

EMPLOYEES' RETIREMENT SYSTEM OF THE STATE OF HAWAII

REPORT TO BOARD OF TRUSTEES ON THE 95th ANNUAL
ACTUARIAL VALUATION
FOR THE YEAR ENDING JUNE 30, 2020





January 29, 2020

Board of Trustees
Employees' Retirement System of
The State of Hawaii
City Financial Tower
201 Merchant St., Ste. 1400
Honolulu, HI 96813-2980

Dear Trustees:

SUBJECT: ACTUARIAL VALUATION AS OF JUNE 30, 2020

We certify that the information contained in the 2020 actuarial valuation report is accurate and fairly presents the actuarial position of the Employees' Retirement System of the State of Hawaii (ERS) as of June 30, 2020. There have been no adjustments for events which occurred after this date.

All calculations have been made in conformity with generally accepted actuarial principles and practices and with the Actuarial Standards of Practice issued by the Actuarial Standards Board. In our opinion, the results presented comply with the requirements of the Hawaii statutes and, where applicable, the Internal Revenue Code, ERISA, and the Statements of the Governmental Accounting Standards Board. The undersigned are independent actuaries and consultants. One or more of them are an Enrolled Actuary and/or a Member of the American Academy of Actuaries. All are experienced in performing valuations for large public retirement systems.

This report was prepared at the request of the Board and is intended for use by the ERS and those designated or approved by the Board. This report may be provided to parties other than the ERS only in its entirety and only with the permission of the Board. GRS is not responsible for unauthorized use of this report.

ACTUARIAL VALUATIONS

The primary purpose of the valuation report is to determine the adequacy of the current employer contribution rate through measuring the resulting funding period, to describe the current financial condition of ERS, and to analyze changes in ERS's condition. In addition, the report provides various summaries of the data. This report may not be appropriate for other purposes. The information required by ERS in connection with Governmental Accounting Standards Board Statement No. 67(GASB No.67) will be provided in a separate report.

Valuations are prepared annually, as of June 30th of each year, the last day of ERS's plan year and fiscal year.

FINANCING OBJECTIVES

Contribution rates are established by Law that, over time, are intended to remain level as a percent of payroll. The employee and employer contribution rates have been set by Law and are intended to provide for the normal costs of the ERS and to amortize the unfunded actuarial accrued liability (UAAL) over a reasonable amount of time, which will ensure benefit security and intergenerational equity.

PROGRESS TOWARD REALIZATION OF FINANCING OBJECTIVES

We have determined that the funding period for paying off the UAAL of the ERS (in aggregate) is 26 years. This is the same as the prior year's funding period of 26 years. Normally, we would expect the funding period to decrease by one each year if all assumptions are exactly met. Therefore, this year's funding period is one year larger than expected. This result is due to losses on both the liabilities and investments of the ERS. However, because this period is less than 30 years, the objectives set in State statute are currently being realized. (Hawaii Revised Statutes §88-122(e)(1) state that the employer contribution rates are subject to adjustment when the funding period is in excess of 30 years.)

The 2017 Legislature passed legislation that made significant changes to the future employer contribution rates. This is the final year of four scheduled increases. The employer contribution rate for Police and Fire employees increased to 41% for FY2021, and the employer contribution rate for All Other Employees increased to 24% for FY2021. The 26 year funding period assumes all of the currently scheduled contribution increases occur and remain in effect throughout the period. Under current law, the contribution rates are expected to stay at these levels until the ERS is fully funded.

The funded ratio (the ratio of the actuarial value of assets to the actuarial accrued liability) is a standard measure of a plan's funded status. The funded status alone is not appropriate for assessing the need for future contributions nor assessing the sufficiency of plan assets to cover the estimated cost of settling the plan's benefit obligations. However, the trend (historical and projected) of the funded ratio is a strong metric to use for assessing the dependability of the current funding policy and its ability to accumulate assets to pay benefits when due. The funded ratio is currently 55.3% which is a small increase over the 55.2% funded ratio in the previous valuation. The funded ratio did not improve more due to actuarial losses on both investments and liabilities.

The 2011 Legislature made changes to the benefits and member contribution rates for employees hired after June 30, 2012. Because these changes result in significantly higher contributions towards the unfunded liability in the future than in the current year, we believe it is more appropriate to determine the funding period using an open group projection rather than a static mathematical formula, which assumes that all amortization payments in the future will be the same percentage of pay as in the current year.

The actuarial accrued liability (AAL), the unfunded actuarial accrued liability (UAAL), and the determination of the resulting funding period illustrate the progress toward the realization of financing objectives. The ERS had a liability experience loss which was caused by individual salary increases (for Police and Fire employees) being larger than expected by the assumptions. The ERS also experience a loss on the actuarial value of assets which further increased the UAAL. In addition, the ERS currently experiences negative



amortization (interest on the UAAL is greater than the contributions towards the elimination of the UAAL). As a result, the UAAL grew (in dollars) based on this actuarial valuation as of June 30, 2020 and ERS's underfunded status as measured by the UAAL is now \$14.607 billion.

Because of the less than favorable investment performance in FY2020, the ERS is now deferring \$699 million in investment losses, compared with \$95 million in deferred investment losses last year. If there are no significant investment gains or other actuarial gains, the funded status of the ERS would be expected to decrease in the near future before increasing over the long term.

Thus, given the plan's current and future contribution rates and the new tier of benefits, if all actuarial assumptions are met (including the assumption of the plan earning 7.00% on the actuarial valuation of assets), it is expected that:

1. The employer normal cost as a percentage of pay will decrease to the level of the newest tier as the old tier population declines and is replaced by new tier members,
2. The employer contribution will remain level throughout the amortization period,
3. Thus, the net amount available to amortize the UAAL will increase over time,
4. The unfunded actuarial accrued liability will increase in nominal dollars until the net amount for amortization is large enough to cover the interest charges, or approximately 2026, and then begin to decrease,
5. The unfunded actuarial accrued liability will be fully amortized after 26 years, and
6. In the absence of benefit improvements and in consistent financial markets, the funded ratio should increase steadily until it reaches 100%.

However, it is important to again note that these statements are based on the actual experience meeting the current assumptions. Also, these statements depend upon the employers meeting the contribution requirements established by the 2017 Legislature. Future changes to the actuarial assumptions or future changes to reduce the contribution requirements could significantly change the outlook of the ERS and the expectation on when the ERS will reach a 100% funded level.

This valuation assumed the continuing ability of the plan sponsors to make the contributions necessary to fund this plan. A determination regarding whether or not the plan sponsor is actually able to do so is outside our scope of expertise and was not performed.

BENEFIT PROVISIONS AND LEGISLATIVE CHANGES

This is the eight valuation with members covered under the new benefit tier.

There have been no changes in the benefit provisions since the prior valuation. See Table 16 of this report for more details on the benefit provisions for members of the ERS. However, the 2017 Legislature



passed Act 017 which contained significant increases to the employer contribution rates over a 4-year period. These increases have improved the outlook of ERS. As long as the contributions are made, the ERS's funded status should improve and the ERS should be able to absorb moderate adverse experience without a need to further increase the contribution rates.

ASSUMPTIONS AND METHODS

The actuarial assumptions used were adopted by the Board in August of 2019 based on the recommendations provided by an Experience Study performed by GRS. The actuarial assumptions and methods are the same as used in the prior valuation.

Further detail on the assumptions and methods may be found in Table 18 of this report.

The actuarial assumptions represent estimates of future experience and are not market measures. The results of the actuarial valuation are dependent on the actuarial assumptions used. Actual results can and almost certainly will differ, as actual experience deviates from the assumptions. Even seemingly minor changes in the assumptions can materially change the liabilities, calculated contribution rates and funding periods. Based on the scope of this engagement, we have not performed analysis on the potential range of future measurements based on other factors. The actuarial calculations are intended to provide information for rational decision making.

In our opinion, the assumptions are internally consistent and are reasonably based on the actual experience of ERS.

This report was prepared using our proprietary valuation model and related software which in our professional judgment has the capability to provide results that are consistent with the purposes of the valuation and has no material limitations or known weaknesses. We performed tests to ensure that the model reasonably represents that which is intended to be modeled.

DATA

Member data for retired, active, and inactive participants was supplied as of March 31, 2020, by ERS's staff. We have not subjected this data to any auditing procedures, but have examined the data for reasonableness and consistency with the prior year's data. Asset information was supplied by ERS's staff.

RESPONSIBILITY FOR TABLES AND SCHEDULES

The actuary is responsible for the information with respect to years after 1999 in the Required Supplementary Information, and the Notes to Required Supplementary Information in the Financial Section of the ERS's Comprehensive Annual Financial Report (CAFR). Information with respect to years prior to 2000 was supplied by ERS.




Tables and schedules in the Actuarial Section of the CAFR were generally prepared directly by the Actuary. However, certain of these tables were prepared by ERS utilizing information from this report. When the tables were prepared by ERS from our report, they are so noted.

The undersigned are independent actuaries and consultants. Mr. Newton is an Enrolled Actuary, a Member of the American Academy of Actuaries and meets the Qualification Standards of the American Academy of Actuaries. Finally, all of the undersigned are experienced in performing valuations for large public retirement systems.

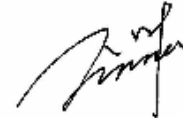
Sincerely,



Joseph P. Newton, FSA, EA
Pension Market Leader & Actuary



Lewis Ward
Consultant



Linna Ye, ASA, MAAA
Actuary

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SECTION A – EXECUTIVE SUMMARY

The following table summarizes the key results of the June 30, 2020 actuarial valuation of the Employees' Retirement System of the State of Hawaii (ERS).

Item	2020	2019
Membership <ul style="list-style-type: none"> • Number of <ul style="list-style-type: none"> - Active members - Retirees and beneficiaries - Inactive, vested - Total • Covered payroll for active members • Actual benefit payments and refunds 	66,750 51,153 9,204 <hr style="width: 100%;"/> 127,107 \$4,523 million \$1,568 million	66,383 49,885 9,321 <hr style="width: 100%;"/> 125,589 \$4,393 million \$1,486 million
Assets <ul style="list-style-type: none"> • Actuarial (smoothed) value • Market value • Return on actuarial value • Return on market value • Employer contributions during fiscal year • External cash flow % 	\$18,084 million \$17,385 million 5.6% 2.1% \$1,099 million (1.1%)	\$17,322 million \$17,227 million 6.8% 5.7% \$923 million (1.8%)
Actuarial Information <ul style="list-style-type: none"> • Total normal cost % (employee + employer) • Unfunded actuarial accrued liability (UAAL) • Funded ratio (based on smoothed assets) • Funded ratio (based on market assets) • Funding period (years)* • Employer contribution rate % of projected payroll** For FY beginning July 1 	14.12% \$14,607 million 55.3% 53.2% 26 26.00%	14.13% \$14,074 million 55.2% 54.9% 26 23.61%

* Funding Period based on actuarial value of assets, scheduled increases in employer contribution rates, and an open group projection reflecting changes in benefits and future member contribution rates.

** Weighted average of 41.0% Contribution Rate for Police and Firefighters and 24.0% Contribution Rate for All Other Employees for fiscal year beginning July 1, 2020.
 Weighted average of 36.0% Contribution Rate for Police and Firefighters and 22.0% Contribution Rate for All Other Employees for fiscal year beginning July 1, 2019.



SECTION B – INTRODUCTION

The results of the June 30, 2020 actuarial valuation of ERS are presented in this report.

The primary purpose of the valuation report is to determine the adequacy of the current employer contribution rates through measuring the resulting funding period, to describe the current financial condition of ERS, and to analyze changes in ERS's condition.

In preparing this valuation, Gabriel, Roeder, Smith & Company (GRS) has relied on employee data and asset information provided by the staff of ERS. While not verifying the data at their source, GRS has performed such tests for consistency and reasonableness as has been deemed necessary to be satisfied with the appropriateness of using the data supplied.

Section C discusses the funded status of ERS. Section D analyzes the change in the UAAL. Section G discusses the disclosure requirements of GASB No. 67.

Sections E, F, H, and I discuss background information used in the preparation of this report--benefit provisions, actuarial assumptions and methods, financial information, and membership data. Section J contains a discussion about risk and plan maturity measures and a table showing current and historical risk metrics. Section K contains a final summary and some closing comments about this year's valuation and Section L contains the actuarial certification.

All the tables referenced by the other sections appear in Section M.

SECTION C – FUNDED STATUS

Table 1 shows the development of the Plan's liabilities and funded status for the current year and compares it with those of the prior year.

The calculation of the funded status involves the following steps and includes the following comments:

- The actuarial present value of future benefits is determined for the present members, including retired members, beneficiaries, inactive members, and active members. This amounts to \$38.2 billion. Table 2 shows the development of this total for the current year and the prior year.
- The individual entry age normal funding method is used to allocate the actuarial present value of future benefits between that portion due for the current year (the normal cost), prior years (the actuarial accrued liability) and future years (the present value of future normal cost). Under the individual entry age normal cost method, the current and future normal costs are determined as a level percentage of payroll. Table 3 shows an analysis of the normal cost for the current year and the prior year. The amount needed to fund the current and future normal costs is 26.38% of pay for Police and Fire employees and 12.44% for All Other Employees. It includes all of the employees' contribution (if any) and the employers' normal cost rate.
- The impact of the new tier of benefits can be seen in comparing the normal cost for the employee groups from the prior year to the current year. The change in the Total Normal Cost rate shows the impact of the change in benefits between the old tier and the new tier. The change in the employer normal cost rate shows both the impact on the change in benefits and the larger contribution rates paid by employees in the new tier. We expect a year-to-year decrease in the normal cost and for that to continue for at least the next decade.
- A part of the normal cost is paid by the employee contributions of 12.60% of pay for Police and Firefighters, leaving 13.78% of pay to be funded by the employers. Thus the current year's employer normal cost for Police and Firefighters is deemed to be 13.78% of the valuation payroll. As for the All Other Employees group, the average weighted effective employee contribution rate is 5.54% of pay, leaving 6.90% of pay to be funded by the employers. This is shown in Line 3 of Table 1.
- The UAAL is \$14.607 billion for 2020, an increase from \$14.074 billion in 2019. As indicated in Table 1, the UAAL equals the difference between the total actuarial accrued liability (Item 7) and current actuarial assets (Item 8).
- In determining the number of years that will be required to amortize the UAAL, an assumption is made concerning future growth of the ERS covered payroll. Payroll can grow from intrinsic growth in the pay of individual members and it can also grow due to active membership growth. In determining the funding period of the ERS, we have assumed that the number of active members will remain constant in our open group projection.

SECTION C – FUNDED STATUS (CONTINUED)

- As shown in Item 10 of Table 1 and on Table 9c, the period to fund the UAAL is 28 years for the Police and Fire and 25 years for the All Other Employees group (i.e. the UAAL is expected to be paid off in fiscal year 2045). When combining both groups, the aggregate funding period for ERS is 26 years. Since the aggregate funding period based on the contribution rates is less than 30 years, the employer contribution rates are adequate to meet the requirements of Hawaii Revised Statutes §88-122(e)(1). Please note that this statement assumes the current contribution rates will remain in effect throughout the entire funding period.

As of the valuation date, ERS has a funded ratio of 55.3%, based on the actuarial value of assets.

Due to the significant changes in the future contribution rates and benefits for employees hired after June 30, 2012, the ERS funding policy uses an open group projection for determining how many years it will take to eliminate the unfunded liabilities of the ERS. The ERS is expected to be fully funded in 2046 which is 26 years from now. Therefore, the funding period is equal to 26 years. The open group projection assumes that the number of active members will remain constant and that there will be no actuarial gains or losses on liabilities or investments.

SECTION D – ANALYSIS OF CHANGES

Section C has noted that the unfunded actuarial accrued liability (UAAL) is \$14.607 billion as of June 30, 2020 compared to the \$14.074 billion UAAL for 2019.

Table 7 develops the estimated yield for the year based on two measures of asset values. Table 9b takes the information contained in Table 6 and develops the expected value of actuarial assets for this valuation, based on the prior year's investment return assumption of 7.00%.

As shown in Item 6 of Table 9b, the expected value of actuarial assets as of June 30, 2020 is \$18.328 billion. As developed in Table 6, the actual value of actuarial assets as of the valuation date is \$18.084 billion (as repeated in Item 7 of Table 9b). Thus the loss for the year is the difference between the actual value and the expected value, or \$243.5 million (as shown in Item 8). This asset loss for the year is a direct reflection of the estimated yield for the year based on the value of actuarial assets, namely 5.59% (as shown in Item B4 of Table 7) being less than the assumed rate of return.

The markets returned a negative result in FY 2020 with a return of 2.09% on the market value of assets, which is significantly below our benchmark of 7.0%. Therefore, the return for the year was less than our expectation. The rate of return for the actuarial value was 5.59%, which is greater than the market return due to the smoothing methodology used in the determination of the actuarial value of assets. The actuarial value of assets exceeds the market value of assets by \$699 million, so there are \$699 million in deferred investment losses still to be recognized in the actuarial value of assets.

Table 9a shows the total unanticipated change in the unfunded actuarial accrued liability was \$308 million (item 7), this means the UAAL increased \$308 million more than expected from all sources for the 2018/2019 plan year. As noted above, the actuarial investment loss was equal to \$244 million. This means that there was a liability loss during the year equal to almost \$64 million. The liability experience loss is primarily due to larger than expected salary increases for the Police and Fire employee group. For Tier 1 members, the pensionable earnings include overtime, and it is possible a source of the higher salaries was higher than average overtime during the fiscal year. If so, some of the loss from this valuation will likely be offset by a gain in the future if the overtime returns to normal levels.

Table 9c shows the current year's valuation results plus a 30-year open group projection of the ERS's assets and liabilities. As discussed previously, this projection assumes no actuarial gains or losses in the actuarial liabilities or the actuarial value of assets. In addition, the projection assumes the current employer contribution rates will continue and reflects the changes to the benefits and member contribution rates of employees hired after June 30, 2012. As may be seen by examining this table, the unfunded liability of the ERS (Column 7) is expected to grow as a dollar amount until 2026 before beginning to decline and finally being eliminated in 2046.

The June 30, 2046 valuation is 26 years from this valuation. Therefore, for the purpose of satisfying Hawaii Revised Statutes §88-122(e)(1) the funding period is considered to be 26 years.

SECTION E – ERS ASSETS

Table 4 presents a summary of the market value of assets held by the ERS. About 58% of the total invested assets available for benefits are held in equities (including alternative investments) and real estate compared to about 60% last year. Table 5 shows a reconciliation of the assets from the beginning of the prior year to the valuation date.

Table 6 shows the development of the Actuarial Value of Assets (AVA). An actuarial value is used in order to dampen some of the year-to-year fluctuations which would occur if the market value were used instead. The expected actuarial value of assets is calculated and compared to the actual market value of assets. This difference is then compared with the remaining deferrals from the prior years to determine this year's excess/shortfall. The current year's excess/shortfall is offset directly against any prior years' deferrals of the opposite sign (oldest bases first). Any remaining bases are then recognized over four year period from the date the base was established. Any remaining deferrals, after the current year's recognition, are then subtracted from the market value of assets to get the final actuarial value of assets. This method has the advantage of more quickly converging towards the market value in years when the returns go in the opposite direction of the prior years.

Table 7 shows an estimate of the ERS's dollar-weighted rate of return for the year. This is shown on (i) the market value of assets (reflecting all realized and unrealized gains and losses), and (ii) the actuarial value of assets. While the dollar-weighted market return this year was 2.09%, the return on the actuarial value was 5.59%. The difference between these is due to the smoothing effect of the AVA valuation method.

Table 9b determines the asset gain or loss for the year, based on the difference between the actual fund return and the actuarial value of assets and the prior year's assumed rate of 7.00%.

Finally, Table 13 shows a history of cash flows for the trust.

SECTION F – BENEFIT AND CONTRIBUTION PROVISIONS

Table 16 summarizes the benefit provisions of ERS used in this valuation. Table 17 is a historical record of prior legislative changes starting with changes effective in 1999. There were significant changes made by the 2011 Legislature to the benefit provisions of the ERS for employees hired after June 30, 2012. Because the Board has chosen to use the Individual Entry Age Normal Cost method, the normal cost and the growth of the accrued liabilities will be slowly impacted by the changes in the benefit provisions, as members under the new tier are hired to replace members who are covered under the older tier of benefits.

There have been no changes to the benefit provisions since the last valuation that had an actuarial impact on the valuation. However, there have been significant changes to the statutory employer contribution rates. The 2017 Legislature enacted ACT 017 which increases the employer contribution rates over a four year period.

The employer contribution rates for Police and Fire employees are 41% of pay in FY 2021 and beyond while the employer contribution rates for All Other Employees are 24% of pay in FY 2021 and beyond.

This valuation reflects benefits promised to members by the ERS's statutes. There are no ancillary benefits - retirement type benefits not required by the ERS's statutes but which might be deemed an ERS liability if continued beyond the availability of funding by the current funding source.

Act 179/2004 was adopted during FY2003/2004 and established the new Hybrid class that became effective on July 1, 2006. Current participants had the choice to elect to move to the new class or stay in the current plan. There were 26,228 plan members who elected to transfer. The Hybrid class membership has since grown to more than 50,000 members.

SECTION G – GASB DISCLOSURE

The Governmental Accounting Standards Board (GASB) has issued Statement No. 67 which provides the manner in which the actuarial condition of a public sector retirement plan is to be disclosed in the system's financial statements. This new standard replaces GASB No. 25, and went into effect for the ERS for fiscal years ending on or after June 30, 2014.

Similar to last year, we will provide a separate accounting report with the required disclosures under this new standard.

SECTION H – ACTUARIAL ASSUMPTIONS AND METHODS

In determining costs and liabilities, actuaries use assumptions about the future, such as rates of salary increase, probabilities of retirement, termination, death and disability, and an investment return assumption. The ERS's Board adopts the assumptions used, taking into account the actuary's recommendations.

In addition to the actuarial assumptions, the actuary also makes use of an actuarial funding method to allocate costs to particular years. In common with most public sector plans, ERS uses the entry age normal method (individual normal cost). This method produces a relatively level pattern of funding for individual employees over time. We believe this method is appropriate for ERS.

The ERS's Board adopted new actuarial assumptions on August 12, 2019 to be used effective with the June 30, 2019 actuarial valuation. For a complete description of the recommended assumption changes please see our experience study report dated July 30, 2019.

Please see Table 18 for a complete description of the actuarial assumptions and methods.

SECTION I – MEMBERSHIP DATA

Membership data was provided in electronic files, via a secured file transfer protocol, by the staff. Data for active members include sex, birthdate, service, pay rate as of March 2020, employer entity and accumulated employee contributions. Data for inactive, nonretired members was similar, but also includes the members' unreduced benefit. For retired members, data includes status (service retiree, disabled retiree or beneficiary), sex, birthdate, pension amount, pension COLA amount, form of payment, beneficiary sex and birthdate if applicable, and date of retirement.

While not verifying the correctness of the data at the source, we performed various tests to ensure the internal consistency of the data and its overall reasonableness. Membership statistics are summarized in Table 12a. Table 12b summarizes certain active member data, and the age/service distribution of active members is shown in Table 19. Tables 30-43 show various distributions of retirees.

Since last year, the number of active members increased by 367 members from 66,383 to 66,750. These 66,750 active members are distributed as follows:

<u>Category</u>	<u>Number</u>	<u>% of Total</u>
(1)	(2)	(3)
Police & Fire	4,940	7.4%
Contributory	608	0.9%
Noncontributory	11,191	16.8%
Hybrid	<u>50,011</u>	<u>74.9%</u>
Total	66,750	100.00%

Covered payroll (which is the annualized pay for all active members on the census date) increased by 3.0% since last year. ERS also provided the actual aggregate payroll for fiscal year 2020 on which contributions were received (this includes payroll for members who terminated and retired during the year). The lesser of the covered payroll and the aggregate payroll is adjusted by the payroll growth rate to produce the *projected FY 2021 payroll for contribution purposes*, as shown in Item 1 of Table 1.

Average age of the active members remained unchanged at 47.9 and the average service also remained unchanged at 13.1 years.

SECTION J – ASSESSMENT AND DISCLOSURE OF RISK ASSOCIATED WITH MEASURING PENSION OBLIGATIONS AND DETERMINING PENSION PLAN CONTRIBUTIONS

The determination of the accrued liability and an actuarially determined contribution (or funding period) requires the use of assumptions regarding future economic and demographic experience. Risk measures, as illustrated in this report, are intended to aid in the understanding of the effects of future experience differing from the assumptions used in the course of the actuarial valuation. Risk measures may also help with illustrating the potential volatility in the accrued liability and an actuarially determined contribution (or funding period) that result from the differences between actual experience and the actuarial assumptions.

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 due to changing conditions; 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. The scope of an actuarial valuation does not include an analysis of the potential range of such future measurements.

Examples of risk that may reasonably be anticipated to significantly affect the plan's future financial condition include:

1. Investment risk – actual investment returns may differ from the expected returns;
2. Asset/Liability mismatch – changes in asset values may not match changes in liabilities, thereby altering the gap between the accrued liability and assets and consequently altering the funded status and contribution requirements;
3. Contribution risk – actual contributions may differ from expected future contributions. For example, actual contributions may not be made in accordance with the plan's funding policy or material changes may occur in the anticipated number of covered employees, covered payroll, or other relevant contribution base;
4. Salary and Payroll risk – actual salaries and total payroll may differ from expected, resulting in actual future accrued liability and contributions differing from expected;
5. Longevity risk – members may live longer or shorter than expected and receive pensions for a period of time other than assumed;
6. Other demographic risks – members may terminate, retire or become disabled at times or with benefits other than assumed resulting in actual future accrued liability and contributions differing from expected.

The effects of certain trends in experience can generally be anticipated. For example if the investment return since the most recent actuarial valuation is less (or more) than the assumed rate, the cost of the plan can be expected to increase (or decrease). Likewise if longevity is improving (or worsening), increases (or decreases) in cost can be anticipated.

SECTION J – ASSESSMENT AND DISCLOSURE OF RISK ASSOCIATED WITH MEASURING PENSION OBLIGATIONS AND DETERMINING PENSION PLAN CONTRIBUTIONS (CONTINUED)

PLAN MATURITY MEASURES

Risks facing a pension plan evolve over time. A young plan with virtually no investments and paying few benefits may experience little investment risk. An older plan with a large number of members in pay status and a significant trust may be much more exposed to investment risk. Several generally accepted plan maturity measures are described below and are followed by a table showing a 10-year history of the measurements for ERS.

RATIO OF MARKET VALUE OF ASSETS TO PAYROLL

The relationship between assets and payroll is a useful indicator of the potential volatility of contributions. For example, if the market value of assets is 2.0 times the payroll, a return on assets 5% different than assumed would equal 10% of payroll. A higher/lower or increasing/decreasing level of this maturity measure generally indicates a higher/lower or increasing/decreasing volatility in plan sponsor contributions as a percentage of payroll.

RATIO OF ACTUARIAL ACCRUED LIABILITY TO PAYROLL

The relationship between actuarial accrued liability and payroll is a useful indicator of the potential volatility of contributions for a fully funded plan. A funding policy that targets a funded ratio of 100% is expected to result in the ratio of assets to payroll and the ratio of liability to payroll converging over time.

The ratio of liability to payroll may also be used as a measure of sensitivity of the liability itself. For example, if the actuarial accrued liability is 2.5 times the payroll (5 to 2 ratio), a change in liability 2% other than assumed would equal 5% of payroll. A higher/lower or increasing/decreasing level of this maturity measure generally indicates a higher/lower or increasing/decreasing volatility in liability (and also plan sponsor contributions) as a percentage of payroll.

RATIO OF ACTIVES TO RETIREES AND BENEFICIARIES

A young plan with many active members and few retirees will have a high ratio of active to retirees. A mature open plan may have close to the same number of actives to retirees resulting in a ratio near 1.0. A super-mature or closed plan may have significantly more retirees than actives resulting in a ratio below 1.0.

RATIO OF NET CASH FLOW TO MARKET VALUE OF ASSETS

A positive net cash flow means contributions exceed benefits and expenses. A negative cash flow means existing funds are being used to make payments. A certain amount of negative net cash flow is generally expected to occur when benefits are prefunded through a qualified trust. Large negative net cash flows as a percent of assets may indicate a super-mature plan or a need for additional contributions.

DURATION OF ACTUARIAL ACCRUED LIABILITY

The duration of the actuarial accrued liability may be used to approximate the sensitivity to a 1% change in the assumed rate of return. For example, duration of 10 indicates that the liability would increase approximately 10% if the assumed rate of return were lowered 1%.



SECTION J – ASSESSMENT AND DISCLOSURE OF RISK ASSOCIATED WITH MEASURING PENSION OBLIGATIONS AND DETERMINING PENSION PLAN CONTRIBUTIONS (CONTINUED)

ADDITIONAL RISK ASSESSMENT

Additional assessment may include scenario tests, sensitivity tests, stochastic modeling, stress tests, and a comparison of the present value of accrued benefits at low-risk discount rates with the actuarial accrued liability. While a robust measurement of additional risk assessment is outside the scope of the annual actuarial valuation, some scenario tests and sensitivity tests are included in the valuation summary PowerPoint presentation presented to the Board at the Board's January Board Meeting.

In addition an annual stress test as prescribed by state law is conducted each year. Please see the stress test report dated December 31, 2020, which was conducted in conjunction with this valuation.

SECTION J – ASSESSMENT AND DISCLOSURE OF RISK ASSOCIATED WITH MEASURING PENSION OBLIGATIONS AND DETERMINING PENSION PLAN CONTRIBUTIONS (CONTINUED)

	2020	2019	2018	2017	2016	2015	2014	2013	2012	2011
Ratio of the market value of assets to payroll	3.75	3.81	3.79	3.68	3.30	3.48	3.56	3.16	2.90	2.97
Ratio of actuarial accrued liability to payroll	7.06	6.95	6.82	6.72	6.44	5.57	5.57	5.44	5.32	5.13
Ratio of actives to retirees and beneficiaries	1.30	1.33	1.36	1.40	1.48	1.52	1.56	1.58	1.61	1.65
Ratio of net cash flow to market value of assets	-1.1%	-1.8%	-2.0%	-2.0%	-1.9%	-1.8%	-2.0%	-2.5%	-2.7%	-1.9%
Duration of the actuarial accrued liability*	15.03	15.11	NA	NA	NA	NA	NA	NA	NA	NA

*Duration measure not available prior to 2019

SECTION K – SUMMARY AND CLOSING COMMENTS

To summarize the results of the actuarial valuation of the Employees' Retirement System as of June 30, 2020, it is our opinion that if all assumptions are met going forward, the present assets plus future required contributions will be sufficient to provide the benefits specified in the law.

This year's valuation shows that the ERS is expected to be fully funded in 2046 (26 years from this year's valuation date), which is one year later than the projected year in last year's valuation.

Based on this year's valuation results, the statutory contribution rates are sufficient to eliminate the UAAL over a period of 30 years or less as specified by Hawaii Revised Statute 88-122(e)(1).

As noted above it is now expected to take one year longer than indicated by last year's valuation to achieve full funding. This is due to the actuarial losses on liabilities and investments that occurred in FY2020.

Our modeling continues to show that the new contribution levels should be able to absorb material adverse experience without resulting in a need for further contribution rate increases. Moderate adverse experience may result in the date the ERS obtaining a fully funded status in a year later than 2046, but it is not expected to result in a requirement for further contribution rate increases.

The results of this valuation are cautionary. The period over which the ERS is expected to achieve full funding increased primarily due to investment losses and significant salary increases especially for Police and Fire employees. The end date for achieving full funding for All Other Employees did lengthen by one year when compared with last year (2045 versus 2044), and the length of time for Police and Fire employees increased by 1 years from 2047 to 2048. Also, the ERS is now deferring over \$600 million in investment losses. If these deferred investment losses are recognized instead of being offset but investment gains, the end date for achieving full funding could be pushed out additional years.

Finally, while the last two years have seen the end date for achieving a fully funded status move farther out. It is important to note that the ERS is still on schedule to achieve a fully funded status in the same year that was illustrated in the impact statements provided to the 2017 Legislature when they adopted the current contribution schedule.

SECTION L – ACTUARIAL CERTIFICATION STATEMENT

	Police and Firefighters June 30, 2020 (1)	All Other Employees June 30, 2020 (2)	All Employees June 30, 2020 (3)
1. Gross normal cost as a percentage of pay	26.38%	12.44%	14.12%
2. Present value of future benefits			
a. Active employees	\$ 4,195,196,544	\$ 15,281,150,289	\$ 19,476,346,833
b. Inactive members	79,482,769	920,479,464	999,962,233
c. Pensioners and beneficiaries	3,473,676,818	14,247,263,100	17,720,939,918
d. Total	<u>\$ 7,748,356,131</u>	<u>\$ 30,448,892,853</u>	<u>\$ 38,197,248,984</u>
3. Present value of future employee and employer contributions			
a. Present value of future normal costs	\$ 1,328,565,986	\$ 4,176,927,154	\$ 5,505,493,140
b. Present value of future employee contributions	679,510,147	2,068,032,535	2,747,542,682
c. Present value of future employer normal costs (Item 3a - Item 3b)	\$ 649,055,839	\$ 2,108,894,619	\$ 2,757,950,458
4. Actuarial accrued liability (Item 2d - Item 3a)	\$ 6,419,790,145	\$ 26,271,965,699	\$ 32,691,755,844
5. Actuarial value of assets			
a. Annuity Savings Fund	\$ 1,244,568,885	\$ 1,920,083,500	\$ 3,164,652,385
b. Pension Accumulation Fund	2,527,929,604	12,391,800,910	14,919,730,514
c. Total	<u>\$ 3,772,498,489</u>	<u>\$ 14,311,884,410</u>	<u>\$ 18,084,382,899</u>
6. Unfunded actuarial accrued liability	\$ 2,647,291,656	\$ 11,960,081,289	\$ 14,607,372,945
7. Adequacy of contribution rates			
a. Statutory Contribution Rate for Fiscal Year Fiscal Year 2021	41.00%	24.00%	26.00%
b. Funding Period in years as of June 30, 2020*	28	25	26

* The Funding Period is calculated using an open group projection which reflects the impact of both the new employer contribution rates schedule and the benefits and member contribution rates for employees hired after June 30, 2012.



SECTION L – ACTUARIAL CERTIFICATION STATEMENT (CONTINUED)

The actuarial valuation as of June 30, 2020 is based on the provisions of Chapter 88 of the Hawaii Revised Statutes, as amended. The assumptions used in the cost calculations were those adopted by the Board of Trustees on August 12, 2019 based on the actuary's actuarial experience investigation report for the period ending June 30, 2018. The actuarial calculations were performed by qualified actuaries in accordance with accepted actuarial procedures.

In our opinion, the comparison of the current contribution policies to ERS's liabilities were calculated in accordance with the provisions of Chapter 88 regarding the funding of the Employees' Retirement System on an actuarial reserve basis.

All of our work conforms with generally accepted actuarial principles and practices, and with the Actuarial Standards of Practice issued by the Actuarial Standards Board. In our opinion, our calculations also comply with the requirements of state law and, where applicable, the Internal Revenue Code, ERISA, and the Statements of the Governmental Accounting Standards Board. The undersigned is an independent actuary and consultant. Mr. Newton is an Enrolled Actuary, a Member of the American Academy of Actuaries and meets the Qualification Standards of the American Academy of Actuaries. Finally, he is experienced in performing valuations for large public retirement systems.



Joseph P. Newton, FSA, EA, MAAA
Pension Market Leader & Actuary

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TABLE 1

Development of Employer Cost

	Police and Firefighters June 30, 2020 (1)	All Other Employees June 30, 2020 (2)	All Employees June 30, 2020 (3)
1. Projected FY 2021 payroll for contribution purposes	\$ 544,830,476	\$ 4,085,399,815	\$ 4,630,230,291
2. Gross normal cost (Table 3)	26.38%	12.44%	14.12%
3. Employer normal cost rate (Table 3)	13.78%	6.90%	7.73%
4. Present value future benefits (Table 2)	\$ 7,748,356,131	\$ 30,448,892,853	\$ 38,197,248,984
5. Present value future employer normal cost	\$ 649,055,839	\$ 2,108,894,619	\$ 2,757,950,458
6. Present value future employee contributions	\$ 679,510,147	\$ 2,068,032,535	\$ 2,747,542,682
7. Actuarial accrued liability (Item 4 - Item 5 - Item 6)	\$ 6,419,790,145	\$ 26,271,965,699	\$ 32,691,755,844
8. Actuarial value of assets	\$ 3,772,498,489	\$ 14,311,884,410	\$ 18,084,382,899
9. Unfunded actuarial accrued liability (UAAL) (Item 7 - Item 8)	\$ 2,647,291,656	\$ 11,960,081,289	\$ 14,607,372,945
10. Funding Period*	28	25	26

	Police and Firefighters June 30, 2019 (1)	All Other Employees June 30, 2019 (2)	All Employees June 30, 2019 (3)
1. Projected FY 2020 payroll for contribution purposes	\$ 519,202,297	\$ 4,000,491,950	\$ 4,519,694,247
2. Gross normal cost (Table 3)	26.55%	12.46%	14.13%
3. Employer normal cost rate (Table 3)	14.02%	7.07%	7.89%
4. Present value future benefits (Table 2)	\$ 7,330,373,403	\$ 29,407,679,596	\$ 36,738,052,999
5. Present value future employer normal cost	\$ 637,639,225	\$ 2,119,482,767	\$ 2,757,121,992
6. Present value future employee contributions	\$ 640,268,219	\$ 1,944,215,103	\$ 2,584,483,322
7. Actuarial accrued liability (Item 4 - Item 5 - Item 6)	\$ 6,052,465,959	\$ 25,343,981,726	\$ 31,396,447,685
8. Actuarial value of assets	\$ 3,551,743,411	\$ 13,770,450,696	\$ 17,322,194,107
9. Unfunded actuarial accrued liability (UAAL) (Item 7 - Item 8)	\$ 2,500,722,548	\$ 11,573,531,030	\$ 14,074,253,578
10. Funding Period*	28	25	26

* The Funding Period is calculated using an open group projection which reflects the impact of both the new employer contribution rates schedule and the benefits and member contribution rates for employees hired after June 30, 2012. Please refer to Table 9c for the full projection.



TABLE 2**Actuarial Present Value of Future Benefits**

	Police and Firefighters June 30, 2020 (1)	All Other Employees June 30, 2020 (2)	All Employees June 30, 2020 (3)
1. Active members			
a. Service retirement benefits	\$ 4,026,844,092	\$ 13,965,295,501	\$ 17,992,139,593
b. Termination Benefits	114,838,599	870,432,213	985,270,812
c. Survivor benefits	19,508,421	129,364,833	148,873,254
d. Disability retirement benefits	34,005,432	316,057,742	350,063,174
e. Total	\$ 4,195,196,544	\$ 15,281,150,289	\$ 19,476,346,833
2. Retired members			
a. Service retirement	\$ 3,265,083,643	\$ 13,156,827,978	\$ 16,421,911,621
b. Disability retirement	36,232,215	282,943,658	319,175,873
c. Beneficiaries	172,360,960	807,491,464	979,852,424
d. Total	\$ 3,473,676,818	\$ 14,247,263,100	\$ 17,720,939,918
3. Inactive members			
a. Vested terminations	\$ 73,308,524	\$ 790,006,745	\$ 863,315,269
b. Nonvested terminations	6,174,245	130,472,719	136,646,964
c. Total	\$ 79,482,769	\$ 920,479,464	\$ 999,962,233
4. Total actuarial present value of future benefits	\$ 7,748,356,131	\$ 30,448,892,853	\$ 38,197,248,984

	Police and Firefighters June 30, 2019 (1)	All Other Employees June 30, 2019 (2)	All Employees June 30, 2019 (3)
1. Active members			
a. Service retirement benefits	\$ 3,859,043,305	\$ 13,596,788,804	\$ 17,455,832,109
b. Termination Benefits	110,568,937	845,427,012	955,995,949
c. Survivor benefits	18,791,799	126,515,261	145,307,060
d. Disability retirement benefits	32,201,533	303,820,751	336,022,284
e. Total	\$ 4,020,605,574	\$ 14,872,551,828	\$ 18,893,157,402
2. Retired members			
a. Service retirement	\$ 3,040,786,559	\$ 12,614,610,560	\$ 15,655,397,119
b. Disability retirement	34,619,141	263,829,249	298,448,390
c. Beneficiaries	156,594,832	760,677,866	917,272,698
d. Total	\$ 3,232,000,532	\$ 13,639,117,675	\$ 16,871,118,207
3. Inactive members			
a. Vested terminations	\$ 72,308,757	\$ 783,113,393	\$ 855,422,150
b. Nonvested terminations	5,458,540	112,896,700	118,355,240
c. Total	\$ 77,767,297	\$ 896,010,093	\$ 973,777,390
4. Total actuarial present value of future benefits	\$ 7,330,373,403	\$ 29,407,679,596	\$ 36,738,052,999

TABLE 3**Analysis of Normal Cost**

	Police and Firefighters June 30, 2020	All Other Employees June 30, 2020	All Employees June 30, 2020
	(1)	(2)	(3)
1. Normal cost as a percent of pay			
a. Service retirement benefits	23.38%	9.19%	10.90%
b. Deferred termination benefits	1.18%	0.83%	0.87%
c. Refunds	0.87%	1.47%	1.40%
d. Disability retirement benefits	0.41%	0.47%	0.46%
e. Survivor benefits	0.19%	0.13%	0.14%
f. Administrative Expenses	0.35%	0.35%	0.35%
g. Total	26.38%	12.44%	14.12%
2. Employee contribution rate	12.60%	5.54%	6.39%
3. Effective employer normal cost rate (Item 1g - Item 2)	13.78%	6.90%	7.73%

	Police and Firefighters June 30, 2019	All Other Employees June 30, 2019	All Employees June 30, 2019
	(1)	(2)	(3)
1. Normal cost as a percent of pay			
a. Service retirement benefits	23.54%	9.24%	10.93%
b. Deferred termination benefits	1.19%	0.84%	0.88%
c. Refunds	0.87%	1.44%	1.37%
d. Disability retirement benefits	0.41%	0.46%	0.46%
e. Survivor benefits	0.19%	0.13%	0.14%
f. Administrative Expenses	0.35%	0.35%	0.35%
g. Total	26.55%	12.46%	14.13%
2. Employee contribution rate	12.53%	5.39%	6.24%
3. Effective employer normal cost rate (Item 1g - Item 2)	14.02%	7.07%	7.89%

TABLE 4

**Statement of Net Position
(Assets at Market or Fair Value)**

Item	Valuation as of	
	June 30, 2020	June 30, 2019
1. Cash and cash equivalents	\$ 3,312,051,850	\$ 2,362,691,855
2. Receivables:		
a. Accounts receivable and others	\$ 5,728,204	\$ 4,548,592
b. Investment sale proceeds	150,789,478	115,157,638
c. Accrued income	38,399,145	52,743,120
d. Member and employer contributions	54,670,412	49,826,612
e. Subtotal	<u>\$ 249,587,239</u>	<u>\$ 222,275,962</u>
3. Investments		
a. Equity securities	\$ 6,422,516,554	\$ 7,208,854,437
b. Fixed income securities	4,131,855,027	4,740,413,816
c. Real estate investments	1,531,902,816	1,322,644,117
d. Alternative investments	2,199,495,724	1,842,502,723
e. Subtotal	<u>\$ 14,285,770,121</u>	<u>\$ 15,114,415,093</u>
4. Other		
a. Invested securities lending collateral	\$ 992,602,987	\$ 1,021,730,729
b. Equipment at cost, net of depreciation	7,654,129	6,617,009
c. Other assets	-	-
d. Subtotal	<u>\$ 1,000,257,116</u>	<u>\$ 1,028,347,738</u>
5. Total assets	\$ 18,847,666,326	\$ 18,727,730,648
6. Liabilities		
a. Accounts payable	\$ 128,401,072	\$ 105,797,810
b. Investment commitments payable	150,439,791	193,066,322
c. Securities lending collateral	992,602,987	1,021,730,729
d. Notes payable	190,742,000	180,108,800
e. Total liabilities	<u>\$ 1,462,185,850</u>	<u>\$ 1,500,703,661</u>
7. Total market value of assets available for benefits (Item 5 - Item 6e)	\$ 17,385,480,476	\$ 17,227,026,987
% in equities	10,153,915,094 58%	10,374,001,277 60%

TABLE 5

Statement of Changes in Net Position

	Year Ending	
	June 30, 2020	June 30, 2019
1. a. Value of assets at beginning of year	\$ 17,227,026,987	\$ 16,598,407,973
b. Adjustment due to post valuation changes in CAFR assets	-	-
c. Adjusted value of assets at beginning of year	\$ 17,227,026,987	\$ 16,598,407,973
2. Revenue for the year		
a. Contributions		
i. Member contributions	\$ 287,398,031	\$ 273,223,578
ii. Employer contributions	1,098,589,013	922,635,334
iii. Total	\$ 1,385,987,044	\$ 1,195,858,912
b. Income		
i. Interest, dividends, and other income	\$ 484,153,583	\$ 474,513,941
ii. Investment expenses	(86,461,633)	(40,370,043)
iii. Net	\$ 397,691,950	\$ 434,143,898
c. Net realized and unrealized gains/(loss)	\$ (39,409,286)	\$ 498,552,514
d. Net income/(loss)	\$ 358,282,664	\$ 932,696,412
e. Total revenue	\$ 1,744,269,708	\$ 2,128,555,324
3. Expenditures for the year		
a. Refunds	\$ 22,443,593	\$ 16,502,635
b. Benefit payments	1,545,589,761	1,469,634,809
c. Administrative and miscellaneous expenses	17,782,865	13,798,866
d. Total expenditures	\$ 1,585,816,219	\$ 1,499,936,310
4. Increase/(decrease) in net assets (Item 2e - Item 3d)	\$ 158,453,489	\$ 628,619,014
5. Value of assets at end of year (Item 1c + Item 4)	\$ 17,385,480,476	\$ 17,227,026,987

TABLE 6

Development of Actuarial Value of Assets

	Year Ending June 30, 2020
1. Actuarial value of assets, beginning of year	\$ 17,322,194,107
2. Net new investments	
a. Contributions	\$ 1,385,987,044
b. Benefits paid and Refunds	(1,568,033,354)
c. Administrative expenses	(17,782,865)
d. Subtotal	(199,829,175)
3. Market value of assets at end of year	\$ 17,385,480,476
4. Expected return on actuarial value of assets	\$ 1,205,559,566
5. Expected actuarial value of assets, end of year	\$ 18,327,924,498
6. Excess/(shortfall) return (Item 3-Item 5)	\$ (942,444,022)
7. Development of amounts to be recognized as of June 30, 2020:	
Remaining Deferrals of Excess (Shortfall) of	
Investment Income	
Offsetting of Gains/(Losses)	
Net Deferrals Remaining	
Years Remaining	
Recognized for this valuation	
Remaining after this valuation	
Fiscal Year End	(1)
	(2)
	(3) = (1) + (2)
	(4)
	(5) = (3) / (4)
	(6) = (3) - (5)
2017	\$ 0
2018	0
2019	(95,167,120)
2020	(847,276,902)
Total	\$ (942,444,022)
\$ 0	\$ 0
0	0
0	(31,722,373)
0	(211,819,226)
1	\$ 0
2	0
3	(63,444,747)
4	(635,457,676)
\$ (243,541,599)	\$ (698,902,423)
8. Actuarial value of assets as of June 30, 2020 (Item 3 - Item 7)	\$ 18,084,382,899
9. Ratio of actuarial value to market value	104.0%
10. Asset gain/(loss) for year (Item 8 - Item 5)	\$ (243,541,599)

TABLE 7

Estimation of Yields

	June 30, 2020 (1)	June 30, 2019 (2)
A. Market value yield		
1. Beginning of year market assets	\$ 17,227,026,987	\$ 16,598,407,973
2. Investment income		
a. Change in assets (Item 3 - Item 1)	\$ 158,453,489	\$ 628,619,014
b. Cash Flow	<u>(199,829,175)</u>	<u>(304,077,398)</u>
c. Total investment income based on market value (Item 2a less Item 2b)	\$ 358,282,664	\$ 932,696,412
3. End of year market assets	\$ 17,385,480,476	\$ 17,227,026,987
4. Estimated dollar weighted market value yield (net of investment and administrative expenses)	2.09%	5.67%
B. Actuarial value yield		
1. Beginning of year actuarial assets	\$ 17,322,194,107	\$ 16,512,744,474
2. Investment income (based on asset valuation method)		
a. Change in assets (Item 3 - Item 1)	\$ 762,188,792	\$ 809,449,633
b. Cash Flow	<u>(199,829,175)</u>	<u>(304,077,398)</u>
c. Total investment income based on market value (Item 2a less Item 2b)	\$ 962,017,967	\$ 1,113,527,031
3. End of year actuarial assets	\$ 18,084,382,899	\$ 17,322,194,107
4. Estimated actuarial value yield (net of investment and administrative expenses)	5.59%	6.81%

TABLE 8

Allocation of Cash and Investments

	<u>June 30, 2020</u> (1)	<u>June 30, 2019</u> (2)
1. Cash and short-term equivalents	18.8%	13.5%
2. Fixed income securities	23.5%	27.1%
3. Equity securities	36.5%	41.3%
4. Real estate	8.7%	7.6%
5. Other	<u>12.5%</u>	<u>10.5%</u>
6. Total investments	100.0%	100.0%

TABLE 9A**Total Experience Gain or Loss**

Item (1)	Police and Firefighters (2)	All Other Employees (3)	All Employees (4)
A. Calculation of total actuarial gain or loss			
1. Unfunded actuarial accrued liability (UAAL), as of June 30, 2019	\$ 2,500,722,548	\$ 11,573,531,030	\$ 14,074,253,578
2. Normal cost for the year (includes admin expense)	\$ 147,045,443	\$ 497,436,911	\$ 644,482,354
3. Less: contributions and assessments for the year	\$ (282,267,107)	\$ (1,103,719,937)	\$ (1,385,987,044)
4. Interest at 7.00%			
a. On UAAL	\$ 175,050,578	\$ 810,147,172	\$ 985,197,750
b. On normal cost	5,146,591	17,410,292	22,556,883
c. On contributions	(9,879,349)	(38,630,198)	(48,509,547)
d. Total	\$ 170,317,820	\$ 788,927,266	\$ 959,245,086
5. Expected UAAL as of June 30, 2020 (Sum of Items 1 - 4)	\$ 2,535,818,704	\$ 11,756,175,270	\$ 14,291,993,974
6. Actual UAAL as of June 30, 2020	\$ 2,647,291,656	\$ 11,960,081,289	\$ 14,607,372,945
7. Total gain/(loss) for the year (Item 5 - Item 6)	\$ (111,472,952)	\$ (203,906,019)	\$ (315,378,971)
B. Source of gains and losses			
8. Asset gain/(loss) for the year (Table 9b)	\$ (50,775,431)	\$ (192,766,168)	\$ (243,541,599)
9. Gain/(loss) due to change in actuarial assumptions	-	-	-
10. Other liability gain/(loss)	(60,697,521)	(11,139,851)	(71,837,372)
11. Change in benefit provisions	-	-	-
12. Total gain/(loss) for the year	\$ (111,472,952)	\$ (203,906,019)	\$ (315,378,971)

TABLE 9B**Investment Experience Gain or Loss**

Item (1)	June 30, 2020 (2)	June 30, 2019 (3)
1. Actuarial assets, beginning of year	\$ 17,322,194,107	\$ 16,512,744,474
2. Total contributions during year	\$ 1,385,987,044	\$ 1,195,858,912
3. Benefits and refunds paid	\$ (1,568,033,354)	\$ (1,486,137,444)
4. Administrative expenses paid	\$ (17,782,865)	\$ (13,798,866)
5. Assumed net investment income at 7.00%		
a. Beginning of year assets	\$ 1,212,553,586	\$ 1,155,892,113
b. Contributions	48,509,547	41,855,062
c. Benefits and refunds paid	(54,881,167)	(52,014,811)
d. Administrative expenses paid	(622,400)	(482,960)
e. Total	\$ 1,205,559,566	\$ 1,145,249,404
6. Expected actuarial assets, end of year (Sum of items 1 through 5)	\$ 18,327,924,498	\$ 16,484,189,974
7. Actual actuarial assets, end of year	\$ 18,084,382,899	\$ 16,512,744,474
8. Asset gain/(loss) for year (Item 7 - Item 6)	\$ (243,541,599)	\$ 28,554,500
9. Asset gain/(loss) as a percent of actuarial value of assets, end of year (Item 8 / Item 7)	(1.35%)	0.17%

TABLE 9C

Projection Results Based on June 30, 2020 Actuarial Valuation

Valuation as of June 30,	Employer Contribution Rate for Fiscal Year Following Valuation Date	Compensation (in Millions)	Employer Contributions (in Millions)	Actuarial Accrued Liability (AAL, in Millions)	Actuarial Value of Assets (AVA, in Millions)	Unfunded Actuarial Accrued Liability (UAAL, in Millions)	Funded Ratio
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
2020	26.00%	\$ 4,630	\$ 1,204	\$ 32,692	\$ 18,084	\$ 14,607	55.3%
2021	25.99%	4,747	1,234	33,931	19,176	14,755	56.5%
2022	25.99%	4,878	1,268	35,170	20,291	14,879	57.7%
2023	25.98%	5,014	1,303	36,411	21,434	14,978	58.9%
2024	25.97%	5,155	1,339	37,652	22,605	15,047	60.0%
2025	25.96%	5,302	1,377	38,891	23,808	15,084	61.2%
2026	25.95%	5,456	1,416	40,128	25,044	15,084	62.4%
2027	25.92%	5,616	1,456	41,361	26,317	15,044	63.6%
2028	25.92%	5,784	1,499	42,590	27,629	14,960	64.9%
2029	25.92%	5,960	1,545	43,816	28,989	14,827	66.2%
2030	25.92%	6,142	1,592	45,041	30,402	14,638	67.5%
2031	25.92%	6,334	1,642	46,264	31,875	14,390	68.9%
2032	25.92%	6,533	1,693	47,487	33,413	14,074	70.4%
2033	25.92%	6,740	1,747	48,710	35,025	13,685	71.9%
2034	25.92%	6,957	1,803	49,934	36,719	13,215	73.5%
2035	25.92%	7,182	1,862	51,163	38,505	12,658	75.3%
2036	25.92%	7,416	1,922	52,397	40,393	12,004	77.1%
2037	25.92%	7,660	1,986	53,640	42,395	11,246	79.0%
2038	25.92%	7,915	2,052	54,897	44,523	10,373	81.1%
2039	25.92%	8,182	2,121	56,171	46,794	9,377	83.3%
2040	25.92%	8,460	2,193	57,468	49,224	8,244	85.7%
2041	25.92%	8,751	2,268	58,796	51,831	6,965	88.2%
2042	25.92%	9,053	2,347	60,159	54,633	5,526	90.8%
2043	25.92%	9,367	2,428	61,564	57,651	3,913	93.6%
2044	25.92%	9,693	2,513	63,018	60,906	2,112	96.6%
2045	25.92%	10,032	2,601	64,527	64,419	109	99.8%
2046	25.92%	10,383	2,692	66,098	68,212	(2,114)	103.2%
2047	25.92%	10,748	2,786	67,736	72,311	(4,575)	106.8%
2048	25.92%	11,127	2,884	69,448	76,741	(7,292)	110.5%
2049	25.92%	11,518	2,986	71,242	81,529	(10,287)	114.4%

Projection assumes all assumptions exactly met, including a 7.00% annual return on the current actuarial value of assets.



TABLE 10**Employer Covered Payroll**

	Police and Firefighters		All Other Employees		All Employees	
	March 31, 2020	March 31, 2019	March 31, 2020	March 31, 2019	March 31, 2020	March 31, 2019
	(1)	(2)	(3)	(4)	(5)	(6)
State of Hawaii	\$ 21,751,747	\$ 19,410,030	\$3,312,460,129	\$ 3,226,364,174	\$ 3,334,211,876	\$3,245,774,204
City & County of Honolulu	327,751,567	313,593,919	364,427,889	355,800,251	692,179,456	669,394,170
Board of Water Supply	-	-	39,554,639	37,828,935	39,554,639	37,828,935
County of Hawaii	84,333,316	77,788,640	106,697,395	104,793,756	191,030,711	182,582,396
County of Maui	63,443,252	62,596,539	113,336,252	109,321,019	176,779,504	171,917,558
County of Kauai	29,126,375	28,255,604	60,482,384	57,232,285	89,608,759	85,487,889
Total All Employers	\$ 526,406,257	\$ 501,644,732	\$3,996,958,688	\$ 3,891,340,420	\$ 4,523,364,945	\$4,392,985,152

TABLE 11**Schedule of Funding Progress**

Valuation Date	Actuarial Value of Assets (AVA)	Actuarial Accrued Liability (AAL)	Unfunded Actuarial		Annual Covered Payroll	UAAL as % of Payroll (4)/(6)
			Accrued Liability (UAAL) (3) - (2)	Funded Ratio (2)/(3)		
(1)	(2)	(3)	(4)	(5)	(6)	(7)
June 30, 2005	\$ 8,914.8	\$ 12,986.0	\$ 4,071.1	68.6%	\$ 3,041.1	133.9%
June 30, 2006 *	9,529.4	14,661.4	5,132.0	65.0%	3,238.3	158.5%
June 30, 2007 **	10,589.8	15,696.5	5,106.8	67.5%	3,507.0	145.6%
June 30, 2008	11,381.0	16,549.1	5,168.1	68.8%	3,782.1	136.6%
June 30, 2009	11,400.1	17,636.4	6,236.3	64.6%	4,030.1	154.7%
June 30, 2010	11,345.6	18,483.7	7,138.1	61.4%	3,895.7	183.2%
June 30, 2011 **	11,942.8	20,096.9	8,154.2	59.4%	3,916.0	208.2%
June 30, 2012	12,242.5	20,683.4	8,440.9	59.2%	3,890.0	217.0%
June 30, 2013	12,748.8	21,243.7	8,494.9	60.0%	3,906.7	217.4%
June 30, 2014	13,641.8	22,220.1	8,578.3	61.4%	3,991.6	214.9%
June 30, 2015**	14,463.7	23,238.4	8,774.7	62.2%	4,171.4	210.4%
June 30, 2016**	14,998.7	27,439.2	12,440.5	54.7%	4,258.9	292.1%
June 30, 2017	15,720.6	28,648.6	12,928.0	54.9%	4,265.0	303.1%
June 30, 2018	16,512.7	29,917.4	13,404.7	55.2%	4,383.7	305.8%
June 30, 2019**	17,322.2	31,396.4	14,074.3	55.2%	4,519.7	311.4%
June 30, 2020	18,084.4	32,691.8	14,607.4	55.3%	4,630.2	315.5%

Note : Dollar amounts in millions.

* Assumption changes and new Hybrid class effective June 30, 2006.

** New assumption effective on valuation date.

TABLE 12A

Membership Data

	Police and Firefighters		All Other Employees		All Employees	
	June 30, 2020	June 30, 2019	June 30, 2020	June 30, 2019	June 30, 2020	June 30, 2019
	(1)	(2)	(3)	(4)	(5)	(6)
1. Active members						
a. Number	4,940	4,857	61,810	61,526	66,750	66,383
b. Total salary	\$ 526,406,257	\$ 501,644,732	\$ 3,996,958,688	\$ 3,891,340,420	\$ 4,523,364,945	\$ 4,392,985,152
c. Average salary	\$ 106,560	\$ 103,283	\$ 64,665	\$ 63,247	\$ 67,766	\$ 66,176
d. Average age	42.4	42.7	48.4	48.4	47.9	47.9
e. Average service	14.1	14.4	13.0	13.0	13.1	13.1
2. Inactive members						
a. Number	386	387	8,818	8,934	9,204	9,321
b. Total annual deferred benefits	\$ 6,728,387	\$ 6,758,663	\$ 96,886,510	\$ 96,469,915	\$ 103,614,897	\$ 103,228,578
c. Average annual deferred benefit	\$ 17,431	\$ 17,464	\$ 10,987	\$ 10,798	\$ 11,258	\$ 11,075
3. Service retirees						
a. Number	3,845	3,750	40,911	40,015	44,756	43,765
b. Total annual benefits	\$ 239,239,259	\$ 223,126,890	\$ 1,143,046,701	\$ 1,091,736,349	\$ 1,382,285,960	\$ 1,314,863,239
c. Average annual benefit	\$ 62,221	\$ 59,501	\$ 27,940	\$ 27,283	\$ 30,885	\$ 30,044
4. Disabled retirees						
a. Number	126	128	1,604	1,547	1,730	1,675
b. Total annual benefits	\$ 3,196,381	\$ 3,062,338	\$ 23,597,029	\$ 21,973,444	\$ 26,793,410	\$ 25,035,782
c. Average annual benefit	\$ 25,368	\$ 23,925	\$ 14,711	\$ 14,204	\$ 15,488	\$ 14,947
5. Beneficiaries						
a. Number	346	321	4,321	4,124	4,667	4,445
b. Total annual benefits	\$ 14,332,093	\$ 12,811,415	\$ 75,813,525	\$ 70,305,830	\$ 90,145,618	\$ 83,117,245
c. Average annual benefit	\$ 41,422	\$ 39,911	\$ 17,545	\$ 17,048	\$ 19,316	\$ 18,699



TABLE 12B**Historical Summary of Active Member Data**

Year Ending June 30,	Active Members		Total Salaries		Average Salary		Average Age	Average Service
	Number	Percent Increase	Amount in \$ Millions	Percent Increase	\$ Amount	Percent Increase		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
2000	59,191	1.4%	\$ 2,275.3	4.1%	\$ 38,440	2.6%	45.5	13.0
2001	59,992	1.4%	2,350.2	3.3%	39,175	1.9%	45.6	13.3
2002	62,208	3.7%	2,568.7	9.3%	41,292	5.4%	45.8	13.2
2003	62,292	0.1%	2,718.4	5.8%	43,640	5.7%	46.0	13.1
2004	62,573	0.5%	2,755.5	1.4%	44,037	0.9%	46.0	13.0
2005	63,073	0.8%	2,924.5	6.1%	46,368	5.3%	46.3	13.0
2006	64,069	1.6%	3,113.7	6.5%	48,599	4.8%	46.4	13.0
2007	65,251	1.8%	3,340.5	7.3%	51,194	5.3%	46.5	13.0
2008	66,589	2.1%	3,601.7	7.8%	54,089	5.7%	46.6	12.9
2009	67,912	2.0%	3,838.0	6.6%	56,514	4.5%	46.8	12.9
2010	65,890	-3.0%	3,713.6	-3.2%	56,360	-0.3%	47.1	13.2
2011	65,310	-0.9%	3,731.4	0.5%	57,133	1.4%	47.4	13.4
2012	65,599	0.4%	3,706.1	-0.7%	56,497	-1.1%	47.6	13.5
2013	66,226	1.0%	3,720.8	0.4%	56,184	-0.6%	47.7	13.5
2014	67,206	1.5%	3,871.0	4.0%	57,600	2.5%	47.8	13.5
2015	67,310	0.2%	3,952.6	2.1%	58,723	1.9%	47.8	13.2
2016	67,377	0.1%	4,118.4	4.2%	61,124	4.1%	47.9	13.3
2017	65,911	-2.2%	4,134.2	0.4%	62,723	2.6%	48.0	13.3
2018	66,271	0.5%	4,257.2	3.0%	64,240	2.4%	47.9	13.2
2019	66,383	0.2%	4,393.0	3.2%	66,176	3.0%	47.9	13.1
2020	66,750	0.6%	4,523.4	3.0%	67,766	2.4%	47.9	13.1

TABLE 13**History of Cash Flow**

Year Ending June 30, (1)	Contributions			Expenditures				External Cash Flow for the Year ² (9)	Market Value of Assets (10)	External Cash Flow as Percent of Market Value (11)
	Employee (2)	Employer (3)	Total (4)	Benefit	Administrative		Total (8)			
				Payments (5)	Refunds (6)	Expenses ¹ (7)				
2008	\$ 163.4	\$ 488.8	\$ 652.2	\$ (792.3)	\$ (3.7)	\$ (10.7)	\$ (806.7)	\$ (154.5)	\$ 10,846.8	(1.4%)
2009	184.5	578.6	763.1	(839.1)	(3.5)	(12.3)	(854.9)	(91.8)	8,818.0	(1.0%)
2010	360.0	547.6	907.6	(906.4)	(7.8)	(12.2)	(926.4)	(18.8)	9,821.6	(0.2%)
2011	231.0	534.9	765.9	(960.2)	(7.9)	(13.3)	(981.4)	(215.5)	11,642.3	(1.9%)
2012	178.8	548.4	727.2	(1,015.4)	(7.2)	(11.6)	(1,034.2)	(307.0)	11,285.9	(2.7%)
2013	185.8	581.4	767.2	(1,060.6)	(7.2)	(12.3)	(1,080.1)	(312.9)	12,357.8	(2.5%)
2014	206.1	653.1	859.2	(1,122.4)	(8.5)	(12.6)	(1,143.5)	(284.3)	14,203.0	(2.0%)
2015	223.5	717.8	941.3	(1,170.7)	(10.5)	(14.0)	(1,195.2)	(253.9)	14,505.5	(1.8%)
2016	236.8	756.6	993.4	(1,232.6)	(12.9)	(14.0)	(1,259.5)	(266.1)	14,070.0	(1.9%)
2017	250.7	781.2	1,031.9	(1,306.8)	(16.3)	(15.0)	(1,338.1)	(306.2)	15,698.3	(2.0%)
2018	259.4	847.6	1,107.0	(1,395.9)	(20.8)	(15.8)	(1,432.5)	(325.5)	16,598.4	(2.0%)
2019	273.2	922.6	1,195.8	(1,469.6)	(16.5)	(13.8)	(1,499.9)	(304.1)	17,227.0	(1.8%)
2020	287.4	1,098.6	1,386.0	(1,545.6)	(22.4)	(17.8)	(1,585.8)	(199.8)	17,385.5	(1.1%)

Amounts in \$ millions

¹ Excludes investment expenses

² Column (9) = Column (4) + Column (8)



TABLE 14

Solvency Test

	<u>June 30, 2020</u> (1)	<u>June 30, 2019</u> (2)
1. Actuarial accrued liability (AAL)		
a. Active member contributions	\$ 2,231,363,386	\$ 2,202,196,568
b. Retirees and beneficiaries	17,720,939,918	16,871,118,207
c. Active and inactive members	<u>12,739,452,540</u>	<u>12,323,132,910</u>
d. Total	\$ 32,691,755,844	\$ 31,396,447,685
2. Actuarial value of assets	\$ 18,084,382,899	\$ 17,322,194,107
3. Cumulative portion of AAL covered		
a. Active member contributions	100%	100%
b. Retirees and beneficiaries	89%	90%
c. Active and inactive members	0%	0%

TABLE 15**Highlights of Last Five Annual Actuarial Valuations
2016 through 2020**

Item	Valuation Date: June 30				
	2016	2017	2018	2019	2020
Number of active members	67,377	65,911	66,271	66,383	66,750
Number of inactive members	7,741	9,241	9,249	9,321	9,204
Number of pensioners	41,654	42,857	44,305	45,440	46,486
Number of beneficiaries	3,852	4,070	4,264	4,445	4,667
Average monthly contributory member pension amount	\$ 2,730	\$ 2,854	\$ 2,994	\$ 3,136	\$ 3,293
Average monthly noncontributory member pension amount	\$ 1,637	\$ 1,669	\$ 1,702	\$ 1,736	\$ 1,773
Average monthly hybrid member pension amount	\$ 2,139	\$ 2,178	\$ 2,238	\$ 2,285	\$ 2,345
Average monthly beneficiary amount	\$ 1,419	\$ 1,472	\$ 1,515	\$ 1,558	\$ 1,610
Total actuarial value of assets (\$millions)	\$ 14,999	\$ 15,721	\$ 16,513	\$ 17,322	\$ 18,084
Unfunded actuarial accrued liability (\$millions)	\$ 12,440.5	\$ 12,928.0	\$ 13,404.7	\$ 14,074.3	\$ 14,607.4
Funding Period (in years) ⁽¹⁾	66	26	25	26	26
Item (Dollar amounts in millions)	Fiscal Year				
	2015-2016	2016-2017	2017-2018	2018-2019	2019-2020
Employer contributions ⁽²⁾	\$ 756.6	\$ 781.2	\$ 847.6	\$ 922.6	\$ 1,098.6

⁽¹⁾ Beginning with the 2011 valuation, the funding period was determined using an open group projection. Prior valuations determined the remaining amortization based on the assumption that the amortization payment would remain constant as a percentage of pay.

⁽²⁾ Beginning July 1, 2014, the employer contribution rate was 24.0% for Police and Fire, 16.5% for All Other Employees. Beginning July 1, 2015, the employer contribution rate was 25.0% for Police and Fire, 17.0% for All Other Employees. Beginning July 1, 2016, the employer contribution rate was 25.0% for Police and Fire, 17.0% for All Other Employees. Beginning July 1, 2017, the employer contribution rate was 28.0% for Police and Fire, 18.0% for All Other Employees. Beginning July 1, 2018, the employer contribution rate was 31.0% for Police and Fire, 19.0% for All Other Employees.

TABLE 16**Summary of Benefit Provisions
(For Members Hired Prior to 7/1/2012)**

	<u>Noncontributory</u>	<u>Contributory</u>	<u>Hybrid</u>
Employee Contributions	No employee contributions	7.8% of salary	6.0% of salary
Normal Retirement			
Eligibility	Age 62 and 10 years credited service; or Age 55 and 30 years credited service	Age 55 and 5 years credited service	Age 62 and 5 years credited service; or Age 55 and 30 years credited service
Benefit	1 ¼% of average final compensation times years of credited service (Average Final Compensation or AFC is an average of the highest salaries during any three years of credited service, excluding any salary paid in lieu of vacation or if ERS membership occurred prior to 1/1/71, AFC may be an average of the highest salaries during any five years of credited service including any salary paid in lieu of vacation.)	2% of average final compensation times years of credited service (Average Final Compensation or AFC is an average of the highest salaries during any three years of credited service, excluding any salary paid in lieu of vacation or if ERS membership occurred prior to 1/1/71, AFC may be an average of the highest salaries during any five years of credited service including any salary paid in lieu of vacation.)	2% of average final compensation times years of credited service, split formula for unconverted noncontributory service at 1 ¼% (Average Final Compensation or AFC is an average of the highest salaries during any three years of credited service, excluding any salary paid in lieu of vacation or if ERS membership occurred prior to 1/1/71, AFC may be an average of the highest salaries during any five years of credited service including any salary paid in lieu of vacation.)

TABLE 16 (CONTINUED)

	Noncontributory	Contributory	Hybrid
Early Retirement			
Eligibility	Age 55 and 20 years credited service	Any age and 25 years credited service	Age 55 with 20 years credited service
Benefit	Maximum allowance reduced 6% per year under age 62	Maximum allowance reduced 5% per year under age 55 plus 4% per year under age 50	Maximum allowance reduced 5% for each year under age 62
Deferred Vesting			
Eligibility	10 years credited service	5 years credited service and contributions left in the ERS	5 years credited service and contributions left in the ERS
Benefit	Accrued maximum allowance payable at age 65	Accrued maximum allowance payable at age 55	Accrued maximum allowance payable at age 62
Annuity Savings Account			
Interest	Not applicable	4.5% per annum on employee contributions and accrued interest	4.5% per annum on employee contributions and accrued interest
Eligibility	Not applicable	Requests refund and forfeits future retirement benefit	Requests refund and forfeits future retirement benefit
Benefit			
- Terminates with less than 5 years credited service	Not applicable	Return of member's contributions and accrued interest	Return of member's contributions and accrued interest
- Terminates with 5 or more years of credited service	Not applicable	Return of member's contributions and accrued interest	Return of member's Hybrid contributions and accrued interest, both times 150%. Return of non-Hybrid balance transfers and accrued interest.

TABLE 16 (CONTINUED)



	Noncontributory	Contributory	Hybrid
Ordinary Disability			
Eligibility	10 years credited service	10 years credited service	10 years credited service
Benefit	1 ¼% of AFC times years of credited service, unreduced for age (Minimum is 12.5% of AFC)	1 ¾% of AFC times years of credited service, unreduced for age (Minimum is 30% of AFC)	2% of AFC times years of credited service, unreduced for age, split formula for unconverted noncontributory service at 1 ¼% (Minimum is 25% of AFC)
Service-Connected Disability			
Eligibility	Any age or credited service	Any age or credited service	Any age or credited service
Benefit	Accrued maximum allowance, but not less than 15% AFC. For accidents that occur on or after July 1, 2004, lifetime pension of 35% of AFC.	Totally disabled: lifetime pension of 66 2/3% AFC plus annuity. Occupationally disabled: same benefit (66 2/3% pension plus annuity) paid for 3 years and then pension is reduced to 33 1/3% AFC if not totally disabled. For accidents on or after July 7, 1998, lifetime pension of 50% of AFC plus refund of member's contributions and accrued interest.	Lifetime pension of 35% of AFC plus refund of member's contributions and accrued interest.

TABLE 16 (CONTINUED)

	Noncontributory	Contributory	Hybrid
Ordinary Death			
Eligibility	Active employee at time of death with at least 10 years of credited service	Active employee at time of death with at least 1 year of service	Active employee at time of death with at least 5 years of service
Benefit	<p>Surviving spouse/reciprocal beneficiary and dependent children receive a benefit equal to a percentage of member's accrued maximum allowance unreduced for age; or</p> <p>Option B (100% Joint and Survivor) benefit for surviving spouse if member was eligible for retirement at time of death and a percentage of member's accrued maximum allowance unreduced for age for the dependent children</p>	<p>Lump sum payment of member's contributions and accrued interest plus a percentage of the salary earned in the 12 months preceding death; or</p> <p>Option 3 (50% Joint and Survivor) benefit if member was not eligible for retirement at the time of death, credited with 10 years of service, and one beneficiary designated (benefit calculated using the ordinary disability retirement formula); or</p> <p>Option 2 (100% Joint and Survivor) benefit if member was eligible for retirement at the time of death and one beneficiary designated</p>	<p>Return of member's Hybrid contributions and accrued interest (both times 150%) plus return of non-Hybrid balance transfers and accrued interest; or</p> <p>Option 3 (50% Joint Survivor) lifetime benefit if credited with at least 10 years of service and one beneficiary designated; or</p> <p>Option 2 (100% Joint Survivor) lifetime monthly benefit if member was eligible for service retirement at time of death, and one beneficiary designated</p>

TABLE 16 (CONTINUED)

	Noncontributory	Contributory	Hybrid
Service-Connected Death			
Eligibility	Any age or service	Any age or service	Any age or service
Benefit	<p>Surviving spouse/reciprocal beneficiary receives pension equal to 30% of AFC (until remarriage or re-entry into a new reciprocal beneficiary relationship); additional benefits payable to surviving dependent children (up to age 18)</p> <p>If there is no spouse/reciprocal beneficiary or dependent children, no benefit is payable.</p>	<p>Lump sum payment of member’s contributions and accrued interest, plus pension of 50% AFC to surviving spouse/reciprocal beneficiary (until remarriage or re-entry into a new reciprocal beneficiary relationship);</p> <p>If there is no surviving spouse or reciprocal beneficiary, surviving dependent children (up to age 18) or dependent parents shall be eligible for a monthly benefit.</p> <p>If there is no spouse/reciprocal beneficiary or dependent children/parents, the ordinary death benefit shall be payable to the designated beneficiary.</p>	<p>Lump sum payment of member’s contributions and accrued interest, plus pension of 50% AFC to surviving spouse/reciprocal beneficiary (until remarriage or re-entry into a new reciprocal beneficiary relationship);</p> <p>If there is no surviving spouse or reciprocal beneficiary, surviving dependent children (up to age 18) or dependent parents shall be eligible for a monthly benefit.</p> <p>If there is no spouse/reciprocal beneficiary or dependent children/parents, the ordinary death benefit shall be payable to the designated beneficiary.</p>

TABLE 16 (CONTINUED)

For members hired after June 30, 2011, the interest crediting rate on employee contributions and accrued interest is 2.0% per annum.

The plan provisions summarized above apply to teachers and most State and County employees. Special provisions applicable to other groups of employees are outlined below:

- A. Police officers, firefighters, investigators of the Department of the Prosecuting Attorney and the Attorney General, narcotic enforcement investigators, and public safety investigators contribute 12.2% of their monthly salary to the ERS instead of 7.8%. These members may retire at age 55 with 5 years of credited service or at any age with 25 years of credited service and receive a retirement benefit of 2 ½% of average final compensation (AFC) for each year of such service up to a maximum of 80% AFC, provided the last 5 years of credited service in any of these occupations.
- B. Judges, elected officials, and legislative officers may retire at age 55 with at least 5 years of credited service, or at any age with at least 10 years of credited service and receive a pension of 3 ½% of AFC for each year of such service plus an annuity from their contributions allocable to the period of such service. This benefit cannot exceed 75% of the AFC. Judges hired after June 30, 1999 require 25 years of credited service in order to retire before age 55.
- C. Sewer workers in specified classifications, water safety officers, and emergency medical technicians (EMTs) may retire at any age if they are credited with 25 years of such service with the last 5 or more years in these occupations. (The 25-year feature is phased in through 7/1/2008 for EMTs.)
- D. Sewer workers in specified classifications, water safety officers, and emergency medical technicians (EMTs) that transfer to the Hybrid class contribute 9.75% of their monthly salary to the ERS. These members may retire at age 62 with 5 years of credited service or at any age if they are credited with 25 years of such service with the last 5 or more years in these occupations.

TABLE 16 (CONTINUED)
Summary of Benefit Provisions
(For Members Hired After 6/30/2012)

	Contributory (for Police/Fire)	Contributory (for Judges/Elected Officers)	Hybrid
Employee Contributions	14.2% of base pay earnings	9.8% of base pay earnings	8.0% of base pay earnings 11.75% of base pay earnings for Sewer workers, water safety officers, and emergency medical technicians (EMTs)
Normal Retirement Eligibility	Age 60 and 10 years credited service	Age 60 and 10 years credited service	Age 65 and 10 years credited service; or Age 60 and 30 years credited service Sewer workers, water safety officers, and EMTs may retire with 25 years credited service at age 55.
Benefit	2.25% of average final compensation times years of credited service. (Average final compensation or AFC is an average of the highest base pay earnings during any five years of credited service, excluding any salary paid in lieu of vacation.) Maximum is 80% of AFC.	3.0% of average final compensation times years of credited service (Average final compensation or AFC is an average of the highest base pay earnings during any five years of credited service, excluding any salary paid in lieu of vacation.) Maximum is 75% of AFC.	1.75% of average final compensation times years of credited service (Average final compensation or AFC is an average of the highest base pay earnings during any five years of credited service, excluding any salary paid in lieu of vacation.)

TABLE 16 (CONTINUED)

	Contributory (for Police/Fire)	Contributory (for Judges/Elected Officers)	Hybrid
Early Retirement			
Eligibility	Age 55 and 25 years credited service	Age 55 and 25 years credited service Any age with 10 years for elected officers	Age 55 with 20 years credited service Sewer workers, water safety officers, and emergency medical technicians (EMTs) may retire with 25 years credited service.
Benefit	Maximum allowance reduced 6% per year under age 60	Maximum allowance reduced 6% per year under age 60	Maximum allowance reduced 5% for each year under age 65
Deferred Vesting			
Eligibility	10 years credited service and contributions left in the ERS	10 years credited service and contributions left in the ERS	10 years credited service and contributions left in the ERS
Benefit	Accrued maximum allowance payable at age 60	Accrued maximum allowance payable at age 60	Accrued maximum allowance payable at age 65
Annuity Savings Account			
Interest	2.0% per annum	2.0% per annum	2.0% per annum
Eligibility	Requests refund and forfeits future retirement benefit	Requests refund and forfeits future retirement benefit	Requests refund and forfeits future retirement benefit
Benefit			
- Terminates with less than 10 years credited service	Return of member's contributions and accrued interest	Return of member's contributions and accrued interest	Return of member's contributions and accrued interest
- Terminates with 10 or more years of credited service	Return of member's contributions and accrued interest	Return of member's contributions and accrued interest	Return of member's contributions and accrued interest, both times 120%

TABLE 16 (CONTINUED)

	Contributory (for Police/Fire)	Contributory (for Judges/Elected Officers)	Hybrid
Ordinary Disability			
Eligibility	10 years credited service	10 years credited service	10 years credited service
Benefit	1 ¾% of AFC times years of credited service, unreduced for age (Minimum is 30% of AFC)	3.0% of AFC times years of credited service, unreduced for age (Minimum is 30% of AFC)	1 ¾% of AFC times years of credited service, unreduced for age (Minimum is 25% of AFC)
Service-Connected Disability			
Eligibility	Any age or credited service	Any age or credited service	Any age or credited service
Benefit	Lifetime pension of 50% of AFC plus refund of member’s contributions and accrued interest.	Lifetime pension of 50% of AFC plus refund of member’s contributions and accrued interest.	Lifetime pension of 35% of AFC plus refund of member’s contributions and accrued interest.

TABLE 16 (CONTINUED)

	Contributory (for Police/Fire)	Contributory (for Judges/Elected Officers)	Hybrid
Ordinary Death			
Eligibility	Active employee at time of death with at least 1 years of credited service	Active employee at time of death with at least 1 years of credited service	Active employee at time of death with at least 10 years of service
Benefit	<p>Lump sum payment of member’s contributions and accrued interest plus a percentage of the salary earned in the 12 months preceding death; or</p> <p>Option 3 (50% Joint Survivor) lifetime benefit if credited with at least 10 years of service and one beneficiary designated; or</p> <p>Option 2 (100% Joint Survivor) lifetime monthly benefit if member was eligible for service retirement at time of death, and one beneficiary designated</p>	<p>Lump sum payment of member’s contributions and accrued interest plus a percentage of the salary earned in the 12 months preceding death; or</p> <p>Option 3 (50% Joint Survivor) lifetime benefit if credited with at least 10 years of service and one beneficiary designated; or</p> <p>Option 2 (100% Joint Survivor) lifetime monthly benefit if member was eligible for service retirement at time of death, and one beneficiary designated</p>	<p>Return of member’s Hybrid contributions and interest; or</p> <p>Option 3 (50% Joint Survivor) lifetime benefit if credited with at least 10 years of service and one beneficiary designated; or</p> <p>Option 2 (100% Joint Survivor) lifetime monthly benefit if member was eligible for service retirement at time of death, and one beneficiary designated</p>

TABLE 16 (CONTINUED)

	Contributory (for Police/Fire)	Contributory (for Judges/Elected Officers)	Hybrid
Service-Connected Death			
Eligibility	Any age or service	Any age or service	Any age or service
Benefit	<p>Same for all members.</p> <p>Lump sum payment of member’s contributions and interest, plus pension of 50% AFC to surviving spouse/reciprocal beneficiary (until remarriage or re-entry into a new reciprocal beneficiary relationship);</p> <p>If there is no surviving spouse or reciprocal beneficiary, surviving dependent children (up to age 18) or dependent parents shall be eligible for a monthly benefit.</p> <p>If there is no spouse/reciprocal beneficiary or dependent children/parents, the ordinary death benefit shall be payable to the designated beneficiary.</p>		

TABLE 16 (CONTINUED)

Post Retirement Benefit

Each retiree's original retirement allowance is increased by 1 ½% (if their membership date is after June 30, 2012) or 2 ½% (if their membership date is before July 1, 2012) on each July 1 beginning the calendar year after retirement. This cumulative benefit is not compounded.

Retirement Options

Contributory or Hybrid Member

Maximum Allowance: The member receives a lifetime maximum allowance and at death the difference between the value of the member's contributions at the time of retirement and the retirement allowance paid prior to death is paid to the designated beneficiary(ies) or estate.

Option One: The member receives a reduced lifetime allowance based on age and at death, the difference between the initial insurance reserve and the retirement allowance paid prior to death is paid to the designated beneficiary(ies) or estate.

Option Two (100% Joint and Survivor with Pop-Up): The member receives a reduced lifetime allowance based on ages of both the member and the sole beneficiary and at death of the member; the same allowance is paid to the designated beneficiary for life. Should the designated beneficiary predecease the retiree, another beneficiary cannot be named, the benefit will revert back to the Maximum Allowance, and all payments will cease at the retiree's death.

Option Three (50% Joint and Survivor with Pop-Up): This allowance is similar to Option Two. The member receives a reduced lifetime allowance which is higher than Option Two and is based on ages of both the member and the sole beneficiary; however, at death of the member one-half of the allowance is paid to the designated beneficiary for life. Like Option Two, should the designated beneficiary predecease the retiree, another beneficiary cannot be named, the benefit will revert back to the Maximum Allowance, and all payments will cease at the retiree's death.

Option Four: This option allows the member to devise an allowance that will provide a benefit according to the member's specifications. It requires certification by the Actuary and approval of the Board of Trustees. The following Option Four allowances have been approved:

Combination of Options Five and Maximum Allowance: The member receives a reduced lifetime allowance and is allowed to withdraw the pre-1987 nontaxable contribution, 50% of accumulated contributions, or 75% of accumulated contributions (Hybrid class members are not allowed the 75% option); at death, the difference between the value of the member's contributions at the time of retirement and the retirement allowance paid prior to death is paid to the designated beneficiary(ies) or estate.

Combination of Options Five and One: The member receives a reduced lifetime allowance and is allowed to withdraw the pre-1987 nontaxable contributions, 50% of accumulated contributions, or 75% of accumulated contributions (Hybrid class members are not allowed the 75% option); at death, the difference between the initial insurance reserve and the retirement allowance paid prior to death is paid to the designated beneficiary(ies) or estate.



TABLE 16 (CONTINUED)

Combination of Options Five and Two: The member receives a reduced lifetime allowance based on ages of both member and the sole beneficiary, and is allowed to withdraw the pre-1987 nontaxable contributions, 50% of accumulated contributions, or 75% of accumulated contributions (Hybrid class members are not allowed the 75% option); at death of the member, the same allowance is paid to the designated beneficiary for life. As in the case of Option Two, should the designated beneficiary predecease the retiree, another beneficiary cannot be named, the benefit will revert back to the Maximum Allowance (as adjusted for the contribution withdrawal), and all payments will cease at the retiree's death.

Combination of Options Five and Three: The member receives a reduced lifetime allowance based on ages of both member and the sole beneficiary, and is allowed to withdraw the pre-1987 nontaxable contributions, 50% of accumulated contributions, or 75% of accumulated contributions (Hybrid class members are not allowed the 75% option); at death of the member, one-half of the allowance is paid to the designated beneficiary for life. As in the case of Option Three, should the designated beneficiary predecease the retiree, another beneficiary cannot be named, the benefit will revert back to the Maximum Allowance (as adjusted for the contribution withdrawal), and all payments will cease at the retiree's death.

Option Five: The member receives a reduced lifetime allowance and is allowed to withdraw all accumulated contributions; at death, the retiree is entitled to the pension for the entire month that death occurs.

Option Four and Option Five are restricted to those members with at least ten years of credited service excluding unused sick leave credit.

Regardless of the option selected, should death occur during the first year of retirement, the designated beneficiary may elect to receive benefits as if death had occurred immediately prior to retirement in lieu of the death benefits described above.

Noncontributory Member

Maximum Allowance: The member receives a lifetime pension and at death, the retiree is entitled to the pension for the entire month that death occurs.

Option A (50% Joint and Survivor with Pop-Up): The member receives a reduced lifetime pension and at death of the member, one-half of the pension is paid to the sole designated beneficiary for life. Should the designated beneficiary predecease the retiree, another beneficiary cannot be named, the benefit will revert back to the Maximum Allowance, and all payments will cease at the retiree's death.

Option B (100% Joint and Survivor with Pop-up): The member receives a reduced lifetime pension and at death of the member, the same pension is paid to the sole designated beneficiary for life. Like Option A, should the designated beneficiary predecease the retiree, another beneficiary cannot be named, the benefit will revert back to the Maximum Allowance, and all payments will cease at the retiree's death.

Option C (Ten-Year Guarantee): The member receives a reduced lifetime pension. Should death occur within ten years of retirement, the same pension will be paid to the designated beneficiary for the balance of the ten-year period. Should the designated beneficiary predecease the retiree, another beneficiary can be named.

Regardless of the option selected, should death occur during the first year of retirement, the designated beneficiary may elect to receive benefits as if death had occurred immediately prior to retirement in lieu of the death benefits described above.



TABLE 17

Summary of Plan Changes

Act 65, effective July 1, 1999

Requires judges who enter or re-enter service after June 30, 1999 to be at least 55 years old and five years of service or have 25 years of service to rehire.

Act 100, effective June 30, 1999

Uses actuarial investment earnings in excess of a ten percent (10%) actuarial investment yield rate to reduce the employer's contribution requirements by \$147.0 million and \$50.6 million for fiscal years ending June 30, 2000 and 2001, respectively.

Act 284, effective June 30, 2001

Provide an increase in pension benefits for current retirees with military service who retired prior to July 2, 1989. A retirant who rendered honorable active military service could be granted up to 4 years of military service credits based upon his/her years of credited service under the ERS, not to exceed his/her actual years of military service. The years of military service credits granted are based on the following schedule:

- 0 years for retirants with less than 8 years of credited service
- Up to 2 years of retirants with 8 years or more of credited service
- Up to 3 years of retirants with 20 years or more of credited service
- Up to 4 years of retirants with 25 years or more of credited service

For each year of military service credits granted on the schedule above, the retirant will be provided a \$36.00 increase in his/her monthly pension or retirement allowance.

Act 199, effective June 30, 2003

Emergency Medical Technicians (EMTs) are allowed to retire with an unreduced benefit after 25 years of service regardless of age, of which the last five or more years prior to retirement must be in that capacity. This feature is phased in one year at a time, July 1, 2003 through June 30, 2008.

Act 177, effective July 1, 2004

This Act allows police officers with a permanent service-connected disability to retain the 2-1/2% benefit multiplier for each year of service as a police officer.

Act 181, effective July 1, 2004

This Act establishes fixed employer contribution rates as a percentage of compensation effective July 1, 2005. Employers will contribute 15.75% for their police officers and firefighters and 13.75% for other employees.



TABLE 17 (CONTINUED)

Act 183, effective July 1, 2004

This Act amends the ERS statutes to comply with the federal tax limits on compensation retroactive to July 1, 1996.

Act 56, effective December 1, 2004

This Act amends the ERS statutes to allow the automatic cost-of-living-adjustment to be reflected when determining actuarial equivalent optional forms of payment.

Act 256, effective July 5, 2007

Legislation was enacted to remove the statutory salary increase assumption from the statutes and to grant the ERS's Board of Trustees the authority to set the salary increase assumption. As a result of this legislation, the Board has adopted effective with this valuation the salary increase assumption recommended by GRS as a result of the Experience Study performed in 2006.

Legislation was also enacted to increase the employer contribution rates to the ERS. Effective July 1, 2008, the employer contribution rate for Police and Fire employees will increase from 15.75% to 19.70% and the rate for All Other employees will increase from 13.75% to 15.00%.

Act 163, effective June 23, 2011

Legislation was enacted that increased the future employer contribution rates to ERS. Employers of Police and Fire employees will contribute 22% of pay in FY 2013, 23% in FY 2014, 24% in FY 2015, and 25% in FY 2016 and beyond. Employers of All Other Employees will contribute 15.5% of pay in FY 2013, 16.0% in FY 2014, 16.5% in FY 2015, and 17.0% in FY 2016 and beyond.



TABLE 17 (CONTINUED)

Legislation was enacted that made numerous changes to the benefits and member contribution rates for employees hired after June 30, 2012. Key changes are shown below:

Benefit Provision	Police & Fire Employees	All Other Employees
Benefit Multiplier	2.25%	1.75%
Normal Retirement	Age 55 with 25 years of service, or age 60 with 10 years of service	Age 60 with 30 years of service, or age 65 with 10 years of service
Post-Retirement Increase	1.5%	1.5%
Hybrid Match	N/A	120%
Average Final Compensation	Highest 5 annual base salaries	Highest 5 annual base salaries
Eligibility for Deferred Benefit	10 years of service	10 years of service
Member Contribution Rate	14.20%	8.00%

Similar changes were also made to the benefits of Judges, Legislative Officers, etc.

Similar changes were also made to those employees in the All Other Employees group who are eligible to retire at 25 years of service including the addition of a minimum age requirement (55).

Finally, legislation was enacted that set the investment return assumption for the June 30, 2011 valuation at 7.75% (the rate recommended in the Experience Study presented to the Board in December of 2010). In addition, the legislation granted ERS's Board the authority to set this assumption for valuations after 2011.

Act 152, effective June 26, 2012

Legislation was enacted to eliminate most types of non-base pay from the definition of compensation for employees hired after June 30, 2012. For the impacted employees, non-base pay compensation will be excluded in determining both the contributions made by and on behalf of these employees and the benefits they will earn in the System.

Act 153, effective June 26, 2012

Legislation was enacted to require employers to pay additional contributions if a retiring employee, who was first employed prior to July 1, 2012 and who was last employed by the employer, has significant non-base pay increases included in their average final compensation. The additional contribution is equal to the actuarial present value of the additional benefits earned due to the "excessive" non-base pay increases.

TABLE 17 (CONTINUED)

Act 017, effective July 1, 2017

Legislation was enacted that increased the future employer contribution rates to ERS. Employers of Police and Fire employees will contribute 28% of pay in FY 2018, 31% in FY 2019, 36% in FY 2020, and 41% in FY 2021 and beyond. Employers of All Other Employees will contribute 18% of pay in FY 2018, 19% in FY 2019, 22% in FY 2020, and 24% in FY 2021 and beyond.

TABLE 18

Summary of Actuarial Methods and Assumptions

Basis for assumption setting: The actuarial assumptions were adopted by the Board on August 12, 2019. Rationale for the recommendations are in the most recent experience study dated July 30, 2019.

I. Valuation Date

The valuation date is June 30th of each plan year. This is the date as of which the actuarial present value of future benefits and the actuarial value of assets are determined.

II. Actuarial Cost Method

The normal cost and actuarial accrued liability are determined using the Entry Age Actuarial Cost Method. The actuarial accrued liability is assigned to years prior to the valuation, and the normal cost is assigned to the year following the valuation. The remaining costs are assigned to future years. The normal cost and accrued liability are determined on an individual basis.

The normal cost is the level percentage of payroll contribution required to accumulate the needed funds to pay all expected benefits. This percentage of payroll is then applied to the total compensation for the prior year for all active members, and is then adjusted for the payroll growth assumption.

The actuarial accrued liability is the difference between the total present value of future benefits and the actuarial present value of future normal costs. The unfunded actuarial accrued liability (UAAL) is the excess of the actuarial accrued liability over the actuarial value of assets.

III. Funding of Unfunded Actuarial Accrued Liability

Since the State statutes governing the System establish the employee and employer contribution rates, the actuarial valuation determines the number of years required to amortize (or fund) the UAAL. Because of the legislated increases in future employer contribution rates and the new tier of benefits for employees hired after June 30, 2012, an open group projection of liabilities and assets was used to determine the length of time until the UAAL is eliminated. The open group projection assumed that the number of active members would remain static (i.e. each active employee who leaves employment due to termination, retirement, death or disability, would be replaced by exactly one new employee.

Because of this methodology for determining the funding period, any change in the unfunded actuarial accrued liability due to (i) actuarial gains and losses, (ii) changes in actuarial assumptions, or (iii) amendments, affects the funding period.

Please see Section V of this table for a description of the new entrant profile used in the open group projection.

TABLE 18 (CONTINUED)

IV. Actuarial Value of Assets

The actuarial value of assets is based on the market value of assets with a four-year phase-in of actual investment return in excess of/(less than) expected investment income. Offsetting unrecognized gains and losses are immediately recognized, with the shortest remaining bases recognized first and the net remaining bases continue to be recognized on their original timeframe. The expected actuarial value of assets is calculated net of investment expenses, and the expected investment return is equal to the assumed investment return rate multiplied by the prior year's actuarial value of assets, adjusted for contributions, benefits paid, and refunds.

V. New Entrant Profile

For the purposes of determining the funding period, an open group projection is used which replaces on a one-to-one basis each active member who leaves employment with an average new hire. The average new hire is determined based on a new entrant profile, which is created from the valuation data by determining the entry age and entry pay for anyone with seven or less years of service as of the valuation date. Each group of new hires' salaries is assumed to grow at the General Wage Inflation of 3.50% over the salaries of the previous year's group.

The new entrant profile for members assumed to be hired during the year following the valuation date for the Police and Fire Employees and the All Other Employees are shown in the table below.

New Entrant Profile for Police & Fire Employees		
Entry Age	# of Employees	Average Salary
15-19	2	\$54,605
20-24	175	67,871
25-29	418	67,484
30-34	285	66,402
35-39	136	66,933
40-44	51	69,181
45-49	13	69,063
50-54	2	66,592
55-59	3	76,214
Total	1,085	67,290

It is assumed that 89.2% of new hires will be male.

TABLE 18 (CONTINUED)

New Entrant Profile for All Other Employees		
Entry Age	# of Employees	Average Salary
15-19	17	\$38,029
20-24	1,490	46,860
25-29	3,976	50,043
30-34	3,265	52,785
35-39	2,730	53,415
40-44	2,190	52,444
45-49	1,877	52,641
50-54	1,576	52,497
55-59	1,216	53,769
60-64	633	55,860
65-69	88	63,781
Total	19,058	51,966

It is assumed that 41.8% of new hires will be male.

VI. Actuarial Assumptions

A. Economic Assumptions

1. Investment return: 7.00% per year, compounded annually, composed of an assumed 2.50% inflation rate and a 4.50% net real rate of return (net of investment expenses).
2. General Wage Inflation: 3.50% per annum.

TABLE 18 (CONTINUED)

3. Salary increase rates: As shown below

Years of Service	General Employees		Teachers	
	Service-related Component	Total Rate Including 2.50% Inflation Component and 1.00% Productivity Component	Service-related Component	Total Rate Including 2.50% Inflation Component and 1.25% Productivity Component
1	3.00%	6.50%	2.00%	5.75%
2	3.00%	6.50%	1.75%	5.50%
3	2.00%	5.50%	1.75%	5.50%
4	1.50%	5.00%	1.50%	5.25%
5	1.50%	5.00%	1.00%	4.75%
6	1.25%	4.75%	1.00%	4.75%
7	1.25%	4.75%	0.75%	4.50%
8	1.00%	4.50%	0.75%	4.50%
9	1.00%	4.50%	0.50%	4.25%
10	1.00%	4.50%	0.50%	4.25%
11	0.75%	4.25%	0.50%	4.25%
12	0.75%	4.25%	0.50%	4.25%
13	0.50%	4.00%	0.25%	4.00%
14	0.50%	4.00%	0.25%	4.00%
15	0.50%	4.00%	0.25%	4.00%
16	0.50%	4.00%	0.25%	4.00%
17	0.50%	4.00%	0.25%	4.00%
18	0.50%	4.00%	0.25%	4.00%
19	0.50%	4.00%	0.25%	4.00%
20	0.25%	3.75%	0.25%	4.00%
21	0.25%	3.75%	0.25%	4.00%
22	0.25%	3.75%	0.25%	4.00%
23	0.25%	3.75%	0.25%	4.00%
24	0.25%	3.75%	0.25%	4.00%
25 or more	0.00%	3.50%	0.00%	3.75%

TABLE 18 (CONTINUED)

3. Salary increase rates (continued):

Years of Service	Police & Firefighters	
	Service-related Component	Total Annual Rate of Increase Including 2.50% Inflation Component and 2.5% General Increase Rate
1	2.00%	7.00%
2	2.00%	7.00%
3	1.00%	6.00%
4	1.00%	6.00%
5	1.00%	6.00%
6	0.75%	5.75%
7	0.75%	5.75%
8	0.75%	5.75%
9	0.50%	5.50%
10	0.50%	5.50%
11	0.50%	5.50%
12	0.50%	5.50%
13	0.25%	5.25%
14	0.25%	5.25%
15	0.25%	5.25%
16	0.25%	5.25%
17	0.25%	5.25%
18	0.25%	5.25%
19	0.25%	5.25%
20	0.25%	5.25%
21	0.25%	5.25%
22	0.25%	5.25%
23	0.25%	5.25%
24	0.25%	5.25%
25 or more	0.00%	5.00%

TABLE 18 (CONTINUED)

Salary increases are assumed to occur once a year, on July 1. Therefore the pay used for the period between the valuation date and the first anniversary of the valuation date is equal to the reported pay for the prior year, annualized if necessary, and then increased by the salary increase assumption. To adjust the pays received as of March 31st to the June 30th valuation date, the reported pay for each member is increased by 1%.

TABLE 18 (CONTINUED)

B. Demographic Assumptions

1. Mortality rates:

Active Members: Multiples of the RP 2014 mortality table for active employees based on the occupation of the member as follows:

Type	General Employees	Teachers	Police and Fire
	Male & Female	Male & Female	Male & Female
Ordinary	94%	92%	83%
% of Ordinary	41%	52%	24%
Choosing Annuity			
Duty Related	6%	8%	17%

Healthy Retirees: The 2019 Public Retirees of Hawaii mortality table, generational projection using the BB projection table from the year 2019 and with multipliers based on plan and group experience. The following are sample rates of the base table as of 2019 with the corresponding multipliers:

Healthy Annuitant Mortality Rates Before Projection (Multiplier Applied)

Age	General Employees		Teachers		Police and Fire	
	Male	Female	Male	Female	Male	Female
50	0.2901%	0.2376%	0.2640%	0.1980%	0.3394%	0.2376%
55	0.4195%	0.3042%	0.3817%	0.2535%	0.4908%	0.3042%
60	0.5773%	0.3175%	0.5253%	0.2646%	0.6754%	0.3175%
65	0.8603%	0.3175%	0.7829%	0.2646%	1.0066%	0.3175%
70	1.2866%	0.7022%	1.1708%	0.5852%	1.5053%	0.7022%
75	2.0370%	1.3340%	1.8537%	1.1117%	2.3833%	1.3340%
80	3.4486%	2.2177%	3.1382%	1.8481%	4.0349%	2.2177%
85	6.2716%	3.9579%	5.7072%	3.2982%	7.3378%	3.9579%
90	11.8489%	7.7873%	10.7825%	6.4895%	13.8632%	7.7873%
Multiplier	100%	108%	91%	90%	117%	108%
Setback	0	0	0	0	0	0

TABLE 18 (CONTINUED)

The following table provides the life expectancy for individuals retiring in future years based on the assumption with full generational projection:

<u>Life Expectancy for an Age 65 Retiree in Years</u>					
Gender	Year of Retirement				
	2025	2030	2035	2040	2045
<u>General Retirees</u>					
Male	23.8	24.2	24.7	25.2	25.6
Female	26.8	27.2	27.5	27.9	28.2
<u>Teachers</u>					
Male	24.5	25.0	25.4	25.9	26.3
Female	28.2	28.5	28.8	29.1	29.5
<u>Police and Fire</u>					
Male	22.5	23.0	23.5	24.0	24.5
Female	26.8	27.2	27.5	27.9	28.2

Disabled retirees: Base Table for healthy retiree's occupation, set forward 5 years, generational projection using the BB projection table from the year 2019. Minimum mortality rate of 3.5% for males and 2.5% for females.

2. Disability rates – The assumed total disability rates at select ages are multiples of the client specific table that follows:

Age	Male & Female
25	0.000%
30	0.001%
35	0.008%
40	0.026%
45	0.064%
50	0.146%
55	0.198%
60	0.217%

Note: The disability rates project the percentage of employees at each age that is assumed to become disabled before retiring. Multiples of the rates above are assumed to be ordinary disability or accidental disability, and varies by employee group as follows:

Type	General Employees	Teachers	Police and Fire
	Male & Female	Male & Female	Male & Female
Ordinary	240%	85%	70%
Accidental	40%	7%	100%

TABLE 18 (CONTINUED)

3. Termination Rates - Same male and female rates, based solely on the member's service. Rates reflect terminations for causes other than death, disability or retirement. Employees eligible for retirement are assumed to have no probability of termination. Sample rates are shown below:

Years of Service	Expected Terminations per 1000 Lives (Male & Female)		
	General Employees	Teachers	Police & Fire
0	185.9	243.6	110.0
1	152.5	200.8	95.0
2	124.6	164.7	37.0
3	101.6	134.4	30.1
4	82.9	109.4	26.1
5	67.9	89.0	23.3
6	56.1	72.5	21.0
7	47.0	59.5	19.2
8	40.1	49.4	17.7
9	35.1	41.7	16.4
10	31.5	36.0	15.2
11	29.1	31.9	14.1
12	27.6	29.0	13.2
13	26.6	27.0	12.3
14	25.9	25.7	11.5
15	25.5	24.8	10.8
16	25.1	24.0	10.1
17	24.5	23.2	9.5
18	23.9	22.4	8.9
19	23.0	21.4	8.3
20	22.0	20.2	7.7
21	20.8	18.7	7.2
22	19.5	17.1	6.8
23	18.3	15.4	6.3
24	17.4	13.6	5.8
25	16.8	12.1	0.0
26	16.8	10.9	0.0
27	16.8	10.4	0.0
28	16.8	10.7	0.0
29	16.8	10.0	0.0
30 and more	0.0	0.0	0.0

TABLE 18 (CONTINUED)

4. Retirement Rates – separate male and female rates, based on age. Sample rates are shown below:

Contributory Members

Expected Retirements per 100 Lives									
	General Employees				Teachers				Police/Fire
	Unreduced Retirement		Reduced Retirement		Unreduced Retirement		Reduced Retirement		Unreduced Retirement
Age	Male	Female	Male	Female	Male	Female	Male	Female	Male & Female
45	0	0	0	0	0	0	0	0	13.5
46	0	0	0	0	0	0	0	0	13.5
47	0	0	0	0	0	0	0	0	13.5
48	0	0	0	0	0	0	0	0	13.5
49	0	0	0	0	0	0	0	0	13.5
50	0	0	0	0	0	0	1	0	16.0
51	0	0	2	1	0	0	1	1	16.0
52	0	0	2	1	0	0	1	1	16.0
53	0	0	2	1	0	0	2	2	16.0
54	0	0	3	2	0	0	3	3	16.0
55	25	20	3	2	20	18			20.0
56	25	20			15	16			20.0
57	16	13			15	16			20.0
58	16	13			15	16			22.0
59	13	13			15	16			25.0
60	13	15			14	18			30.0
61	13	15			14	18			30.0
62	28	25			14	25			30.0
63	20	20			14	20			30.0
64	20	20			14	15			30.0
65	20	20			20	25			100.0
66	18	20			15	25			
67	18	20			15	20			
68	18	20			15	20			
69	18	20			15	20			
70	20	20			15	20			
71	20	20			15	20			
72	20	20			15	20			
73	20	20			15	20			
74	20	20			15	20			
75	100	100			100	100			

TABLE 18 (CONTINUED)

Noncontributory Members

Age	Expected Retirements per 100 Lives									
	General Employees				Teachers				Reduced Retirement	
	Unreduced		25 & Out		Reduced		Unreduced		Male	Female
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
55	20	11	15	11	1	1	10	13	1	2
56	18	11	23	11	1	1	10	7	1	2
57	13	11	18	11	1	1	10	8	1	2
58	10	11	15	11	1	1	10	10	2	2
59	10	11	15	11	2	2	10	20	3	3
60	10	14	15	14	3	3	10	11	5	5
61	11	18	16	18	4	4	10	16	7	5
62	20	20	25	20			16	25		
63	20	20	25	20			12	20		
64	12	20	17	20			10	15		
65	14	20	19	20			20	25		
66	20	20	25	20			15	25		
67	20	20	25	20			15	25		
68	20	20	25	20			15	25		
69	20	20	25	20			15	25		
70	20	20	25	20			15	25		
71	20	20	25	20			15	25		
72	20	20	25	20			15	25		
73	20	20	25	20			15	25		
74	20	20	25	20			15	25		
75	100	100	100	100			100	100		

Note: Retirement rates for the 25&out group age 50-54 are 15% for male and 11% for female.

TABLE 18 (CONTINUED)

Hybrid Members

Age	Expected Retirements per 100 Lives							
	General Employees				Teachers			
	Unreduced		Reduced		Unreduced		Reduced	
	Male	Female	Male	Female	Male	Female	Male	Female
55	18	18	1	1	20	16	2	2
56	12	13	1	1	13	10	2	2
57	12	13	1	1	13	10	2	2
58	16	13	1	2	13	12	2	2
59	16	13	2	2	13	12	3	3
60	14	13	2	4	14	14	3	5
61	14	15	3	4	14	18	3	10
62	21	20			22	30		
63	18	20			14	20		
64	18	20			14	20		
65	21	20			20	25		
66	18	18			15	25		
67	18	18			15	25		
68	18	18			15	25		
69	18	18			15	25		
70	20	20			15	25		
71	20	20			15	25		
72	20	20			15	25		
73	20	20			15	25		
74	20	20			15	25		
75	100	100			100	100		

Note: Retirement rates for the 25&out group age 50-54 are 6% for both male and female.

For members hired after June 30, 2012 the retirement rates for members once they reach unreduced retirement eligibility are increased 10% (multiplicative) for each year the member is beyond the age the member would have been eligible under the Hybrid provisions for members hired prior to June 30, 2012.

TABLE 18 (CONTINUED)

C. Other Assumptions

1. Projected payroll for contributions: The aggregate projected payroll for the fiscal year following the valuation date is calculated by increasing the actual payroll paid during the previous fiscal year by the payroll growth rate and multiplying by the ratio of current active members to the average number of active members during the previous fiscal year.
2. Age difference: Male members are assumed to be four years older than their spouses, and female members are assumed to be four years younger than their spouses.
3. Marriage Assumption: While not implicitly used in the valuation, 100% of active members are assumed to be married when setting other benefit election and eligibility assumptions.
4. Percent electing annuity on death for contributory participants (when eligible): All of the spouses of married participants who die after becoming eligible for a retirement benefit are assumed to elect an annuity or a refund, whichever is more valuable at time of participant's death.
5. Payment Option: Future healthy retirees are assumed to choose the life only payment option. 50% of future disabled retirees are assumed to choose the 100% Joint and Survivor option.
6. Percent electing deferred termination benefit: vested terminating members are assumed to elect a refund or a deferred benefit, whichever is more valuable at the time of termination.
7. Assumed age for commencement of deferred benefits: Members electing to receive a deferred benefit are assumed to commence receipt when eligible for early retirement.
8. Administrative expenses: Administrative expenses are assumed to be 0.35% of active member payroll.
9. Reemployment, purchase of service, transfers: No recognition is made of (i) future member reimbursements upon reemployment, (ii) future purchase of additional service, or (iii) special transfer provisions.
10. Sick Leave: It is assumed that all members will have their benefit service increased by sick leave and the following loads will be applied by group:

General Employees	3.75%
Teachers	4.25%
Police and Fire	5.00%

TABLE 18 (CONTINUED)

11. COLA delay: It is assumed that the first COLA will be received 9 months after retirement. Teachers are assumed to receive COLA 12 months after retirement,
12. There will be no recoveries once disabled.
13. No surviving spouse will remarry and there will be no children's benefit.
14. Pay increase timing: Beginning of (fiscal) year. This is equivalent to assuming that reported pays represent amounts paid to members during the year ended on the valuation date.
15. Decrement timing: Retirements and terminations of Teachers are assumed to occur at the beginning of the year. All other decrements are assumed to occur mid-year.
16. Eligibility testing: Eligibility for benefits is determined based upon the age nearest birthday and service nearest whole year on the date the decrement is assumed to occur.
17. Decrement relativity: Decrement rates are used directly from the experience study, without adjustment for multiple decrement table effects.
18. Incidence of Contributions: Contributions are assumed to be received continuously throughout the year based upon the computed percent of payroll shown in this report, and the actual payroll payable at the time contributions are made.
19. Benefit Service: All members are assumed to accrue 1 year of service each year. Exact fractional service is used to determine the amount of benefit payable.
20. Police officers, firefighters, investigators of the Department of the Prosecuting Attorney and the Attorney General, narcotic enforcement investigators, and public safety investigators hired prior to June 30, 2012 are not assumed to retire at age 55 unless they have 10 years of service.

VII. Participant Data

Participant data was supplied in electronic files for (i) active members, (ii) inactive vested members, who are entitled to a future deferred benefit, (iii) members and beneficiaries receiving benefits.

Salary supplied for the current year was based on the actual pensionable earnings for the 12-month period ending the March preceding the valuation date. This pay was increased by 1% to reflect the three month difference from March to June. For members with less than one year of service, the base pay rate provided in the data was used.

TABLE 18 (CONTINUED)

VIII. Dates of Adoption of Assumptions and Methods

The actuarial assumptions and methods were adopted by the Board of Trustees on August 12, 2019 as recommended by Gabriel, Roeder, Smith & Company (GRS).

IX. Changes in Assumptions and Methods since Prior Valuation

The actuarial assumptions have been revised since the prior valuation. Please see our Experience Study report dated July 30, 2019 for a more extensive discussion of the changes in the actuarial assumptions and the rationale for the current assumptions.

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TABLE 19

**Distribution of Active Members by Age and by Years of Service - All Employees
As of 06/30/2020**

Attained Age	Years of Credited Service												Total Count & Avg. Comp.
	0	1	2	3	4	5-9	10-14	15-19	20-24	25-29	30-34	35 & Over	
	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	
Under 25	378 \$46,287	270 \$46,812	68 \$43,521	29 \$46,499	9 \$39,640	4 \$36,935	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	758 \$46,194
25-29	790 \$49,207	911 \$47,431	758 \$48,683	551 \$52,119	391 \$52,152	397 \$56,164	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	3,798 \$50,129
30-34	694 \$51,416	830 \$49,084	801 \$52,942	691 \$53,539	653 \$53,189	2,218 \$62,671	273 \$72,676	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	6,160 \$56,721
35-39	517 \$52,907	695 \$51,722	653 \$53,026	544 \$56,186	465 \$54,423	2,343 \$64,030	1,905 \$73,537	268 \$77,704	0 \$0	0 \$0	0 \$0	0 \$0	7,390 \$62,887
40-44	439 \$52,414	573 \$52,095	477 \$53,499	463 \$53,426	387 \$55,823	1,873 \$64,168	2,069 \$73,855	1,905 \$80,222	222 \$88,888	0 \$0	0 \$0	0 \$0	8,408 \$67,824
45-49	351 \$50,705	405 \$51,685	409 \$52,199	350 \$56,188	332 \$54,534	1,463 \$62,661	1,604 \$71,546	1,979 \$79,754	1,705 \$90,454	271 \$88,314	1 \$59,222	0 \$0	8,870 \$72,191
50-54	273 \$51,760	325 \$52,039	325 \$53,742	278 \$53,485	270 \$53,249	1,237 \$60,288	1,347 \$68,107	1,598 \$75,581	1,597 \$86,743	1,870 \$88,290	334 \$87,174	0 \$0	9,454 \$73,789
55-59	241 \$51,583	313 \$50,687	251 \$53,199	227 \$58,570	210 \$54,495	1,043 \$59,700	1,344 \$63,265	1,360 \$67,989	1,078 \$76,895	1,663 \$81,736	1,359 \$86,633	156 \$87,058	9,245 \$70,988
60-64	161 \$57,185	195 \$52,628	172 \$52,524	209 \$57,687	153 \$56,027	876 \$61,436	1,070 \$62,587	1,124 \$65,770	899 \$70,412	1,133 \$79,054	934 \$84,748	503 \$89,316	7,429 \$70,103
65 & Over	79 \$52,557	103 \$54,907	95 \$55,684	113 \$64,016	96 \$58,494	594 \$65,228	743 \$66,124	816 \$70,346	621 \$72,921	633 \$81,069	590 \$91,192	755 \$99,232	5,238 \$76,088
Total	3,923 \$51,015	4,620 \$50,219	4,009 \$52,109	3,455 \$54,843	2,966 \$54,115	12,048 \$62,484	10,355 \$69,567	9,050 \$74,702	6,122 \$82,320	5,570 \$83,635	3,218 \$86,969	1,414 \$94,362	66,750 \$67,766

TABLE 20

**Distribution of Active Members by Age and by Years of Service
Noncontributory Members, All
As of 06/30/2020**

Attained Age	Years of Credited Service												Total Count & Avg. Comp.
	0	1	2	3	4	5-9	10-14	15-19	20-24	25-29	30-34	35 & Over	
	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	
Under 25	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0
25-29	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0
30-34	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	3 \$58,593	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	3 \$58,593
35-39	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	128 \$68,039	109 \$63,244	0 \$0	0 \$0	0 \$0	0 \$0	237 \$65,834
40-44	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	3 \$32,064	216 \$67,410	724 \$72,188	72 \$66,029	0 \$0	0 \$0	0 \$0	1,015 \$70,616
45-49	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	1 \$53,826	152 \$64,367	752 \$70,682	553 \$75,829	105 \$68,841	0 \$0	0 \$0	1,563 \$71,754
50-54	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	135 \$61,230	651 \$68,035	595 \$74,538	673 \$76,493	134 \$73,766	0 \$0	2,188 \$72,336
55-59	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	2 \$22,775	116 \$54,387	637 \$63,289	491 \$70,839	671 \$75,761	532 \$79,417	49 \$83,000	2,498 \$71,499
60-64	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	97 \$58,455	479 \$60,702	428 \$64,370	531 \$71,708	390 \$79,353	139 \$84,765	2,064 \$69,333
65 & Over	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	1 \$68,163	63 \$63,355	346 \$62,351	315 \$65,402	328 \$76,291	291 \$85,214	279 \$93,229	1,623 \$75,210
Total	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	7 \$37,676	910 \$63,149	3,698 \$66,946	2,454 \$70,893	2,308 \$74,803	1,347 \$80,089	467 \$89,636	11,191 \$71,634



TABLE 21

**Distribution of Active Members by Age and by Years of Service
Noncontributory Members, General Employees
As of 06/30/2020**

Attained Age	Years of Credited Service												Total
	0	1	2	3	4	5-9	10-14	15-19	20-24	25-29	30-34	35 & Over	
	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.
Under 25	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0
25-29	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0
30-34	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	3 \$58,593	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	3 \$0
35-39	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	67 \$62,586	76 \$57,661	0 \$0	0 \$0	0 \$0	0 \$0	143 \$0
40-44	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	3 \$32,064	119 \$62,495	366 \$67,958	49 \$62,877	0 \$0	0 \$0	0 \$0	537 \$66,083
45-49	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	1 \$53,826	118 \$60,972	478 \$65,751	271 \$70,652	88 \$64,261	0 \$0	0 \$0	956 \$66,401
50-54	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	117 \$57,090	495 \$63,669	382 \$71,477	433 \$71,616	113 \$70,726	0 \$0	1,540 \$67,858
55-59	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	2 \$22,775	101 \$52,118	506 \$57,742	372 \$64,503	499 \$71,175	357 \$73,452	42 \$81,312	1,879 \$65,820
60-64	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	86 \$55,459	381 \$55,502	345 \$59,979	443 \$66,838	317 \$75,030	110 \$80,766	1,682 \$64,736
65 & Over	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	50 \$57,782	294 \$58,689	247 \$58,587	253 \$67,758	209 \$74,809	192 \$83,398	1,245 \$66,992
Total	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	6 \$32,595	661 \$58,400	2,596 \$61,563	1,666 \$65,240	1,716 \$69,308	996 \$73,930	344 \$82,302	7,985 \$66,147



TABLE 22

**Distribution of Active Members by Age and by Years of Service
Noncontributory Members, Teachers
As of 06/30/2020**

Attained Age	Years of Credited Service												Total
	0	1	2	3	4	5-9	10-14	15-19	20-24	25-29	30-34	35 & Over	
	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.
Under 25	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0
25-29	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0
30-34	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0
35-39	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	61 \$74,028	33 \$76,103	0 \$0	0 \$0	0 \$0	0 \$0	94 \$74,757
40-44	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	97 \$73,440	358 \$76,514	23 \$72,745	0 \$0	0 \$0	0 \$0	478 \$75,709
45-49	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	34 \$76,149	274 \$79,283	282 \$80,804	17 \$92,554	0 \$0	0 \$0	607 \$80,186
50-54	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	18 \$88,137	156 \$81,886	213 \$80,028	240 \$85,292	21 \$90,125	0 \$0	648 \$82,978
55-59	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	15 \$69,666	131 \$84,716	119 \$90,645	172 \$89,068	175 \$91,586	7 \$93,131	619 \$88,738
60-64	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	11 \$81,876	98 \$80,920	83 \$82,618	88 \$96,225	73 \$98,126	29 \$99,931	382 \$89,574
65 & Over	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	1 \$68,163	13 \$84,788	52 \$83,052	68 \$90,160	75 \$105,078	82 \$111,733	87 \$114,925	378 \$102,279
Total	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	1 \$68,163	249 \$75,754	1,102 \$79,626	788 \$82,843	592 \$90,730	351 \$97,565	123 \$110,149	3,206 \$85,298

TABLE 23

**Distribution of Active Members by Age and by Years of Service
Contributory Members, All
As of 06/30/2020**

Attained Age	Years of Credited Service												Total
	0	1	2	3	4	5-9	10-14	15-19	20-24	25-29	30-34	35 & Over	
	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.
Under 25	43 \$67,907	35 \$68,274	12 \$63,376	5 \$64,159	0 \$0	1 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	96 \$67,268
25-29	67 \$67,784	78 \$67,948	47 \$65,060	51 \$68,326	34 \$71,426	63 \$76,001	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	340 \$69,414
30-34	56 \$63,392	66 \$62,359	79 \$65,212	70 \$66,427	66 \$72,226	316 \$82,739	66 \$107,155	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	719 \$77,124
35-39	16 \$69,723	25 \$65,181	30 \$63,265	42 \$67,745	31 \$66,930	265 \$83,736	289 \$106,389	65 \$115,180	0 \$0	0 \$0	0 \$0	0 \$0	763 \$91,726
40-44	5 \$71,189	11 \$63,843	18 \$67,846	12 \$78,339	9 \$71,588	165 \$85,173	295 \$106,385	307 \$118,117	69 \$129,228	0 \$0	0 \$0	0 \$0	891 \$106,038
45-49	3 \$54,072	6 \$68,688	7 \$78,038	4 \$99,514	9 \$90,063	74 \$87,318	149 \$109,060	312 \$117,837	399 \$133,067	56 \$155,418	0 \$0	0 \$0	1,019 \$121,299
50-54	1 \$197,229	5 \$78,706	1 \$45,438	0 \$0	0 \$0	30 \$79,574	63 \$113,254	183 \$116,714	285 \$133,028	230 \$143,978	53 \$151,339	0 \$0	851 \$129,925
55-59	2 \$69,677	4 \$93,364	0 \$0	0 \$0	1 \$95,809	12 \$123,505	19 \$102,205	43 \$123,762	84 \$127,490	109 \$141,329	65 \$158,726	37 \$102,141	376 \$131,821
60-64	1 \$209,155	2 \$61,721	1 \$73,253	5 \$118,989	0 \$0	8 \$81,059	12 \$121,461	13 \$129,077	25 \$125,672	45 \$137,861	31 \$150,509	115 \$90,040	258 \$112,987
65 & Over	0 \$0	1 \$77,240	1 \$208,565	1 \$77,240	1 \$206,148	5 \$93,485	7 \$103,575	19 \$127,558	14 \$125,302	12 \$136,231	15 \$163,141	159 \$95,797	235 \$107,460
Total	194 \$67,994	233 \$66,596	196 \$66,137	190 \$70,057	151 \$73,027	939 \$83,803	900 \$107,458	942 \$118,148	876 \$131,882	452 \$143,942	164 \$155,189	311 \$94,423	5,548 \$106,005

TABLE 24

**Distribution of Active Members by Age and by Years of Service
Contributory Members, General Employees
As of 06/30/2020**

Attained Age	Years of Credited Service												Total
	0	1	2	3	4	5-9	10-14	15-19	20-24	25-29	30-34	35 & Over	
	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.
Under 25	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0
25-29	0 \$0	0 \$0	0 \$0	1 \$63,230	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	1 \$63,230
30-34	0 \$0	1 \$70,708	0 \$0	1 \$63,230	0 \$0	7 \$75,837	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	9 \$73,866
35-39	0 \$0	3 \$64,542	1 \$63,230	2 \$70,235	1 \$63,230	6 \$71,030	5 \$72,865	1 \$120,118	0 \$0	0 \$0	0 \$0	0 \$0	19 \$72,167
40-44	0 \$0	0 \$0	0 \$0	1 \$202,504	0 \$0	5 \$108,001	9 \$98,453	7 \$94,719	0 \$0	0 \$0	0 \$0	0 \$0	22 \$104,165
45-49	0 \$0	1 \$70,708	1 \$196,639	2 \$130,500	2 \$129,935	4 \$130,438	7 \$109,756	14 \$82,949	8 \$111,879	1 \$151,173	0 \$0	0 \$0	40 \$107,144
50-54	1 \$197,229	1 \$59,146	1 \$45,438	0 \$0	0 \$0	4 \$65,100	9 \$144,787	24 \$107,748	14 \$123,561	9 \$94,973	3 \$93,562	0 \$0	66 \$110,857
55-59	0 \$0	3 \$100,153	0 \$0	0 \$0	1 \$95,809	6 \$159,539	4 \$62,199	9 \$140,978	6 \$72,427	15 \$95,594	7 \$142,203	23 \$73,572	74 \$100,367
60-64	1 \$209,155	1 \$63,230	0 \$0	5 \$118,989	0 \$0	7 \$80,489	8 \$132,172	8 \$144,147	7 \$112,473	6 \$158,572	8 \$151,022	77 \$74,850	128 \$96,497
65 & Over	0 \$0	1 \$77,240	1 \$208,565	1 \$77,240	1 \$206,148	5 \$93,485	6 \$110,568	15 \$130,654	8 \$127,067	6 \$148,308	8 \$199,822	112 \$86,747	164 \$102,930
Total	2 \$203,192	11 \$75,920	4 \$128,468	13 \$107,894	5 \$125,011	44 \$96,983	48 \$110,236	78 \$114,259	43 \$113,100	37 \$115,706	26 \$157,033	212 \$80,997	523 \$100,674



TABLE 25

**Distribution of Active Members by Age and by Years of Service
Contributory Members, Teachers
As of 06/30/2020**

Attained Age	Years of Credited Service												Total Count & Avg. Comp.	
	0	1	2	3	4	5-9	10-14	15-19	20-24	25-29	30-34	35 & Over		
	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.		
Under 25	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0
25-29	0 \$0	0 \$0	1 \$53,486	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	1 \$53,486
30-34	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0
35-39	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0
40-44	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	1 \$54,386	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	1 \$54,386
45-49	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	1 \$82,703	0 \$0	0 \$0	0 \$0	0 \$0	1 \$82,703
50-54	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	1 \$108,033	2 \$83,466	0 \$0	0 \$0	0 \$0	3 \$91,655
55-59	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	1 \$178,806	0 \$0	1 \$110,425	1 \$144,616	2 \$144,616
60-64	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	1 \$186,452	3 \$82,274	3 \$121,173	24 \$102,054	31 \$104,712	
65 & Over	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	1 \$61,617	1 \$67,728	1 \$89,446	1 \$112,215	0 \$0	42 \$112,463	46 \$109,879	
Total	0 \$0	0 \$0	1 \$53,486	0 \$0	0 \$0	0 \$0	2 \$58,002	1 \$67,728	4 \$116,658	7 \$100,682	3 \$121,173	67 \$108,704	85 \$106,533	



TABLE 26

**Distribution of Active Members by Age and by Years of Service
Contributory Members, Police and Firefighters
As of 06/30/2020**

Attained Age	Years of Credited Service												Total
	0	1	2	3	4	5-9	10-14	15-19	20-24	25-29	30-34	35 & Over	
	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	
Under 25	43 \$67,907	35 \$68,274	12 \$63,376	5 \$64,159	0 #DIV/0!	1 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	96 \$67,268
25-29	67 \$67,784	78 \$67,948	46 \$65,312	50 \$68,428	34 \$71,426	63 \$76,001	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	338 \$69,479
30-34	56 \$63,392	65 \$62,231	79 \$65,212	69 \$66,473	66 \$72,226	309 \$82,895	66 \$107,155	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	710 \$77,165
35-39	16 \$69,723	22 \$65,268	29 \$63,266	40 \$67,620	30 \$67,053	259 \$84,030	284 \$106,979	64 \$115,103	0 \$0	0 \$0	0 \$0	0 \$0	744 \$92,225
40-44	5 \$71,189	11 \$63,843	18 \$67,846	11 \$67,051	9 \$71,588	160 \$84,460	285 \$106,818	300 \$118,663	69 \$129,228	0 \$0	0 \$0	0 \$0	868 \$106,145
45-49	3 \$54,072	5 \$68,284	6 \$58,271	2 \$68,527	7 \$78,671	70 \$84,854	142 \$109,026	298 \$119,476	390 \$133,631	55 \$155,495	0 \$0	0 \$0	978 \$121,917
50-54	0 \$0	4 \$83,596	0 \$0	0 \$0	0 \$0	26 \$81,801	54 \$107,998	159 \$118,067	270 \$133,611	219 \$146,545	50 \$154,806	0 \$0	782 \$131,681
55-59	2 \$69,677	1 \$72,995	0 \$0	0 \$0	0 \$0	6 \$87,470	15 \$112,873	34 \$119,205	78 \$131,726	93 \$148,303	58 \$160,720	13 \$152,049	300 \$139,495
60-64	0 \$0	1 \$60,212	1 \$73,253	0 \$0	0 \$0	1 \$85,051	4 \$100,040	5 \$104,965	17 \$127,532	36 \$139,041	20 \$154,704	14 \$152,992	99 \$136,899
65 & Over	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	3 \$132,022	5 \$129,651	5 \$126,541	7 \$121,221	5 \$158,531	25 \$132,729
Total	192 \$66,586	222 \$66,134	191 \$64,898	177 \$67,278	146 \$71,247	895 \$83,155	850 \$107,417	863 \$118,558	829 \$132,930	408 \$147,245	135 \$155,590	32 \$153,475	4,940 \$106,560

TABLE 27

**Distribution of Active Members by Age and by Years of Service
Hybrid Members, All
As of 06/30/2020**

Attained Age	Years of Credited Service												Total
	0	1	2	3	4	5-9	10-14	15-19	20-24	25-29	30-34	35 & Over	
	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	
Under 25	335 \$43,512	235 \$43,616	56 \$39,267	24 \$42,820	9 \$39,640	3 \$49,246	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	662 \$43,138
25-29	723 \$47,486	833 \$45,510	711 \$47,600	500 \$50,466	357 \$50,316	334 \$52,422	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	3,458 \$48,233
30-34	638 \$50,365	764 \$47,937	722 \$51,600	621 \$52,087	587 \$51,049	1,902 \$59,337	204 \$61,728	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	5,438 \$54,022
35-39	501 \$52,370	670 \$51,220	623 \$52,533	502 \$55,219	434 \$53,530	2,078 \$61,517	1,488 \$67,630	94 \$68,557	0 \$0	0 \$0	0 \$0	0 \$0	6,390 \$59,334
40-44	434 \$52,198	562 \$51,865	459 \$52,936	451 \$52,763	378 \$55,448	1,705 \$62,192	1,558 \$68,589	874 \$73,565	81 \$74,843	0 \$0	0 \$0	0 \$0	6,502 \$62,152
45-49	348 \$50,676	399 \$51,429	402 \$51,749	346 \$55,687	323 \$53,544	1,388 \$61,353	1,303 \$68,094	915 \$74,225	753 \$78,615	110 \$72,739	1 \$59,222	0 \$0	6,288 \$64,341
50-54	272 \$51,226	320 \$51,623	324 \$53,767	278 \$53,485	270 \$53,249	1,207 \$59,809	1,149 \$66,440	764 \$72,160	717 \$78,475	967 \$83,255	147 \$76,261	0 \$0	6,415 \$66,838
55-59	239 \$51,432	309 \$50,135	251 \$53,199	227 \$58,570	209 \$54,298	1,029 \$59,027	1,209 \$63,505	680 \$68,864	503 \$74,358	883 \$78,919	762 \$85,521	70 \$81,925	6,371 \$67,197
60-64	160 \$56,235	193 \$52,533	171 \$52,403	204 \$56,184	153 \$56,027	868 \$61,255	961 \$62,269	632 \$68,309	446 \$73,112	557 \$81,306	513 \$84,876	249 \$91,523	5,107 \$68,247
65 & Over	79 \$52,557	102 \$54,688	94 \$54,057	112 \$63,898	95 \$56,940	588 \$64,983	673 \$65,994	451 \$74,070	292 \$78,520	293 \$84,158	284 \$93,517	317 \$106,239	3,380 \$74,328
Total	3,729 \$50,132	4,387 \$49,350	3,813 \$51,388	3,265 \$53,958	2,815 \$53,100	11,102 \$60,696	8,545 \$66,259	4,410 \$71,925	2,792 \$76,814	2,810 \$81,188	1,707 \$85,845	636 \$97,801	50,011 \$62,658



TABLE 28

**Distribution of Active Members by Age and by Years of Service
Hybrid Members, General Employees
As of 06/30/2020**

Attained Age	Years of Credited Service												Total
	0	1	2	3	4	5-9	10-14	15-19	20-24	25-29	30-34	35 & Over	
	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	
Under 25	177 \$39,879	143 \$40,621	49 \$38,376	24 \$42,820	9 \$39,640	3 \$49,246	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	405 \$40,198
25-29	480 \$45,954	552 \$43,825	457 \$45,016	282 \$47,096	207 \$45,714	230 \$49,194	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	2,208 \$45,688
30-34	449 \$47,160	568 \$46,293	525 \$49,554	426 \$49,946	404 \$48,384	1,139 \$56,866	128 \$58,208	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	3,639 \$51,259
35-39	348 \$48,961	498 \$49,096	470 \$50,282	376 \$52,707	321 \$51,236	1,387 \$59,370	788 \$65,409	64 \$65,717	0 \$0	0 \$0	0 \$0	0 \$0	4,252 \$56,322
40-44	308 \$49,216	423 \$49,068	339 \$49,184	341 \$50,368	290 \$53,316	1,212 \$58,767	1,011 \$66,345	416 \$69,416	50 \$71,966	0 \$0	0 \$0	0 \$0	4,390 \$58,314
45-49	237 \$48,204	311 \$49,692	310 \$48,493	267 \$53,116	247 \$51,380	1,048 \$57,382	910 \$63,909	591 \$70,836	336 \$73,852	79 \$67,130	1 \$59,222	0 \$0	4,337 \$59,746
50-54	207 \$49,369	259 \$50,260	252 \$50,763	215 \$50,415	222 \$51,009	935 \$56,109	880 \$62,199	574 \$67,335	441 \$74,285	539 \$80,631	122 \$72,537	0 \$0	4,646 \$62,228
55-59	199 \$49,975	248 \$48,623	211 \$50,715	189 \$55,988	173 \$50,978	840 \$56,284	970 \$59,866	529 \$64,253	365 \$70,303	648 \$75,518	473 \$79,789	60 \$77,753	4,905 \$62,884
60-64	121 \$53,703	160 \$51,740	140 \$50,967	176 \$54,621	126 \$54,597	736 \$58,683	780 \$57,687	506 \$63,390	324 \$66,084	428 \$77,640	375 \$81,094	184 \$86,096	4,056 \$63,994
65 & Over	55 \$45,689	79 \$53,060	81 \$54,375	91 \$62,159	79 \$56,004	498 \$62,410	549 \$61,839	354 \$69,537	224 \$70,903	211 \$77,142	190 \$82,501	207 \$96,529	2,618 \$68,240
Total	2,581 \$47,690	3,241 \$47,671	2,834 \$48,991	2,387 \$51,718	2,078 \$50,728	8,028 \$57,792	6,016 \$62,496	3,034 \$67,330	1,740 \$71,337	1,905 \$77,273	1,161 \$79,874	451 \$89,775	35,456 \$59,061



TABLE 29

**Distribution of Active Members by Age and by Years of Service
Hybrid Members, Teachers
As of 06/30/2020**

Attained Age	Years of Credited Service												Total	
	0	1	2	3	4	5-9	10-14	15-19	20-24	25-29	30-34	35 & Over		
	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.	Count & Avg. Comp.		
Under 25	158 \$47,580	92 \$48,271	7 \$45,500	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	257 \$47,771
25-29	243 \$50,511	281 \$48,819	254 \$52,249	218 \$54,826	150 \$56,667	104 \$59,562	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	1,250 \$52,728
30-34	189 \$57,977	196 \$52,700	197 \$57,050	195 \$56,763	183 \$56,932	763 \$63,025	76 \$67,656	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	1,799 \$59,612
35-39	153 \$60,122	172 \$57,370	153 \$59,450	126 \$62,716	113 \$60,046	691 \$65,826	700 \$70,130	30 \$74,616	0 \$0	0 \$0	0 \$0	0 \$0	0 \$0	2,138 \$65,325
40-44	126 \$59,488	139 \$60,379	120 \$63,536	110 \$60,186	88 \$62,471	493 \$70,611	547 \$72,738	458 \$77,333	31 \$79,484	0 \$0	0 \$0	0 \$0	0 \$0	2,112 \$70,129
45-49	111 \$55,952	88 \$57,568	92 \$62,718	79 \$64,377	76 \$60,577	340 \$73,593	393 \$77,783	324 \$80,408	417 \$82,452	31 \$87,031	0 \$0	0 \$0	0 \$0	1,951 \$74,556
50-54	65 \$57,138	61 \$57,410	72 \$64,281	63 \$63,963	48 \$63,613	272 \$72,528	269 \$80,313	190 \$86,734	276 \$85,169	428 \$86,559	25 \$94,435	0 \$0	0 \$0	1,769 \$78,945
55-59	40 \$58,681	61 \$56,280	40 \$66,303	38 \$71,414	36 \$70,252	189 \$71,222	239 \$78,273	151 \$85,021	138 \$85,084	235 \$88,298	289 \$94,903	10 \$106,956	10 \$106,956	1,466 \$81,630
60-64	39 \$64,092	33 \$56,379	31 \$58,889	28 \$66,011	27 \$62,704	132 \$75,592	181 \$82,017	126 \$88,064	122 \$91,778	129 \$93,468	138 \$95,153	65 \$106,883	65 \$106,883	1,051 \$84,661
65 & Over	24 \$68,298	23 \$60,280	13 \$52,076	21 \$71,432	16 \$61,561	90 \$79,220	124 \$84,390	97 \$90,611	68 \$103,612	82 \$102,210	94 \$115,785	110 \$124,511	110 \$124,511	762 \$95,247
Total	1,148 \$55,622	1,146 \$54,098	979 \$58,327	878 \$60,047	737 \$59,790	3,074 \$68,281	2,529 \$75,212	1,376 \$82,058	1,052 \$85,872	905 \$89,429	546 \$98,540	185 \$117,369	185 \$117,369	14,555 \$71,422



TABLE 30

Summary of Pensions in Force by Type of Retirement

Employee Group	Contributory		Noncontributory		Hybrid	
	Number	Average Monthly Pension	Number	Average Monthly Pension	Number	Average Monthly Pension
All Employees	18,431	\$ 3,293	16,438	\$ 1,773	11,617	\$ 2,345
	<u>Service</u>		<u>Service</u>		<u>Service</u>	
Total	18,051	\$ 3,328	15,526	\$ 1,817	11,179	\$ 2,378
General Employees - male	3,352	2,842	4,927	1,801	3,285	2,447
General Employees - female	5,467	2,086	6,177	1,399	4,854	2,032
Teachers - male	1,429	3,899	1,482	2,543	915	3,216
Teachers - female	3,958	3,452	2,940	2,356	2,125	2,702
Police and Firefighters	3,845	5,177	-	-	-	-
	<u>Ordinary Disability</u>		<u>Ordinary Disability</u>		<u>Ordinary Disability</u>	
Total	149	\$ 1,094	721	\$ 1,031	334	\$ 1,494
General Employees - male	47	1,116	331	1,024	139	1,393
General Employees - female	48	824	301	914	127	1,406
Teachers - male	6	1,592	35	1,566	17	2,035
Teachers - female	19	1,359	54	1,385	51	1,810
Police and Firefighters	29	1,227	-	-	-	-
	<u>Accidental Disability</u>		<u>Accidental Disability</u>		<u>Accidental Disability</u>	
Total	231	\$ 2,021	191	\$ 1,000	104	\$ 1,521
General Employees - male	82	1,765	98	1,015	45	1,527
General Employees - female	47	1,643	83	930	51	1,502
Teachers - male	1	2,030	4	1,364	3	1,298
Teachers - female	4	3,912	6	1,478	5	1,806
Police and Firefighters	97	2,344	-	-	-	-

TABLE 31**Summary of Pensions in Force by Age and Type****General Employees**

Age	Type of Pension			
	Total	Service	Ordinary Disability	Accidental Disability
Total	29,461	28,062	993	406
	Contributory			
Total	9,043	8,819	95	129
30-39	-	-	-	-
40-44	-	-	-	-
45-49	3	2	-	1
50-54	4	3	1	-
55-59	90	79	2	9
60-64	368	348	9	11
65-69	855	823	18	14
70-74	1,258	1,225	14	19
75-79	1,465	1,430	13	22
80-84	1,519	1,489	13	17
85-89	1,723	1,695	11	17
90-94	1,223	1,198	11	14
95-99	464	457	3	4
100 & over	71	70	-	1
	Noncontributory			
Total	11,917	11,104	632	181
30-39	-	-	-	-
40-44	1	-	1	-
45-49	12	-	10	2
50-54	23	-	17	6
55-59	288	204	71	13
60-64	1,027	855	133	39
65-69	2,635	2,423	162	50
70-74	3,137	2,984	124	29
75-79	2,710	2,595	89	26
80-84	1,370	1,337	21	12
85-89	540	535	4	1
90-94	155	152	-	3
95-99	19	19	-	-
100 & over	-	-	-	-
	Hybrid			
Total	8,501	8,139	266	96
30-39	-	-	-	-
40-44	7	-	4	3
45-49	2	-	-	2
50-54	27	-	19	8
55-59	410	344	54	12
60-64	1,535	1,444	75	16
65-69	3,227	3,119	76	32
70-74	2,404	2,359	31	14
75-79	726	713	5	8
80-84	134	131	2	1
85-89	24	24	-	-
90-94	5	5	-	-
95-99	-	-	-	-
100 & over	-	-	-	-

TABLE 32**Summary of Pensions in Force by Age and Type****Teachers**

Age	Type of Pension			
	Total	Service	Ordinary Disability	Accidental Disability
Total	13,054	12,849	182	23
	Contributory			
Total	5,417	5,387	25	5
30-39	-	-	-	-
40-44	1	1	-	-
45-49	4	4	-	-
50-54	2	2	-	-
55-59	25	25	-	-
60-64	129	128	1	-
65-69	384	383	1	-
70-74	995	985	8	2
75-79	1,183	1,177	5	1
80-84	1,079	1,075	4	-
85-89	971	969	1	1
90-94	482	478	3	1
95-99	139	139	-	-
100 & over	23	21	2	-
	Noncontributory			
Total	4,521	4,422	89	10
30-39	-	-	-	-
40-44	-	-	-	-
45-49	3	3	-	-
50-54	9	3	6	-
55-59	87	71	13	3
60-64	224	205	18	1
65-69	717	694	18	5
70-74	1,477	1,458	19	-
75-79	1,243	1,229	13	1
80-84	554	552	2	-
85-89	162	162	-	-
90-94	42	42	-	-
95-99	3	3	-	-
100 & over	-	-	-	-
	Hybrid			
Total	3,116	3,040	68	8
30-39	1	-	1	-
40-44	-	-	-	-
45-49	5	1	4	-
50-54	16	5	10	1
55-59	159	149	7	3
60-64	479	457	20	2
65-69	1,085	1,066	18	1
70-74	987	978	8	1
75-79	309	309	-	-
80-84	62	62	-	-
85-89	10	10	-	-
90-94	2	2	-	-
95-99	1	1	-	-
100 & over	-	-	-	-

TABLE 33**Summary of Pensions in Force by Age and Type****Police and Firefighters**

Age	Type of Pension			
	Total	Service	Ordinary Disability	Accidental Disability
Total	3,971	3,845	29	97
30-39	1	-	-	1
40-44	3	-	1	2
45-49	34	29	-	5
50-54	281	272	5	4
55-59	609	594	5	10
60-64	673	659	3	11
65-69	700	679	5	16
70-74	742	719	3	20
75-79	518	494	4	20
80-84	268	262	2	4
85-89	100	96	1	3
90-94	36	35	-	1
95-99	6	6	-	-
100 & over	-	-	-	-

TABLE 34

**Noncontributory Service Pensions in Force
by Years of Service**

Years of Service	Total		General Employees		Teachers	
	Number	Average Monthly Pension	Number	Average Monthly Pension	Number	Average Monthly Pension
Total	15,526	\$ 1,817	11,104	\$ 1,577	4,422	\$ 2,419
Less than 5	4	737	4	737	-	-
5-9	10	682	8	667	2	745
10-14	2,969	599	2,393	567	576	734
15-19	2,285	975	1,766	913	519	1,185
20-24	2,419	1,311	1,856	1,214	563	1,629
25-29	1,991	1,871	1,447	1,692	544	2,347
30-34	3,532	2,632	2,152	2,406	1,380	2,986
35 and over	2,316	3,455	1,478	3,152	838	3,990

TABLE 35

**Noncontributory Service Pensions in Force
by Years Since Retirement**

Years Since Retirement	Total		General Employees		Teachers	
	Number	Average Monthly Pension	Number	Average Monthly Pension	Number	Average Monthly Pension
Total	15,526	\$ 1,817	11,104	\$ 1,577	4,422	\$ 2,419
Less than 5	3,817	1,641	2,963	1,520	854	2,061
5-9	3,430	1,659	2,521	1,474	909	2,171
10-14	3,439	1,879	2,509	1,627	930	2,559
15-19	2,982	2,014	1,914	1,658	1,068	2,652
20-24	1,091	1,841	743	1,485	348	2,600
25-29	729	2,356	431	2,098	298	2,728
30 -34	37	1,721	22	1,359	15	2,252
35 and over	1	919	1	919	-	-

TABLE 36-1

**Contributory Service Pensions in Force
by Years of Service**

Years of Service	Total		General Employees		Teachers		Police and Firefighters	
	Number	Average Monthly Pension	Number	Average Monthly Pension	Number	Average Monthly Pension	Number	Average Monthly Pension
Total	18,051	\$ 3,328	8,819	\$ 2,373	5,387	\$ 3,571	3,845	\$ 5,177
Less than 5	7	1,373	4	1,276	2	769	1	2,969
5-9	487	467	346	412	133	604	8	570
10-14	938	905	690	750	195	1,343	53	1,301
15-19	1,303	1,455	966	1,186	257	2,173	80	2,394
20-24	1,888	2,006	1,313	1,640	406	2,560	169	3,523
25-29	5,760	3,554	2,125	2,408	1,368	3,142	2,267	4,877
30-34	5,404	4,149	2,050	3,230	2,211	3,901	1,143	6,279
35 and over	2,264	4,597	1,325	3,945	815	5,363	124	6,529

TABLE 36-2

Hybrid Service Pensions in Force

by Years of Service

Years of Service	Total		General Employees		Teachers	
	Number	Average Monthly Pension	Number	Average Monthly Pension	Number	Average Monthly Pension
Total	11,179	\$ 2,378	8,139	\$ 2,200	3,040	\$ 2,857
Less than 5	5	387	2	-	3	644
5-9	1,101	708	893	705	208	722
10-14	1,500	1,016	1,209	977	291	1,179
15-19	1,426	1,443	1,050	1,368	376	1,654
20-24	1,615	1,830	1,120	1,679	495	2,170
25-29	1,515	2,556	1,051	2,383	464	2,949
30-34	2,403	3,387	1,685	3,262	718	3,680
35 and over	1,614	4,497	1,129	4,229	485	5,120

TABLE 37-1

**Contributory Service Pensions in Force
by Years Since Retirement**

Years Since Retirement	Total		General Employees		Teachers		Police and Firefighters	
	Number	Average Monthly Pension	Number	Average Monthly Pension	Number	Average Monthly Pension	Number	Average Monthly Pension
Total	18,051	\$ 3,328	8,819	\$ 2,373	5,387	\$ 3,571	3,845	\$ 5,177
Less than 5	1,443	5,787	360	3,719	195	5,847	888	6,613
5-9	1,677	4,703	692	3,332	316	5,058	669	5,955
10-14	2,373	3,966	1,180	2,986	616	4,415	577	5,492
15-19	3,043	3,480	1,412	2,680	1,035	3,997	596	4,477
20-24	2,198	2,726	1,173	2,008	644	3,283	381	3,998
25-29	4,053	2,897	2,075	2,278	1,474	3,386	504	4,012
30-34	2,127	2,031	1,186	1,621	777	2,440	164	3,057
35 -39	908	1,647	598	1,374	261	2,075	49	2,702
40-44	200	1,289	122	1,094	61	1,483	17	1,992
45 and over	29	855	21	842	8	890	-	-

TABLE 37-2

Hybrid Service Pensions in Force

by Years Since Retirement

Years Since Retirement	Total		General Employees		Teachers	
	Number	Average Monthly Pension	Number	Average Monthly Pension	Number	Average Monthly Pension
Total	11,179	\$ 2,378	8,139	\$ 2,200	3,040	\$ 2,857
Less than 5	5,422	2,343	4,124	2,161	1,298	2,922
5-9	3,989	2,359	2,769	2,181	1,220	2,764
10-14	1,768	2,528	1,246	2,367	522	2,913

TABLE 38**Pensions in Force by Payment Option****General Employees**

Type of Option	Total		Service		Ordinary Disability		Accidental Disability		Other	
	Number	Average Monthly Pension	Number	Average Monthly Pension	Number	Average Monthly Pension	Number	Average Monthly Pension	Number	Average Monthly Pension
Total	29,461	\$ 1,968	28,062	\$ 2,008	993	\$ 1,086	406	\$ 1,340	-	\$ -
Contributory										
Total	9,043	\$ 2,349	8,819	\$ 2,373	95	\$ 968	129	\$ 1,720	-	\$ -
Maximum	1,247	2,503	1,218	2,529	16	1,421	13	1,385	-	-
Option 1	524	1,727	497	1,758	16	1,026	11	1,356	-	-
Option 2	553	2,650	530	2,688	8	1,509	15	1,925	-	-
Option 3	334	3,311	326	3,349	5	1,099	3	2,872	-	-
Option 4	3,962	2,605	3,874	2,631	29	830	59	1,783	-	-
Option 5	2,423	1,785	2,374	1,797	21	533	28	1,654	-	-
Noncontributory										
Total	11,917	\$ 1,536	11,104	\$ 1,577	632	\$ 971	181	\$ 976	-	\$ -
Maximum	6,172	1,532	5,848	1,563	243	957	81	1,021	-	-
Option A	2,489	1,627	2,355	1,660	97	1,094	37	968	-	-
Option B	2,602	1,453	2,287	1,525	260	930	55	955	-	-
Option C	654	1,558	614	1,596	32	1,047	8	706	-	-
Hybrid										
Total	8,501	\$ 2,167	8,139	\$ 2,200	266	\$ 1,399	96	\$ 1,514	-	\$ -
Maximum	3,059	2,106	2,966	2,128	58	1,441	35	1,383	-	-
Option 1	575	1,964	557	1,979	12	1,457	6	1,564	-	-
Option 2	1,893	2,185	1,774	2,237	91	1,372	28	1,587	-	-
Option 3	1,204	2,649	1,166	2,688	25	1,371	13	1,601	-	-
Option 4	1,083	2,166	1,028	2,206	51	1,360	4	2,211	-	-
Option 5	687	1,712	648	1,728	29	1,473	10	1,342	-	-

TABLE 39**Pensions in Force by Payment Option****Teachers**

Type of Option	Total		Service		Ordinary Disability		Accidental Disability		Other	
	Number	Average Monthly Pension	Number	Average Monthly Pension	Number	Average Monthly Pension	Number	Average Monthly Pension	Number	Average Monthly Pension
Total	13,054	\$ 2,984	12,849	\$ 3,006	182	\$ 1,604	23	\$ 1,953	-	\$ -
Contributory										
Total	5,417	\$ 3,561	5,387	\$ 3,571	25	\$ 1,415	5	\$ 3,536	-	\$ -
Maximum	844	3,916	836	3,933	7	1,781	1	4,658	-	-
Option 1	231	3,029	229	3,045	2	1,222	-	-	-	-
Option 2	271	4,291	270	4,300	-	-	1	2,030	-	-
Option 3	172	4,697	170	4,721	2	2,642	-	-	-	-
Option 4	2,191	3,868	2,180	3,879	9	1,373	2	3,013	-	-
Option 5	1,708	2,833	1,702	2,839	5	565	1	4,965	-	-
Noncontributory										
Total	4,521	\$ 2,398	4,422	\$ 2,419	89	\$ 1,456	10	\$ 1,432	-	\$ -
Maximum	2,813	2,449	2,758	2,468	48	1,524	7	1,369	-	-
Option A	771	2,513	762	2,526	8	1,444	1	1,239	-	-
Option B	704	2,106	673	2,140	29	1,343	2	1,750	-	-
Option C	233	2,284	229	2,298	4	1,484	-	-	-	-
Hybrid										
Total	3,116	\$ 2,832	3,040	\$ 2,857	68	\$ 1,866	8	\$ 1,615	-	\$ -
Maximum	1,300	2,766	1,271	2,786	26	1,923	3	1,576	-	-
Option 1	156	2,707	151	2,736	5	1,843	-	-	-	-
Option 2	648	2,790	628	2,812	16	2,160	4	1,826	-	-
Option 3	427	3,257	418	3,296	8	1,510	1	892	-	-
Option 4	317	2,976	307	3,021	10	1,612	-	-	-	-
Option 5	268	2,480	265	2,490	3	1,643	-	-	-	-

TABLE 40
Pensions in Force by Payment Option

Police and Firefighters

Type of Option	Total		Service		Ordinary Disability		Accidental Disability		Other	
	Number	Average Monthly Pension	Number	Average Monthly Pension	Number	Average Monthly Pension	Number	Average Monthly Pension	Number	Average Monthly Pension
Total	3,971	\$ 5,079	3,845	\$ 5,177	29	\$ 1,227	97	\$ 2,344	-	\$ -
Maximum	178	5,737	164	6,023	-	-	14	2,383	-	-
Option 1	47	5,381	40	5,750	1	2,689	6	3,367	-	-
Option 2	273	5,551	253	5,796	8	1,730	12	2,921	-	-
Option 3	126	6,647	123	6,767	2	1,369	1	2,417	-	-
Option 4	2,401	5,423	2,365	5,474	10	1,055	26	2,474	-	-
Option 5	946	3,723	900	3,827	8	720	38	1,894	-	-

TABLE 41**Pensions in Force by Payment Option****General Employees - New Retirees**

Type of Option	Total		Service		Ordinary Disability		Accidental Disability		Other	
	Number	Average Monthly Pension	Number	Average Monthly Pension	Number	Average Monthly Pension	Number	Average Monthly Pension	Number	Average Monthly Pension
Total	1,635	\$ 1,889	1,562	\$ 1,920	52	\$ 1,177	21	\$ 1,288	-	\$ -
	Contributory									
Total	46	\$ 4,022	45	\$ 4,079	1	\$ 1,478	-	\$ -	-	\$ -
Maximum	9	3,967	8	4,279	1	1,478	-	-	-	-
Option 1	-	-	1	11,107	-	-	-	-	-	-
Option 2	8	4,359	8	4,359	-	-	-	-	-	-
Option 3	5	4,075	5	4,075	-	-	-	-	-	-
Option 4	21	3,814	21	3,814	-	-	-	-	-	-
Option 5	2	1,435	2	1,435	-	-	-	-	-	-
	Noncontributory									
Total	654	\$ 1,465	628	\$ 1,480	23	\$ 1,100	3	\$ 1,184	-	\$ -
Maximum	279	1,474	270	1,478	7	1,388	2	1,272	-	-
Option A	177	1,475	170	1,501	6	800	1	1,009	-	-
Option B	161	1,408	152	1,428	9	1,074	-	-	-	-
Option C	37	1,594	36	1,607	1	1,125	-	-	-	-
	Hybrid									
Total	935	\$ 2,080	889	\$ 2,122	28	\$ 1,229	18	\$ 1,306	-	\$ -
Maximum	297	2,105	285	2,138	8	1,245	4	1,471	-	-
Option 1	59	1,694	57	1,708	2	1,296	-	-	-	-
Option 2	221	2,235	211	2,270	4	1,448	6	1,553	-	-
Option 3	105	2,529	98	2,598	3	907	4	2,075	-	-
Option 4	148	1,922	139	1,960	8	1,195	1	2,366	-	-
Option 5	105	1,731	99	1,760	3	1,266	3	1,224	-	-

TABLE 42**Pensions in Force by Payment Option****Teachers - New Retirees**

Type of Option	Total		Service		Ordinary Disability		Accidental Disability		Other	
	Number	Average Monthly Pension	Number	Average Monthly Pension	Number	Average Monthly Pension	Number	Average Monthly Pension	Number	Average Monthly Pension
Total	547	\$ 2,852	535	\$ 2,876	10	\$ 1,797	2	\$ -	-	\$ -
Contributory										
Total	39	\$ 6,184	39	\$ 6,184	-	\$ -	-	\$ -	-	\$ -
Maximum	4	3,745	4	3,745	-	-	-	-	-	-
Option 1	4	6,653	4	6,653	-	-	-	-	-	-
Option 2	9	8,079	9	8,079	-	-	-	-	-	-
Option 3	3	8,810	3	8,810	-	-	-	-	-	-
Option 4	11	5,775	11	5,775	-	-	-	-	-	-
Option 5	8	4,617	8	4,617	-	-	-	-	-	-
Noncontributory										
Total	192	\$ 2,019	189	\$ 2,021	3	\$ 1,879	-	\$ -	-	\$ -
Maximum	103	1,938	103	1,938	-	-	-	-	-	-
Option A	36	2,027	35	2,034	1	1,795	-	-	-	-
Option B	46	2,215	44	2,229	2	1,920	-	-	-	-
Option C	7	1,881	7	1,881	-	-	-	-	-	-
Hybrid										
Total	316	\$ 2,947	307	\$ 2,982	7	\$ 1,762	2	\$ 1,793	-	\$ -
Maximum	119	2,884	115	2,923	3	1,862	1	1,425	-	-
Option 1	13	3,688	13	3,688	-	-	-	-	-	-
Option 2	63	3,320	60	3,367	2	2,507	1	2,161	-	-
Option 3	41	2,899	40	2,929	1	1,732	-	-	-	-
Option 4	47	2,809	46	2,830	1	1,883	-	-	-	-
Option 5	33	2,486	33	2,486	-	-	-	-	-	-

TABLE 43**Pensions in Force by Payment Option****Police and Firefighters - New Retirees**

Type of Option	Total		Service		Ordinary Disability		Accidental Disability		Other	
	Number	Average Monthly Pension	Number	Average Monthly Pension	Number	Average Monthly Pension	Number	Average Monthly Pension	Number	Average Monthly Pension
Total	182	\$ 6,626	180	\$ 6,662	-	\$ -	2	\$ 3,419	-	\$ -
Maximum	14	6,601	14	6,601	-	-	-	-	-	-
Option 1	1	7,905	1	7,905	-	-	-	-	-	-
Option 2	31	6,916	30	7,061	-	-	1	2,563	-	-
Option 3	14	7,262	14	7,262	-	-	-	-	-	-
Option 4	109	6,648	109	6,648	-	-	-	-	-	-
Option 5	13	4,999	12	5,059	-	-	1	4,275	-	-

Section O – Definition of Actuarial Terms

1. *Actuarial Accrued Liability* – for benefits payable in the future to present members, it will equal the present value of benefits payable in the future to them less the present value of future normal costs.
2. *Actuarial Assumptions* – assumptions as to future experience under the ERS. Current actuarial assumptions are detailed in Table 18 of the current annual valuation report. Assumptions include future fund earnings rate, rates of future salary increases, and rates of death (both before and after retirement), disability, retirement, and withdrawal.
3. *Actuarial Gain or Actuarial Loss* - a measure of the difference between actual experience and assumed experience of the ERS. Through the actuarial assumptions, rates of decrements, rates of salary increases, and rates of fund earnings have been forecasted. To the extent that actual experience differs from that assumed, actuarial liabilities emerge which may be the same as forecasted, or they may be larger or smaller than projected. Actuarial gains are due to favorable experience, e.g., the ERS's assets earn more than projected, salaries do not increase as fast as 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 that produce actuarial liabilities which are larger than projected. Actuarial gains will shorten the time required for funding of the actuarial balance sheet deficiency while actuarial losses will lengthen the funding period.
4. *Actuarial Liabilities* - the actuarially determined present value of future benefits to be provided by the ERS. There are separate actuarially determined present values for retired members and non-retired members (either active or inactive). When applied to active members, it takes into account benefits which will be earned through future service and future salary increases.
5. *Actuarial Value of Present Assets* - the value of present ERS assets for valuation purposes. This value is calculated under a four-year phase-in of the excess (shortfall) between expected and actual income return.
6. *Actuarially Determined* - values which 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 law.
7. *Decrement* - those types of activities by members of the ERS which cause them no longer to be members, i.e., death, retirement, disability, and withdrawal. It is a general term referring to any or all of these membership-terminating events.
8. *Defined Benefits* - in a retirement plan, benefits which are defined by a specific formula applied to specific member compensation and/or specific years of service. The amount of the benefit is not a function of contributions or actual earnings on those contributions.
9. *Defined Contributions* - in a retirement plan, periodic contributions to the plan which are defined as a specific percent of compensation.

10. *Experience Study* - a periodic review and analysis of the actual experience of the ERS which 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 as deemed appropriate by the Actuary.
11. *Funding Period* - the number of years in the future that will be required to fund (i.e., pay off or eliminate) the unfunded actuarial accrued liability, based on the actuarial assumptions and assuming no future actuarial gains or losses.
12. *Future Benefits* - benefits specified in the law which will become payable at some time in the future when the member satisfies the requirement to receive such benefits.
13. *Future Contributions* - contributions to be made by the member or the employers in the future.
14. *Normal Cost* - the actuarial cost to fund the benefits provided by the ERS were the funding to begin at date of hire.
15. *Present Value* - the actuarially determined lump sum value as of the valuation date of a series of payments to be made in the future, where the lump sum value is equal to the sum of the discounted value of each future payment. The discounted value of each payment is the product of (a) the amount of the payment, (b) the probability that the payment will be made (based on the current actuarial assumptions as to future experience), and (c) the time value of money (based on the current assumed interest rate).
16. *Unfunded Actuarial Accrued Liability* - that portion of the actuarial accrued liability (including the present value of benefits presently being paid to retired members) that exceeds the value of current assets.
17. *Covered Payroll* - the total annualized payroll of active members as of the valuation date. Used to project individual members pay and benefits.
18. *Projected Payroll for Contributions Purposes* - The aggregate projected payroll for the fiscal year following the valuation date is calculated by increasing the actual payroll paid during the previous fiscal year by the payroll growth rate and multiplying by the ratio of current active members to the average number of active members during the previous fiscal year.