

City of New Orleans Employees' Retirement System

Actuarial Valuation and Review

As of January 1, 2020



This report has been prepared at the request of the Board of Trustees to assist in administering the System. This valuation report may not otherwise be copied or reproduced in any form without the consent of the Board of Trustees and may only be provided to other parties in its entirety, unless expressly authorized by Segal. The measurements shown in this actuarial valuation may not be applicable for other purposes.

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July 31, 2020

Board of Trustees
City of New Orleans Employees' Retirement System
1300 Perdido Street, Suite 1E12
New Orleans, LA 70112

Dear Board Members:

We are pleased to submit this Actuarial Valuation and Review as of January 1, 2020. It summarizes the actuarial data used in the valuation, analyzes the preceding year's experience, and establishes the funding requirements for fiscal 2020.

This report was prepared in accordance with generally accepted actuarial principles and practices at the request of the Board to assist in administering the Retirement System. The census information and financial information on which our calculations were based was prepared by the staff of the System. That assistance is gratefully acknowledged.

The actuarial calculations were directed under the supervision of Jeffrey S. Williams. I am a member of the American Academy of Actuaries and I meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion herein. To the best of my knowledge, the information supplied in this actuarial valuation is complete and accurate, except as noted in Section 4. Further, in my opinion, the assumptions as approved by the Board are reasonably related to the experience of and the expectations for the System.

We look forward to reviewing this report at your next meeting and to answering any questions.

Sincerely,
Segal

A handwritten signature in black ink that reads "Jeffrey S. Williams".

Jeffrey S. Williams, FCA, ASA, MAAA
Vice President and Actuary
Enrolled Actuary No. 20-7009

cc: Jesse Evans, Jr.

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Actuarial Valuation Summary

Purpose and basis

This report was prepared by Segal to present a valuation of the System as of January 1, 2020. The valuation was performed to determine whether the assets and contributions are sufficient to provide the prescribed benefits. The measurements shown in this actuarial valuation may not be applicable for other purposes. In particular, the measures herein are not necessarily appropriate for assessing the sufficiency of System assets to cover the estimated cost of settling the System's benefit obligations. 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; and changes in plan provisions or applicable law.

Certain disclosure information required by GASB statements No. 67 and 68 as of December 31, 2019 for the System will be provided in a separate report.

The contribution requirements presented in this report are based on:

- The benefit provisions of the Pension Plan, as administered by the Board;
- The characteristics of covered active participants, inactive vested participants, and retired participants and beneficiaries as of December 31, 2019, provided by the Administrative Office;
- The assets of the Plan as of December 31, 2019, provided by the Administrative Office;
- Economic assumptions regarding future salary increases and investment earnings;
- Other actuarial assumptions regarding employee terminations, retirement, death, etc. and
- The funding policy adopted by the Plan and the employers.

Section 1: Actuarial Valuation Summary

Valuation highlights

1. Segal strongly recommends an actuarial funding method that targets 100% funding of the actuarial accrued liability. Generally, this implies payments that are ultimately at least enough to cover normal cost, interest on the unfunded actuarial accrued liability and the principal balance. On June 10, 2020, the Board approved updating its funding policy from an open, 15-year, level dollar, amortization of the unfunded liability to a level percent of payroll amortization with layered bases, each having a closed 25-year amortization period. The new funding policy meets this standard.
2. It is important to note that this actuarial valuation is based on plan assets as of December 31, 2019. Due to the COVID-19 pandemic, market conditions have changed significantly since the valuation date. The Plan's actuarial status does not reflect short-term fluctuations of the market, but rather is based on the market values on the last day of the Plan Year. While it is impossible to determine how the market will perform over the next several months, and how that will affect the results of next year's valuation, Segal is available to prepare projections of potential outcomes upon request.
3. The actuarially determined contribution (ADC) for the upcoming year is \$22,890,640, a decrease of \$5,799,119 from last year. The contribution as a percentage of payroll decreased from 22.32% of payroll to 15.31% of payroll. The large decrease in ADC is largely due to the new amortization methodology described above.
4. Actual contributions made during the fiscal year ending December 31, 2019 were \$33,884,678, 118.1% of the actuarially determined contribution (ADC). In the prior fiscal year, actual contributions were \$31,065,227, 110.9% of the prior year ADC.
5. The funded ratio (the ratio of the actuarial value of assets to actuarial accrued liability) is 58.78%, compared to the prior year funded ratio of 61.22%. This ratio is one measure of funding status, and its history is a measure of funding progress. Using the market value of assets, the funded ratio is 57.94%, compared to 55.55% as of the prior valuation date. These measurements are not necessarily appropriate for assessing the sufficiency of System assets to cover the estimated cost of settling the System's benefit obligation or the need for or the amount of future contributions.
6. The unfunded actuarial accrued liability is \$298.1 million, which is an increase of \$42.8 million since the prior valuation.
7. The total actuarial gain for the year was \$12,750,278, or 1.95% of actuarial accrued liability.
 - The actuarial loss from investment experience is \$2,135,147, or 0.33% of actuarial accrued liability.
 - The net experience gain from sources other than investment experience was \$14,885,425, or 2.28% of the actuarial accrued liability. This gain was primarily due to data adjustments.
8. The rate of return on the market value of assets was 16.27% for the January 1, 2019 to December 31, 2019 plan year. The return on the actuarial value of assets was 6.97% for the same period due to the recognition of prior years' investment gains and losses. This resulted in an actuarial loss when measured against the assumed rate of return of 7.50%. This actuarial investment loss increased the average employer contribution rate by 0.09% of pay. Given the low fixed income interest rate environment,

Section 1: Actuarial Valuation Summary

target asset allocation and expectations of future investment returns for various classes, we advise the Board to continue to monitor actual and anticipated investment returns relative to the assumed long term investment return. The Board adopted an investment return assumption of 7.25% with this valuation.

9. The actuarial value of assets is 101.46% of the market value of assets. The investment experience in the past years has only been partially recognized in the actuarial value of assets. As the deferred net loss is recognized in future years, the cost of the Plan is likely to increase unless the net loss is offset by future experience. The recognition of the cumulative market losses of \$6.1 million will also have an impact on the future funded ratio. If the net deferred losses were recognized immediately in the actuarial value of assets, the ADC would increase from 15.31% to 15.56% of payroll.
10. The following actuarial assumptions and methods were approved by the Board and changed with this valuation, following the completion of an experience study of the period between January 1, 2011 through December 31, 2016 by another actuary hired by the System, along with suggested changes by Segal:
 - Update the mortality rates to use the PubG-2010 amount-weighted mortality tables for healthy lives, and PubNS-2010 Disabled Retiree table for disabled lives, and project the mortality improvement for all participants with Scale MP-2018
 - Change the retirement rates to use age-based rates, rather than 100% at selected eligibilities
 - Lower the assumed rate of investment return from 7.50% to 7.25%
 - Change the salary scale to use age-based rates that reflects decreasing pay growth as a participant ages, rather than use 5% increases for all ages
 - Update the turnover rates to reflect recent experience
 - Update the disability rates to only begin after ten years of service, and stop at age 60
 - The amortization methodology was changed from an open, 15-year, level dollar, amortization of the unfunded liability to a level percent of payroll amortization with layered bases, each having a closed 25-year amortization period.

As a result of these assumption changes, the total normal cost increased by \$1,255,157 and the actuarial accrued liability increased by \$70,869,862. When combined with the change in amortization methodology, the total impact was a decrease in the ADC of \$3.3 million, or 2.28% of payroll.

11. There are no material Plan changes included for the first time in this valuation.
12. This report constitutes an actuarial valuation for the purpose of determining the actuarially determined contribution under the Plan's funding policy and measuring the progress of that funding policy. The Net Pension Liability (NPL) and Pension Expense under Governmental Accounting Standards Board (GASB) Statements No. 67 and No. 68, for inclusion in the plan and employer's financial statements as of December 31, 2019, will be provided separately.

Section 1: Actuarial Valuation Summary

13. Since the actuarial valuation results are dependent on a given set of assumptions, there is a risk that emerging results may differ significantly as actual experience proves to be different from the assumptions. We have not been engaged to perform a detailed analysis of the potential range of the impact of risk relative to the System's future financial condition, but have included a brief discussion of some risks that may affect the System in Section 2. A more detailed assessment would provide the Board with a better understanding of the inherent risks.

Section 1: Actuarial Valuation Summary

Summary of key valuation results

		2020	2019
Contributions for plan year beginning January 1:	• Actuarially determined employer contributions	\$22,890,640	\$28,689,759
	• Actuarially determined employer contributions as a percent of payroll	15.31%	22.32%
	• Actual employer contributions	--	\$33,884,678
Actuarial accrued liability for plan year beginning January 1:	• Retired participants and beneficiaries	\$478,363,660	\$427,073,020
	• Inactive vested participants	19,391,301	18,173,208
	• Active participants	225,390,480	213,106,398
	• Total actuarial accrued liability	723,145,441	658,352,626
	• Normal cost including administrative expenses	12,385,743	9,493,233
Assets for plan year beginning January 1:	• Market value of assets (MVA)	\$418,971,331	\$365,737,309
	• Actuarial value of assets (AVA)	425,079,078	403,015,342
	• Actuarial value of assets as a percentage of market value of assets	101.46%	110.19%
Funded status for plan year beginning January 1:	• Unfunded actuarial accrued liability on market value of assets	\$304,174,110	\$292,615,317
	• Funded percentage on MVA basis	57.94%	55.55%
	• Unfunded actuarial accrued liability on actuarial value of assets	\$298,066,363	\$255,337,284
	• Funded percentage on AVA basis	58.78%	61.22%
Demographic data for plan year beginning January 1:	• Number of retired participants and beneficiaries	2,130	2,143
	• Number of inactive vested participants	298	328
	• Number of active participants	3,024	2,873
	• Total payroll	\$149,538,039	\$128,530,078
	• Average payroll	49,450	44,737

Section 1: Actuarial Valuation Summary

Important information about actuarial valuations

An actuarial valuation is a budgeting tool with respect to the financing of future projected obligations of a pension plan. It is an estimated forecast – the actual long-term cost of the plan will be determined by the actual benefits and expenses paid and the actual investment experience of the plan.

In order to prepare a valuation, Segal relies on a number of input items. These include:

Plan of benefits	Plan provisions define the rules that will be used to determine benefit payments, and those rules, or the interpretation of them, may change over time. Even where they appear precise, outside factors may change how they operate. It is important to keep Segal informed with respect to plan provisions and administrative procedures, and to review the plan summary included in our report to confirm that Segal has correctly interpreted the plan of benefits.
Participant data	An actuarial valuation for a plan is based on data provided to the actuary by the City. Segal does not audit such data for completeness or accuracy, other than reviewing it for obvious inconsistencies compared to prior data and other information that appears unreasonable. It is important for Segal to receive the best possible data and to be informed about any known incomplete or inaccurate data.
Assets	The valuation is based on the market value of assets as of the valuation date, as provided by the City. The City uses an “actuarial value of assets” that differs from market value to gradually reflect year-to-year changes in the market value of assets in determining the contribution requirements.
Actuarial assumptions	In preparing an actuarial valuation, Segal projects the benefits to be paid to existing plan participants for the rest of their lives and the lives of their beneficiaries. This projection requires actuarial assumptions as to the probability of death, disability, withdrawal, and retirement of each participant for each year. In addition, the benefits projected to be paid for each of those events in each future year reflect actuarial assumptions as to salary increases and cost-of-living adjustments. The projected benefits are then discounted to a present value, based on the assumed rate of return that is expected to be achieved on the plan’s assets. There is a reasonable range for each assumption used in the projection and the results may vary materially based on which assumptions are selected. It is important for any user of an actuarial valuation to understand this concept. Actuarial assumptions are periodically reviewed to ensure that future valuations reflect emerging plan experience. While future changes in actuarial assumptions may have a significant impact on the reported results that does not mean that the previous assumptions were unreasonable.

Section 1: Actuarial Valuation Summary

The user of Segal's actuarial valuation (or other actuarial calculations) should keep the following in mind:

The actuarial valuation is prepared at the request of the City. Segal is not responsible for the use or misuse of its report, particularly by any other party.

An actuarial valuation is a measurement of the plan's assets and liabilities at a specific date. Accordingly, except where otherwise noted, Segal did not perform an analysis of the potential range of future financial measures. The actual long-term cost of the plan will be determined by the actual benefits and expenses paid and the actual investment experience of the plan.

Actuarial results in this report are not rounded, but that does not imply precision.

If the City is aware of any event or trend that was not considered in this valuation that may materially change the results of the valuation, Segal should be advised, so that we can evaluate it.

Segal does not provide investment, legal, accounting, or tax advice. Segal's valuation is based on our understanding of applicable guidance in these areas and of the plan's provisions, but they may be subject to alternative interpretations. The City should look to their other advisors for expertise in these areas.

As Segal has no discretionary authority with respect to the management or assets of the System, it is not a fiduciary in its capacity as actuaries and consultants with respect to the System.

Actuarial Valuation Results

Participant data

The Actuarial Valuation and Review considers the number and demographic characteristics of covered participants, including active participants, inactive vested participants, retired participants and beneficiaries.

This section presents a summary of significant statistical data on these participant groups.

More detailed information for this valuation year and the preceding valuation can be found in *Section 3, Exhibits A, B, and C.*

Participant Population: 2010 – 2019

Year Ended December 31	Active Participants	Inactive Vested Participants ¹	Retired Participants and Beneficiaries	Total Non-Actives	Ratio of Non-Actives to Actives
2010	2,290	78	2,020	2,098	0.92
2011	2,289	75	2,048	2,123	0.93
2012	2,327	71	2,044	2,115	0.91
2013	2,211	68	2,039	2,107	0.95
2014	2,259	66	2,028	2,094	0.93
2015	2,562	65	2,024	2,089	0.82
2016	2,620	337	2,096	2,433	0.93
2017	2,716	303	2,078	2,381	0.88
2018	2,873	328	2,143	2,471	0.86
2019	3,024	298	2,130	2,428	0.80

¹ Excludes terminated participants due a refund of employee contributions

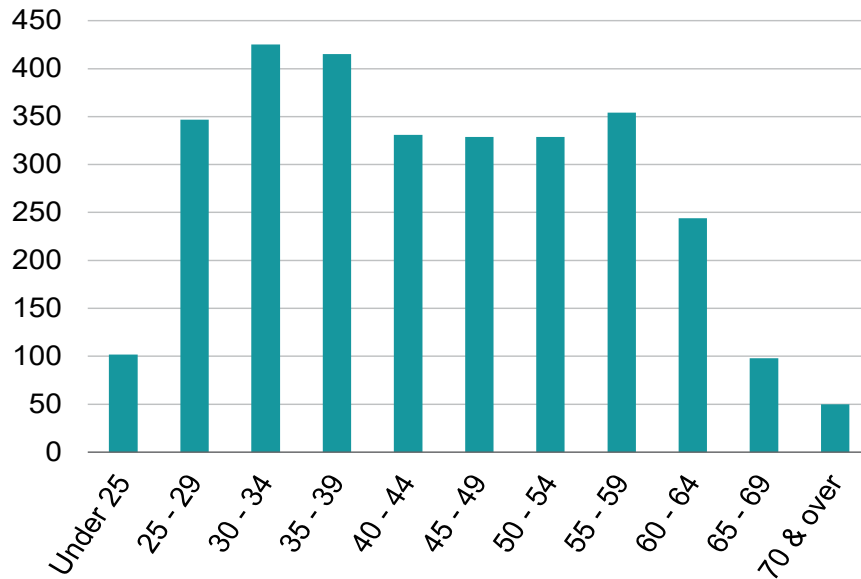
Section 2: Actuarial Valuation Results

Active participants

Plan costs are affected by the age, years of service and payroll of active participants. In this year's valuation, there were 3,024 active participants with an average age of 44.4, average years of service of 6.3 years and average payroll of \$49,450. The 2,873 active participants in the prior valuation had an average age of 44.2, average service of 7.3 years and average payroll of \$44,737.

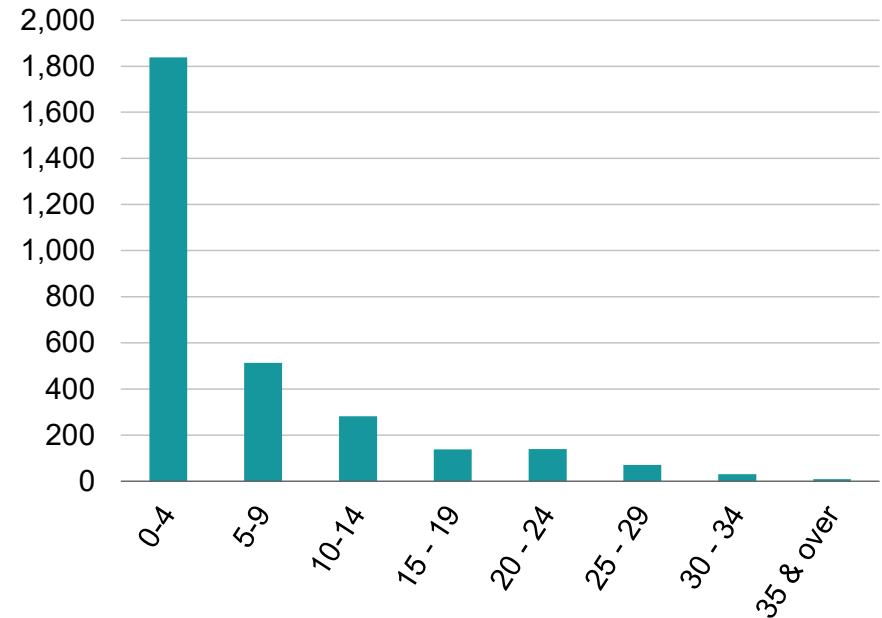
Distribution of Active Participants as of December 31, 2019

Actives by Age



Average age	44.4
Prior year average age	<u>44.2</u>
Difference	0.2

Actives by Years of Service



Average years of service	6.3
Prior year average years of service	<u>7.3</u>
Difference	-1.0

Section 2: Actuarial Valuation Results

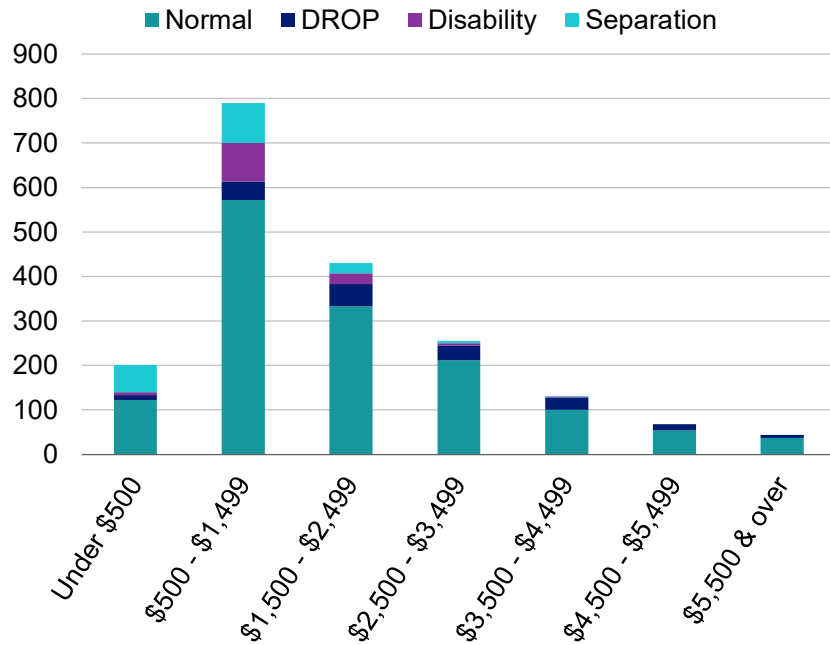
Retired participants and beneficiaries

As of December 31, 2019, 1,919 retired participants and 211 beneficiaries were receiving total monthly benefits of \$3,850,386. For comparison, in the previous valuation, there were 1,936 retired participants and 207 beneficiaries receiving monthly benefits of \$3,792,486.

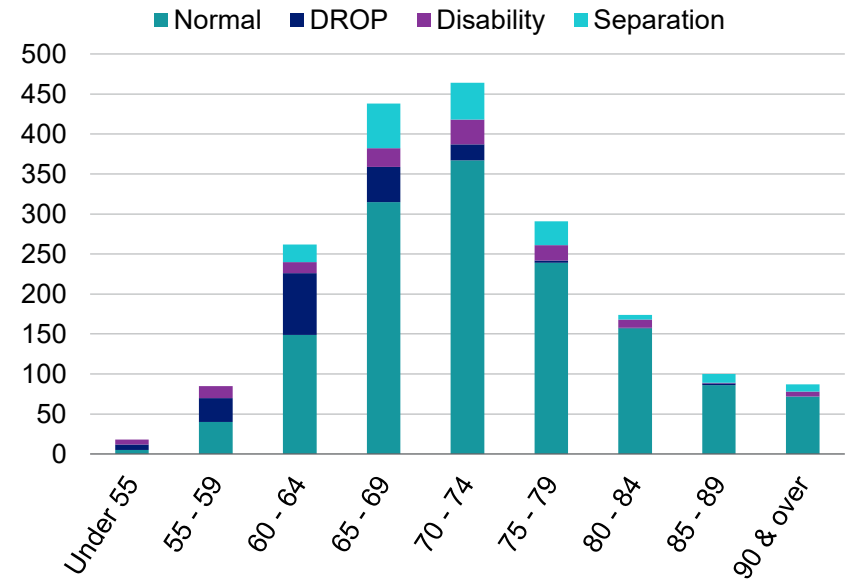
As of December 31, 2019, the average monthly benefit for retired participants is \$1,808, compared to \$1,770 in the previous valuation. The average age for retired participants is 72.3 in the current valuation, compared with 72.0 in the prior valuation.

Distribution of Pensioners as of December 31, 2019

Pensioners by Type and Monthly Amount



Pensioners by Type and Age



Section 2: Actuarial Valuation Results

Historical plan population

The chart below demonstrates the progression of the active population over the last ten years. The chart also shows the changes among the retired population over the same time period.

Participant Data Statistics: 2010 – 2019

Year Ended December 31	Active Participants			Retired Participants and Beneficiaries		
	Count	Average Age	Average Service	Count	Average Age	Average Monthly Amount
2010	2,290	45.4	10.1	2,020	70.7	\$1,513
2011	2,289	45.4	9.5	2,048	70.8	1,473
2012	2,327	45.3	9.4	2,044	71.0	1,521
2013	2,211	45.0	9.4	2,039	71.3	1,557
2014	2,259	44.4	8.6	2,028	71.4	1,617
2015	2,562	44.0	8.3	2,024	71.8	1,629
2016	2,620	44.0	7.8	2,096	71.7	1,707
2017	2,716	44.1	7.5	2,078	72.3	1,758
2018	2,873	44.2	7.3	2,143	72.0	1,770
2019	3,024	44.4	6.3	2,130	72.3	1,808

Note: Average age, service, and monthly amounts prior to 2018 are estimated based on valuation reports from the prior actuary

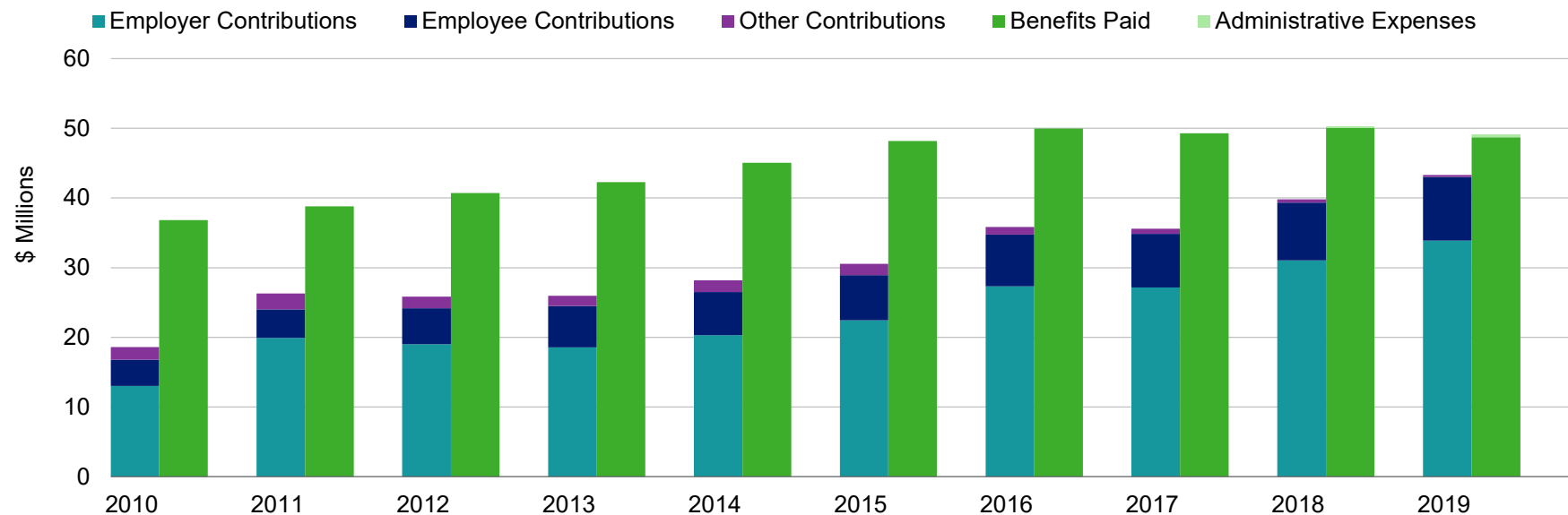
Section 2: Actuarial Valuation Results

Financial information

Retirement plan funding anticipates that, over the long term, both contributions (less administrative expenses) and investment earnings (less investment fees) will be needed to cover benefit payments. Retirement plan assets change as a result of the net impact of these income and expense components.

Additional financial information, including a summary of transactions for the valuation year, is presented in *Section 3, Exhibits D, E and F*.

Comparison of Contributions with Benefits and Expenses
for Years Ended December 31, 2010 – 2019



Section 2: Actuarial Valuation Results

It is desirable to have level and predictable plan costs from one year to the next. For this reason, the Board has approved an asset valuation method that gradually adjusts to market value. Under this valuation method, the full value of market fluctuations is not recognized in a single year and, as a result, the asset value and the plan costs are more stable. The amount of the adjustment to recognize market value is treated as income, which may be positive or negative. Realized and unrealized gains and losses are treated equally and, therefore, the sale of assets has no immediate effect on the actuarial value.

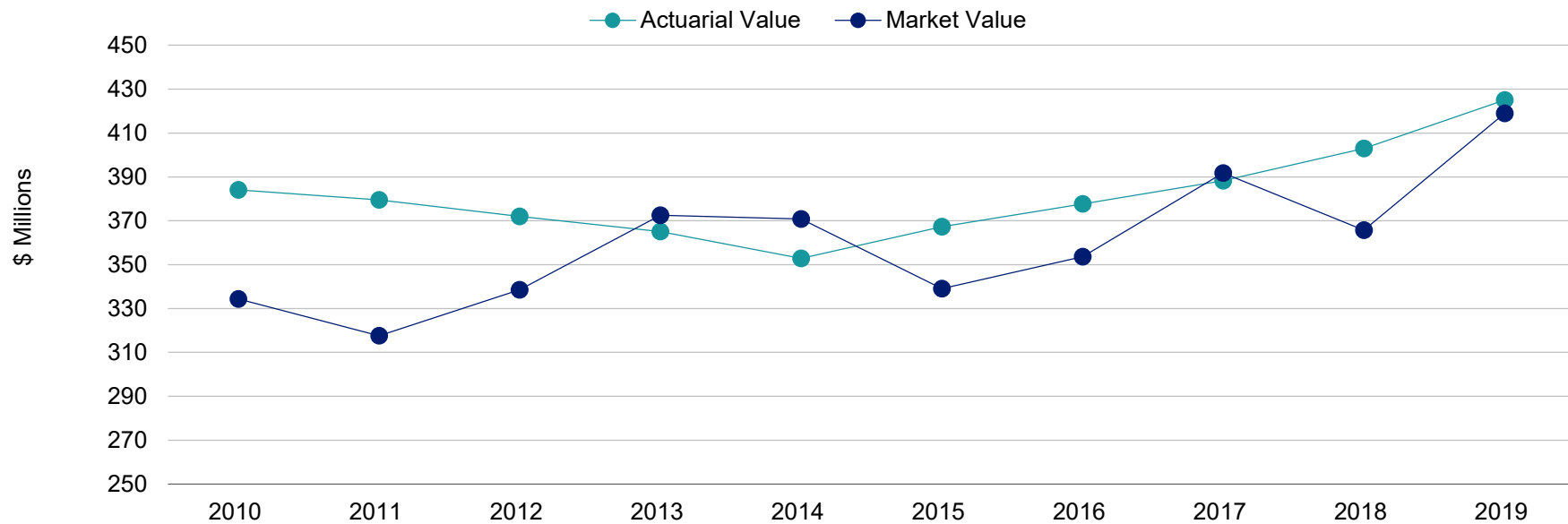
Determination of Actuarial Value of Assets for Year Ended December 31, 2019

Plan Year Ending	Beginning Market Value	Net External Cash Flow for Year	Market Value Investment Income for Year	Ending Market Value	Market Value Performance for Year	Adjusted Market Value
2013	\$338,607,461	-\$16,283,003	\$50,131,156	\$372,455,614	15.1698%	\$473,044,739
2014	372,455,614	-16,860,619	15,155,075	370,750,070	4.1632%	455,589,994
2015	370,750,070	-17,606,672	-14,044,748	339,098,650	-3.8803%	400,565,074
2016	339,098,650	-14,100,637	28,611,585	353,609,598	8.6167%	405,159,586
2017	353,609,598	-13,688,805	51,906,523	391,827,316	14.9688%	435,078,547
2018	391,827,316	-10,500,391	-15,589,616	365,737,309	-4.0327%	387,144,278
2019	365,737,309	<u>-5,809,415</u>	<u>59,043,437</u>	418,971,331	16.2729%	418,971,331
		-\$94,849,542	\$175,213,412			
					Average Adjusted Market Value	\$425,079,078
Actuarial value as a percentage of market value:						101.5%
Amount deferred for future recognition:						-\$6,107,747

Section 2: Actuarial Valuation Results

Both the actuarial value and market value of assets are representations of the Plan's financial status. As investment gains and losses are gradually taken into account, the actuarial value of assets tracks the market value of assets. The actuarial asset value is significant because the Plan's liabilities are compared to these assets to determine what portion, if any, remains unfunded. Amortization of the unfunded actuarial accrued liability is an important element in determining the contribution requirement.

Actuarial Value of Assets vs. Market Value of Assets as of December 31, 2010 – 2019



Section 2: Actuarial Valuation Results

Actuarial experience

To calculate any actuarially determined contribution, assumptions are made about future events that affect the amount and timing of benefits to be paid and assets to be accumulated. To the extent these assumptions are not met, future contribution requirements will be adjusted. If assumptions are changed, any contribution requirement is adjusted to take into account a change in experience anticipated for all future years.

Taking account of experience gains or losses in one year without making a change in assumptions reflects the belief that the single year's experience was a short-term development and that, over the long term, experience will return to the original assumptions. For contribution requirements to remain stable, assumptions should approximate experience.

If assumptions are changed, the contribution requirement is adjusted to take account a change in experience anticipated for all future years.

The total gain is \$12,750,278 which includes \$2,135,147 from investment losses and \$14,885,425 in gains from all other sources. The net experience variation from individual sources other than investments was 2.28% of the actuarial accrued liability. A discussion of the major components of the actuarial experience is on the following pages.

Actuarial Experience for Year Ended December 31, 2019

1	Net gain/(loss) from investments ¹	-\$2,135,147
2	Net gain/(loss) from administrative expenses	16,189
3	Net gain/(loss) from other experience	14,869,236
4	Net experience gain/(loss): 1 + 2 + 3	\$12,750,278

¹ Details on next page

Section 2: Actuarial Valuation Results

Investment experience

A major component of projected asset growth is the assumed rate of return. The assumed return should represent the expected long-term rate of return, based on the Plan's investment policy. The rate of return on the market value of assets was 16.27% for the year ended December 31, 2019.

For valuation purposes, the assumed rate of return on the actuarial value of assets is 7.50%. The actual rate of return on an actuarial basis for the 2019 plan year was 6.97%. Since the actual return for the year was less than the assumed return, the Plan experienced an actuarial loss during the year ended December 31, 2019 with regard to its investments.

Investment Experience

	Year Ended December 31, 2019		Year Ended December 31, 2018	
	Market Value	Actuarial Value	Market Value	Actuarial Value
1 Net investment income	\$59,043,437	\$27,873,151	-\$15,589,616	\$25,282,423
2 Average value of assets	362,832,602	400,110,635	386,577,121	382,983,115
3 Rate of return: 1 + 2	16.27%	6.97%	-4.03%	6.60%
4 Assumed rate of return	7.50%	7.50%	7.50%	7.50%
5 Expected investment income: 2 x 4	27,212,445	30,008,298	28,993,284	28,723,734
6 Actuarial gain/(loss): 1 - 5	<u>\$31,830,992</u>	<u>-\$2,135,147</u>	<u>-\$44,582,900</u>	<u>-\$3,441,311</u>

Section 2: Actuarial Valuation Results

Because actuarial planning is long term, it is useful to see how the assumed investment rate of return has followed actual experience over time. The chart below shows the rate of return on an actuarial basis compared to the actual market value investment return for the last 20 years, including averages over select time periods.

Investment Return – Actuarial Value vs. Market Value: 2000 - 2019

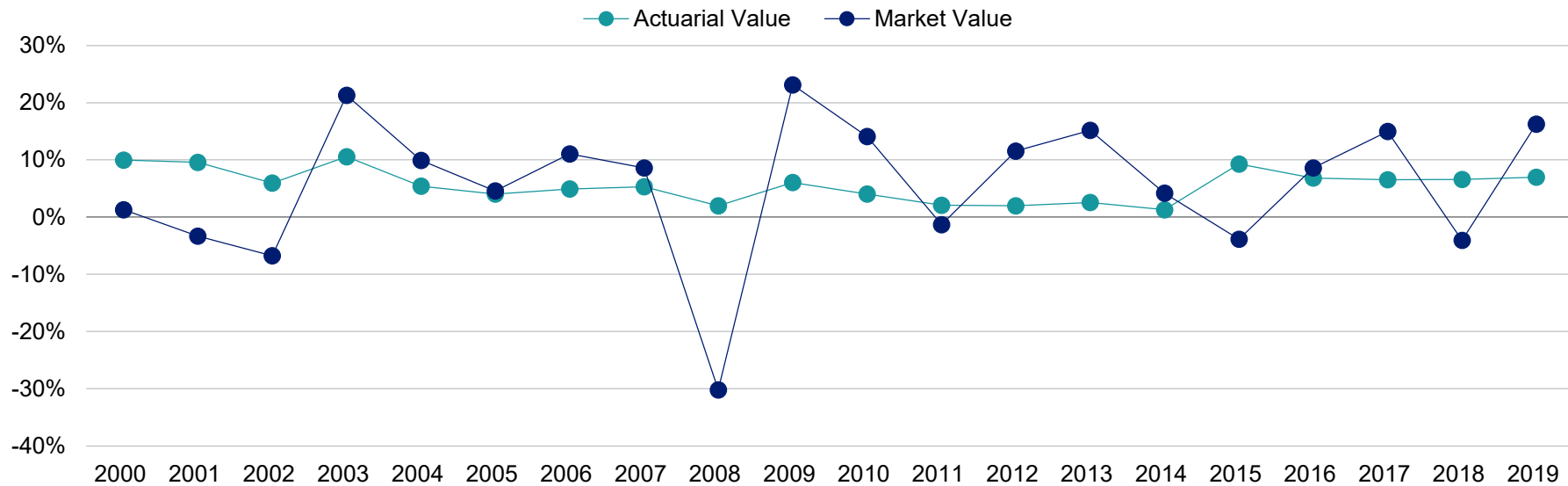
Year Ended December 31	Actuarial Value Investment Return		Market Value Investment Return		Year Ended December 31	Actuarial Value Investment Return		Market Value Investment Return	
	Amount	Percent	Amount	Percent		Amount	Percent	Amount	Percent
2000	\$32,225,447	9.95%	\$4,731,448	1.27%	2010	\$15,192,260	4.02%	\$42,485,923	14.11%
2001	33,184,325	9.58	-12,222,626	-3.34	2011	7,943,416	2.10	-4,276,183	-1.30
2002	21,997,488	5.97	-23,149,025	-6.75	2012	7,368,030	1.98	35,842,303	11.56
2003	39,077,908	10.55	65,492,332	21.30	2013	9,336,061	2.57	50,131,156	15.17
2004	21,411,295	5.39	35,797,958	9.93	2014	4,674,189	1.31	15,155,075	4.16
2005	16,282,219	4.02	17,464,439	4.56	2015	31,975,387	9.29	-14,044,748	-3.88
2006	19,664,372	4.94	41,708,472	11.05	2016	24,574,130	6.82	28,611,585	8.62
2007	20,683,262	5.30	33,770,375	8.62	2017	28,383,779	6.52	51,906,523	14.97
2008	7,678,968	1.99	-120,890,979	-30.18	2018	25,282,423	6.60	-15,589,616	-4.03
2009	22,597,059	6.06	59,869,583	23.13	2019	27,873,151	6.97	59,043,437	16.27
							Most recent five-year average return	7.43%	6.14%
							Most recent ten-year average return	4.93%	7.28%
							Most recent 15-year average return	4.76%	5.37%
							Most recent 20-year average return	5.59%	5.04%

Note: Each year's yield is weighted by the average asset value in that year.

Section 2: Actuarial Valuation Results

As described earlier in this section, the actuarial asset valuation method gradually recognizes fluctuations in the market value rate of return. The goal of this is to stabilize the actuarial rate of return and to produce more level pension plan costs.

Market and Actuarial Rates of Return for Years Ended December 31, 2000 - 2019



Section 2: Actuarial Valuation Results

Non-investment experience

Administrative expenses

- Administrative expenses for the year ended December 31, 2019 totaled \$376,002, as compared to the assumption of \$391,062.

Other experience

There are other differences between the expected and the actual experience that appear when the new valuation is compared with the projections from the previous valuation. These include:

- the extent of turnover among participants,
- retirement experience (earlier or later than projected),
- mortality (more or fewer deaths than projected),
- the number of disability retirements (more or fewer than projected), and
- salary increases (greater or smaller than projected).

The net gain from this other experience for the year ended December 31, 2019 amounted to \$14,869,235, which is 2.3% of the actuarial accrued liability.

Section 2: Actuarial Valuation Results

Actuarial assumptions and methods

The assumption and method changes reflected in this report are:

- Update the mortality rates to use the PubG-2010 amount-weighted mortality tables for healthy lives, and PubNS-2010 Disabled Retiree table for Disabled lives, and project the mortality improvement for all participants with Scale MP-2018
- Change the retirement rates to use age-based rates, rather than 100% at selected eligibilities
- Lower the assumed rate of investment return from 7.50% to 7.25%
- Change the salary scale to use age-based rates that reflects decreasing pay growth as a participant ages, rather than use 5% increases for all ages
- Update the turnover rates to reflect recent experience
- Update the disability rates to only begin after ten years of service, and stop at age 60
- The amortization methodology was changed from an open, 15-year, level dollar, amortization of the unfunded liability to a level percent of payroll amortization with layered bases, each having a closed 25-year amortization period.
- As a result of these assumption changes, the total normal cost increased by \$1,255,157 and the actuarial accrued liability increased by \$70,869,862. When combined with the change in amortization methodology, the total impact was a decrease in the ADC of \$3.3 million, or 2.28% of payroll.

Details on actuarial assumptions and methods are in Section 4, Exhibit I.

Plan provisions

There were no changes in plan provisions since the prior valuation.

A summary of plan provisions is in Section 4, Exhibit II.

Section 2: Actuarial Valuation Results

Development of Unfunded Actuarial Accrued Liability for Year Ended December 31, 2019

1	Unfunded actuarial accrued liability at beginning of year	\$255,337,284
2	Normal cost at beginning of year	9,498,705
3	Total contributions	-43,283,467
4	Interest	
	• For whole year on 1 + 2	\$19,862,699
	• For half year on 3	<u>-1,468,442</u>
	Total interest	<u>18,393,847</u>
5	Expected unfunded actuarial accrued liability	\$239,946,779
6	Changes due to:	
	• (Gain)/loss	-12,750,278
	• Assumptions	70,869,862
	Total changes	<u>\$58,119,584</u>
7	Unfunded actuarial accrued liability at end of year	<u>\$298,066,363</u>

Section 2: Actuarial Valuation Results

Actuarially determined contribution

The actuarially determined contribution is equal to the employer normal cost payment and a payment on the unfunded actuarial accrued liability. As of January 1, 2020, the actuarially determined contribution is \$22,890,640, or 15.31% of payroll.

The contribution requirement as of January 1, 2020 is based on the data previously described, the actuarial assumptions and Plan provisions described in *Section 4*, including all changes affecting future costs adopted at the time of the actuarial valuation, actuarial gains and losses, and changes in the actuarial assumptions.

Actuarially Determined Contribution for Year Beginning January 1

	2020		2019	
	Amount	% of Payroll	Amount	% of Payroll
1. Total normal cost	\$11,937,129	7.98%	\$9,107,643	7.09%
2. Administrative expenses	448,614	0.30%	385,590	0.30%
3. Expected employee contributions	<u>-8,972,282</u>	<u>-6.00%</u>	<u>-7,711,805</u>	<u>-6.00%</u>
4. Employer normal cost: (1) + (2) + (3)	\$3,413,461	2.28%	\$1,781,429	1.39%
5. Actuarial accrued liability	\$723,145,441		\$658,352,626	
6. Actuarial value of assets	425,079,078		403,015,342	
7. Unfunded actuarial accrued liability: (5) - (6)	\$298,066,363		\$255,337,284	
8. Payment on unfunded actuarial accrued liability	19,477,179	13.02%	26,908,330	20.93%
9. Actuarially determined contribution: (4) + (8)	<u>\$22,890,640</u>	<u>15.31%</u>	<u>\$28,689,759</u>	<u>22.32%</u>
10. Payroll	\$149,538,039		\$128,530,078	

Section 2: Actuarial Valuation Results

Reconciliation of actuarially determined contribution

The chart below details the changes in the actuarially determined contribution from the prior valuation to the current year's valuation.

Reconciliation of Actuarially Determined Contribution from January 1, 2019 to January 1, 2020

	Amount
Actuarially Determined Contribution as of January 1, 2019	\$28,689,759
• Effect of investment loss	129,715
• Effect of change in actuarial assumptions	8,260,288
• Effect of change in amortization method	-11,520,236
• Effect of other gains and losses on accrued liability	-2,668,886
Total change	-\$5,799,119
Actuarially Determined Contribution as of January 1, 2020	\$22,890,640

Section 2: Actuarial Valuation Results

History of employer contributions

A history of the most recent years of contributions is shown below.

History of Employer Contributions: 2011 – 2020

Fiscal Year Ended December 31	Actuarially Determined Employer Contribution (ADEC) ¹		Actual Employer Contributions		
	Amount	Percentage of Payroll	Amount	Percentage of Payroll	Percent Contributed
2011	\$20,850,837	24.27%	\$19,917,899	23.18%	95.53%
2012	18,828,419	20.11%	19,010,841	20.30%	100.97%
2013	20,228,129	21.78%	18,544,682	19.97%	91.68%
2014	20,871,424	22.58%	20,306,887	21.97%	97.30%
2015	21,891,996	22.51%	22,447,281	23.08%	102.54%
2016	22,713,296	21.49%	27,304,527	25.83%	120.21%
2017	26,857,512	23.25%	27,169,921	23.52%	101.16%
2018	28,015,495	23.19%	31,065,227	25.71%	110.89%
2019	28,689,759	22.32%	33,884,678	26.36%	118.11%
2020	22,890,640	15.31%	Not made yet	--	--

¹ Prior to 2012, this amount was the Annual Required Contribution (ARC)

Section 2: Actuarial Valuation Results

Risk

Since the actuarial valuation results are dependent on a given set of assumptions and data as of a specific date, there is a risk that emerging results may differ significantly as actual experience differs from the assumptions.

This report does not contain a detailed analysis of the potential range of future measurements, but does include a brief discussion of some risks that may affect the Plan. A more detailed assessment would provide the Trustees with a better understanding of the risks inherent in the Plan. This assessment may include scenario testing, sensitivity testing, stress testing and stochastic modeling.

- Investment Risk (the risk that returns will be different than expected)

If the actual return on market value for the next Plan Year were 1% different from the assumed (either higher or lower), the projected unfunded actuarial liability would change by 0.20%, or about \$585,000.

Since the Plan's assets are much larger than contributions, investment performance may create volatility in contribution requirements. For example, for each 1% difference in return from the assumed return, the actuarially determined contribution would increase or decrease by about \$33,500 (0.02% of payroll).

The market value rate of return over the last 2019 years has ranged from a low of -30.18% to a high of 23.13%.

- Longevity Risk (the risk that mortality experience will be different than expected)

The actuarial valuation includes an expectation of future improvement in life expectancy. Emerging plan experience that does not match these expectations will result in either an increase or decrease in the actuarially determined contribution.

- Contribution Risk (the risk that actual contributions will be different from actuarially determined contribution)

The Plan's funding policy requires payment of the actuarially determined contribution. As long as this policy is adhered to, contribution risk is negligible.

- Demographic Risk (the risk that participant experience will be different than assumed)

Examples of this risk include:

- Actual retirements occurring earlier or later than assumed. The value of retirement plan benefits is sensitive to the rate of benefit accruals and any early retirement subsidies that apply.
- More or less active participant turnover than assumed.

- Actual Experience Over the Last 20 years and Implications for the Future

Past experience can help demonstrate the sensitivity of key results to the Plan's actual experience.

Section 2: Actuarial Valuation Results

If all investment returns were equal to the assumed return over the last ten years, the market value of assets as of the current valuation date would be approximately \$477.9 million as opposed to the actual value of \$418,971,331.

- Maturity Measures

As pension plans mature, the cash need to fulfill benefit obligations will increase over time. Therefore, cash flow projections and analysis should be performed to assure that the Plan's asset allocation is aligned to meet emerging pension liabilities.

Currently the Plan has a non-active to active participant ratio of 0.87. For the prior year benefits paid and administrative expenses were \$5,809,415 more than contributions received. As the Plan matures, more cash will be needed from the investment portfolio to meet benefit payments.

Section 2: Actuarial Valuation Results

GFOA funded liability by type

The Actuarial Accrued Liability represents the present value of benefits earned, calculated using the plan's actuarial cost method. The Actuarial Value of Assets reflects the financial resources available to liquidate the liability. The portion of the liability covered by assets reflects the extent to which accumulated plan assets are sufficient to pay future benefits, and is shown for liabilities associated with employee contributions, pensioner liabilities, and other liabilities. The Government Finance Officers Association (GFOA) recommends that the funding policy aim to achieve a funded ratio of 100 percent.

GFOA Solvency Test as of December 31

	2020	2019
Actuarial accrued liability (AAL)		
• Active member contributions	\$56,251,888	\$47,308,349
• Retirees and beneficiaries	478,363,660	427,073,020
• Active and inactive members (employer-financed)	188,529,893	183,971,257
Total	\$723,145,441	\$658,352,626
Actuarial value of assets	\$425,079,078	\$403,015,342
Cumulative portion of AAL covered		
• Active member contributions	100.00%	100.00%
• Retirees and beneficiaries	77.10%	83.29%
• Active and inactive members (employer-financed)	0.00%	0.00%

Supplemental Information

Exhibit A: Table of Plan Coverage

Category	Year Ended December 31		Change From Prior Year
	2019	2018	
Active participants in valuation:			
• Number	3,024	2,873	5.3%
• Average age	44.4	44.2	0.2
• Average years of service	6.3	7.3	-1.0
• Total payroll	\$149,538,039	\$128,530,078	16.3%
• Average payroll	49,450	44,737	10.5%
• Account balances	56,251,888	47,308,349	18.9%
• Total active vested participants	1,312	1,258	4.3%
Inactive vested participants	298	328	-9.1%
Retired participants:			
• Number in pay status	1,794	1,799	-0.3%
• Average age	72.3	72.0	0.3
• Average monthly benefit	\$1,931	\$1,893	2.0%
Disabled participants:			
• Number in pay status	125	137	-8.8%
• Average age	69.8	69.6	0.2
• Average monthly benefit	\$1,238	\$1,205	2.7%
Beneficiaries:			
• Number in pay status	211	207	1.9%
• Average age	73.9	73.9	0.0
• Average monthly benefit	\$1,097	\$1,074	2.1%

Section 3: Supplemental Information

Exhibit B: Participants in Active Service as of December 31, 2019 by Age, Years of Service, and Average Payroll

Age	Total	0-4	5-9	10-14	15 - 19	20 - 24	25 - 29	30 - 34	35 - 39	40 & over
Under 25	102	102	--	--	--	--	--	--	--	--
	\$29,766	\$29,766	--	--	--	--	--	--	--	--
25 - 29	347	318	27	2	--	--	--	--	--	--
	40,233	40,203	\$43,282	\$3,753	--	--	--	--	--	--
30 - 34	425	317	83	21	4	--	--	--	--	--
	47,715	45,208	56,822	\$50,535	\$42,607	--	--	--	--	--
35 - 39	415	261	91	51	11	1	--	--	--	--
	51,689	47,861	61,401	55,843	\$44,620	\$32,985	--	--	--	--
40 - 44	331	190	60	37	28	13	3	--	--	--
	54,355	51,829	57,665	60,702	62,301	\$42,766	\$45,887	--	--	--
45 - 49	329	164	60	45	22	32	6	--	--	--
	55,796	50,970	68,548	51,366	57,233	62,868	50,396	--	--	--
50 - 54	329	147	50	30	32	39	24	7	--	--
	54,184	48,925	54,989	53,637	55,438	59,555	74,234	\$56,837	--	--
55 - 59	354	141	64	48	20	44	22	14	1	--
	49,354	45,992	50,161	43,042	48,503	54,761	65,005	59,359	\$69,571	--
60 - 64	244	120	44	28	15	10	15	6	4	2
	47,702	44,630	48,853	50,793	48,164	48,190	58,872	65,515	43,450	\$28,879
65 - 69	98	50	26	10	4	1	2	3	1	1
	53,055	55,659	50,079	57,281	35,067	51,916	47,117	46,564	72,537	42,981
70 & over	50	28	8	10	3	--	1	--	--	--
	46,524	41,085	52,939	56,899	50,666	--	31,326	--	--	--
Total	3,024	1,838	513	282	139	140	74	31	7	3
	\$49,450	\$45,602	\$56,296	\$52,175	\$53,407	\$56,190	\$64,771	\$57,286	\$51,905	\$33,580

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Exhibit C: Reconciliation of Participant Data

	Active Participants	Inactive Vested Participants	Disableds	Retired Participants	Beneficiaries	Total
Number as of January 1, 2019	2,873	328	137	1,799	207	5,344
• New participants	559	N/A	N/A	N/A	N/A	559
• Terminations – with vested rights	-18	18	0	0	0	0
• Terminations – without vested rights	-351	N/A	N/A	N/A	N/A	-351
• Retirements	-52	-14	N/A	66	N/A	0
• New disabilities	0	0	0	N/A	N/A	0
• Return to work	13	-13	0	0	N/A	0
• Died	0	0	-12	-72	-13	-97
• Lump sum cash-outs	0	0	0	0	0	0
• Rehire	0	0	N/A	0	N/A	0
• Certain period expired	N/A	N/A	0	0	-1	-1
• Data adjustments	0	-21	0	1	0	-20
• Active participants no longer accruing benefits	0	0	N/A	N/A	N/A	0
• New beneficiaries	0	0	0	0	18	18
Number as of January 1, 2020	3,024	298	125	1,794	211	5,452

Section 3: Supplemental Information

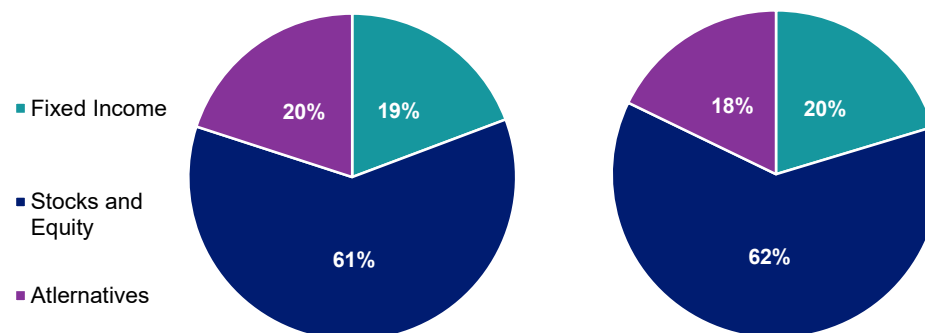
Exhibit D: Summary Statement of Income and Expenses on a Market Value Basis

	Year Ended December 31, 2019	Year Ended December 31, 2018
Net assets at market value at the beginning of the year	\$365,737,309	\$391,827,316
Contribution income:		
• Employer contributions	\$30,743,553	\$31,065,227
• Member contributions	9,134,139	8,246,577
• Other contributions	3,405,775	507,195
• Less administrative expenses	<u>-376,002</u>	<u>-243,972</u>
<i>Net contribution income</i>	\$42,907,465	\$39,575,027
Investment income:		
• Interest, dividends and other income	\$6,548,044	\$6,204,635
• Asset appreciation	53,259,588	-20,855,301
• Less investment fees	<u>-764,195</u>	<u>-938,950</u>
<i>Net investment income</i>	<u>\$59,043,437</u>	<u>-\$15,589,616</u>
Total income available for benefits	\$101,950,902	\$23,985,411
Less benefit payments	-\$48,716,880	-\$50,075,418
Change in market value of assets	\$53,234,022	-\$26,090,007
Net assets at market value at the end of the year	\$418,971,331	\$365,737,309

Section 3: Supplemental Information

Exhibit E: Summary Statement of Plan Assets

	December 31, 2019	December 31, 2018
Cash equivalents	\$34,976,333	\$33,356,057
Total accounts receivable	\$3,638,180	\$2,081,766
Investments:		
• Stocks and Equity	\$231,978,736	\$210,556,930
• Fixed Income	73,600,546	69,183,824
• Alternatives	76,358,814	60,642,549
Total investments at market value	\$381,938,096	\$340,383,303
Total assets	\$420,552,609	\$375,821,126
Total accounts payable	-1,581,278	-10,083,817
Net assets at market value	\$418,971,331	\$365,737,309
Net assets at actuarial value	\$425,079,078	\$403,015,342



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Exhibit F: Development of the Fund through December 31, 2019

Year Ended December 31	Employer Contributions	Employee Contributions	Other Contributions	Net Investment Return ¹	Admin. Expenses ²	Benefit Payments	Market Value of Assets at Year-End	Actuarial Value of Assets at Year-End	Actuarial Value as a Percent of Market Value
2010	\$13,031,810	\$3,781,490	\$1,792,875	\$42,485,923	--	\$36,838,681	\$334,408,848	\$384,105,611	114.9%
2011	19,917,899	4,087,034	2,281,255	-4,276,183	--	38,809,216	317,609,637	379,526,159	119.5%
2012	19,010,841	5,155,380	1,685,729	35,842,303	--	40,696,429	338,607,461	372,049,545	109.9%
2013	18,544,682	5,953,535	1,483,869	50,131,156	--	42,265,089	372,455,614	365,102,483	98.0%
2014	20,306,887	6,193,573	1,677,851	15,155,075	--	45,038,930	370,750,070	352,915,906	95.2%
2015	22,447,281	6,490,092	1,622,658	-14,044,748	--	48,166,703	339,098,650	367,274,453	108.3%
2016	27,304,527	7,444,419	1,106,421	28,611,585	--	49,956,004	353,609,598	377,748,008	106.8%
2017	27,169,921	7,677,009	729,180	51,906,523	\$296,496	49,264,915	391,827,316	388,233,310	99.1%
2018	31,065,227	8,246,577	507,195	-15,589,616	243,972	50,075,418	365,737,309	403,015,342	110.2%
2019	33,884,678	9,134,139	264,650	59,043,437	376,002	48,716,880	418,971,331	425,079,078	101.5%

¹ On a market basis, net of investment fees and administrative expenses

² Information not available in prior actuary's reports

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Exhibit G: Table of Amortization Bases

Type	Date Established	Initial Period	Initial Amount	Annual Payment ¹	Years Remaining	Outstanding Balance
Initial unfunded liability	01/01/2020	25	\$239,946,779	\$15,679,348	25	\$239,946,779
Actuarial gain	01/01/2020	25	-12,750,278	-833,168	25	-12,750,278
Change in assumptions	01/01/2020	25	70,869,862	4,630,999	25	70,869,862
Total				\$19,477,179		\$298,066,363

¹ Level percentage of payroll

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Exhibit H: Definition of Pension Terms

The following list defines certain technical terms for the convenience of the reader:

Actuarial Accrued Liability for Actives:	The equivalent of the accumulated normal costs allocated to the years before the valuation date.
Actuarial Accrued Liability for Pensioners and Beneficiaries:	Actuarial Present Value of lifetime benefits to existing pensioners and beneficiaries. This sum takes account of life expectancies appropriate to the ages of the annuitants and the interest that the sum is expected to earn before it is entirely paid out in benefits.
Actuarial Cost Method:	A procedure allocating the Actuarial Present Value of Future Benefits to various time periods; a method used to determine the Normal Cost and the Actuarial Accrued Liability that are used to determine the actuarially determined contribution.
Actuarial Gain or 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. To the extent that actual experience differs from that assumed, Actuarial Accrued Liabilities emerge which may be the same as forecasted, or may be larger or smaller than projected. Actuarial gains are due to favorable experience, e.g., assets earn more than projected, salary increases are less than assumed, members retire later than assumed, etc. Favorable experience means actual results produce actuarial liabilities not as large as projected by the actuarial assumptions. On the other hand, actuarial losses are the result of unfavorable experience, i.e., actual results yield actuarial liabilities that are larger than projected.
Actuarially Equivalent:	Of equal Actuarial Present Value, determined as of a given date and based on a given set of Actuarial Assumptions.
Actuarial Present Value (APV):	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. Each such amount or series of amounts is: Adjusted for the probable financial effect of certain intervening events (such as changes in compensation levels, marital status, etc.) Multiplied by the probability of the occurrence of an event (such as survival, death, disability, withdrawal, etc.) on which the payment is conditioned, and Discounted according to an assumed rate (or rates) of return to reflect the time value of money.
Actuarial Present Value of Future Benefits:	The Actuarial Present Value of benefit amounts 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, anticipated future compensation, and future service credits. The

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	Actuarial Present Value of Future Benefits includes the liabilities for active members, retired members, beneficiaries receiving benefits, and inactive members entitled to either a refund of member contributions or a future retirement benefit. Expressed another way, it is the value that would have to be invested on the valuation date so that the amount invested plus investment earnings would provide sufficient assets to pay all projected benefits and expenses when due.
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 plan, as well as Actuarially Determined Contributions.
Actuarial Value of Assets (AVA):	The value of the Plan's assets as of a given date, used by the actuary for valuation purposes. This may be the market or fair value of plan assets, but commonly plans use a smoothed value in order to reduce the year-to-year volatility of calculated results, such as the funded ratio and the Actuarially Determined Contribution.
Actuarially Determined:	Values that have been determined utilizing the principles of actuarial science. An actuarially determined value is derived by application of the appropriate actuarial assumptions to specified values determined by provisions of the Plan.
Actuarially Determined Contribution (ADC):	The employer's periodic required contributions, expressed as a dollar amount or a percentage of covered plan compensation, determined under the Plan's funding policy. The ADC consists of the Employer Normal Cost and the Amortization Payment.
Amortization Method:	A method for determining the Amortization Payment. The most common methods used are level dollar and level percentage of payroll. Under the Level Dollar method, the Amortization Payment is one of a stream of payments, all equal, whose Actuarial Present Value is equal to the Unfunded Actuarial Accrued Liability. Under the Level Percentage of Pay method, the Amortization Payment is one of a stream of increasing payments, whose Actuarial Present Value is equal to the Unfunded Actuarial Accrued Liability. Under the Level Percentage of Pay method, the stream of payments increases at the assumed rate at which total covered payroll of all active members will increase.
Amortization Payment:	The portion of the pension plan contribution, or ADC, that is intended to pay off the Unfunded Actuarial Accrued Liability.
Assumptions or Actuarial Assumptions:	The estimates upon which the cost of the Plan is calculated, including: <u>Investment return</u> - the rate of investment yield that the Plan will earn over the long-term future; <u>Mortality rates</u> - the rate or probability of death at a given age for employees and pensioners; <u>Retirement rates</u> - the rate or probability of retirement at a given age or service; <u>Disability rates</u> - the rate or probability of disability retirement at a given age;

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	<p><u>Withdrawal rates</u> - the rate or probability at which employees of various ages are expected to leave employment for reasons other than death, disability, or retirement;</p> <p><u>Salary increase rates</u> - the rates of salary increase due to inflation, real wage growth and merit and promotion increases.</p>
Closed Amortization Period:	A specific number of years that is counted down by one each year, and therefore declines to zero with the passage of time. For example, if the amortization period is initially set at 20 years, it is 19 years at the end of one year, 18 years at the end of two years, etc. See Open Amortization Period.
Decrements:	Those causes/events due to which a member's status (active-inactive-retiree-beneficiary) changes, that is: death, retirement, disability, or withdrawal.
Defined Benefit Plan:	A retirement plan in which benefits are defined by a formula based on the member's compensation, age and/or years of service.
Defined Contribution Plan:	A retirement plan, such as a 401(k) plan, a 403(b) plan, or a 457 plan, in which the contributions to the plan are assigned to an account for each member, the plan's earnings are allocated to each account, and each member's benefits are a direct function of the account balance.
Employer Normal Cost:	The portion of the Normal Cost to be paid by the employer. This is equal to the Normal Cost less expected member contributions.
Experience Study:	A periodic review and analysis of the actual experience of the Plan that may lead to a revision of one or more actuarial assumptions. Actual rates of decrement and salary increases are compared to the actuarially assumed values and modified based on recommendations from the Actuary.
Funded Ratio:	The ratio of the Valuation/Actuarial Value of Assets (VVA/AVA) to the Actuarial Accrued Liability (AAL). Plans sometimes also calculate a market funded ratio, using the Market Value of Assets (MVA), rather than the VVA/AVA.
GASB 67 and GASB 68:	Governmental Accounting Standards Board (GASB) Statements No. 67 and No. 68. These are the governmental accounting standards that set the accounting rules for public retirement systems and the employers that sponsor or contribute to them. Statement No. 68 sets the accounting rules for the employers that sponsor or contribute to public retirement systems, while Statement No. 67 sets the rules for the systems themselves.
Investment Return:	The rate of earnings of the Plan from its investments, including interest, dividends and capital gain and loss adjustments, computed as a percentage of the average value of the fund. For actuarial purposes, the investment return often reflects a smoothing of the capital gains and losses to avoid significant swings in the value of assets from one year to the next.
Net Pension Liability (NPL):	The Net Pension Liability is equal to the Total Pension Liability minus the Plan Fiduciary Net Position.

Section 3: Supplemental Information

Normal Cost:	The portion of the Actuarial Present Value of Future Benefits and expenses allocated to a valuation year by the Actuarial Cost Method. Any payment with respect to an Unfunded Actuarial Accrued Liability is not part of the Normal Cost (see Amortization Payment). For pension plan benefits that are provided in part by employee contributions, Normal Cost refers to the total of member contributions and employer Normal Cost unless otherwise specifically stated.
Open Amortization Period:	An open amortization period is one which is used to determine the Amortization Payment but which does not change over time. If the initial period is set as 30 years, the same 30-year period is used in each future year in determining the Amortization Period.
Plan Fiduciary Net Position:	Market value of assets.
Total Pension Liability (TPL):	The actuarial accrued liability under the entry age normal cost method and based on the blended discount rate as described in GASB 67 and 68.
Unfunded Actuarial Accrued Liability:	The excess of the Actuarial Accrued Liability over the Valuation/Actuarial Value of Assets. This value may be negative, in which case it may be expressed as a negative Unfunded Actuarial Accrued Liability, also called the Funding Surplus or an Overfunded Actuarial Accrued Liability.
Valuation Date or Actuarial Valuation Date:	The date as of which the value of assets is determined and as of which the Actuarial Present Value of Future Benefits is determined. The expected benefits to be paid in the future are discounted to this date.
Valuation Value of Assets	The Actuarial Value of Assets reduced by the value of non-valuation reserves.

Actuarial Valuation Basis

Exhibit I: Actuarial Assumptions and Actuarial Cost Method

Rationale for Assumptions	The information and analysis used in selecting each demographic assumption that has a significant effect on this actuarial valuation is from the 2011 – 2016 Actuarial Experience Study as performed by another actuary.																																																																		
Net Investment Return:	7.25%																																																																		
Salary Increases:	Age-based annual rates ranging from 10% to 3.2%																																																																		
Mortality Rates:	<p><i>Healthy Pre-Retirement:</i> PubG-2010 Employee Mortality Tables, amount-weighted, projected generationally with Scale MP-2018</p> <p><i>Healthy Post-Retirement:</i> PubG-2010 General Healthy Retiree Tables, amount-weighted, projected generationally with Scale MP-2018</p> <p><i>Disabled:</i> PubNS-2010 Non-Safety Disabled Retiree Tables, amount-weighted, projected generationally with Scale MP-2018</p>																																																																		
Termination Rates before Retirement:	<table border="1"> <thead> <tr> <th rowspan="3">Age</th> <th colspan="2">Mortality¹</th> <th colspan="3">Rate (%)</th> </tr> <tr> <th rowspan="2">Male</th> <th rowspan="2">Female</th> <th rowspan="2">Disability²</th> <th colspan="2">Withdrawal after 5 years of Service³</th> </tr> <tr> <th>Male</th> <th>Female</th> </tr> </thead> <tbody> <tr> <td>20</td> <td>0.037</td> <td>0.013</td> <td>0.1650</td> <td>20.00</td> <td>18.00</td> </tr> <tr> <td>30</td> <td>0.036</td> <td>0.015</td> <td>0.1650</td> <td>15.00</td> <td>12.00</td> </tr> <tr> <td>40</td> <td>0.066</td> <td>0.036</td> <td>0.1350</td> <td>7.00</td> <td>6.00</td> </tr> <tr> <td>50</td> <td>0.149</td> <td>0.083</td> <td>0.5250</td> <td>7.00</td> <td>6.00</td> </tr> <tr> <td>60</td> <td>0.319</td> <td>0.186</td> <td>0.0000</td> <td>7.00</td> <td>6.00</td> </tr> <tr> <td>70</td> <td>0.703</td> <td>0.489</td> <td>0.0000</td> <td>7.00</td> <td>6.00</td> </tr> <tr> <td>80</td> <td>1.730</td> <td>1.330</td> <td>0.0000</td> <td>7.00</td> <td>6.00</td> </tr> <tr> <td>90</td> <td>1.730</td> <td>1.330</td> <td>0.0000</td> <td>7.00</td> <td>6.00</td> </tr> </tbody> </table> <p>¹ Mortality rates shown for base table. ² All disabilities are assumed to be Ordinary Disabilities. ³ For the first five years of service, turnover is as shown on the next page.</p>						Age	Mortality ¹		Rate (%)			Male	Female	Disability ²	Withdrawal after 5 years of Service ³		Male	Female	20	0.037	0.013	0.1650	20.00	18.00	30	0.036	0.015	0.1650	15.00	12.00	40	0.066	0.036	0.1350	7.00	6.00	50	0.149	0.083	0.5250	7.00	6.00	60	0.319	0.186	0.0000	7.00	6.00	70	0.703	0.489	0.0000	7.00	6.00	80	1.730	1.330	0.0000	7.00	6.00	90	1.730	1.330	0.0000	7.00	6.00
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Section 4: Actuarial Valuation Basis

Turnover during first five years of service		
	Rate %	
Years of Service	Male	Female
0 but less than 1	35.0	35.0
1 but less than 2	30.0	25.0
2 but less than 3	20.0	20.0
3 but less than 4	20.0	20.0
4 but less than 5	15.0	15.0

Retirement Rates:		Age	Rate %
		Less than 60	30.0
		60	40.0
		61-65	30.0
		65-69	40.0
		70	100.0
Weighted Average Retirement Age:	Age 61, determined as follows: The weighted average retirement age for each participant is calculated as the sum of the product of each potential current or future retirement age times the probability of surviving from current age to that age and then retiring at that age, assuming no other decrements. The overall weighted retirement age is the average of the individual retirement ages based on all the active participants included in the January 1, 2020 actuarial valuation.		
Retirement Age for Inactive Vested Participants:	62		
Payroll Increase:	2.25%		
Administrative Expenses:	0.3% of payroll		
Unknown Data for Participants:	Same as those exhibited by participants with similar known characteristics. If not specified, participants are assumed to be male.		
Benefit Election:	All participants are assumed to elect the life only form of payment.		
Actuarial Value of Assets:	Market value of assets is averaged for the seven-year period ending on the valuation date by reflecting the actual cash flow and adjusting each prior year's market value to the current valuation date using the actuarial interest assumption in effect for each of the seven years.		

Section 4: Actuarial Valuation Basis

Actuarial Cost Method:

Entry Age Actuarial Cost Method. Entry Age is the age at date of employment, or, if date is unknown, current age minus years of service. Normal Cost and Actuarial Accrued Liability are calculated on an individual basis and are allocated by service, with Normal Cost determined using the plan of benefits applicable to each participant.

Justification for Change in Actuarial Assumptions:

The following assumptions were changed with this valuation, based on an experience study for the period of January 1, 2011 through December 31, 2016 conducted by another actuary employed by the City, with suggested changes by Segal:

- Update the mortality rates to use the PubG-2010 mortality tables for healthy lives, and PubNS-2010 Disabled Retiree table for Disabled lives, and project the mortality improvement for all participants with Scale MP-2018
- Change the retirement rates to use an age-based approach, rather than 100% at selected eligibilities
- Lower the assumed rate of investment return from 7.50% to 7.25%
- Change the salary scale to use an age-based approach that reflects decreasing pay growth as a participant ages, rather than use 5% increases for all ages
- Update the turnover rates to reflect recent experience
- Update the disability rates to only begin after ten years of service, and stop at age 60

Section 4: Actuarial Valuation Basis

Exhibit II: Summary of Plan Provisions

This exhibit summarizes the major provisions of the Plan included in the valuation. It is not intended to be, nor should it be interpreted as, a complete statement of all plan provisions.

Plan Year:	January 1 through December 31
Plan Status:	Ongoing
Normal Retirement:	
<u>Members Hired Prior to January 1, 2018</u>	
<i>Eligibility</i>	Age 65 and 5 years of service
<i>Amount</i>	2.5% of average compensation times creditable service for the first 25 years plus 4.0% of average compensation times creditable service thereafter
<i>Average Annual Compensation</i>	Average annual compensation for highest consecutive 60 month period. Compensation for purposes of calculating a pension is capped at \$200,000 per year.
<u>Members Hired on or After January 1, 2018</u>	
<i>Eligibility</i>	Age 65 and 5 years of service
<i>Amount</i>	1.9% of average compensation times creditable service
<i>Average Annual Compensation</i>	Average annual compensation for highest consecutive 60 month period. Compensation for purposes of calculating a pension is capped at \$100,000 per year, adjusted for inflation as determined by the Trustees from time to time.
Unreduced Early Retirement:	
<u>Members Hired Prior to January 1, 2018</u>	
<i>Eligibility</i>	Any age with 30 years of service or age plus service equals 80
<i>Amount</i>	Normal Retirement amount, unreduced
<u>Members Hired on or After January 1, 2018</u>	
<i>Eligibility</i>	Any age with 30 years of service or age 62 with 20 years of service
<i>Amount</i>	Normal Retirement amount, unreduced

Section 4: Actuarial Valuation Basis

<p>Early Retirement:</p> <p><u>Members Hired Prior to January 1, 2018</u></p> <p><i>Eligibility</i></p> <p><i>Amount</i></p>	<p>Age 60 and 10 years of service</p> <p>Normal Retirement amount, reduced by 3% per year prior to age 62</p>
<p>Minimum Retirement Benefit:</p>	<p>\$3,600 per year for any member with at least 10 years of creditable service</p>
<p>Ordinary Disability:</p> <p><i>Eligibility</i></p> <p><i>Amount</i></p>	<p>Any age with 10 years of service</p> <p>75% of the benefit the member would have earned had they worked until age 65</p>
<p>Accidental Disability:</p> <p><i>Eligibility</i></p> <p><i>Amount</i></p>	<p>Disability occurs as a result of an accident sustained while in the actual performance of duty, without willful negligence on the member's part</p> <p>65% of the member's compensation for the 12 months preceding the accident, offset by any payments received from Workers Compensation</p>
<p>Vesting:</p>	<p>5 years of service</p>
<p>Spouse's Pre-Retirement Death Benefit:</p> <p><u>Death while an Active Member</u></p> <p><i>Member had less than three years of service at date of death</i></p> <p><i>Member had at least three years of service at date of death</i></p> <p><u>Death after Separation from Service</u></p> <p><i>Not Retirement Eligible</i></p> <p><i>Retirement Eligible</i></p>	<p>Refund of member contributions plus interest</p> <p>Refund of member contributions plus interest plus 25% of the member's base pensionable earnings in the year preceding death plus 5% of the member's base pensionable earnings for each full year in excess of three years</p> <p>Refund of member contributions plus interest</p> <p>Survivor's portion of 100% Joint and Survivor benefit with Pop-Up, payable as if member retired immediately prior to death</p>
<p>Post-Retirement Death Benefit:</p>	<p>Based on form of payment chosen by member upon retirement</p>
<p>Optional Forms of Benefits:</p>	<p>Life Only Annuity; 50% or 100% Joint and Survivor Pension with Pop-Up</p>

Section 4: Actuarial Valuation Basis

DROP:	<p>Members eligible for Normal Retirement or Unreduced Early Retirement may elect to defer receipt of their retirement benefits while continuing employment*. Upon the effective date of participating in the DROP, a member's years of service and Average Monthly Compensation become frozen for purposes of determining pension benefits. Additional service beyond the date of DROP participation no longer accrues any additional benefits under the Retirement System. Benefits that would have been payable are accumulated at interest to date of termination and paid in a single lump sum or in substantially equal payments over a period designated by the member but not to exceed 119 months. The interest rate shall be determined annually by the Trustees and credited as of each December 31st.</p> <p>*Members with at least 10 years of creditable service as of January 1, 2018 have a maximum DROP period of five (5) years; all other members have a maximum DROP period of three (3) years.</p>
Contribution Rates:	
<i>Member</i>	6.0% of pensionable compensation
<i>Employer</i>	Actuarial Determined Contribution less member contributions
Changes in Plan Provisions:	There are no plan changes reflected for the first time in this valuation.