males, blended 50% Blue Collar and 50% White Collar. Females: RP-2014 Blue Collar Mortality Tables for Females. Both males and females are projected with a unisex table based on Social Security Administration data from the most recent 60 years available (adopted 1/1/2017).
<i>Disabled Members</i>	RP-2014 Disabled Male Mortality projected with a unisex table based on Social Security Administration data from the most recent 60 years available (adopted 1/1/2017).

Other Terminations of Employment

The rates of assumed future withdrawal from active service for reasons other than death, disability, or service retirement are shown for representative ages in Exhibit A.6 (adopted 1/1/2017).

Vesting

We assume all members who terminate with less than five years of service withdraw their accumulated contributions. For members who terminate with five or more years of service, we assume they will elect a deferred retirement benefit, payable at age 60.

Interest on Member Contributions

A portion of employee contributions into the retirement fund is credited with interest at a specified rate set by the Retirement Board. That portion is equal to all contributions made before February 1, 2009 and contributions made up to 6.44% of pay after February 1, 2009. Interest on that portion of member contributions is assumed to accrue at an annual rate of 1.5% per quarter, compounded quarterly. This is equivalent to 6.136% per annum, compounded annually (adopted 1/1/1979).

Portability

The estimated cost of portability with other public retirement systems was included in this valuation. The available data to measure the costs of portability is small. As data on portability retirements continues to be collected, more accurate measurements will be possible in the future. For now, we are assuming:

- A 1% increase to the early retirement liabilities for actives when compared to what the liabilities would be without portability.
- An 18% increase to the deferred vested decrement for actives when compared to what the liabilities would be without portability.
- An 18% increase to the liabilities for vested terminated members when compared to what the liabilities would be without portability.

(The above assumptions were adopted 1/1/2017.)

Probability of Eligible Survivors for Death Benefits of Active Members

For members not currently in pay status, all members are assumed to have eligible survivors (spouses or qualified domestic partners). Survivors are assumed to be three years younger than male members and three years older than female members. Survivors are assumed to be of the opposite sex as the member.

Exhibit A.1 Summary of Valuation Assumptions

(January 1, 2020)

Economic Assumptions - Annual Rates of Growth

A.	Wage inflation	3.75%
B.	Investment return	7.00%
C.	Membership increase	0.00%
D.	Benefits (postretirement)	2.125%
E.	Member contribution accounts	6.136%
F.	Price inflation	2.75%

Non-economic Assumptions

A.	Salary increases due to promotion and longevity	Exhibit A.2
B.	Service retirement	Exhibit A.3
C.	Disability	Exhibit A.4
D.	Mortality among inactive members, service retired members and beneficiaries RP-2014 Mortality Table for Males, blended 50% Blue Collar and 50% White Collar. RP-2014 Blue Collar Mortality Tables for females. Both males and females are projected with a unisex table based on Social Security Administration data from the most recent 60 years available.	Exhibit A.5
E.	Mortality among disabled members RP-2014 Disabled Male Mortality projected with a unisex table based on Social Security Administration data from the most recent 60 years available.	Exhibit A.5
E.	Mortality among contributing members RP-2014 Employee Mortality for respective sexes, projected with a unisex table based on Social Security Administration data from the most recent 60 years available.	Exhibit A.6
F.	Other terminations of employment	Exhibit A.7

Exhibit A.2 Future Salaries

Annual Rate of Increase		
Years of Service	Promotion and Longevity	Total*
1	4.75%	8.68%
2	4.00%	7.90%
3	3.50%	7.38%
4	2.75%	6.60%
5	2.25%	6.08%
6	1.90%	5.72%
7	1.70%	5.51%
8	1.40%	5.20%
9	1.25%	5.05%
10	1.10%	4.89%
11	0.95%	4.74%
12	0.80%	4.58%
13	0.75%	4.53%
14	0.70%	4.48%
15	0.65%	4.42%
16	0.60%	4.37%
17	0.55%	4.32%
18	0.50%	4.27%
19	0.47%	4.24%
20	0.44%	4.21%
21	0.41%	4.18%
22	0.38%	4.14%
23	0.35%	4.11%
24	0.33%	4.09%
25	0.31%	4.07%
26	0.29%	4.05%
27	0.27%	4.03%
28 and over	0.25%	4.01%

* Including a 3.75% general wage increase assumption.

Exhibit A.3 Service Retirement

Age	Males		Females	
	Eligible for Reduced Benefits	Eligible for Full Benefits	Eligible for Reduced Benefits	Eligible for Full Benefits
45 or younger	1.0%	15.0%	2.0%	12.0%
46	1.0%	15.0%	2.0%	12.0%
47	1.0%	15.0%	2.0%	12.0%
48	1.0%	15.0%	2.0%	12.0%
49	1.5%	15.0%	2.5%	12.0%
50	2.0%	15.0%	3.5%	12.0%
51	2.0%	12.0%	3.5%	10.0%
52	2.5%	12.0%	3.5%	10.0%
53	2.5%	12.0%	3.5%	10.0%
54	2.5%	12.0%	3.5%	10.0%
55	2.5%	12.0%	5.0%	10.0%
56	2.5%	12.0%	5.0%	10.0%
57	2.5%	12.0%	5.0%	10.0%
58	2.5%	12.0%	5.0%	10.0%
59	2.5%	12.0%	5.0%	10.0%
60		13.5%		10.0%
61		13.5%		15.0%
62		15.0%		15.0%
63		15.0%		15.0%
64		15.0%		15.0%
65		25.0%		22.0%
66		25.0%		22.0%
67		25.0%		20.0%
68		25.0%		20.0%
69		25.0%		20.0%
70 or older		100.0%		100.0%

Exhibit A.4
Disability
Annual Probabilities

Age	Males and Females
22	.02%
27	.02
32	.05
37	.05
42	.05
47	.08
52	.10
57	.10

Exhibit A.5
Post-Commencement Mortality
Annual Probabilities

Age	Retired Members and Beneficiaries		Disabled Members	Projection Scale*
	Males	Females	Males and Females	Males and Females, Healthy and Disabled
50	0.34%	0.28%	2.04%	1.19%
51	0.37	0.30	2.10	1.20
52	0.40	0.33	2.16	1.21
53	0.43	0.35	2.22	1.20
54	0.46	0.38	2.28	1.19
55	0.50	0.40	2.34	1.17
56	0.53	0.43	2.40	1.17
57	0.56	0.46	2.46	1.17
58	0.60	0.49	2.52	1.19
59	0.64	0.53	2.59	1.21
60	0.68	0.57	2.66	1.24
61	0.73	0.62	2.74	1.25
62	0.79	0.67	2.83	1.26
63	0.85	0.73	2.93	1.27
64	0.93	0.80	3.04	1.26
65	1.01	0.87	3.17	1.25
66	1.10	0.96	3.31	1.25
67	1.21	1.05	3.46	1.24
68	1.33	1.15	3.64	1.24
69	1.46	1.27	3.83	1.23
70	1.60	1.40	4.03	1.22
71	1.77	1.54	4.26	1.21
72	1.95	1.70	4.52	1.20
73	2.16	1.88	4.79	1.19
74	2.38	2.08	5.10	1.18
75	2.64	2.30	5.43	1.16
76	2.92	2.54	5.79	1.13
77	3.24	2.81	6.19	1.11
78	3.60	3.11	6.64	1.11
79	4.00	3.44	7.12	1.11
80	4.46	3.82	7.66	1.10
81	4.97	4.24	8.26	1.07
82	5.55	4.71	8.91	1.02
83	6.20	5.24	9.64	0.95
84	6.94	5.83	10.44	0.87
85	7.76	6.50	11.33	0.79
86	8.69	7.25	12.31	0.71
87	9.73	8.08	13.39	0.64
88	10.89	9.00	14.57	0.58
89	12.18	10.04	15.87	0.53
90	13.63	11.19	17.30	0.49

* Projection Scale is based on Social Security Administration data from 1953-2013. The projection scale is applied to the annual probabilities listed above. The probabilities above reflect the probabilities in 2014. Therefore, the year 2015 is the first year the improvement scale is applied.

Exhibit A.6
Pre-Commencement Mortality
Annual Probabilities

Age	Contributing Members		Projection Scale*
	Males	Females	Males and Females
20	0.04%	0.02%	1.15%
21	0.04	0.02	1.04
22	0.05	0.02	0.96
23	0.05	0.02	0.90
24	0.05	0.02	0.86
25	0.05	0.02	0.82
26	0.05	0.02	0.78
27	0.04	0.02	0.75
28	0.04	0.02	0.74
29	0.04	0.02	0.75
30	0.05	0.02	0.76
31	0.05	0.03	0.79
32	0.05	0.03	0.81
33	0.05	0.03	0.84
34	0.05	0.03	0.88
35	0.05	0.03	0.91
36	0.05	0.03	0.95
37	0.06	0.04	1.00
38	0.06	0.04	1.06
39	0.06	0.04	1.12
40	0.06	0.04	1.18
41	0.07	0.05	1.22
42	0.07	0.05	1.24
43	0.08	0.06	1.23
44	0.09	0.07	1.21
45	0.10	0.07	1.18
46	0.11	0.08	1.17
47	0.12	0.09	1.16
48	0.14	0.10	1.17
49	0.15	0.11	1.18
50	0.17	0.12	1.19
51	0.19	0.14	1.20
52	0.21	0.15	1.21
53	0.23	0.16	1.20
54	0.25	0.17	1.19
55	0.28	0.19	1.17
56	0.31	0.20	1.17
57	0.34	0.22	1.17
58	0.38	0.24	1.19
59	0.42	0.25	1.21
60	0.47	0.27	1.24

* Projection Scale is based on Social Security Administration data from 1953-2013.

Exhibit A.7
Other Terminations of Employment
Among Members Not Eligible to Retire

Annual Probabilities

<u>Years of Service</u>	<u>Males</u>	<u>Females</u>
1	20.0%	20.0%
2	8.0	10.0
3	7.0	10.0
4	4.5	8.0
5	4.0	6.0
6	3.5	5.7
7	3.5	5.3
8	3.0	5.0
9	2.8	4.8
10	2.6	4.6
11	2.4	4.4
12	2.2	4.2
13	2.0	4.0
14	1.9	3.6
15	1.8	3.2
16	1.7	2.8
17	1.6	2.4
18	1.5	2.0
19	1.5	1.9
20	1.5	1.8
21	1.5	1.7
22	1.5	1.6
23 or more	1.5	1.5

Appendix B Provisions of Governing Law

All actuarial calculations are based upon our understanding of the Tacoma Employees' Retirement System, Chapter 1.30 of the Tacoma City Code. The benefit and contribution provisions of this law are summarized briefly below for reference purposes, along with corresponding references to the City code. This summary encompasses the major provisions of the System. It does not attempt to cover all the detailed provisions.

Effective Date

The effective date of the Retirement System was January 1, 1941.

(Section 1.30.280)

Members' Mandatory Contribution Rate

The members' mandatory contribution rate is currently 9.66% for 2020.

(Sections 1.30.340 and 1.30.350)

City Contribution Rate

The City contribution rate is the amount which is determined by actuarial investigation to be necessary to fund membership service, prior service, and basic service pensions on an actuarially sound basis. It has been established at 11.34% of salary for 2020.

(Sections 1.30.360 and 1.30.665)

Normal Accumulated Contributions

An employee's normal accumulated contributions are based on contributions compounded quarterly at 6.00%. Effective February 1, 2009, the accumulated contributions used in determining benefits changed. The outline below specifies which contribution amounts are used in benefit calculations.

A = accumulated contributions earned up until Feb. 1, 2009

B = accumulated contributions based on 6.44% of pay starting Feb. 1, 2009 and running into the foreseeable future

C = accumulated contributions based on the excess of the normal rate (currently 9.66%) over 6.44% of pay

I = accumulated interest on only A and B

1. If a member terminates employment, but does not have five years of service and requests a refund of contributions:

- The member will be entitled to a payment of $(A + B + C + I)$

2. If a member terminates employment, has five years or more of service, and requests a refund of contributions:

- The member will be entitled to a payment of:

$$C + 1.5 \times (A + B + I)$$

3. The 200% of employee contributions with interest retirement benefit will be based on $(A + B + I)$.

4. The 10-year death benefit will be based on 200% of $(A + B + I)$.

5. The contribution amount that the reduction for Benefit Options A and B will be based on is $(A + B + C + I)$.

Overtime Contributions

Effective January 1, 2000, neither member nor City contributions are collected on overtime pay. Prior overtime contributions are eligible for a 50% employer match at time of either termination or retirement.

(Sections 1.30.550)

Service Retirement

- Eligibility*
1. 30 years of service; or
 2. Age 60; or
 3. Age 55 and 10 years of service; or
 4. Age 40 and 20 years of service.

Normal Form Straight life benefit.

Optional Forms Actuarial equivalent according to the mortality and interest basis adopted by the Retirement Board for such purposes.

Amount of Allowance The total monthly allowance is the product of the following items:

1. Total years of service;
2. Average final compensation*; and
3. A percentage determined as follows:

Age	Creditable Service												
	30	29	28	27	26	25	24	23	22	21	20	19-10	9-1
40							0.759	0.698	0.642	0.591	0.544	N/A	N/A
41						0.897	0.825	0.759	0.698	0.642	0.591	N/A	N/A
42					1.060	0.975	0.897	0.825	0.759	0.698	0.642	N/A	N/A
43				1.252	1.152	1.060	0.975	0.897	0.825	0.759	0.698	N/A	N/A
44			1.417	1.332	1.252	1.152	1.060	0.975	0.897	0.825	0.759	N/A	N/A
45		1.603	1.507	1.417	1.332	1.252	1.152	1.060	0.975	0.897	0.825	N/A	N/A
46	2.000	1.706	1.603	1.507	1.417	1.332	1.252	1.152	1.060	0.975	0.897	N/A	N/A
47	2.000	1.815	1.706	1.603	1.507	1.417	1.332	1.252	1.152	1.060	0.975	N/A	N/A
48	2.000	1.871	1.815	1.706	1.603	1.507	1.417	1.332	1.252	1.152	1.060	N/A	N/A
49	2.000	1.929	1.871	1.815	1.706	1.603	1.507	1.417	1.332	1.252	1.152	N/A	N/A
50	2.000	1.964	1.929	1.871	1.815	1.706	1.603	1.507	1.417	1.332	1.252	N/A	N/A
51	2.000	2.000	1.964	1.929	1.871	1.815	1.706	1.603	1.507	1.417	1.332	N/A	N/A
52	2.000	2.000	2.000	1.964	1.929	1.871	1.815	1.706	1.603	1.507	1.417	N/A	N/A
53	2.000	2.000	2.000	2.000	1.964	1.929	1.871	1.815	1.706	1.603	1.507	N/A	N/A
54	2.000	2.000	2.000	2.000	2.000	1.964	1.929	1.871	1.815	1.706	1.603	N/A	N/A
55	2.000	2.000	2.000	2.000	2.000	2.000	1.964	1.929	1.871	1.815	1.706	1.706	N/A
56	2.000	2.000	2.000	2.000	2.000	2.000	2.000	1.964	1.929	1.871	1.815	1.815	N/A
57	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	1.964	1.929	1.871	1.871	N/A
58	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	1.964	1.929	1.929	N/A
59	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	1.964	1.964	N/A
60	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000	2.000

In the event a member's age plus years of credited service equals 80 or more, the percentage amount is 2.00%.

* Average final compensation is based on greatest compensation during any consecutive 24-month period (Section 1.30.150).

<i>Maximum Years of Membership Service</i>	Effective January 1, 1976, any member with 30 or more years of membership service shall receive no further membership service credit.
<i>Minimum Benefit Based on Member Contributions</i>	The monthly retirement allowance for members retiring from City service on and after January 1, 1997 will not be less than the actuarial equivalent of 200% of the member's accumulated normal contributions. Note that the factors used to determine the actuarial equivalence changed effective January 1, 2020.

(Sections 1.30.570, 1.30.580, and 1.30.660)

Disability Retirement

Service Requirements	Five years of service credited within the 10 years preceding disability retirement. If disabled while on the job, there is no service requirement.
Normal Form	Modified cash refund annuity.
Optional Forms	Actuarial equivalent according to the mortality and interest basis adopted by the Retirement Board for such purposes.
Amount of Allowance	The total monthly disability allowance is the product of the following items: <ol style="list-style-type: none"> 1. Total years of service that could have been earned to age 65; 2. Average final compensation; and 3. 1.5%. <p>The maximum disability retirement allowance is 1/3 of average final compensation or, if greater, 1.5% times completed years of service times average final compensation. The minimum disability allowance is \$100 per month.</p>

(Sections 1.30.630 and 1.30.640)

Death Benefits

Retired Members Death benefits to retired members are payable according to the form of retirement allowance elected.

Active Members

1. Payment of accumulated contributions, including additional contributions to the beneficiary in a lump sum refund or in installments not to exceed five years; or
2. If, at the time of death, the member had completed five years of service, the beneficiary may elect to receive, in place of (1) above, a monthly allowance, payable for 10 years, having the same value as twice the accumulated normal member contributions, with interest as of February 1, 2009 plus twice the accumulated normal contributions after such date, up to a rate of 6.44% of compensation; or
3. In lieu of (2) above, the spouse may elect to defer receipt of an immediate monthly allowance and elect to commence payment at a later date. The value of the deferred death benefit is equal to the value of the benefit payable immediately.
4. If, at the time of death, the member was eligible for service retirement and had named a beneficiary, the beneficiary may receive, in place of (1) above, a monthly allowance, for life, equal to the benefit she would have received had the member retired, on the day before he died, with a 100% contingent annuitant option in force; or
5. In lieu of (4) above, the beneficiary may elect to receive a lump-sum cash payment, not to exceed one-half of the deceased member's accumulated contributions and accumulated additional contributions, and a retirement allowance based on a 100% contingent annuitant option, reduced by the value of the cash payment.

(Section 1.30.670)

Withdrawal Benefits

Form Payment of accumulated contributions, including member overtime, and additional contributions.

(Section 1.30.330)

Vested Withdrawal Benefits

Service Requirements Five years of service.

Options:

1. Amount of allowance is the same as service retirement benefit. Benefits commence at age 60.
2. If the member terminates employment after December 31, 1996, the member may elect payment of 1.5 times the member's accumulated normal contributions and any overtime contributions, plus any additional contributions. This benefit is in lieu of the deferred retirement benefit in (1) above.

(Section 1.30.600)

Postretirement Cost-of-Living Increases

Provisions As of July 1st of each year, every monthly retirement allowance less the portion provided by additional contributions is automatically increased 2.125% provided the Consumer Price Index (Seattle Area-all items) has increased 2.125% or more over the preceding calendar year. This increase is granted to any member of the Retirement System whose retirement or death occurred on or before July 1st of the preceding year. The 2.125% rate was effective January 1, 2003.

The amount of any cost-of-living increase or decrease in any year which is in excess of the maximum annual retirement allowance adjustment of 2.125% shall be accumulated from year to year and included in the computation of increases or decreases in succeeding years.

After applying the above adjustment, if the member's inflation-adjusted monthly retirement allowance is less than 50% of the purchasing power of the monthly retirement allowance at date of retirement determined using the same index described above (the indexed benefit), then the monthly retirement allowance will be further increased so that it shall not be less than 50% of the indexed benefit.

(Section 1.30.665)

Portability Benefits TERS participates in the portability of public retirement benefits in Washington State public retirement systems. As contemplated under Chapter 41.54 RCW, this allows a member to use all years of service with qualified Washington systems to determine eligibility for benefits under TERS. Effective in 1999, TERS expanded the state provisions to include these years for determining the benefit percentage factor for retirement benefits.

(Section 1.30.890)

Appendix C Valuation Data

This valuation is based upon the membership of the System as of January 1, 2020. Membership data were supplied by the Tacoma Employees' Retirement System and accepted for valuation purposes without audit.

The data for all contributing members, former contributing members, and their survivors are summarized in Exhibit C-1.

Exhibits C-2 through C-4 present distributions of members receiving service retirement benefits, members receiving disability retirement benefits, and beneficiaries receiving benefits. Shown in the tables are the numbers of persons receiving benefits, the total annual benefits received, and the average annual benefit per recipient.

Exhibit C-5 contains a summary of the data for contributing members. Values shown in the table are the numbers of members and their total annual salaries.

The valuation also includes liabilities attributable to vested members who have terminated employment but have neither retired nor withdrawn their contributions. There are 551 such members.

In addition, there are also 194 members who have terminated and are not vested. Their total accumulated employee contributions are \$1.0 million.

Exhibit C.1
Summary of Membership Data

	Contributing Members					Annuitants				
	Number			Annual Salaries (\$1,000)	Average Annual Salaries	Number			Annual Benefits (\$1,000)	Average Annual Benefits
	Males	Females	Total			Males	Females	Total		
January 1, 2020	1,818	1,258	3,076	\$276,277	\$89,817	1,432	1,185	2,617	\$91,848	\$35,097
January 1, 2019	1,792	1,197	2,989	258,890	86,614	1,346	1,128	2,474	82,464	33,332
January 1, 2018	1,775	1,173	2,948	248,176	84,185	1,295	1,101	2,396	76,859	32,078
January 1, 2017	1,812	1,152	2,964	243,504	82,154	1,255	1,048	2,303	71,528	31,059
January 1, 2016	1,777	1,150	2,927	234,597	80,149	1,234	1,000	2,234	67,639	30,277

Exhibit C.2
Members and Alternate Payees Receiving Service Retirement Benefits
January 1, 2020

	<50	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85-89	90+	Totals
Number of Persons											
Male	0	5	58	204	372	366	184	108	65	29	1,391
Female	1	7	44	150	279	197	121	54	33	19	905
Total	1	12	102	354	651	563	305	162	98	48	2,296
Annual Benefits	\$15,599	\$366,813	\$4,541,306	\$14,620,629	\$25,347,206	\$20,743,891	\$10,042,068	\$5,359,502	\$2,767,794	\$1,289,455	\$85,094,264
Average Annual Benefits	15,599	30,568	44,523	41,301	38,936	36,845	32,925	33,083	28,243	26,864	37,062

Exhibit C.3
Members Receiving Disability Retirement Benefits
January 1, 2020

	<50	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85-89	90+	Totals
Number of Persons											
Male	0	1	2	1	3	3	1	0	0	0	11
Female	1	1	3	4	3	2	0	1	0	0	15
Total	1	2	5	5	6	5	1	1	0	0	26
Annual Benefits	\$19,313	\$48,468	\$91,594	\$89,582	\$121,265	\$88,763	\$15,288	\$15,813	\$0	\$0	\$490,086
Average Annual Benefits	19,313	24,234	18,319	17,916	20,211	17,753	15,288	15,813	0	0	18,849

**Milliman January 1, 2020 Actuarial Valuation
Tacoma Employees' Retirement System**
**Appendix C
Valuation Data**
**Exhibit C.4
Survivors Receiving Benefits**
January 1, 2020

	<50	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85-89	90+	Totals
Number of Persons											
Male	8	0	2	4	5	4	1	3	2	1	30
Female	18	6	12	18	35	29	39	26	29	53	265
Total	26	6	14	22	40	33	40	29	31	54	295
Annual Benefits	\$433,723	\$91,308	\$367,130	\$667,532	\$900,183	\$801,506	\$919,382	\$546,562	\$651,324	\$884,908	\$6,263,558
Average Annual Benefits	16,682	15,218	26,224	30,342	22,505	24,288	22,985	18,847	21,010	16,387	21,232

This work product was prepared solely for the Tacoma Employees' Retirement System for the purposes described herein and may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work. Milliman recommends that third parties be aided by their own actuary or other qualified professional when reviewing the Milliman work product.

Exhibit C.5
Number of Employees and Monthly Salaries - By Age Group

January 1, 2020

Number of Employees - By Age Group

Nearest Year of Service	<20	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70+	Totals
0		28	58	64	67	45	23	32	14	10	1	1	343
1		7	33	54	50	31	25	21	9	7	1		238
2		1	19	45	31	36	25	18	13	6	1	1	196
3-4		4	37	67	65	62	41	32	27	19	1		355
5-9			8	66	81	86	73	60	56	28	16	2	476
10-14				17	72	113	104	109	78	89	18	1	601
15-19					10	53	79	87	98	50	17	3	397
20-24						8	40	68	76	68	15	1	276
25-29							5	27	50	37	5	2	126
30-34								6	16	27	4		53
35-39									3	8	1		12
40+										1	2		3
Totals	0	40	155	313	376	434	415	460	440	350	82	11	3,076

Annual Salaries - By Age Group

Nearest Year of Service	<20	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70+	Totals
0		\$1,513,098	\$3,571,696	\$4,076,366	\$4,673,161	\$3,760,660	\$1,855,985	\$2,368,647	\$1,279,118	\$799,864	*	*	\$24,056,113
1		431,580	2,135,283	3,889,708	4,052,841	2,657,222	2,185,623	1,906,172	676,904	651,576	*		18,766,932
2		*	1,354,500	3,579,047	2,510,999	2,905,396	2,269,702	1,448,389	1,164,092	649,740	*	*	16,034,551
3-4		313,019	2,718,265	5,308,586	5,460,936	5,342,579	3,688,733	2,706,037	2,401,977	1,999,206	*		29,990,610
5-9			707,386	5,339,817	7,746,743	8,333,659	6,786,055	5,865,572	5,723,307	3,099,485	1,739,057	201,032	45,542,113
10-14				1,399,068	7,459,572	10,691,936	9,829,864	10,196,208	6,967,785	8,209,552	1,666,830	*	56,510,551
15-19					967,220	5,171,069	7,785,008	7,995,585	8,798,691	4,802,990	1,783,912	319,508	37,623,982
20-24						863,241	4,070,016	7,471,246	7,643,450	6,453,868	1,402,606	*	27,966,328
25-29							696,322	3,396,890	4,926,182	3,825,543	512,653	259,688	13,617,277
30-34								544,393	1,505,131	2,398,845	354,099		4,802,467
35-39									305,157	683,302	*		1,084,493
40+										*	209,186		281,903
Totals	0	2,322,177	10,487,130	23,592,593	32,871,470	39,725,763	39,167,307	43,899,139	41,391,792	33,646,687	8,110,960	1,062,302	276,277,319

* If there is 1 participant in a cell, the annual salary is not reported.

Appendix D Comparative Schedules

This section contains tables that summarize the experience of the System since January 1, 1976. Earlier data are not available.

Exhibit D-1 shows a summary of the contributing members and the annuitants covered as of the various valuation dates.

Exhibit D-2 summarizes the contribution rates used by each annual actuarial valuation and the resulting amortization period.

Exhibit D-3 presents a history of the System's funding progress since 1985.

Exhibit D-4 shows a summary of the history of the Economic Assumptions.

Any review of these comparative schedules should be made in the light of Exhibit D-5, which shows the significant changes affecting the actuarial valuations in recent years.

Exhibit D-6 shows the prior and future four-year cycles of actuarial projects.

**Milliman January 1, 2020 Actuarial Valuation
Tacoma Employees' Retirement System**
**Appendix D
Comparative Schedules**
**Exhibit D.1
Membership Data**

Valuation Date (Jan. 1)	Active Members					Annuitants			
	Number	Annual Salaries in Millions	Average Annual Salary	Average Age	Average Years of Service	Number	Annual Benefits in Thousands	Average Annual Benefit	Average Age*
1976	2,088	\$31	\$ 15,006	44.5	10.5	763	\$ 2,457	\$ 3,221	**
1979	2,099	40	19,024	43.6	10.0	952	3,898	4,095	69.1
1982	2,128	56	26,400	42.6	9.7	1,110	5,743	5,173	69.1
1985	2,137	64	29,765	42.4	9.6	1,244	8,410	6,760	69.6
1987	2,205	68	30,593	42.3	9.5	1,315	10,098	7,679	70.0
1989	2,315	76	32,725	42.5	9.5	1,378	11,899	8,635	70.6
1991	2,515	89	35,397	42.9	9.6	1,425	13,353	9,371	71.4
1993	2,630	100	38,138	43.5	9.9	1,439	14,868	10,332	72.0
1995	2,817	113	39,999	43.7	10.0	1,438	16,369	11,383	72.6
1997	2,667	118	44,230	45.0	10.9	1,453	18,107	12,462	73.1
1998	2,655	119	44,919	44.0	9.8	1,653	23,520	14,229	71.1
1999	2,650	123	46,508	44.7	10.3	1,622	23,864	14,712	71.6
2001	2,814	142	50,540	45.3	10.5	1,582	25,156	15,901	72.1
2003	2,935	161	54,946	46.1	10.9	1,599	27,678	17,310	72.1
2005	3,072	177	57,531	46.2	10.8	1,646	31,171	18,937	72.4
2007	2,967	178	60,070	46.8	11.2	1,734	36,491	21,044	72.0
2009	3,123	200	64,195	46.8	10.9	1,819	41,866	23,016	71.4
2011	3,112	221	70,959	47.6	11.4	1,894	47,443	25,049	71.2
2012	3,038	218	71,615	48.0	11.7	1,950	51,057	26,183	71.2
2013	2,861	208	72,648	47.9	11.7	2,106	57,820	27,455	70.9
2014	2,881	215	74,459	48.2	12.0	2,119	59,813	28,227	71.1
2015	2,884	222	77,025	48.4	12.0	2,167	63,492	29,300	71.2
2016	2,927	235	80,149	48.1	11.8	2,234	67,639	30,277	71.2
2017	2,964	244	82,154	47.9	11.6	2,303	71,528	31,059	71.2
2018	2,948	248	84,185	47.7	11.5	2,396	76,859	32,078	71.3
2019	2,989	259	86,614	47.4	11.3	2,474	82,464	33,332	71.4
2020	3,076	276	89,817	46.7	10.4	2,617	91,848	35,097	71.4

* Excludes survivors and disabled members before 2007.

** Not calculated.

**Milliman January 1, 2020 Actuarial Valuation
Tacoma Employees' Retirement System**
**Appendix D
Comparative Schedules**
**Exhibit D.2
Contribution Rates**

Valuation Date (Jan. 1)	Member	Employer	Total	Normal Cost Rate	UAAL Rate	Amortization (Years)	Funding Ratio
1976	6.50%	9.21%	15.71%	12.78%	2.93%	--	55.0%
1979	7.56%	11.77%	19.33%	15.39%	3.94%	--	52.0%
1982	8.89%	10.44%	19.33%	15.72%	3.63%	35	59.1%
1985	8.89%	10.44%	19.33%	14.44%	4.89%	23	71.2%
1987	8.89%	10.44%	19.33%	14.81%	4.52%	11	86.1%
1989	8.89%	10.44%	19.33%	16.25%	3.08%	22	82.9%
1991	8.89%	10.44%	19.33%	16.96%	2.37%	34	82.3%
1993	8.89%	10.44%	19.33%	17.24%	2.09%	26	88.1%
1995	8.89%	10.44%	19.33%	16.28%	3.05%	9	93.1%
1997	7.68%	9.02%	16.70%	16.84%	-0.14%	Over 30	101.0%
1998	7.68%	9.02%	16.70%	16.96%	-0.26%	Over 30	101.6%
1999	7.68%	9.02%	16.70%	17.04%	-0.34%	Over 30	106.3%
2001	6.44%	7.56%	14.00%	17.65%	-3.65%	27	115.7%
2003	6.44%	7.56%	14.00%	17.67%	-3.67%	11	107.8%
2005	6.44%	7.56%	14.00%	16.25%	-2.25%	19	107.0%
2007	6.44%	7.56%	14.00%	17.37%	-3.37%	40	114.0%
2009	8.28%	9.72%	18.00%	17.16%	0.84%	Does not amortize	109.5%
2011	9.20%	10.80%	20.00%	17.33%	2.67%	13	94.9%
2012	9.20%	10.80%	20.00%	17.34%	2.66%	35	90.1%
2013	9.20%	10.80%	20.00%	17.80%	2.20%	65	90.9%
2014	9.20%	10.80%	20.00%	18.79%	1.21%	Does not amortize	92.6%
2015	9.20%	10.80%	20.00%	18.84%	1.16%	52	95.5%
2016	9.20%	10.80%	20.00%	18.87%	1.13%	21	97.4%
2017	9.20%	10.80%	20.00%	18.69%	1.31%	32	96.2%
2018	9.66%	11.34%	21.00%	18.49%	2.51%	2	99.2%
2019	9.66%	11.34%	21.00%	18.53%	2.47%	9	97.3%
2020	9.66%	11.34%	21.00%	18.59%	2.41%	6	98.0%

Exhibit D.3 Historical Funding Summary

January 1,	(A) Fair Value of Assets (FVA)	(B) Actuarial Value of Assets (AVA)	(C) Actuarial Accrued Liability*	(A) - (C) FVA Funding Reserve/ (Shortfall)	(A) / (C) FVA Funding Ratio	(B) - (C) AVA Funding Reserve/ (Shortfall)	(B) / (C) AVA Funding Ratio
1985	\$ 125,400,000	\$ 134,700,000	\$ 189,200,000	\$ (63,800,000)	66%	\$ (54,500,000)	71%
1987	169,200,000	189,900,000	220,500,000	(51,300,000)	77%	(30,600,000)	86%
1989	192,000,000	197,400,000	238,100,000	(46,100,000)	81%	(40,700,000)	83%
1991	227,100,000	238,400,000	289,700,000	(62,600,000)	78%	(51,300,000)	82%
1993	301,600,000	306,100,000	347,600,000	(46,000,000)	87%	(41,500,000)	88%
1995	353,400,000	367,100,000	394,500,000	(41,100,000)	90%	(27,400,000)	93%
1997	486,800,000	482,700,000	477,900,000	8,900,000	102%	4,800,000	101%
1998	553,500,000	523,800,000	515,700,000	37,800,000	107%	8,100,000	102%
1999	596,400,000	570,700,000	537,600,000	58,800,000	111%	33,100,000	106%
2001	710,700,000	700,700,000	605,700,000	105,000,000	117%	95,000,000	116%
2003	611,200,000	740,100,000	686,800,000	(75,600,000)	89%	53,300,000	108%
2005	890,000,000	807,300,000	754,300,000	135,700,000	118%	53,000,000	107%
2007	1,117,600,000	1,021,300,000	895,800,000	221,800,000	125%	125,500,000	114%
2009	763,600,000	1,097,300,000	1,002,300,000	(238,700,000)	76%	95,000,000	109%
2011	1,081,100,000	1,074,800,000	1,132,900,000	(51,800,000)	95%	(58,100,000)	95%
2012	1,082,900,000	1,068,300,000	1,185,500,000	(102,600,000)	91%	(117,200,000)	90%
2013	1,218,700,000	1,187,100,000	1,306,600,000	(87,900,000)	93%	(119,500,000)	91%
2014	1,388,900,000	1,297,000,000	1,400,000,000	(11,100,000)	99%	(103,000,000)	93%
2015	1,478,500,000	1,402,700,000	1,468,200,000	10,300,000	101%	(65,500,000)	96%
2016	1,448,700,000	1,501,700,000	1,542,200,000	(93,500,000)	94%	(40,500,000)	97%
2017	1,547,700,000	1,585,000,000	1,648,100,000	(100,400,000)	94%	(63,100,000)	96%
2018	1,723,200,000	1,667,000,000	1,680,700,000	42,500,000	103%	(13,700,000)	99%
2019	1,635,000,000	1,713,900,000	1,761,700,000	(126,700,000)	93%	(47,800,000)	97%
2020	1,876,100,000	1,818,700,000	1,856,000,000	20,100,000	101%	(37,300,000)	98%

* Actuarial Accrued Liability values are calculated at a 7.00% discount rate for 2017 and beyond. For 2014-2016, a 7.25% discount rate was used. For 2013, a 7.50% discount rate was used. From 2001 to 2012, a 7.75% discount rate was used. For 1997 to 2001, a 7.50% discount rate was used. For 1995 and before, a discount rate of 7.00% was used.

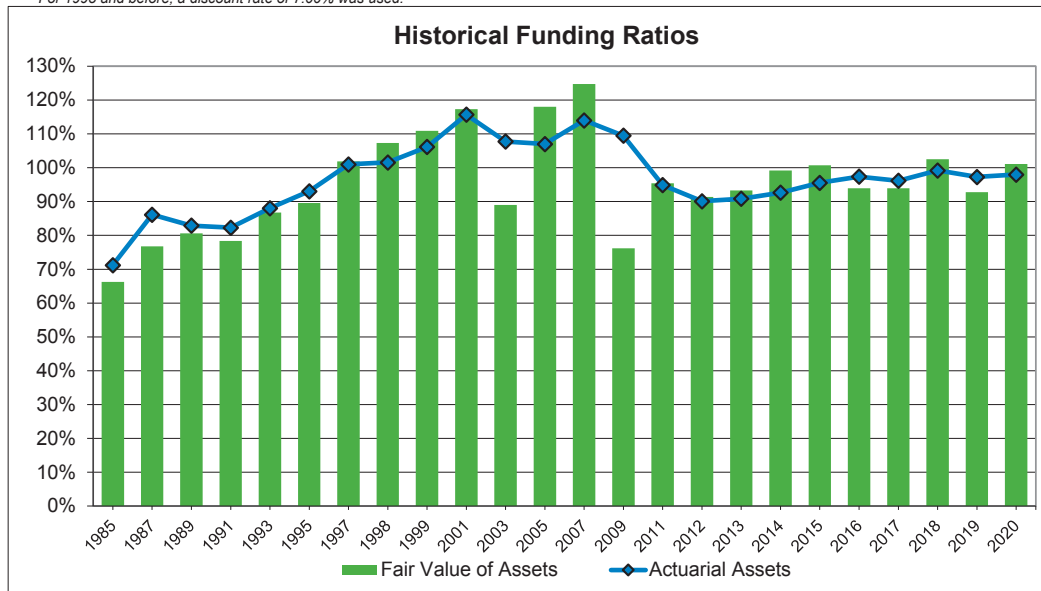


Exhibit D.4 Changes in Economic Assumptions

Actuarial Valuation Date	(a) Price Inflation*	(b) Wage Inflation	(b) - (a) Real Wage Inflation	(c) Discount Rate	(c) - (a) Real Investment	(c) - (b) Spread
1976 - 1989		5.00%		7.00%		2.00%
1991 - 1993		5.00% **		7.00% **		2.00%
1995		4.50%		7.00%		2.50%
1997 - 1999	4.50%	5.00%	0.50%	7.50%	3.00%	2.50%
2001 - 2003	4.00%	4.50%	0.50%	7.75%	3.75%	3.25%
2005 - 2007	3.25%	4.00%	0.75%	7.75%	4.50%	3.75%
2009 - 2012	3.25%	4.25%	1.00%	7.75%	4.50%	3.50%
2013	3.00%	4.00%	1.00%	7.50%	4.50%	3.50%
2014 - 2016	3.00%	4.00%	1.00%	7.25%	4.25%	3.25%
2017 - 2020	2.75%	3.75%	1.00%	7.00%	4.25%	3.25%

* There was no explicit assumption for price inflation until the January 1, 1997 Valuation.

** A select and ultimate assumption was used. The ultimate rate is displayed here.

Exhibit D.5 Significant Changes in Benefits, Contributions, and Assumptions

Valuation Date*	Change
1976	The actuarial assumptions related to the rate of investment return and the rate of increase in the general wage level were changed from those used by the System's previous actuary.
1979	All actuarial assumptions except those related to the rate of investment return and the rate of increase in the general wage level were changed.
1982	Four-year select and ultimate assumptions were adopted for investment return and general wage level. Employer contribution rates were decreased and employee contribution rates were increased; both are now set by law.
1985	Almost all actuarial assumptions were changed.
1987	Select and ultimate assumptions for investment return and general wage level were dropped. The net administrative expense assumption was increased 0.05%.
1989	Almost all non-economic actuarial assumptions were changed. In addition, select economic assumptions were adopted for the next four-year period.
1991	The mortality assumption for service retirees and beneficiaries was changed. In addition, select economic assumptions were adopted for the next four-year period.
1993	Almost all non-economic actuarial assumptions were changed.
1995	Changed actuarial assumption for rate of increase in the general wage level. Certain retired members benefits were increased.
1997	All economic and non-economic actuarial assumptions except the mortality rates were changed. Benefits were improved. Contribution rates were lowered. The actuarial asset valuation method was changed.
1998	The mortality assumption for service retirees, beneficiaries, and disabled members was changed.
2001	All economic and non-economic actuarial assumptions except the retirement and mortality rate were changed. Benefits were improved in both 1999 and 2000. Contribution rates were lowered effective January 1, 2001.
2003	The mortality assumption for service retirees and beneficiaries was changed.
2005	Wage inflation, price inflation and all active demographic assumptions were changed.
2007	The mortality assumption for contributing members, service retirees, beneficiaries, and disabled members was changed.
2009	Wage inflation, investment expenses, and all active demographic assumptions were changed. Contribution rates were increased effective February 1, 2009.
2011	Contribution rates were increased effective January 1, 2011.
2012	Contribution rates were increased effective January 1, 2012.
2013	The discount rate (investment return assumption) was lowered, along with price and wage inflation. Most active demographic assumptions were changed. The mortality assumption for contributing members, service retirees, beneficiaries, and disabled members was changed.
2014	The discount rate (investment return assumption) was lowered.
2017	Nearly all economic and non-economic actuarial assumptions were changed.
2018	Contribution rates were increased effective February 2018. Reflected new annuity conversion factors effective January 1, 2020.

* Valuations as of January 1.

Exhibit D.6 Actuarial Project Schedule

(Four-Year Cycle)

Regular Annual Projects in the Four-Year Period Ending with the Current Year

Year	Project
2017	January 1, 2017 Actuarial Valuation
2018	January 1, 2018 Actuarial Valuation
2019	January 1, 2019 Actuarial Valuation
2020	January 1, 2020 Actuarial Valuation
2020	Experience Study for four years 2016-2019

Regular Annual Projects in the Four-Year Period Following the Current Year

Year	Project
2021	January 1, 2021 Actuarial Valuation
2022	January 1, 2022 Actuarial Valuation
2023	January 1, 2023 Actuarial Valuation
2024	January 1, 2024 Actuarial Valuation
2024	Experience Study for four years 2020-2023

Appendix E Glossary

The following definitions are from a glossary adopted by the Actuarial Standards Board. In some cases, the definitions have been modified for specific applicability to the Tacoma Employees' Retirement System. Defined terms are capitalized throughout this Appendix.

Actuarial Assumptions

Assumptions as to the occurrence of future events affecting pension costs, such as: mortality, withdrawal, disability, and retirement; changes in compensation; rates of investment earnings and asset appreciation or depreciation; procedures used to determine the Actuarial Value of Assets; and other relevant items.

Actuarial Cost Method

A procedure for determining the Actuarial Present Value of pension plan benefits and expenses and for developing an actuarially equivalent allocation of this value to time periods, usually in the form of a Normal Cost and an Actuarial Accrued Liability.

Actuarial Accrued Liability

That portion, as determined by a particular Actuarial Cost Method, of the Actuarial Present Value of pension plan benefits and expenses which is not provided for by future Normal Costs.

Actuarial Present Value

The value of an amount or series of amounts payable or receivable at various times, determined as of a given date by the application of a particular set of Actuarial Assumptions.

Actuarial Valuation

The determination, as of a valuation date, of the Normal Cost, Actuarial Accrued Liability, Actuarial Value of Assets, and related Actuarial Present Values for a pension plan.

Actuarial Value of Assets

The value of cash, investments, and other property belonging to a pension plan, as used by the actuary for the purpose of an Actuarial Valuation.

Actuarially Determined Total Contribution

A potential payment to the Plan as determined by the actuary using a contribution allocation procedure. For TERS, it is defined in the Retirement Board Funding and Benefits Policy as the rate that is the greater of (1) the Normal Cost Rate or (2) the recommended combined employer and employee contribution for the reporting period that amortizes the UAAL (if any) over a maximum of 25 years, but will not be less than the actual contribution rate.

The Actuarially Determined Employer Contribution is the Actuarially Determined Total Contribution minus the contributions paid by employees. This amount is disclosed with the financial reporting information under GASB Statements 67 and 68.

Actuarially Equivalent

Of equal Actuarial Present Value, determined as of a given date with each value based on the same set of Actuarial Assumptions.

Amortization Payment

That portion of the pension plan contribution that is designed to pay interest on and to amortize the Unfunded Actuarial Accrued Liability.

Credited Projected Benefit

That portion of the projected benefit allocated to each individual's service to date, determined in accordance with the terms of the pension plan and based on future compensation as projected to retirement.

Entry Age Actuarial Cost Method

A method under which the Actuarial Present Value of the Projected Benefits of each individual included in an Actuarial Valuation is allocated on a level basis over the earnings of the individual between entry age and assumed exit ages. The portion of this Actuarial Present Value allocated to a valuation year is called the Normal Cost. The portion of this Actuarial Present Value not provided for at a valuation date by the Actuarial Present Value of future Normal Costs is called the Actuarial Accrued Liability.

Experience Gain (Loss)

A measure of the difference between actual experience and that expected based upon a set of Actuarial Assumptions, during the period between two Actuarial Valuation dates, as determined in accordance with a particular Actuarial Cost Method.

Funding Reserve or Funding Excess

If the Actuarial Value of Assets exceeds the Actuarial Accrued Liability, the Unfunded Actuarial Accrued Liability is a negative amount and may be referred to as the Funding Reserve.

Normal Cost

That portion of the Actuarial Present Value of pension plan benefits and expenses which is allocated to a valuation year by the Actuarial Cost Method.

Projected Benefits

Those pension plan benefit amounts which are expected to be paid at various future times under a particular set of Actuarial Assumptions, taking into account such items as the effect of advancement in age and past and anticipated future compensation and service credits.

Unaccrued Benefit

The excess of an individual's Projected Benefits over the Nonforfeitable Benefit as of a specified date.

Unfunded Actuarial Accrued Liability

The excess of the Actuarial Accrued Liability over the Actuarial Value of Assets.

Statistical Section

For the year ended December 31, 2019

This part of the Tacoma Employees' Retirement System's comprehensive annual financial report presents detailed information as a context for understanding what the information in the financial statements, note disclosures, and required supplementary information says about the System's overall financial health.

Contents

Schedules

Financial Trends Information

1 - 5

These schedules contain trend information to help readers understand how the System's financial performance and well-being have changed over time.

Demographic and Economic Information

6 - 8

These schedules offer demographic and economic indicators to help readers understand the environment within which the System's financial activities take place.

Except where noted, the information in these schedules is derived from the System's comprehensive annual financial reports for the relevant year.

Changes in Net Position For Last Ten Calendar Years

Financial Trends Information Schedule 1

Calendar Year	Additions	Deductions	Net Change	Net Position	
				Beginning of Year	End of Year
2019	\$ 331,956,968	\$ 90,881,994	\$ 241,074,974	\$ 1,635,020,381	\$ 1,876,095,355
2018	(4,304,850)	83,924,291	(88,229,141)	1,723,249,522	1,635,020,381
2017	254,716,554	79,131,750	175,585,805	1,547,663,717	1,723,249,522
2016	172,882,538	73,914,009	98,968,529	1,448,695,188	1,547,663,717
2015	40,483,253	70,334,873	(29,851,620)	1,478,546,808	1,448,695,188
2014	156,028,612	66,352,758	89,675,854	1,388,870,954	1,478,546,808
2013	233,913,056	63,758,093	170,154,963	1,218,715,990	1,388,870,954
2012	195,061,491	59,251,017	135,810,474	1,082,905,516	1,218,715,990
2011	55,878,236	54,028,452	1,849,784	1,081,055,732	1,082,905,516
2010	174,240,406	50,500,574	123,739,832	957,315,900	1,081,055,732

Additions to Fiduciary Net Position by Source For Last Ten Calendar Years

Financial Trends Information Schedule 2

Calendar Year	Member Contribution	%	Employer Contributions	%	Net Investment Income	%	Total
2019	\$ 26,303,297	7.9%	\$ 30,239,417	9.1%	\$ 275,414,254	83.0%	\$ 331,956,968
2018	^a 25,193,034	-585.2%	28,587,937	-664.1%	(58,085,821)	1349.3%	(4,304,850)
2017	23,008,946	9.0%	26,091,331	10.2%	205,616,277	80.7%	254,716,554
2016	22,407,327	13.0%	25,536,034	14.8%	124,939,177	72.3%	172,882,538
2015	21,258,474	52.5%	24,557,390	60.7%	(5,332,611)	-13.2%	40,483,253
2014	20,698,886	13.3%	23,903,892	15.3%	111,425,834	71.4%	156,028,612
2013	20,149,424	8.6%	23,085,117	9.9%	190,678,515	81.5%	233,913,056
2012	20,365,089	10.4%	22,741,360	11.7%	151,955,042	77.9%	195,061,491
2011	19,902,966	35.6%	22,511,500	40.3%	13,463,770	24.1%	55,878,236
2010	18,884,094	10.8%	21,349,373	12.3%	134,006,939	76.9%	174,240,406

^a The loss from investment income exceeded the contributions made by members and the employers. This created negative total revenues and caused the percentages displayed to change sharply from previous years.

Benefits and Refund Deductions from Net Position by Type For Last Ten Calendar Years

Financial Trends Information Schedule 3

Calendar Year	Type of Benefits			Total Benefits	Type of Refund		Total Refund
	Service	Survivor	Disability		Death	Separation	
2019	\$ 79,765,472 89.53%	\$ 6,228,727 6.99%	\$ 494,023 0.55%	\$ 86,488,222 97.08%	\$ 374,880 0.42%	\$ 2,229,192 2.50%	\$ 2,604,072 2.92%
2018	73,639,003 89.55%	5,913,125 7.19%	482,088 0.59%	80,034,216 97.33%	27,110 0.03%	2,172,101 2.64%	2,199,211 2.67%
2017	68,597,676 88.55%	5,986,221 7.73%	463,074 0.60%	75,046,971 96.88%	35,437 0.05%	2,385,236 3.08%	2,420,673 3.12%
2016	64,019,898 88.92%	5,621,915 7.81%	480,628 0.67%	70,122,441 97.40%	2,205 0.00%	1,871,408 2.60%	1,873,613 2.60%
2015	60,158,017 87.68%	5,476,217 7.98%	498,177 0.73%	66,132,411 96.39%	48,547 0.07%	2,426,816 3.54%	2,475,363 3.61%
2014	56,535,677 87.47%	5,423,800 8.39%	526,129 0.81%	62,485,606 96.67%	345,359 0.53%	1,805,670 2.79%	2,151,028 3.33%
2013	53,569,453 86.27%	5,220,958 8.41%	488,362 0.79%	59,278,773 95.46%	434,728 0.70%	2,384,119 3.84%	2,818,847 4.54%
2012	49,574,663 86.15%	4,791,021 8.33%	474,964 0.83%	54,840,648 95.30%	166,524 0.29%	2,538,247 4.41%	2,704,771 4.70%
2011	44,798,313 85.70%	4,570,973 8.74%	466,864 0.89%	49,836,150 95.34%	23,616 0.05%	2,413,769 4.62%	2,437,385 4.66%
2010	41,349,194 84.99%	4,600,258 9.46%	456,801 0.94%	46,406,253 95.38%	5,467 0.01%	2,242,089 4.61%	2,247,556 4.62%

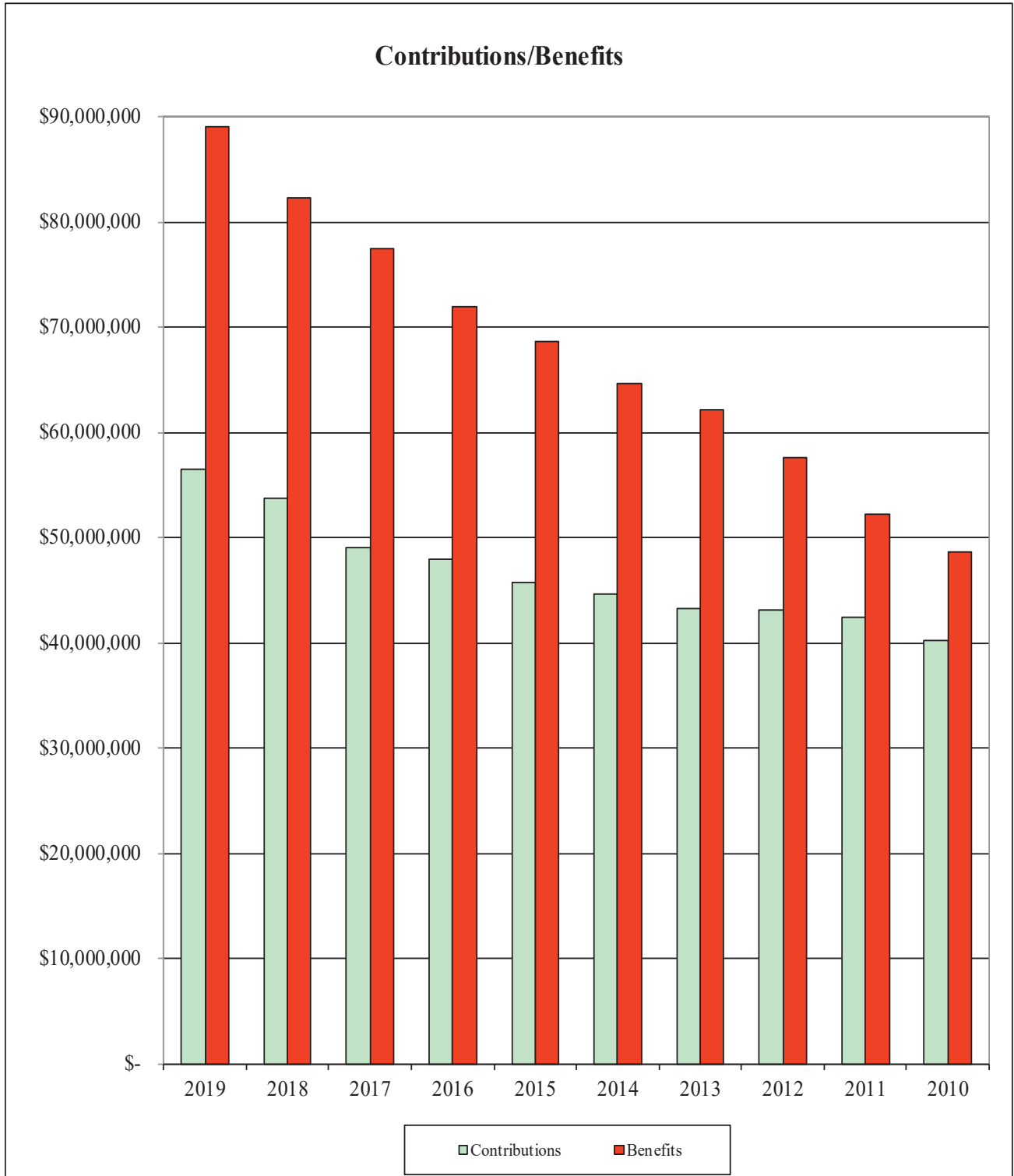
Deductions from Net Position by Type For Last Ten Calendar Years

Financial Trends Information Schedule 4

Year Ending	Benefits	%	Refunds	%	Administrative Expenses	%	Total Deductions
2019	\$ 86,488,222	95.2%	\$ 2,604,072	2.9%	\$ 1,789,700	2.0%	\$ 90,881,994
2018	80,034,214	95.4%	2,199,211	2.6%	1,690,865	2.0%	83,924,290
2017	75,046,971	94.8%	2,420,673	3.1%	1,663,105	2.1%	79,130,749
2016	70,122,441	94.9%	1,873,613	2.5%	1,917,955	2.6%	73,914,009
2015	66,132,411	94.0%	2,475,363	3.5%	1,727,099	2.5%	70,334,873
2014	62,485,606	94.2%	2,151,028	3.2%	1,716,124	2.6%	66,352,758
2013	59,278,773	93.0%	2,818,847	4.4%	1,660,473	2.6%	63,758,093
2012	54,840,648	92.6%	2,704,771	4.6%	1,705,598	2.9%	59,251,017
2011	49,836,150	92.2%	2,437,385	4.5%	1,754,917	3.2%	54,028,452
2010	46,406,253	91.9%	2,247,556	4.5%	1,846,765	3.7%	50,500,574

Comparison of Contributions Versus Benefits For Last Ten Calendar Years

**Financial Trends Information
Schedule 5**



Demographics of Pensioners and Active Members As of December 31, 2019

Demographic Trends Information Schedule 6

Members By Type										
	2019	2018	2017	2016	2015	2014	2013	2012	2011	2010
Active	3,076	2,989	2,948	2,964	2,927	2,884	2,881	2,861	3,038	3,112
Deferred	551	557	530	516	483	458	434	426	395	378
Pensioners	2,617	2,474	2,396	2,303	2,234	2,167	2,119	2,107	1,950	1,894
*Non-vested	194	190	185	159	161	169	187			
Total Members	6,438	6,210	6,059	5,942	5,805	5,678	5,621	5,394	5,383	5,384

*Active Members By Employer							
City of Tacoma	2,791	2,706	2,677	2,687	2,654	2,622	2,613
Pierce Transit	9	7	8	8	7	6	7
South Sound 911	2	2	2	2	4	4	4
Tacoma-Pierce County Health Department	274	274	261	267	262	252	257
Total Active Members	3,076	2,989	2,948	2,964	2,927	2,884	2,881

*Pensioners by Type							
Service	2,296	2,148	2,072	1,979	1,909	1,843	1,801
Survivor	295	299	298	295	296	293	288
Disability	26	27	26	29	29	31	30
Total Pensioners	2,617	2,474	2,396	2,303	2,234	2,167	2,119

*This schedule or line entry is to be built prospectively until it contains ten years of data.

Retired Members by Type of Benefits As of December 31, 2019

Demographic and Economic Information Schedule 7

Amount of Monthly Benefits	Type of Retirement				Option Selected							
	Service	Survivors	Disability	Total	Unmod	A	B	C-5	C-10	D	E	F
Under \$500	105	22	-	127	44	5	9	15	15	9	27	3
\$500 - \$999	183	62	1	246	45	9	10	17	58	43	61	3
\$1,000 - \$1,499	231	61	12	304	57	21	19	20	38	86	63	-
\$1,500 - \$1,999	221	52	9	282	51	17	27	14	42	57	69	5
\$2,000 - \$2,499	242	29	4	275	36	11	34	21	51	55	64	3
\$2,500 - \$2,999	256	35	-	291	44	7	16	19	41	76	84	4
\$3,000 - \$3,499	227	11	-	238	37	7	17	18	47	61	51	-
\$3,500 - \$3,999	193	12	-	205	20	8	18	16	38	57	47	1
Over \$4,000	638	11	-	649	88	13	46	49	146	158	143	6
Total	2,296	295	26	2,617	422	98	196	189	476	602	609	25
Average Benefit	\$ 3,086	\$ 1,768	\$ 1,570	\$ 2,141								

Description of Retirement Options

Unmodified	The maximum allowance the retiree can receive is the Unmodified monthly form of payment. This option is for the member only, and does not provide for a spouse or beneficiary.
Option A	Provides that, at the time of death, the beneficiary will receive a lump sum refund of the difference between the total accumulated contributions and interest at the date of retirement and the annuity payments received since retirement.
Option B	Provides that, at the time of death, the beneficiary will continue to receive monthly annuity payments until the total equals the total accumulated contributions and interest at the date of retirement.
Option C	Provides for the payment of a retirement allowance for a guaranteed period of years. If the retiree lives beyond the guaranteed period, the allowance is continued for life, but if the retiree dies before the expiration of the period, the allowance will be continued to the beneficiary for the balance of the time. Retirees have an option of five or ten years for the guaranteed period.
Option D	Provides a modified monthly allowance for life and, after death, the spouse at the time of retirement will receive one-half of this amount each month for life. (See *Pop-Up Provision and ** Divorce Pop-Up Provision).
Option E	Provides a modified monthly allowance for life and, after death, the spouse at the time of retirement will receive the same monthly allowance for life. (See *Pop-Up Provision and **Divorce Pop-Up Provision).
Option F	If the member, at the time of retirement, has no spouse, a modified monthly allowance for life is provided and, after death, the chosen beneficiary will receive one-half of this amount each month for life or will receive the same monthly allowance for life. (See *Pop-Up Provision).
*Pop-Up Provision	Retiring on or after 1/1/99 and have elected Option D or E, and if the spouse dies before the retiree, then the benefit is increased to the Unmodified retirement allowance. The same benefit is provided for Option F as well.
**Divorce Pop-Up Provision	Retiring on or after 1/1/08 and have elected Option D or E, and divorced thereafter and have satisfied Section 1.30.690.C of the Tacoma Municipal Code, the benefit payable effective as of the first day of the month following the entry of the Order shall be increased to the Unmodified retirement allowance. Provided further, that in the event that the retiree later remarries, within three months of remarriage the retiree will have the option to irrevocably designate the new spouse as the wife or husband under Options D or E, subject to the same conditions as provided in Options D or E for a retiree who remarries after the death of a spouse.

Average Benefit Payments For Last Ten Calendar Years

Demographic and Economic Information Schedule 8

Retirement Dates	Years of Credited Service					
	0-10	10-15	15-20	20-25	25+	Total
Period 1/1/2010 - 12/31/2010						
Average monthly benefit	\$ 526	\$ 1,753	\$ 2,097	\$ 2,476	\$ 4,140	\$ 2,689
Average final salary (monthly)	\$ 4,928	\$ 6,271	\$ 5,296	\$ 5,713	\$ 6,574	\$ 5,907
Number of active retirees	10	7	11	21	27	76
Period 1/1/2011 - 12/31/2011						
Average monthly benefit	\$ 1,001	\$ 1,649	\$ 1,836	\$ 2,737	\$ 5,138	\$ 2,472
Average final salary (monthly)	\$ 5,568	\$ 4,715	\$ 4,889	\$ 5,900	\$ 7,337	\$ 5,682
Number of active retirees	12	11	16	34	39	112
Period 1/1/2012 - 12/31/2012						
Average monthly benefit	\$ 817	\$ 1,470	\$ 2,312	\$ 3,230	\$ 6,410	\$ 2,848
Average final salary (monthly)	\$ 5,702	\$ 5,980	\$ 5,359	\$ 6,001	\$ 6,974	\$ 6,003
Number of active retirees	32	29	23	43	79	206
Period 1/1/2013 - 12/31/2013						
Average monthly benefit	\$ 1,036	\$ 1,746	\$ 2,383	\$ 2,880	\$ 4,368	\$ 2,483
Average final salary (monthly)	\$ 6,419	\$ 6,621	\$ 5,939	\$ 6,101	\$ 6,609	\$ 6,338
Number of active retirees	21	12	16	14	13	76
Period 1/1/2014 - 12/31/2014						
Average monthly benefit	\$ 880	\$ 1,665	\$ 1,976	\$ 2,601	\$ 4,598	\$ 2,344
Average final salary (monthly)	\$ 3,937	\$ 6,327	\$ 6,081	\$ 6,306	\$ 6,861	\$ 5,902
Number of active retirees	28	10	10	14	48	110
Period 1/1/2015 - 12/31/2015						
Average monthly benefit	\$ 956	\$ 1,691	\$ 2,548	\$ 2,765	\$ 4,764	\$ 2,545
Average final salary (monthly)	\$ 4,946	\$ 6,626	\$ 7,159	\$ 6,391	\$ 7,127	\$ 6,450
Number of active retirees	30	21	17	17	44	129
Period 1/1/2016 - 12/31/2016						
Average monthly benefit	\$ 1,049	\$ 1,692	\$ 2,063	\$ 3,014	\$ 4,779	\$ 2,519
Average final salary (monthly)	\$ 4,545	\$ 5,702	\$ 5,942	\$ 6,558	\$ 7,495	\$ 6,048
Number of active retirees	43	13	16	23	43	138
Period 1/1/2017 - 12/31/2017						
Average monthly benefit	\$ 984	\$ 1,842	\$ 2,284	\$ 3,254	\$ 4,923	\$ 2,657
Average final salary (monthly)	\$ 5,880	\$ 7,317	\$ 7,662	\$ 7,356	\$ 7,590	\$ 7,161
Number of active retirees	40	19	21	16	60	156
Period 1/1/2018 - 12/31/2018						
Average monthly benefit	\$ 858	\$ 1,757	\$ 2,587	\$ 3,049	\$ 5,472	\$ 3,367
Average final salary (monthly)	\$ 4,641	\$ 6,914	\$ 7,717	\$ 7,169	\$ 8,065	\$ 7,130
Number of active retirees	24	23	20	16	56	139
Period 1/1/2019 - 12/31/2019						
Average monthly benefit	\$ 906	\$ 1,732	\$ 2,239	\$ 3,594	\$ 5,238	\$ 3,856
Average final salary (monthly)	\$ 6,439	\$ 5,376	\$ 6,760	\$ 7,328	\$ 7,618	\$ 7,152
Number of active retirees	19	15	28	24	101	187
Summary of 2010 - 2019						
Average monthly benefit	\$ 930	\$ 1,685	\$ 2,260	\$ 2,991	\$ 5,180	\$ 2,855
Average final salary (monthly)	\$ 4,764	\$ 6,274	\$ 6,387	\$ 6,397	\$ 7,338	\$ 6,445
Number of active retirees	259	160	178	222	510	1,329

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Retirement System Office

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