

# Public Employees' Retirement Association of Colorado

## Actuarial Valuation and Review

As of December 31, 2020

State Division Trust Fund  
School Division Trust Fund  
Local Government Division Trust Fund  
Judicial Division Trust Fund  
Denver Public Schools Division Trust Fund

This report has been prepared at the request of the Board of Trustees to assist in administering the Funds. The measurements shown in this actuarial valuation may not be applicable for other purposes.

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**Segal**



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May 21, 2021

The Board of Trustees  
Public Employees' Retirement Association of Colorado  
1301 Pennsylvania Street  
Denver, CO 80203-2386

Dear Trustees:

We certify that the information contained in this report is accurate and fairly presents the actuarial position of the Division Trust Funds of the Public Employees' Retirement Association of Colorado (PERA) as of December 31, 2020.

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 also comply with Colorado Statutes, and, where applicable, the Internal Revenue Code, and ERISA. The undersigned are independent actuaries. All are Fellows of the Society of Actuaries, Enrolled Actuaries, and Members of the American Academy of Actuaries, and are experienced in performing valuations for large public retirement systems. All meet the Qualification Standards of the American Academy of Actuaries.

## **PENSION FUNDING ACTUARIAL VALUATION – DIVISION TRUST FUNDS**

The primary purposes of the valuation report are to determine the adequacy of the current employer contribution rates, to describe the current financial condition of PERA, and to analyze changes in PERA's financial condition. Valuations are prepared annually, as of December 31 of each year, the last day of PERA's plan and fiscal year.

## **PENSION FINANCING OBJECTIVES**

PERA maintains five pre-funded, hybrid defined benefit pension plans (i.e., State Division Trust Fund, School Division Trust Fund, Local Government Division Trust Fund, Judicial Division Trust Fund, and Denver Public Schools (DPS) Division Trust Fund). Each defined benefit pension plan is funded through PERA-affiliated employer and member contributions including adjustments resulting from the Automatic Adjustment Provision (AAP), a \$225 million direct distribution from the State of Colorado, and the investment earnings resulting from those contributions. In addition, for employees of employers of the State and Local Government Divisions,

hired on or after January 1, 2019, who chose to participate in the PERAChoice Defined Contribution (DC) Plan in lieu of participating in PERA's Defined Benefit (DB) Plan, a DC Supplement is paid to the Defined Benefit Plan to help fund the unfunded actuarial accrued liability (UAAL). Determined separately for the State and Local Government Divisions and calculated as a rate of pay, the DC Supplement is first payable as of January 1, 2021, by all employers of the two divisions, updated annually with each funding actuarial valuation. The fixed contribution rate at which each division's employers and members contribute is determined by the Colorado General Assembly and defined within the statutes governing PERA.

In addition to House Bill (HB) 20-1379, suspending the July 1, 2020, \$225 million Direct Distribution from the State, and HB 20-1394, modifying member and employer contribution rates for the 2020-21 and 2021-22 fiscal years for most members of the Judicial Division, the following legislation was enacted in 2020 and reflected in this actuarial valuation:

- SB 20-057, enacted June 29, 2020, and effective as of July 1, 2020, extends the "State Trooper" benefit structure to new and existing employees of the Division of Fire Prevention and Control in the Department of Public Safety, classified as firefighter I through firefighter VII, within the State Division membership.

PERA's defined benefit pension plan funding policy, as developed and maintained by the PERA Board of Trustees (Board), is used to gauge the adequacy of the statutory contributions. The purposes of this pension funding policy are to state the overall funding goals and annual actuarial metrics and to guide the Board when considering whether to pursue or support proposed contribution and benefit legislation related to the Division Trust Funds. The policy also includes a brief list of governance responsibilities regarding the commissioning, collection, and review of actuarial information, as described in the Board's Governance Manual.

PERA also maintains two pre-funded defined benefit retiree health care subsidy plans (i.e., Health Care Trust Fund and DPS Health Care Trust Fund), classified as other postemployment benefit (OPEB) plans. The Board maintains a separate defined benefit OPEB plan funding policy (OPEB funding policy) with regard to these plans. The results of the OPEB funding actuarial valuation are included in a separate report.

PERA's pension funding policy is provided in *Section 4, Exhibit III*.

## PROGRESS TOWARD REALIZATION OF PENSION FINANCING OBJECTIVES

Shown in the following table are the resulting effective amortization periods for each division as of December 31, 2020, recognizing all current sources of income from employer contributions, member contributions, and the direct distribution as applicable, and any future increases to the base employer contributions, member contributions, Amortization Equalization Disbursement (AED), Supplemental Amortization Equalization Disbursement (SAED), and Pension Certificates of Participation (PCOP):

| Trust Fund  | Effective Amortization Period |
|---|-------------------------------|
| State Division                                    | 33 years                      |
| School Division                                   | 43 years                      |
| Local Government Division                         | 29 years                      |
| Judicial Division                                 | 13 years                      |
| Denver Public Schools (DPS) Division <sup>1</sup> | 16 years                      |

<sup>1</sup> Resulting amortization period assumes declining PCOP offset rate as described in statute. Prior years' reports sustained the PCOP offset at the current rate for purposes of this calculation.

Members who begin membership after December 31, 2019, will be covered by a different benefit structure with a lower normal cost rate, so, as members who began membership prior to January 1, 2020, leave covered employment and are replaced by members in the lower cost benefit structure, the total normal cost rate is expected to decline. As a result, the portion of the total statutory contribution rate available to pay off the UAAL is expected to increase each year in the future until all active members in the valuation are covered by the provisions in the most recent benefit tier. While this is expected to improve the Plan's financial health in future years, it is impossible to anticipate the long-term funding progress without performing an open group projection of future valuation results. Such projections are performed to assist the Board in evaluating the long-term funding of each division, but the projections are completed after the actuarial valuation results are known.

The December 31, 2020 valuation results for the DPS Division are based upon the current statutory levels of funding, including the assumed decline in the PCOP offset applied each year until 2039, the target date of equalization. Colorado statutes call for a "true-up" calculation every five years, targeting equalization of the ratio of unfunded actuarial accrued liability over payroll between the DPS and School Divisions at the end of the 30-year period beginning January 1, 2010. As such, future levels of funding for the DPS

Division may differ from those assumed. The next true-up is scheduled for 2025, based upon an evaluation performed as of December 31, 2023.

## REPORTING CONSEQUENCES

Information required by PERA in connection with the Governmental Accounting Standards Board Statements No. 67 and 68 (GASB 67 and GASB 68) are included in a separate report. PERA is required to disclose certain actuarial information in its Comprehensive Annual Financial Report, including the Net Pension Liability (NPL), the sensitivity of the NPL to changes in the discount rate, a schedule of changes in NPL, and a comparison of actual contributions to the ADC. PERA's affiliated employers are required to comply with GASB 68, which also requires disclosure of certain actuarial information in their financial statements. This information is provided in a separate report.

## BENEFIT PROVISIONS

Plan benefits are specified in Title 24, Article 51 of the Colorado Revised Statutes (C.R.S.), administrative rules set forth at 8 C.C.R. 1502-1, and applicable provisions of the federal Internal Revenue Code. Colorado State law provisions may be amended from time to time by the Colorado General Assembly. A summary of the plan provisions is provided in *Section 4, Exhibit II*.

## ASSUMPTIONS AND METHODS

The information and analysis used in selecting each assumption that has a significant effect on this actuarial valuation resulted from the 2020 Experience Analysis report, titled, *Public Employees' Retirement Association of Colorado Analysis of Actuarial Experience during the Period January 1, 2016 through December 31, 2019*. All recommended changes to the demographic and economic actuarial assumptions resulting from this study were reviewed and adopted by the Board at their November 20, 2020 meeting, to be effective for this December 31, 2020 actuarial valuation. As a result of the 2019 Asset Liability Study, concluded at the November 15, 2019 Board meeting, the Board reaffirmed the 7.25% assumed long-term rate of investment return effective as of January 1, 2020. This Board decision also was in alignment with the analysis provided in the 2020 Analysis of Actuarial Experience report. In addition, effective November 16, 2018, the pension funding policy was revised to better align the 30-year period to achieve 100% funding as targeted through the enactment of SB 18-200. Therefore, the UAAL as of December 31, 2017 is the initial legacy liability and is amortized over 30 years from December 31, 2017 (i.e., 27 years remaining as of December 31, 2020). Pursuant to the Board's funding policy, any growth (or reduction) in unfunded liabilities resulting from the initial legacy UAAL, is amortized over the same closed period. Thus, the 2020 contribution deficiency is amortized over a 27 year period, but the 2020 actuarial experience gain or

loss, recognized as a new layer of UAAL, is amortized over 30 years. A summary of the assumptions and methods applied in this valuation is provided in *Section 4, Exhibit I*.

## DATA

Member data for retired, active, and inactive participants was supplied as of December 31, 2020, by PERA. 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 also supplied by PERA. That assistance is gratefully acknowledged.

Sincerely,  
Segal



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Senior Vice President and Actuary



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Brad Ramirez, FSA, MAAA, EA  
Vice President and Actuary



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Senior Actuary

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# Section 1: Actuarial Valuation Summary

## Purpose and Basis

This report was prepared by Segal to present a funding valuation of the Division Trust Funds of the Public Employees' Retirement Association of Colorado (PERA) as of December 31, 2020. The funding valuation was performed to determine whether the assets and contribution rates are sufficient to provide the prescribed benefits. The measurements shown in this actuarial valuation may not be applicable for other purposes. In particular, the measures herein are not necessarily appropriate for assessing the sufficiency of PERA's Division Trust Fund assets to cover the estimated cost of settling the coordinated benefit obligations of those trusts. Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the following: plan experience differing from that anticipated by the economic or demographic assumptions; changes in economic or demographic assumptions; increases or decreases expected as part of the natural operation of the methodology used for these measurements; and changes in plan provisions or applicable law.

Certain disclosure information required by GASB 67 and GASB 68 as of December 31, 2020, for PERA is provided in a separate report.

The contribution requirements presented in this report are based on:

- The benefit provisions set forth in the Colorado Revised Statutes, as administered by the PERA Board of Trustees ("Board"), including the recently enacted SB 20-057, as detailed in the Plan Provisions section of this report in *Section 4, Exhibit II*;
- The characteristics of covered active members, inactive members, and retirees and survivors as of December 31, 2020, provided by PERA;
- The assets of PERA's Division Trust Funds as of December 31, 2020, provided by PERA;
- Economic and other actuarial assumptions regarding future salary increases, investment earnings, employee terminations, retirement, death, etc., as updated and approved by the Board, at the November 20, 2020 Board meeting, effective for this December 31, 2020 actuarial valuation; and
- The pension funding policy adopted by the PERA Board of Trustees, most recently updated effective November 16, 2018.

The DC Supplement presented in this report is based on PERAChoice census data as of December 31, 2020, determined separately for the State and Local Government Divisions as a rate of pay, and payment of such, will be applicable to the DB plan year ending December 31, 2022.

In addition, contribution requirements resulting from the December 31, 2020, funding actuarial valuation and applicable to the plan year ending December 31, 2022, will be used in the contribution adequacy test under the Automatic Adjustment Provision ("AAP") enacted under Senate Bill 2018-200 (SB 18-200). See *Section 2* of this report for additional detail.

## Section 1: Actuarial Valuation Summary

### Valuation Highlights – State Division Trust Fund

1. Segal strongly recommends an actuarial funding method that targets 100% funding of the actuarial accrued liability. Generally, this implies payments that are ultimately at least enough to cover normal cost, interest on the unfunded actuarial accrued liability and a portion of the principal balance. The pension funding policy adopted by PERA for evaluating the State Division Trust Fund meets this standard.
2. The employers' contributions to the State Division on account of benefits consist of four amounts set by statute. The basic amount is 9.38% of salary for General Members and 12.08% of salary for State Trooper Members (after reduction for the Health Care Trust Fund Contribution of 1.02% of salary). The AAP assessment, performed as of December 31, 2018, increased employer and member contributions each by 0.50% of salary and reduced the maximum Annual Increase (AI) rate, referred to as the "AI cap", by 0.25%, as of July 1, 2020. For members of the PERA Benefit Structure hired on or after January 1, 2007, an allocation of the statutory rates of 1.00% of salary is made each year to pre-fund the Annual Increase Reserve (AIR), which provides post-retirement increases for these members in retirement. In addition, an annual direct distribution is paid from the State treasury and is allocated to the State Division until the Fund is 100% funded. The allocation for each year beginning July 1, 2022, and forward, is estimated at \$76.4 million. This additional amount is considered in the number of years to amortize the Unfunded Actuarial Accrued Liability (UAAL). Lastly, employers make an Amortization Equalization Disbursement (AED) contribution of 5.00% and Supplemental Amortization Equalization Disbursement (SAED) contribution of 5.00%.
3. The employer statutory contribution rate for the plan year beginning January 1, 2022 is equal to 19.34% of salary for employers. Based upon the results of the December 31, 2020 actuarial valuation, after recognizing the net employer normal cost rate of 2.39% of salary, the remaining basic contribution is 16.95% of salary. Contributions at this level will amortize the UAAL of \$11.1 billion over 33 years, assuming the aggregate payroll of the State Division increases by 3.00% per year.
4. Changes in actuarial assumptions were approved by the Board at the November 20, 2020, Board meeting. The assumptions adopted are outlined in detail in *Section 4, Exhibit 1* of the report. As a result of these assumption changes, the total normal cost rate increased by 1.33% and the actuarial accrued liability increased by \$947.8 million.
5. The AAP assessment, performed as of December 31, 2020, indicates the need to increase employer and member contribution rates each by 0.50% of salary and reduce the AI cap by 0.25%, beginning July 1, 2022.
6. As of January 1, 2021, the employer contribution rate is adjusted to include the DC supplement, which is calculated separately for the State Division. The DC supplement is the employer contribution amount made to the State Division Trust Fund (the DB plan) on behalf of DC Plan members who commence employment on or after January 1, 2019. The DC Supplement calculation as of December 31, 2020, increases employer contribution rates effective January 1, 2022, by 0.10%.
7. The UAAL as of December 31, 2017 is the initial legacy liability and is amortized over 30 years from December 31, 2017 (i.e., 27 years remaining as of December 31, 2020). Pursuant to the Board's funding policy, any growth (or reduction) in unfunded liabilities resulting from the initial legacy UAAL, is amortized over the same closed period. Thus, the 2020 contribution deficiency

## Section 1: Actuarial Valuation Summary

is also amortized over a 27 year period, but the 2020 actuarial experience gain or loss, recognized as a new layer of UAAL, is amortized over 30 years.

8. Actual employer contributions made during the plan year ending December 31, 2020 were \$626.9 million, which is 85.7% of the actuarially determined contribution. In the prior plan year, actual contributions, including the State direct distribution, were \$671.7 million, which is 96.3% of the prior year actuarially determined contribution.
9. The funded ratio based on the actuarial value of assets over the actuarial accrued liability as of December 31, 2020 is 59.1%, compared to 58.0% as of December 31, 2019. This ratio is a measure of funded status and its history is a measure of funding progress. Based on the market value of assets, the funded ratio as of December 31, 2020 is 65.1%, compared to 61.5% as of December 31, 2019. These measurements are not necessarily appropriate for assessing the sufficiency of the Plan's assets to cover the estimated cost of settling the Plan's benefit obligation or the need for or the amount of future contributions.
10. For the year ended December 31, 2020, PERA's total fund annualized rate of return on a market value basis was reported to be 17.4%. For the same period, Segal has determined specifically for the State Division Trust Fund, the asset return on a market value basis was 17.0%. After gradual recognition of investment gains and losses under the actuarial smoothing method, the actuarial rate of return was 13.1%. This represents an experience gain when compared to the assumed rate of 7.25%. As of December 31, 2020, the actuarial value of assets of \$16.0 billion represented 90.8% of the market value of \$17.7 billion.
11. The portion of deferred investment gains and losses recognized during the calculation of the December 31, 2020 actuarial value of assets contributed a gain of \$848.0 million. The demographic and liability experience, including administrative expenses, resulted in a net loss of \$20.0 million.
12. The term "State Trooper" for PERA purposes has an expanded definition under Colorado law and includes several categories of employees as follows: (1) an employee of the Colorado State Patrol or Colorado Bureau of Investigation (CBI) vested with the powers of peace officers; (2) beginning July 1, 2020, a new or existing employee of the Division of Fire Prevention and Control in the Department of Public Safety classified as firefighter I through firefighter VII, within the State Division membership; (3) a new member hired on or after January 1, 2020, as a county sheriff, undersheriff, deputy sheriff, noncertified deputy sheriff, or detention officer by a Local Government Division employer; and (4) a new member hired on or after January 1, 2020, as a corrections officer classified as I through IV by a State Division employer. The "State Trooper" classification entails a separate contribution rate for both employers and members, and different retirement eligibilities from those applicable to the general employees of employers in the State and Local Government Divisions. Given these differences, application of a separate set of actuarial assumptions is necessary with respect to PERA members designated as "State Troopers". For ease of reporting with regard to the State and Local Government Divisions only, members with the "State Trooper" benefit structure are referred to as "State Troopers" or "State Trooper Members". Members without the "State Trooper" designation are referred to as "General Members".

## Section 1: Actuarial Valuation Summary

### Valuation Highlights – School Division Trust Fund

1. Segal strongly recommends an actuarial funding method that targets 100% funding of the actuarial accrued liability. Generally, this implies payments that are ultimately at least enough to cover normal cost, interest on the UAAL and a portion of the principal balance. The pension funding policy adopted by PERA for evaluating the School Division Trust Fund meets this standard.
2. The employers' contributions to the School Division on account of benefits consist of four amounts set by statute. The basic amount is 9.38% (after reduction for the Health Care Trust Fund Contribution of 1.02% of salary). The AAP assessment, performed as of December 31, 2018, increased employer and member contributions each by 0.50% of salary and reduced the AI cap by 0.25%, as of July 1, 2020. For members of the PERA Benefit Structure hired on or after January 1, 2007, an allocation of the statutory rates of 1.00% of salary is made each year to pre-fund the AIR, which provides post-retirement increases for these members in retirement. In addition, an annual direct distribution is paid from the State treasury and allocated to the School Division until the Fund is 100% funded. The allocation for each year, beginning July 1, 2022, and forward, is estimated at \$128.0 million. This additional amount is considered in the number of years to amortize the UAAL. Lastly, employers make an AED contribution of 4.50% and a SAED contribution of 5.50%.
3. The employer statutory contribution rate for the plan year beginning January 1, 2022 is equal to 19.33% of salary for employers. Based upon the results of the December 31, 2020 actuarial valuation, after recognizing the net employer normal cost rate of 4.20% of salary, the remaining basic contribution is 15.13% of salary. Contributions at this level will amortize the UAAL of \$18.0 billion over 43 years, assuming the aggregate payroll of the School Division increases by 3.00% per year.
4. Changes in actuarial assumptions were approved by the Board at the November 20, 2020, Board meeting. The assumptions adopted are outlined in detail in *Section 4, Exhibit 1* of the report. As a result of these assumption changes, the total normal cost rate increased by 2.04% and the actuarial accrued liability increased by \$1.8 billion.
5. The AAP assessment, performed as of December 31, 2020, indicates the need to increase employer and member contribution rates each by 0.50% of salary and reduce the AI cap by 0.25%, beginning July 1, 2022.
6. The UAAL as of December 31, 2017 is the initial legacy liability and is amortized over 30 years from December 31, 2017 (i.e., 27 years remaining as of December 31, 2020). Pursuant to the Board's funding policy, any growth (or reduction) in unfunded liabilities resulting from the initial legacy UAAL, is amortized over the same closed period. Thus, the 2020 contribution deficiency is also amortized over a 27 year period, but the 2020 actuarial experience gain or loss, recognized as a new layer of UAAL, is amortized over 30 years.
7. Actual employer contributions made during the plan year ending December 31, 2020 were \$1.0 billion, which is 84.9% of the actuarially determined contribution. In the prior plan year, actual contributions, including the State direct distribution, were \$1.1 billion, which is 91.7% of the prior year actuarially determined contribution.

## Section 1: Actuarial Valuation Summary

8. The funded ratio based on the actuarial value of assets over the actuarial accrued liability as of December 31, 2020 is 60.6%, compared to 59.9% as of December 31, 2019. This ratio is a measure of funding status and its history is a measure of funded progress. Based on the market value of assets, the funded ratio as of December 31, 2020 is 66.7%, compared to 63.5% as of December 31, 2019. These measurements are not necessarily appropriate for assessing the sufficiency of the Plan's assets to cover the estimated cost of settling the Plan's benefit obligation or the need for or the amount of future contributions.
9. For the year ended December 31, 2020, PERA's total fund annualized rate of return on a market value basis was reported to be 17.4%. For the same period, Segal has determined specifically for the School Division Trust Fund, the asset return on a market value basis was 17.1%. After gradual recognition of investment gains and losses under the actuarial smoothing method, the actuarial rate of return was 13.1%. This represents an experience gain when compared to the assumed rate of 7.25%. As of December 31, 2020, the actuarial value of assets of \$27.6 billion represented 90.8% of the market value of \$30.4 billion.
10. The portion of deferred investment gains and losses recognized during the calculation of the December 31, 2020 actuarial value of assets contributed a gain of \$1.4 billion. The demographic and liability experience, including administrative expenses, resulted in a net loss of \$220.5 million.

## Section 1: Actuarial Valuation Summary

### Valuation Highlights – Local Government Division Trust Fund

1. Segal strongly recommends an actuarial funding method that targets 100% funding of the actuarial accrued liability. Generally, this implies payments that are ultimately at least enough to cover normal cost, interest on the UAAL and a portion of the principal balance. The pension funding policy adopted by PERA for evaluating the Local Government Division Trust Fund meets this standard.
2. The employers' contributions to the Local Division on account of benefits consist of four amounts set by statute. The basic amount is 8.98% of salary for General Members and 11.83% of salary for State Trooper Members (after reduction for the Health Care Trust Fund Contribution of 1.02% of salary). The AAP assessment, performed as of December 31, 2018, increased employer and member contributions each by 0.50% of salary and reduced the AI cap by 0.25%, as of July 1, 2020. For members of the PERA Benefit Structure hired on or after January 1, 2007, an allocation of the statutory rates of 1.00% of salary is made each year to pre-fund the AIR, which provides post-retirement increases for these members in retirement. In addition, employers make an AED contribution of 2.20% and a SAED contribution of 1.50%.
3. The employer statutory contribution rate for the plan year beginning January 1, 2022 is equal to 12.52% of salary for employers. Based upon the results of the December 31, 2020 actuarial valuation, after recognizing the net employer normal cost rate of 4.37% of salary, the remaining basic contribution is 8.15% of salary. Contributions at this level will amortize the UAAL of \$1.0 billion over 29 years, assuming the aggregate payroll of the Local Government Division increases by 3.00% per year.
4. Changes in actuarial assumptions were approved by the Board at the November 20, 2020, Board meeting. The assumptions adopted are outlined in detail in *Section 4, Exhibit 1* of the report. As a result of these assumption changes, the total normal cost rate increase by 1.77% and the actuarial accrued liability increased by \$202.3 million.
5. The AAP assessment, performed as of December 31, 2020, indicates the need to increase employer and member contribution rates each by 0.50% of salary and reduce the AI cap by 0.25%, beginning July 1, 2022.
6. As of January 1, 2021, the employer contribution rate is adjusted to include the DC supplement, which is calculated separately for the Local Government Division. The DC supplement is the employer contribution amount made to the Local Government Division Trust Fund (the DB plan) on behalf of DC Plan members who commence employment on or after January 1, 2019. The DC Supplement calculation as of December 31, 2020, increases employer contribution rates effective January 1, 2022, by 0.03%.
7. The UAAL as of December 31, 2017 is the initial legacy liability and is amortized over 30 years from December 31, 2017 (i.e., 27 years remaining as of December 31, 2020). Pursuant to the Board's funding policy, any growth (or reduction) in unfunded liabilities resulting from the initial legacy UAAL, is amortized over the same closed period. Thus, the 2020 contribution deficiency is also amortized over a 27 year period, but the 2020 actuarial experience gain or loss, recognized as a new layer of UAAL, is amortized over 30 years.

## Section 1: Actuarial Valuation Summary

8. Actual employer contributions made during the plan year ending December 31, 2020 were \$85.2 million, which is 93.8% of the actuarially determined contribution. In the prior plan year, actual contributions were \$81.4 million, which is 107.4% of the prior year actuarially determined contribution.
9. The funded ratio based on the actuarial value of assets over the actuarial accrued liability as of December 31, 2020 is 82.4%, compared to 80.7% as of December 31, 2019. This ratio is a measure of funding status and its history is a measure of funded progress. Based on the market value of assets, the funded ratio as of December 31, 2020 is 90.8%, compared to 85.5% as of December 31, 2019. These measurements are not necessarily appropriate for assessing the sufficiency of the Plan's assets to cover the estimated cost of settling the Plan's benefit obligation or the need for or the amount of future contributions.
10. For the year ended December 31, 2020, PERA's total fund annualized rate of return on a market value basis was reported to be 17.4%. For the same period, Segal has determined specifically for the Local Government Division Trust Fund, the asset return on a market value basis was 17.1%. After gradual recognition of investment gains and losses under the actuarial smoothing method, the actuarial rate of return was 13.1%. This represents an experience gain when compared to the assumed rate of 7.25%. As of December 31, 2020, the actuarial value of assets of \$4.7 billion represented 90.8% of the market value of \$5.1 billion.
11. The portion of deferred investment gains and losses recognized during the calculation of the December 31, 2020 actuarial value of assets contributed a gain of \$244.2 million. The demographic and liability experience, including administrative expenses, resulted in a net loss of \$10.7 million.
12. The term "State Trooper" for PERA purposes has an expanded definition under Colorado law and includes several categories of employees as follows: (1) an employee of the Colorado State Patrol or CBI vested with the powers of peace officers; (2) beginning July 1, 2020, a new or existing employee of the Division of Fire Prevention and Control in the Department of Public Safety classified as firefighter I through firefighter VII, within the State Division membership; (3) a new member hired on or after January 1, 2020, as a county sheriff, undersheriff, deputy sheriff, noncertified deputy sheriff, or detention officer by a Local Government Division employer; and (4) a new member hired on or after January 1, 2020, as a corrections officer classified as I through IV by a State Division employer. The "State Trooper" classification entails a separate contribution rate for both employers and members, and different retirement eligibilities from those applicable to the general employees of employers in the State and Local Government Divisions. Given these differences, application of a separate set of actuarial assumptions is necessary with respect to PERA members designated as "State Troopers". For ease of reporting with regard to the State and Local Government Divisions, members with the "State Trooper" benefit structure are referred to as "State Troopers" or "State Trooper Members". Members without the "State Trooper" designation are referred to as "General Members".

## Section 1: Actuarial Valuation Summary

### Valuation Highlights – Judicial Division Trust Fund

1. Segal strongly recommends an actuarial funding method that targets 100% funding of the actuarial accrued liability. Generally, this implies payments that are ultimately at least enough to cover normal cost, interest on the UAAL and a portion of the principal balance. The pension funding policy adopted by PERA for evaluating the Judicial Division Trust Fund meets this standard.
2. The employers' contributions to the Judicial Division on account of benefits consist of four amounts set by statute. The basic amount is 12.89% of salary (after reduction for the Health Care Trust Fund Contribution of 1.02% of salary). The AAP assessment, performed as of December 31, 2018, increased employer and member contributions each by 0.50% of salary and reduced the AI cap by 0.25%, as of July 1, 2020. For members of the PERA Benefit Structure hired on or after January 1, 2007, an allocation of the statutory rates of 1.00% of salary is made each year to pre-fund the AIR, which provides post-retirement increases for these members in retirement. In addition, an annual direct distribution is paid from the State treasury and allocated to the Judicial Division until the Fund is 100% funded. The allocation for each year beginning July 1, 2022, and forward, is estimated at \$1.4 million. This additional amount is considered in the number of years to amortize the UAAL. Lastly, employers make AED and SAED contributions at the following rates:

| Year           | AED   | SAED  |
|----------------|-------|-------|
| 2020           | 3.80% | 3.80% |
| 2021           | 4.20% | 4.20% |
| 2022           | 4.60% | 4.60% |
| 2023 and later | 5.00% | 5.00% |

3. After consideration of HB 20-1394, modifying Judicial Division employer and member contribution rates, the employer statutory contribution rate for the plan year beginning January 1, 2022 is equal to 19.72% of salary. Based upon the results of the December 31, 2020 actuarial valuation, after recognizing the net employer normal cost rate of 4.50% of salary, the remaining basic contribution amounts to 15.22% of salary. Contributions at this level will amortize the UAAL of \$101.8 million over 13 years, assuming the aggregate payroll of the Judicial Division increases by 3.00% per year.
4. Changes in actuarial assumptions were approved by the Board at the November 20, 2020, Board meeting. The assumptions adopted are outlined in detail in *Section 4, Exhibit 1* of the report. As a result of these assumption changes, the total normal cost rate increased by 0.91% and the actuarial accrued liability increased by \$0.9 million.
5. The AAP assessment, performed as of December 31, 2020, indicates the need to increase employer and member contribution rates each by 0.50% of salary and reduce the AI cap by 0.25%, beginning July 1, 2022.



## Section 1: Actuarial Valuation Summary

6. The UAAL as of December 31, 2017 is the initial legacy liability and is amortized over 30 years from December 31, 2017 (i.e., 27 years remaining as of December 31, 2020). Pursuant to the Board's funding policy, any growth (or reduction) in unfunded liabilities resulting from the initial legacy UAAL, is amortized over the same closed period. Thus, the 2020 contribution deficiency is also amortized over a 27 year period, but the 2020 actuarial experience gain or loss, recognized as a new layer of UAAL, is amortized over 30 years.
7. Actual employer contributions made during the plan year ending December 31, 2020 were \$10.1 million, which is 83.7% of the actuarially determined contribution. In the prior plan year, actual contributions, including the State direct distribution, were \$11.7 million, which is 100.4% of the prior year actuarially determined contribution.
8. The funded ratio based on the actuarial value of assets over the actuarial accrued liability as of December 31, 2020 is 78.7%, compared to 74.0% as of December 31, 2019. This ratio is a measure of funding status and its history is a measure of funded progress. Based on the market value of assets, the funded ratio as of December 31, 2020 is 86.6%, compared to 78.4% as of December 31, 2019. These measurements are not necessarily appropriate for assessing the sufficiency of the Plan's assets to cover the estimated cost of settling the Plan's benefit obligation or the need for or the amount of future contributions.
9. For the year ended December 31, 2020, PERA's total fund annualized rate of return on a market value basis was reported to be 17.4%. For the same period, Segal has determined specifically for the Judicial Division Trust Fund, the asset return on a market value basis was 17.1%. After gradual recognition of investment gains and losses under the actuarial smoothing method, the actuarial rate of return was 12.9%. This represents an experience gain when compared to the assumed rate of 7.25%. As of December 31, 2020, the actuarial value of assets of \$376.4 million represented 90.9% of the market value of \$414.1 million.
10. The portion of deferred investment gains and losses recognized during the calculation of the December 31, 2020 actuarial value of assets contributed a gain of \$19.2 million. The demographic and liability, including administrative expenses, experience resulted in a net loss of \$2.8 million.

## Section 1: Actuarial Valuation Summary

### Valuation Highlights – Denver Public Schools Division Trust Fund

1. Segal strongly recommends an actuarial funding method that targets 100% funding of the actuarial accrued liability. Generally, this implies payments that are ultimately at least enough to cover normal cost, interest on the UAAL and a portion of the principal balance. The pension funding policy adopted by PERA for evaluating the Denver Public Schools Division Trust Fund meets this standard.
2. The employers' contributions to the Denver Public Schools Division (DPS) on account of benefits consist of four amounts set by statute. The basic amount is 9.38% of salary (after reduction for the Health Care Trust Fund Contribution of 1.02% of salary). The AAP assessment, performed as of December 31, 2018, increased employer and member contributions each by 0.50% of salary and reduced the AI cap, by 0.25% as of July 1, 2020. For members of the PERA Benefit Structure hired on or after January 1, 2010, an allocation of the statutory rates of 1.00% of salary is made each year to pre-fund the AIR, which provides post-retirement increases for these members in retirement. In addition, an annual direct distribution is paid from the State treasury and allocated to the DPS Division until the Fund is 100% funded. The allocation for each year beginning July 1, 2022, and forward, is estimated at \$19.3 million. This additional amount is considered in the number of years to amortize the UAAL. Lastly, employers make an AED contribution of 4.50% and a SAED contribution of 5.50%.
3. The employer statutory contribution rate for the plan year beginning January 1, 2022 is equal to a net of 7.69% of salary for employers as shown below.

|  | <b>Contribution</b> |
|--|---------------------|
| Employer Statutory (weighted and equal to the statutory base rate less the adjustment for the 0.69% AIR contributions for post-2006 members) | 10.21%              |
| AED and SAED   | 10.00%              |
| DPS HCTF   | (1.02%)             |
| PCOP Credit  | <u>(11.50%)</u>     |
| Net  | 7.69%               |

4. Based upon the results of the December 31, 2020 actuarial valuation, after recognizing the net employer normal cost rate of 2.83% of salary, the remaining basic contribution amounts to 4.86% of salary. Contributions at this level will amortize the UAAL of \$850.5 million over 16 years, assuming the aggregate payroll of the DPS Division increases by 3.00% per year.
5. The 16 year effective amortization period of the DPS Division reflects the expected level (current and future) of the DPS Division's employer contribution offsets resulting from the cost of certain Pension Certificates of Participation (PCOP) continued

## Section 1: Actuarial Valuation Summary

into the future<sup>1</sup>. Additionally, Colorado statutes call for a "true-up" calculation every five years, targeting equalization of the ratio of UAAL over payroll between the DPS Division and the School Division as of December 31, 2039. The most recent true-up indicated that the Employer Contribution Rate for the DPS Division could be reduced by 10.15%; however, Section 24-51-412(2) of PERA Law and SB 18-200 would effectively limit the adjustments to the base Employer Contribution Rates to 4.5% in 2020 and gradually to 0.75% in 2027 and thereafter.

6. Changes in actuarial assumptions were approved by the Board at the November 20, 2020, Board meeting. The assumptions adopted are outlined in detail in *Section 4, Exhibit 1* of the report. As a result of these assumption changes, the total normal cost rate increased by 1.09% and the actuarial accrued liability increased by \$117.5 million.
7. The AAP assessment, performed as of December 31, 2020, indicates the need to increase employer and member contribution rates each by 0.50% of salary and reduce the AI cap by 0.25%, beginning July 1, 2022.
8. The UAAL as of December 31, 2017 is the initial legacy liability and is amortized over 30 years from December 31, 2017 (i.e., 27 years remaining as of December 31, 2020). Pursuant to the Board's funding policy, any growth (or reduction) in unfunded liabilities resulting from the initial legacy UAAL, is amortized over the same closed period. Thus, the 2020 contribution deficiency is also amortized over a 27 year period, but the 2020 actuarial experience gain or loss, recognized as a new layer of UAAL, is amortized over 30 years.
9. Actual employer contributions made during the plan year ending December 31, 2020 were \$50.9 million, which is 63.3% of the actuarially determined contribution. In the prior plan year, actual contributions, including the State direct distribution, were \$57.6 million, which is 70.2% of the prior year actuarially determined contribution.
10. The funded ratio based on the actuarial value of assets over the actuarial accrued liability as of December 31, 2020 is 81.2%, compared to 80.0% as of December 31, 2019. This ratio is a measure of funding status and its history is a measure of funded progress. Based on the market value of assets, the funded ratio as of December 31, 2020 is 89.5%, compared to 84.8% as of December 31, 2019. These measurements are not necessarily appropriate for assessing the sufficiency of the Plan's assets to cover the estimated cost of settling the Plan's benefit obligation or the need for or the amount of future contributions.
11. For the year ended December 31, 2020, PERA's total fund annualized rate of return on a market value basis was reported to be 17.4%. For the same period, Segal has determined specifically for the DPS Division Trust Fund, the asset return on a market value basis was 17.1%. After gradual recognition of investment gains and losses under the actuarial smoothing method, the actuarial rate of return was 13.1%. This represents an experience gain when compared to the assumed rate of 7.25%. As of December 31, 2020, the actuarial value of assets of \$3.7 billion represented 90.8% of the market value of \$4.1 billion.

<sup>1</sup> In prior valuations, the current level of PCOP offsets as of the valuation date was held level in future years. As the PCOP offsets are expected to reduce over time, under this prior methodology, the realized amortization period was expected to be lower if the DPS Division's statutory employer contribution amounts were maintained at their current level. This new approach to reflecting future decreases in PCOP offsets in the determination of the DPS Division effective amortization period brings this calculation more in line with the actual projected number of years to reach full funding.

## Section 1: Actuarial Valuation Summary

12. The portion of deferred investment gains and losses recognized during the calculation of the December 31, 2020 actuarial value of assets contributed a gain of \$195.5 million. The demographic and liability experience, including administrative expenses, resulted in a net loss of \$46.4 million.

## Section 1: Actuarial Valuation Summary

### Summary of Key Valuation Results for State Division

|  |  | 2020                 | 2019                 |
|--|--|----------------------|----------------------|
| <b>Demographic data for plan year beginning December 31:</b> | • Number of retirees and survivors   | 41,988               | 41,305               |
|  | • Number of terminated vested members  | 7,802                | 7,412                |
|  | • Number of inactive members   | 83,941               | 81,012               |
|  | • Number of active members   |                      |                      |
|  | ○ General  | 52,152               | 54,380               |
|  | ○ State Troopers   | <u>1,491</u>         | <u>872</u>           |
|  | ○ Total  | 53,643               | 55,252               |
|  | • Total payroll supplied by PERA   |                      |                      |
|  | ○ General  | \$2,970,036,061      | \$2,911,592,723      |
|  | ○ State Troopers   | <u>119,125,008</u>   | <u>83,860,098</u>    |
|  | ○ Total  | \$3,089,161,069      | \$2,995,452,821      |
| • Average payroll supplied by PERA                           |  |                      |                      |
| ○ General  | \$56,950   | \$53,542             |                      |
| ○ State Troopers   | 79,896   | 96,170               |                      |
| ○ Total  | \$57,587   | \$54,214             |                      |
| <b>Actuarial accrued liability as of December 31:</b>        | • Retirees and survivors   | \$18,110,898,108     | \$17,413,035,154     |
|  | • Terminated vested members  | 589,665,691          | 583,773,380          |
|  | • Inactive members   | 175,451,932          | 161,120,196          |
|  | • Active members   | <u>8,240,789,580</u> | <u>7,559,719,490</u> |
|  | • Total  | \$27,116,805,311     | \$25,717,648,220     |
| <b>Assets as of December 31:</b>                             | • Market value of assets (MVA)   | \$17,660,157,424     | \$15,819,842,540     |
|  | • Actuarial value of assets (AVA)  | 16,039,286,529       | 14,922,049,783       |
|  | • Actuarial value of assets as a percentage of market value of assets            | 90.8%                | 94.3%                |
| <b>Funded status for plan year ending December 31:</b>       | • Unfunded/(overfunded) actuarial accrued liability on market value of assets    | \$9,456,647,887      | \$9,897,805,680      |
|  | • Funded percentage on MVA basis   | 65.1%                | 61.5%                |
|  | • Unfunded/(overfunded) actuarial accrued liability on actuarial value of assets | \$11,077,518,782     | \$10,795,598,437     |
|  | • Funded percentage on AVA basis   | 59.1%                | 58.0%                |
|  | • Effective amortization period  | 33 years             | 27 years             |

## Section 1: Actuarial Valuation Summary

|   |  |                      |                   |
|---|--|----------------------|-------------------|
| <b>Gains/(losses):</b>                                | • Asset experience                                   | \$848,047,819        | \$364,689,817     |
|   | • Liability and other experience                     | (19,960,824)         | (235,610,267)     |
|   | • Plan changes                                       | 0                    | 480,596,769       |
|   | • Assumption/method changes                          | <u>(947,845,612)</u> | <u>0</u>          |
|   | • Total gain/(loss)                                  | (\$119,758,617)      | \$609,676,319     |
| <b>Contribution for plan year ending December 31:</b> |  | <b>12/31/2022</b>    | <b>12/31/2021</b> |
|   | • Total normal cost rate                             | 12.97%               | 11.66%            |
|   | • Less member contribution rate                      | <u>(10.58%)</u>      | <u>(10.31%)</u>   |
|   | • Employer normal cost rate                          | 2.39%                | 1.35%             |
|   | • Unfunded actuarial accrued liability rate          | <u>21.06%</u>        | <u>19.70%</u>     |
|   | • Actuarially determined contribution rate           | 23.45%               | 21.05%            |
|   | • Equivalent single amortization period <sup>1</sup> | 25 years             | 26 years          |
|   | • DC Supplement rate                                 | 0.10%                | 0.05%             |

<sup>1</sup> State Division reflects an adjustment for the impact of AED and SAED as well as DC Supplement (for members hired on or after January 1, 2019) contributions received from employers on the estimated pensionable payroll of employees electing to participate in the defined contribution plan.

## Section 1: Actuarial Valuation Summary

### Summary of Key Valuation Results for School Division

|  |  | 2020                   | 2019                  |
|--|--|------------------------|-----------------------|
| <b>Demographic data for plan year beginning December 31:</b> | • Number of retirees and survivors   | 70,397                 | 68,523                |
|  | • Number of terminated vested members  | 19,413                 | 17,693                |
|  | • Number of inactive members   | 144,066                | 132,833               |
|  | • Number of active members   | 119,421                | 128,938               |
|  | • Total payroll supplied by PERA   | \$5,146,117,910        | \$5,104,430,888       |
|  | • Average payroll supplied by PERA   | 43,092                 | 39,588                |
| <b>Actuarial accrued liability as of December 31:</b>        | • Retirees and survivors   | \$28,090,040,035       | \$26,810,574,792      |
|  | • Terminated vested members  | 1,008,626,049          | 958,067,225           |
|  | • Inactive members   | 277,746,002            | 245,412,545           |
|  | • Active members   | <u>16,155,662,849</u>  | <u>14,411,006,573</u> |
|  | • Total  | \$45,532,074,935       | \$42,425,061,135      |
| <b>Assets as of December 31:</b>                             | • Market value of assets (MVA)   | \$30,372,888,017       | \$26,936,490,370      |
|  | • Actuarial value of assets (AVA)  | 27,581,088,477         | 25,412,013,802        |
|  | • Actuarial value of assets as a percentage of market value of assets            | 90.8%                  | 94.3%                 |
| <b>Funded status for plan year ending December 31:</b>       | • Unfunded/(overfunded) actuarial accrued liability on market value of assets    | \$15,159,186,918       | \$15,488,570,765      |
|  | • Funded percentage on MVA basis   | 66.7%                  | 63.5%                 |
|  | • Unfunded/(overfunded) actuarial accrued liability on actuarial value of assets | \$17,950,986,458       | \$17,013,047,333      |
|  | • Funded percentage on AVA basis   | 60.6%                  | 59.9%                 |
|  | • Effective amortization period  | 43 years               | 28 years              |
| <b>Gains/(losses):</b>                                       | • Asset experience   | \$1,447,267,437        | \$616,162,760         |
|  | • Liability and other experience   | (220,502,395)          | (635,057,496)         |
|  | • Plan changes   | 0                      | 829,604,881           |
|  | • Assumption/method changes  | <u>(1,839,281,320)</u> | <u>0</u>              |
|  | • Total gain/(loss)  | (\$612,516,278)        | \$810,710,145         |
| <b>Contribution for plan year ending December 31:</b>        |  | <b>12/31/2022</b>      | <b>12/31/2021</b>     |
|  | • Total normal cost rate   | 14.70%                 | 12.73%                |
|  | • Less member contribution rate  | <u>(10.50%)</u>        | <u>(10.25%)</u>       |
|  | • Employer normal cost rate  | 4.20%                  | 2.48%                 |
|  | • Unfunded actuarial accrued liability rate                                      | <u>20.34%</u>          | <u>18.13%</u>         |
|  | • Actuarially determined contribution rate                                       | 24.54%                 | 20.61%                |
|  | • Equivalent single amortization period  | 27 years               | 28 years              |

## Section 1: Actuarial Valuation Summary

### Summary of Key Valuation Results for Local Government Division

|  |  | 2020                 | 2019                 |
|--|--|----------------------|----------------------|
| <b>Demographic data for plan year beginning December 31:</b> | • Number of retirees and survivors   | 8,198                | 7,951                |
|  | • Number of terminated vested members  | 2,730                | 2,677                |
|  | • Number of inactive members   | 27,245               | 26,274               |
|  | • Number of active members   |                      |                      |
|  | ○ General  | 12,743               | 13,086               |
|  | ○ State Troopers   | 14                   | N/A                  |
|  | ○ Total  | 12,757               | 13,086               |
|  | • Total payroll supplied by PERA   |                      |                      |
|  | ○ General  | \$697,210,169        | \$681,093,520        |
|  | ○ State Troopers   | 849,490              | 0                    |
|  | ○ Total  | \$698,059,659        | \$681,093,520        |
| • Average payroll supplied by PERA                           |  |                      |                      |
| ○ General  | \$54,713   | \$52,048             |                      |
| ○ State Troopers   | 60,678   | N/A                  |                      |
| ○ Total  | \$54,720   | \$52,048             |                      |
| <b>Actuarial accrued liability as of December 31:</b>        | • Retirees and survivors   | \$3,597,102,074      | \$3,406,032,707      |
|  | • Terminated vested members  | 243,302,173          | 256,592,674          |
|  | • Inactive members   | 55,447,756           | 51,266,639           |
|  | • Active members   | <u>1,763,051,093</u> | <u>1,602,541,310</u> |
|  | • Total  | \$5,658,903,096      | \$5,316,433,330      |
| <b>Assets as of December 31:</b>                             | • Market value of assets (MVA)   | \$5,135,806,651      | \$4,545,959,241      |
|  | • Actuarial value of assets (AVA)  | 4,663,030,639        | 4,288,325,330        |
|  | • Actuarial value of assets as a percentage of market value of assets            | 90.8%                | 94.3%                |
| <b>Funded status for plan year ending December 31:</b>       | • Unfunded/(overfunded) actuarial accrued liability on market value of assets    | \$523,096,445        | \$770,474,089        |
|  | • Funded percentage on MVA basis   | 90.8%                | 85.5%                |
|  | • Unfunded/(overfunded) actuarial accrued liability on actuarial value of assets | \$995,872,457        | \$1,028,108,000      |
|  | • Funded percentage on AVA basis   | 82.4%                | 80.7%                |
|  | • Effective amortization period  | 29 years             | 22 years             |



## Section 1: Actuarial Valuation Summary

|   |                                  |                      |                   |
|---|----------------------------------|----------------------|-------------------|
| <b>Gains/(losses):</b>                                | • Asset experience               | \$244,236,967        | \$103,711,238     |
|   | • Liability and other experience | (10,696,997)         | (43,468,843)      |
|   | • Plan changes                   | 0                    | 100,004,591       |
|   | • Assumption/method changes      | <u>(202,330,333)</u> | <u>0</u>          |
|   | • Total gain/(loss)              | \$31,209,637         | \$160,246,986     |
| <b>Contribution for plan year ending December 31:</b> |                                  | <b>12/31/2022</b>    | <b>12/31/2021</b> |
| • Total normal cost rate                              |                                  | 12.87%               | 11.14%            |
| • Less member contribution rate                       |                                  | <u>(8.50%)</u>       | <u>(8.50%)</u>    |
| • Employer normal cost rate                           |                                  | 4.37%                | 2.64%             |
| • Unfunded actuarial accrued liability rate           |                                  | <u>8.35%</u>         | <u>8.20%</u>      |
| • Actuarially determined contribution rate            |                                  | 12.72%               | 10.84%            |
| • Equivalent single amortization period <sup>1</sup>  |                                  | 27 years             | 28 years          |
| • DC Supplement rate                                  |                                  | 0.03%                | 0.02%             |

<sup>1</sup> Local Government Division reflects an adjustment for the impact of AED and SAED as well as DC Supplement (for members hired on or after January 1, 2019) contributions received from employers on the estimated pensionable payroll of employees electing to participate in the defined contribution plan.

## Section 1: Actuarial Valuation Summary

### Summary of Key Valuation Results for Judicial Division

|  |  | 2020               | 2019               |
|--|--|--------------------|--------------------|
| <b>Demographic data for plan year beginning December 31:</b> | • Number of retirees and survivors   | 416                | 401                |
|  | • Number of terminated vested members  | 14                 | 14                 |
|  | • Number of inactive members   | 5                  | 6                  |
|  | • Number of active members   | 344                | 339                |
|  | • Total payroll supplied by PERA   | \$54,780,086       | \$53,427,351       |
|  | • Average payroll supplied by PERA   | 159,244            | 157,603            |
| <b>Actuarial accrued liability as of December 31:</b>        | • Retirees and survivors   | \$314,249,678      | \$299,393,349      |
|  | • Terminated vested members  | 4,262,292          | 4,602,248          |
|  | • Inactive members   | 134,547            | 177,590            |
|  | • Active members   | <u>159,558,306</u> | <u>157,864,953</u> |
|  | • Total  | \$478,204,823      | \$462,038,140      |
| <b>Assets as of December 31:</b>                             | • Market value of assets (MVA)   | \$414,097,923      | \$362,108,323      |
|  | • Actuarial value of assets (AVA)  | 376,437,305        | 342,071,056        |
|  | • Actuarial value of assets as a percentage of market value of assets            | 90.9%              | 94.5%              |
| <b>Funded status for plan year ending December 31:</b>       | • Unfunded/(overfunded) actuarial accrued liability on market value of assets    | \$64,106,900       | \$99,929,817       |
|  | • Funded percentage on MVA basis   | 86.6%              | 78.4%              |
|  | • Unfunded/(overfunded) actuarial accrued liability on actuarial value of assets | \$101,767,518      | \$119,967,084      |
|  | • Funded percentage on AVA basis   | 78.7%              | 74.0%              |
|  | • Effective amortization period  | 13 years           | 16 years           |
| <b>Gains/(losses):</b>                                       | • Asset experience   | \$19,194,050       | \$7,950,182        |
|  | • Liability and other experience   | (2,827,087)        | (9,817,268)        |
|  | • Plan changes   | 0                  | 8,063,590          |
|  | • Assumption/method changes  | <u>(930,344)</u>   | <u>0</u>           |
|  | • Total gain/(loss)  | \$15,436,619       | \$6,196,504        |
| <b>Contribution for plan year ending December 31:</b>        |  | <b>12/31/2022</b>  | <b>12/31/2021</b>  |
|  | • Total normal cost rate   | 17.35%             | 16.76%             |
|  | • Less member contribution rate  | <u>(12.85%)</u>    | <u>(14.97%)</u>    |
|  | • Employer normal cost rate  | 4.50%              | 1.79%              |
|  | • Unfunded actuarial accrued liability rate                                      | <u>11.05%</u>      | <u>12.34%</u>      |
|  | • Actuarially determined contribution rate                                       | 15.56%             | 14.13%             |
|  | • Equivalent single amortization period  | 27 years           | 28 years           |

## Section 1: Actuarial Valuation Summary

### Summary of Key Valuation Results for Denver Public Schools Division

|  |  | 2020                 | 2019                 |
|--|--|----------------------|----------------------|
| <b>Demographic data for plan year beginning December 31:</b> | • Number of retirees and survivors   | 7,134                | 7,148                |
|  | • Number of terminated vested members  | 2,237                | 1,988                |
|  | • Number of inactive members   | 14,661               | 13,522               |
|  | • Number of active members   |                      |                      |
|  | ○ DPS benefit structure  | 2,425                | 2,636                |
|  | ○ PERA benefit structure   | <u>12,268</u>        | <u>13,043</u>        |
|  | ○ Total  | 14,693               | 15,679               |
|  | • Total payroll supplied by PERA   |                      |                      |
|  | ○ DPS benefit structure  | \$189,700,881        | \$187,626,595        |
|  | ○ PERA benefit structure   | <u>581,646,723</u>   | <u>548,637,203</u>   |
|  | ○ Total  | \$771,347,604        | \$736,263,798        |
|  | • Average payroll supplied by PERA   |                      |                      |
| ○ DPS benefit structure                                      | \$78,227   | \$71,179             |                      |
| ○ PERA benefit structure                                     | 47,412   | 42,064               |                      |
| ○ Total  | \$52,498   | \$46,959             |                      |
| <b>Actuarial accrued liability as of December 31:</b>        | • Retirees and survivors   | \$2,812,545,682      | \$2,767,515,983      |
|  | • Terminated vested members  | 115,136,215          | 97,250,492           |
|  | • Inactive members   | 47,509,123           | 42,007,018           |
|  | • Active members   | <u>1,557,354,603</u> | <u>1,356,610,862</u> |
|  | • Total  | \$4,532,545,623      | \$4,263,384,355      |
| <b>Assets as of December 31:</b>                             | • Market value of assets (MVA)   | \$4,055,819,315      | \$3,616,649,237      |
|  | • Actuarial value of assets (AVA)  | 3,682,072,107        | 3,410,264,090        |
|  | • Actuarial value of assets as a percentage of market value of assets            | 90.8%                | 94.3%                |
| <b>Funded status for plan year ending December 31:</b>       | • Unfunded/(overfunded) actuarial accrued liability on market value of assets    | \$476,726,308        | \$646,735,118        |
|  | • Funded percentage on MVA basis   | 89.5%                | 84.8%                |
|  | • Unfunded/(overfunded) actuarial accrued liability on actuarial value of assets | \$850,473,516        | \$853,120,265        |
|  | • Funded percentage on AVA basis   | 81.2%                | 80.0%                |
|  | • Effective amortization period  | 16 years             | 25 years             |

## Section 1: Actuarial Valuation Summary

|   |   |                      |                   |
|---|---|----------------------|-------------------|
| <b>Gains/(losses):</b>                                | • Asset experience                          | \$195,535,778        | \$84,158,350      |
|   | • Liability and other experience            | (46,430,145)         | 11,719,174        |
|   | • Plan changes                              | 0                    | 76,021,953        |
|   | • Assumption/method changes                 | <u>(117,503,086)</u> | <u>0</u>          |
|   | • Total gain/(loss)                         | \$31,602,547         | \$171,899,477     |
| <b>Contribution for plan year ending December 31:</b> |   | <b>12/31/2022</b>    | <b>12/31/2021</b> |
|   | • Total normal cost rate                    | 13.33%               | 12.19%            |
|   | • Less member contribution rate             | <u>(10.50%)</u>      | <u>(10.25%)</u>   |
|   | • Employer normal cost rate                 | 2.83%                | 1.94%             |
|   | • Unfunded actuarial accrued liability rate | <u>6.42%</u>         | <u>6.28%</u>      |
|   | • Actuarially determined contribution rate  | 9.25%                | 8.22%             |
|   | • Equivalent single amortization period     | 27 years             | 28 years          |

## Section 1: Actuarial Valuation Summary

### Important Information About Actuarial Valuations

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

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

|                              |  |
|------------------------------|--|
| <b>Plan of benefits</b>      | Plan provisions define the rules that will be used to determine benefit payments, and those rules, or the interpretation of them, may change over time. Even where they appear precise, outside factors may change how they operate. It is important to keep Segal informed with respect to plan provisions and administrative procedures, and to review the plan summary included in our report to confirm that Segal has correctly interpreted the plan of benefits.   |
| <b>Participant data</b>      | An actuarial valuation for a plan is based on data provided to the actuary by the Association. Segal does not audit such data for completeness or accuracy, other than reviewing it for obvious inconsistencies compared to prior data and other information that appears unreasonable. It is important for Segal to receive the best possible data and to be informed about any known incomplete or inaccurate data.  |
| <b>Assets</b>                | The valuation is based on the market value of assets as of the valuation date, as provided by the Association. The Association uses an “actuarial value of assets” that differs from market value to gradually reflect year-to-year changes in the market value of assets in determining the contribution requirements.  |
| <b>Actuarial assumptions</b> | In preparing an actuarial valuation, Segal projects the benefits to be paid to existing plan participants for the rest of their lives and the lives of their beneficiaries. This projection requires actuarial assumptions as to the probability of death, disability, withdrawal, and retirement of each participant for each year. In addition, the benefits projected to be paid for each of those events in each future year reflect actuarial assumptions as to salary increases and cost-of-living adjustments. The projected benefits are then discounted to a present value, based on the assumed rate of return that is expected to be achieved on the plan’s assets. There is a reasonable range for each assumption used in the projection and the results may vary materially based on which assumptions are selected. It is important for any user of an actuarial valuation to understand this concept. Actuarial assumptions are periodically reviewed to ensure that future valuations reflect emerging plan experience. While future changes in actuarial assumptions may have a significant impact on the reported results that does not mean that the previous assumptions were unreasonable. |
| <b>Models</b>                | Segal valuation results are based on proprietary actuarial modeling software. The actuarial valuation models generate a comprehensive set of liability and cost calculations that are prepared to meet regulatory, legislative and client requirements. Deterministic cost projections are based on a proprietary forecasting model. Our Actuarial Technology and Systems unit, comprised of both actuaries and programmers, is responsible for the initial development and maintenance of these models. The models have a modular structure that allows for a high degree of accuracy, flexibility and user control. The client team programs the assumptions and the plan provisions, validates the models, and reviews test lives and results, under the supervision of the responsible actuary.  |

## Section 1: Actuarial Valuation Summary

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

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

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

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Actuarial results in this report are not rounded, but that does not imply precision. In addition, in some cases the underlying calculations involve more precision than what is presented in this report and the rounded numbers shown herein may appear not to add as a result.

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

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

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

# Section 2: Actuarial Valuation Results

## Member Data

The Actuarial Valuation and Review considers the number and demographic characteristics of covered members, including active members, inactive members, retirees and beneficiaries.

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

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

### STATE DIVISION Member Population: 2011 – 2020

| As of December 31 | Active General Members | Active State Troopers Members | Active Total | Terminated Vested Members | Inactive Members | Retirees and Survivors | Total Membership | Ratio of Retirees and Survivors to Actives |
|-------------------|------------------------|-------------------------------|--------------|---------------------------|------------------|------------------------|------------------|--|
| 2011              | 54,145                 | 811                           | 54,956       | 4,756                     | 58,597           | 33,212                 | 151,521          | 0.60                                       |
| 2012              | 53,993                 | 811                           | 54,804       | 5,029                     | 61,293           | 34,125                 | 155,251          | 0.62                                       |
| 2013              | 54,538                 | 816                           | 55,354       | 5,340                     | 63,759           | 34,981                 | 159,434          | 0.63                                       |
| 2014              | 54,471                 | 829                           | 55,300       | 5,678                     | 66,330           | 35,937                 | 163,245          | 0.65                                       |
| 2015              | 54,450                 | 841                           | 55,291       | 6,075                     | 69,385           | 36,992                 | 167,743          | 0.67                                       |
| 2016              | 54,889                 | 836                           | 55,725       | 6,426                     | 72,398           | 38,140                 | 172,689          | 0.68                                       |
| 2017              | 54,814                 | 872                           | 55,686       | 6,788                     | 75,350           | 39,364                 | 177,188          | 0.71                                       |
| 2018              | 54,623                 | 888                           | 55,511       | 7,074                     | 78,576           | 40,446                 | 181,607          | 0.73                                       |
| 2019              | 54,380                 | 872                           | 55,252       | 7,412                     | 81,012           | 41,305                 | 184,981          | 0.75                                       |
| 2020              | 52,152                 | 1,491                         | 53,643       | 7,802                     | 83,941           | 41,988                 | 187,374          | 0.78                                       |

## Section 2: Actuarial Valuation Results

### SCHOOL DIVISION Member Population: 2011 – 2020

| As of<br>December 31 | Active<br>Members | Terminated<br>Vested<br>Members | Inactive<br>Members | Retirees<br>and Survivors | Total<br>Membership | Ratio of<br>Retirees and<br>Survivors<br>to Actives |
|----------------------|-------------------|---------------------------------|---------------------|---------------------------|---------------------|---|
| 2011                 | 114,820           | 11,250                          | 89,225              | 51,898                    | 267,193             | 0.45  |
| 2012                 | 115,294           | 11,942                          | 93,097              | 53,952                    | 274,285             | 0.47  |
| 2013                 | 117,727           | 12,854                          | 96,832              | 55,986                    | 283,399             | 0.48  |
| 2014                 | 119,618           | 13,807                          | 101,603             | 58,145                    | 293,173             | 0.49  |
| 2015                 | 120,239           | 14,904                          | 108,184             | 60,109                    | 303,436             | 0.50  |
| 2016                 | 121,945           | 15,727                          | 113,942             | 62,102                    | 313,716             | 0.51  |
| 2017                 | 122,990           | 16,439                          | 120,037             | 64,327                    | 323,793             | 0.52  |
| 2018                 | 126,333           | 17,001                          | 125,944             | 66,543                    | 335,821             | 0.53  |
| 2019                 | 128,938           | 17,693                          | 132,833             | 68,523                    | 347,987             | 0.53  |
| 2020                 | 119,421           | 19,413                          | 144,066             | 70,397                    | 353,297             | 0.59  |



## Section 2: Actuarial Valuation Results

### LOCAL GOVERNMENT DIVISION Member Population: 2011 – 2020

| As of<br>December<br>31 | Active<br>General<br>Members | Active State<br>Trooper<br>Members | Active Total | Terminated<br>Vested<br>Members | Inactive<br>Members | Retirees<br>and<br>Survivors | Total<br>Membership | Ratio of<br>Retirees and<br>Survivors<br>to Actives |
|-------------------------|------------------------------|------------------------------------|--------------|---------------------------------|---------------------|------------------------------|---------------------|---|
| 2011                    | 16,065                       | 0                                  | 16,065       | 1,436                           | 17,725              | 5,320                        | 40,546              | 0.33  |
| 2012                    | 12,097                       | 0                                  | 12,097       | 3,075                           | 20,104              | 5,901                        | 41,177              | 0.49  |
| 2013                    | 11,954                       | 0                                  | 11,954       | 2,868                           | 20,286              | 6,167                        | 41,275              | 0.52  |
| 2014                    | 12,084                       | 0                                  | 12,084       | 2,788                           | 20,956              | 6,466                        | 42,294              | 0.54  |
| 2015                    | 12,176                       | 0                                  | 12,176       | 2,791                           | 21,915              | 6,777                        | 43,659              | 0.56  |
| 2016                    | 12,736                       | 0                                  | 12,736       | 2,748                           | 22,896              | 7,065                        | 45,445              | 0.55  |
| 2017                    | 12,770                       | 0                                  | 12,770       | 2,741                           | 23,937              | 7,369                        | 46,817              | 0.58  |
| 2018                    | 13,260                       | 0                                  | 13,260       | 2,696                           | 25,034              | 7,662                        | 48,652              | 0.58  |
| 2019                    | 13,086                       | 0                                  | 13,086       | 2,677                           | 26,274              | 7,951                        | 49,988              | 0.61  |
| 2020                    | 12,743                       | 14                                 | 12,757       | 2,730                           | 27,245              | 8,198                        | 50,930              | 0.64  |

## Section 2: Actuarial Valuation Results

### JUDICIAL DIVISION Member Population: 2011 – 2020

| As of<br>December 31 | Active<br>Members | Terminated<br>Vested<br>Members | Inactive<br>Members | Retirees<br>and<br>Survivors | Total<br>Membership | Ratio of<br>Retirees and<br>Survivors<br>to Actives |
|----------------------|-------------------|---------------------------------|---------------------|------------------------------|---------------------|---|
| 2011                 | 329               | 8                               | 5                   | 312                          | 654                 | 0.95  |
| 2012                 | 329               | 7                               | 5                   | 321                          | 662                 | 0.98  |
| 2013                 | 332               | 6                               | 5                   | 323                          | 666                 | 0.97  |
| 2014                 | 334               | 5                               | 9                   | 331                          | 679                 | 0.99  |
| 2015                 | 334               | 7                               | 8                   | 345                          | 694                 | 1.03  |
| 2016                 | 335               | 8                               | 5                   | 361                          | 709                 | 1.08  |
| 2017                 | 332               | 9                               | 5                   | 376                          | 722                 | 1.13  |
| 2018                 | 332               | 12                              | 4                   | 382                          | 730                 | 1.15  |
| 2019                 | 339               | 14                              | 6                   | 401                          | 760                 | 1.18  |
| 2020                 | 344               | 14                              | 5                   | 416                          | 779                 | 1.21  |

## Section 2: Actuarial Valuation Results

### DENVER PUBLIC SCHOOLS DIVISION Member Population: 2011 – 2020

| As of<br>December 31 | Active<br>Members | Terminated<br>Vested<br>Members | Inactive<br>Members | Retirees<br>and<br>Survivors | Total<br>Membership | Ratio of<br>Retirees and<br>Survivors<br>to Actives |
|----------------------|-------------------|---------------------------------|---------------------|------------------------------|---------------------|---|
| 2011                 | 13,571            | 553                             | 3,118               | 6,311                        | 23,553              | 0.47  |
| 2012                 | 13,911            | 645                             | 4,414               | 6,415                        | 25,385              | 0.46  |
| 2013                 | 14,816            | 759                             | 5,501               | 6,564                        | 27,640              | 0.44  |
| 2014                 | 15,414            | 850                             | 6,787               | 6,698                        | 29,749              | 0.43  |
| 2015                 | 15,929            | 1,109                           | 8,118               | 6,812                        | 31,968              | 0.43  |
| 2016                 | 15,950            | 1,374                           | 9,545               | 6,941                        | 33,810              | 0.44  |
| 2017                 | 15,991            | 1,596                           | 10,919              | 7,044                        | 35,550              | 0.44  |
| 2018                 | 16,148            | 1,780                           | 12,286              | 7,156                        | 37,370              | 0.44  |
| 2019                 | 15,679            | 1,988                           | 13,522              | 7,148                        | 38,337              | 0.46  |
| 2020                 | 14,693            | 2,237                           | 14,661              | 7,134                        | 38,725              | 0.49  |

## Section 2: Actuarial Valuation Results

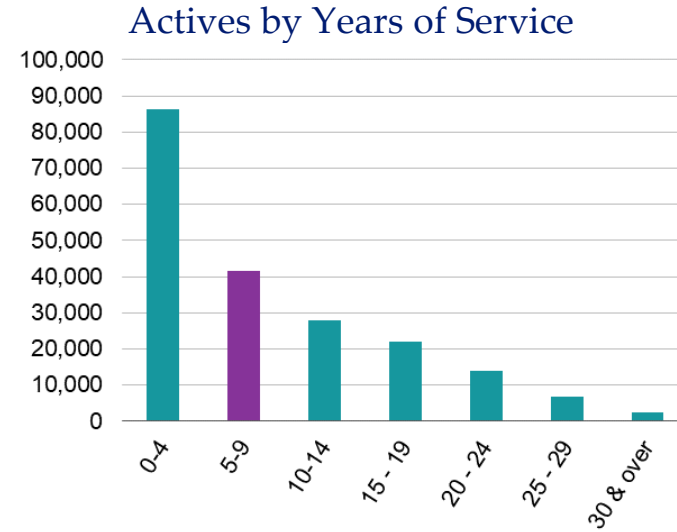
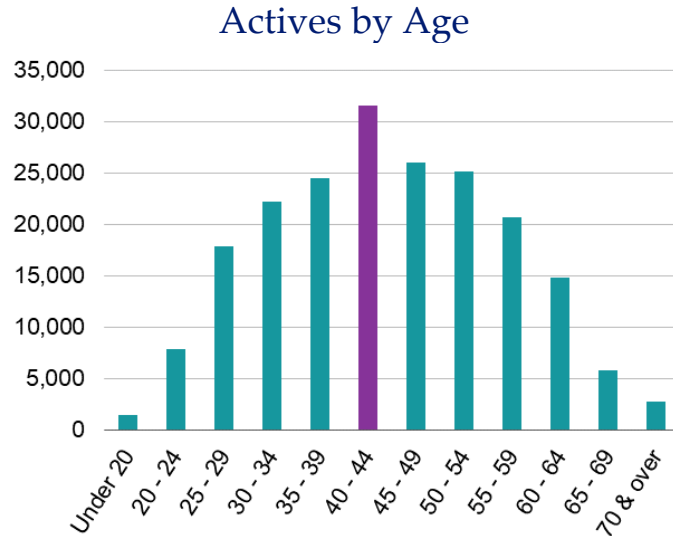
### Active Members

Plan costs are affected by the age, years of service and compensation of active members. The following table shows the number of active members, average age, average years of service, and average payroll for the Division Trust Funds for the current and prior year valuations.

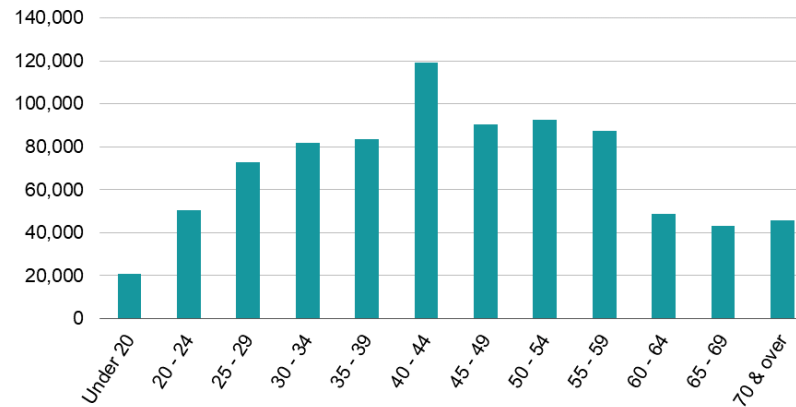
| Item                      | State Division<br>General | State Division<br>State<br>Troopers | School<br>Division | Local<br>Government<br>Division<br>General | Local<br>Government<br>Division State<br>Troopers | Judicial<br>Division | Denver Public<br>Schools<br>Division |
|---------------------------|---------------------------|-------------------------------------|--------------------|--|---|----------------------|--------------------------------------|
| <b>December 31, 2020:</b> |                           |                                     |                    |  |   |                      |                                      |
| Number                    | 52,152                    | 1,491                               | 119,421            | 12,743                                     | 14  | 344                  | 14,693                               |
| Average age               | 45.6                      | 39.0                                | 44.7               | 44.7                                       | 37.5  | 54.6                 | 41.0                                 |
| Average service           | 9.1                       | 7.8                                 | 9.1                | 7.7  | 1.2   | 12.7                 | 7.2                                  |
| Average payroll           | \$56,950                  | \$79,896                            | \$43,092           | \$54,713                                   | \$60,678  | \$159,244            | \$52,498                             |
| <b>December 31, 2019:</b> |                           |                                     |                    |  |   |                      |                                      |
| Number                    | 54,380                    | 872                                 | 128,938            | 13,086                                     | N/A   | 339                  | 15,679                               |
| Average age               | 45.4                      | 42.1                                | 44.6               | 44.0                                       | N/A   | 55.3                 | 40.8                                 |
| Average service           | 8.7                       | 12.7                                | 8.4                | 7.5  | N/A   | 13.1                 | 6.6                                  |
| Average payroll           | \$53,542                  | \$96,170                            | \$39,588           | \$52,047                                   | N/A   | \$157,603            | \$46,959                             |

## Section 2: Actuarial Valuation Results

### ALL DIVISION TRUST FUNDS ACTIVE MEMBER DATA



### Average Payroll of Actives by Age



Note: The purple bar represents the average age and average service for active members.

## Section 2: Actuarial Valuation Results

### Retirees and Survivors

The following table shows the number of retirees and survivors, average age, and average annual benefit for the current and prior valuations.

| Item                             | State Division | School Division | Local Government Division | Judicial Division | Denver Public Schools Division |
|----------------------------------|----------------|-----------------|---------------------------|-------------------|--------------------------------|
| <b>December 31, 2020:</b>        |                |                 |                           |                   |                                |
| Number of retirees and survivors | 41,988         | 70,397          | 8,198                     | 416               | 7,134                          |
| Average age                      | 72.1           | 71.9            | 70.2                      | 74.7              | 74.6                           |
| Average annual benefit           | \$40,212       | \$36,428        | \$38,008                  | \$72,277          | \$39,011                       |
| <b>December 31, 2019:</b>        |                |                 |                           |                   |                                |
| Number of retirees and survivors | 41,305         | 68,523          | 7,951                     | 401               | 7,148                          |
| Average age                      | 72.1           | 71.9            | 70.0                      | 74.8              | 74.6                           |
| Average annual benefit           | \$39,857       | \$36,202        | \$37,512                  | \$70,605          | \$38,633                       |

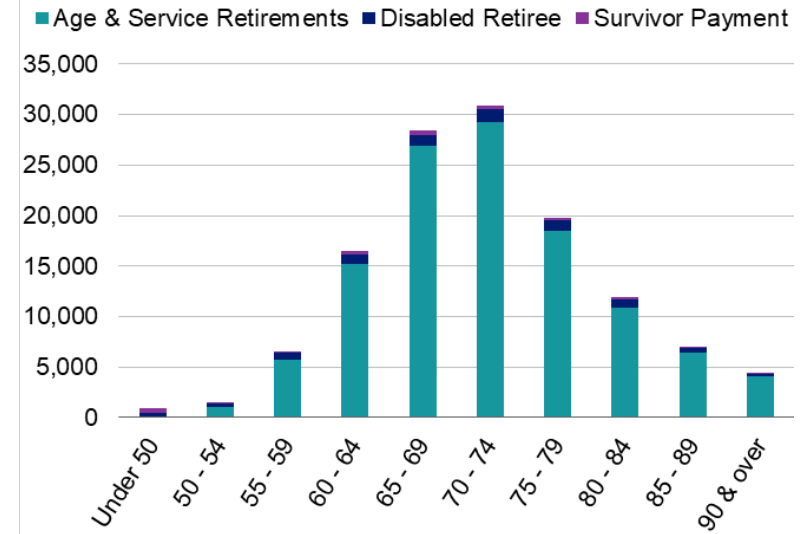
## Section 2: Actuarial Valuation Results

### ALL DIVISION TRUST FUNDS RETIREE AND SURVIVOR DATA

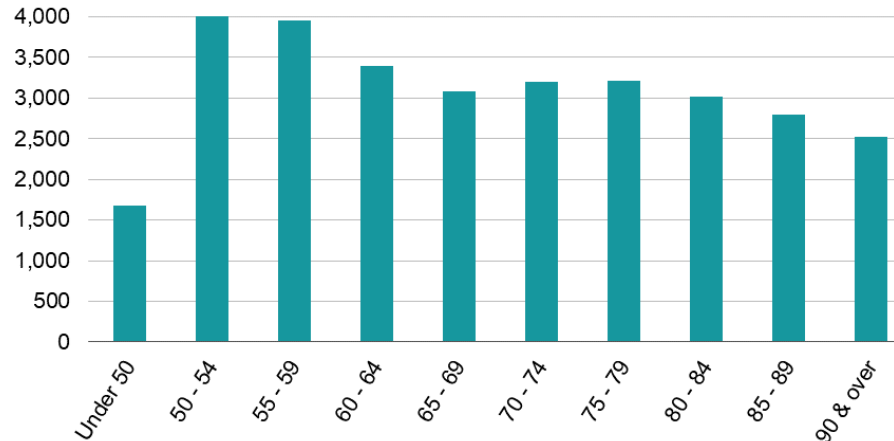
Retirees and Survivors by Type and Amount



Retirees and Survivors by Type and Age



Average Benefit Amounts of Retirees and Survivors by Age



## Section 2: Actuarial Valuation Results

### Historical Plan Population

The charts below demonstrate the progression of the active population over the last 10 years.

#### STATE DIVISION Active Member Data Statistics: 2011 – 2020

| As of<br>December 31 | Active Members |                   | Total Payroll Supplied by<br>PERA, Annualized |                   | Average Payroll |                   | Average<br>Age | Average<br>Service |
|----------------------|----------------|-------------------|---|-------------------|-----------------|-------------------|----------------|--------------------|
|                      | Number         | Percent<br>Change | Amount in<br>\$ Thousands                     | Percent<br>Change | \$ Amount       | Percent<br>Change |                |                    |
| 2011                 | 54,956         | --                | \$2,393,791                                   | --                | \$43,558        | --                | 45.98          | 8.96               |
| 2012                 | 54,804         | (0.28%)           | 2,384,934                                     | (0.37%)           | 43,518          | (0.09%)           | 46.19          | 9.04               |
| 2013                 | 55,354         | 1.00%             | 2,474,965                                     | 3.77%             | 44,712          | 2.74%             | 46.10          | 9.00               |
| 2014                 | 55,300         | (0.10%)           | 2,564,670                                     | 3.62%             | 46,377          | 3.72%             | 46.01          | 9.02               |
| 2015                 | 55,291         | (0.02%)           | 2,641,867                                     | 3.01%             | 47,781          | 3.03%             | 45.87          | 8.97               |
| 2016                 | 55,725         | 0.78%             | 2,710,651                                     | 2.60%             | 48,643          | 1.80%             | 45.66          | 8.84               |
| 2017                 | 55,686         | (0.07%)           | 2,774,207                                     | 2.34%             | 49,819          | 2.42%             | 45.50          | 8.78               |
| 2018                 | 55,511         | (0.31%)           | 2,898,827                                     | 4.49%             | 52,221          | 4.82%             | 45.36          | 8.75               |
| 2019                 | 55,252         | (0.47%)           | 2,995,453                                     | 3.33%             | 54,214          | 3.82%             | 45.33          | 8.80               |
| 2020                 | 53,643         | (2.91%)           | 3,089,161                                     | 3.13%             | 57,587          | 6.22%             | 45.37          | 9.06               |



## Section 2: Actuarial Valuation Results

### SCHOOL DIVISION Active Member Data Statistics: 2011 – 2020

| As of<br>December 31 | Active Members |                   | Total Payroll Supplied by<br>PERA, Annualized |                   | Average Payroll |                   | Average<br>Age | Average<br>Service |
|----------------------|----------------|-------------------|---|-------------------|-----------------|-------------------|----------------|--------------------|
|                      | Number         | Percent<br>Change | Amount in<br>\$ Thousands                     | Percent<br>Change | \$ Amount       | Percent<br>Change |                |                    |
| 2011                 | 114,820        | --                | \$3,821,603                                   | --                | \$33,283        | --                | 44.60          | 8.46               |
| 2012                 | 115,294        | 0.41%             | 3,819,066                                     | (0.07%)           | 33,125          | (0.47%)           | 44.62          | 8.46               |
| 2013                 | 117,727        | 2.11%             | 3,938,650                                     | 3.13%             | 33,456          | 1.00%             | 44.57          | 8.38               |
| 2014                 | 119,618        | 1.61%             | 4,063,236                                     | 3.16%             | 33,968          | 1.53%             | 44.49          | 8.29               |
| 2015                 | 120,239        | 0.52%             | 4,235,290                                     | 4.23%             | 35,224          | 3.70%             | 44.55          | 8.36               |
| 2016                 | 121,945        | 1.42%             | 4,349,320                                     | 2.69%             | 35,666          | 1.25%             | 44.53          | 8.38               |
| 2017                 | 122,990        | 0.86%             | 4,471,357                                     | 2.81%             | 36,355          | 1.93%             | 44.60          | 8.42               |
| 2018                 | 126,333        | 2.72%             | 4,789,503                                     | 7.12%             | 37,912          | 4.28%             | 44.56          | 8.38               |
| 2019                 | 128,938        | 2.06%             | 5,104,431                                     | 6.58%             | 39,588          | 4.42%             | 44.56          | 8.41               |
| 2020                 | 119,421        | (7.38%)           | 5,146,118                                     | 0.82%             | 43,092          | 8.85%             | 44.67          | 9.09               |

## Section 2: Actuarial Valuation Results

### LOCAL GOVERNMENT DIVISION Active Member Data Statistics: 2011 – 2020

| As of<br>December 31 | Active Members |                   | Total Payroll Supplied by<br>PERA, Annualized |                   | Average Payroll |                   | Average<br>Age | Average<br>Service |
|----------------------|----------------|-------------------|---|-------------------|-----------------|-------------------|----------------|--------------------|
|                      | Number         | Percent<br>Change | Amount in<br>\$ Thousands                     | Percent<br>Change | \$ Amount       | Percent<br>Change |                |                    |
| 2011                 | 16,065         | --                | \$718,169                                     | --                | \$44,704        | --                | 44.15          | 7.67               |
| 2012                 | 12,097         | (24.70%)          | 523,668                                       | (27.08%)          | 43,289          | (3.17%)           | 44.75          | 7.89               |
| 2013                 | 11,954         | (1.18%)           | 529,003                                       | 1.02%             | 44,253          | 2.23%             | 44.71          | 8.02               |
| 2014                 | 12,084         | 1.09%             | 540,468                                       | 2.17%             | 44,726          | 1.07%             | 44.67          | 7.89               |
| 2015                 | 12,176         | 0.76%             | 561,518                                       | 3.89%             | 46,117          | 3.11%             | 44.45          | 7.80               |
| 2016                 | 12,736         | 4.60%             | 608,223                                       | 8.32%             | 47,756          | 3.55%             | 44.53          | 7.60               |
| 2017                 | 12,770         | 0.27%             | 632,768                                       | 4.04%             | 49,551          | 3.76%             | 43.97          | 7.58               |
| 2018                 | 13,260         | 3.84%             | 660,998                                       | 4.46%             | 49,849          | 0.60%             | 44.08          | 7.31               |
| 2019                 | 13,086         | (1.31%)           | 681,093                                       | 3.04%             | 52,047          | 4.41%             | 43.96          | 7.51               |
| 2020                 | 12,757         | (2.51%)           | 698,060                                       | 2.49%             | 54,720          | 5.14%             | 44.65          | 7.74               |

## Section 2: Actuarial Valuation Results

### JUDICIAL DIVISION Active Member Data Statistics: 2011 – 2020

| As of<br>December 31 | Active Members |                   | Total Payroll Supplied by<br>PERA, Annualized |                   | Average Payroll |                   | Average<br>Age | Average<br>Service |
|----------------------|----------------|-------------------|---|-------------------|-----------------|-------------------|----------------|--------------------|
|                      | Number         | Percent<br>Change | Amount in<br>\$ Thousands                     | Percent<br>Change | \$ Amount       | Percent<br>Change |                |                    |
| 2011                 | 329            | --                | \$39,033                                      | --                | \$118,642       | --                | 56.14          | 13.63              |
| 2012                 | 329            | 0.00%             | 39,045  | 0.03%             | 118,678         | 0.03%             | 56.25          | 14.00              |
| 2013                 | 332            | 0.91%             | 39,942  | 2.30%             | 120,306         | 1.37%             | 56.40          | 14.23              |
| 2014                 | 334            | 0.60%             | 42,977  | 7.60%             | 128,674         | 6.96%             | 56.54          | 14.36              |
| 2015                 | 334            | 0.00%             | 46,870  | 9.06%             | 140,329         | 9.06%             | 56.65          | 14.32              |
| 2016                 | 335            | 0.30%             | 48,700  | 3.90%             | 145,372         | 3.59%             | 55.93          | 13.79              |
| 2017                 | 332            | (0.90%)           | 48,948  | 0.51%             | 147,433         | 1.42%             | 55.39          | 13.22              |
| 2018                 | 332            | 0.00%             | 50,506  | 3.18%             | 152,126         | 3.18%             | 56.06          | 13.71              |
| 2019                 | 339            | 2.11%             | 53,427  | 5.78%             | 157,603         | 3.60%             | 55.25          | 13.14              |
| 2020                 | 344            | 1.47%             | 54,780  | 2.53%             | 159,244         | 1.04%             | 54.57          | 12.71              |

## Section 2: Actuarial Valuation Results

### DENVER PUBLIC SCHOOLS DIVISION Active Member Data Statistics: 2011 – 2020

| As of<br>December 31 | Active Members |                   | Total Payroll Supplied by<br>PERA, Annualized |                   | Average Payroll |                   | Average<br>Age | Average<br>Service |
|----------------------|----------------|-------------------|---|-------------------|-----------------|-------------------|----------------|--------------------|
|                      | Number         | Percent<br>Change | Amount in<br>\$ Thousands                     | Percent<br>Change | \$ Amount       | Percent<br>Change |                |                    |
| 2011                 | 13,571         | --                | \$491,646                                     | --                | \$36,228        | --                | 42.35          | 5.90               |
| 2012                 | 13,911         | 2.51%             | 510,872                                       | 3.91%             | 36,724          | 1.37%             | 42.14          | 5.90               |
| 2013                 | 14,816         | 6.51%             | 547,660                                       | 7.20%             | 36,964          | 0.65%             | 41.49          | 5.79               |
| 2014                 | 15,414         | 4.04%             | 584,319                                       | 6.69%             | 37,908          | 2.55%             | 41.00          | 5.80               |
| 2015                 | 15,929         | 3.34%             | 621,115                                       | 6.30%             | 38,993          | 2.86%             | 41.78          | 7.15               |
| 2016                 | 15,950         | 0.13%             | 642,177                                       | 3.39%             | 40,262          | 3.25%             | 40.42          | 5.88               |
| 2017                 | 15,991         | 0.26%             | 658,198                                       | 2.49%             | 41,161          | 2.23%             | 40.48          | 6.06               |
| 2018                 | 16,148         | 0.98%             | 722,040                                       | 9.70%             | 44,714          | 8.63%             | 40.44          | 6.21               |
| 2019                 | 15,679         | (2.90%)           | 736,264                                       | 1.97%             | 46,959          | 5.02%             | 40.83          | 6.56               |
| 2020                 | 14,693         | (6.29%)           | 771,348                                       | 4.77%             | 52,498          | 11.80%            | 41.02          | 7.21               |

## Section 2: Actuarial Valuation Results

The charts below show the growth among the service retiree population over the last 10 years. Disability retirees and survivors are not included in the charts.

### STATE DIVISION Service Retiree Data Statistics: 2011 – 2020

| As of<br>December 31 | Service Retirees |                   | Average Annual Amount |                   | Average<br>Age |
|----------------------|------------------|-------------------|-----------------------|-------------------|----------------|
|                      | Number           | Percent<br>Change | \$ Amount             | Percent<br>Change |                |
| 2011                 | 28,709           | --                | \$38,375              | --                | 70.6           |
| 2012                 | 29,659           | 3.31%             | 39,182                | 2.10%             | 70.7           |
| 2013                 | 30,515           | 2.89%             | 39,888                | 1.80%             | 71.0           |
| 2014                 | 31,511           | 3.26%             | 40,271                | 0.96%             | 71.2           |
| 2015                 | 32,594           | 3.44%             | 40,886                | 1.53%             | 71.4           |
| 2016                 | 33,756           | 3.57%             | 41,857                | 2.37%             | 71.6           |
| 2017                 | 34,974           | 3.61%             | 42,021                | 0.39%             | 71.8           |
| 2018                 | 36,063           | 3.11%             | 41,958                | (0.15%)           | 72.0           |
| 2019                 | 36,999           | 2.60%             | 41,631                | (0.78%)           | 72.2           |
| 2020                 | 37,807           | 2.18%             | 41,951                | 0.77%             | 72.5           |

## Section 2: Actuarial Valuation Results

### SCHOOL DIVISION Service Retiree Data Statistics: 2011 – 2020

| As of<br>December 31 | Service Retirees |                   | Average Annual Amount |                   | Average<br>Age |
|----------------------|------------------|-------------------|-----------------------|-------------------|----------------|
|                      | Number           | Percent<br>Change | \$ Amount             | Percent<br>Change |                |
| 2011                 | 47,663           | --                | \$35,638              | --                | 69.5           |
| 2012                 | 49,695           | 4.26%             | 36,149                | 1.43%             | 69.7           |
| 2013                 | 51,665           | 3.96%             | 36,630                | 1.33%             | 70.1           |
| 2014                 | 53,778           | 4.09%             | 36,858                | 0.62%             | 70.4           |
| 2015                 | 55,747           | 3.66%             | 37,255                | 1.08%             | 70.8           |
| 2016                 | 57,748           | 3.59%             | 38,003                | 2.01%             | 71.1           |
| 2017                 | 59,968           | 3.84%             | 37,938                | (0.17%)           | 71.4           |
| 2018                 | 62,154           | 3.65%             | 37,724                | (0.56%)           | 71.7           |
| 2019                 | 64,144           | 3.20%             | 37,273                | (1.20%)           | 72.0           |
| 2020                 | 66,096           | 3.04%             | 37,440                | 0.45%             | 72.3           |

## Section 2: Actuarial Valuation Results

### LOCAL GOVERNMENT DIVISION Service Retiree Data Statistics: 2011 – 2020

| As of<br>December 31 | Service Retirees |                   | Average Annual Amount |                   | Average<br>Age |
|----------------------|------------------|-------------------|-----------------------|-------------------|----------------|
|                      | Number           | Percent<br>Change | \$ Amount             | Percent<br>Change |                |
| 2011                 | 4,449            | --                | \$37,438              | --                | 68.1           |
| 2012                 | 5,027            | 12.99%            | 37,975                | 1.43%             | 67.7           |
| 2013                 | 5,287            | 5.17%             | 38,354                | 1.00%             | 68.1           |
| 2014                 | 5,595            | 5.83%             | 38,244                | (0.29%)           | 68.5           |
| 2015                 | 5,908            | 5.59%             | 38,709                | 1.22%             | 68.8           |
| 2016                 | 6,197            | 4.89%             | 39,371                | 1.71%             | 69.1           |
| 2017                 | 6,510            | 5.05%             | 39,403                | 0.08%             | 69.5           |
| 2018                 | 6,813            | 4.65%             | 39,509                | 0.27%             | 69.8           |
| 2019                 | 7,105            | 4.29%             | 39,077                | (1.09%)           | 70.1           |
| 2020                 | 7,375            | 3.80%             | 39,494                | 1.07%             | 70.5           |

## Section 2: Actuarial Valuation Results

### JUDICIAL DIVISION Service Retiree Data Statistics: 2011 – 2020

| As of<br>December 31 | Service Retirees |                   | Average Annual Amount |                   | Average<br>Age |
|----------------------|------------------|-------------------|-----------------------|-------------------|----------------|
|                      | Number           | Percent<br>Change | \$ Amount             | Percent<br>Change |                |
| 2011                 | 278              | --                | \$57,565              | --                | 74.1           |
| 2012                 | 286              | 2.88%             | 59,399                | 3.19%             | 74.1           |
| 2013                 | 290              | 1.40%             | 61,786                | 4.02%             | 74.5           |
| 2014                 | 299              | 3.10%             | 62,341                | 0.90%             | 74.7           |
| 2015                 | 311              | 4.01%             | 65,048                | 4.34%             | 74.6           |
| 2016                 | 327              | 5.14%             | 68,813                | 5.79%             | 74.3           |
| 2017                 | 344              | 5.20%             | 71,084                | 3.30%             | 74.4           |
| 2018                 | 349              | 1.45%             | 71,996                | 1.28%             | 75.1           |
| 2019                 | 369              | 5.73%             | 72,855                | 1.19%             | 74.9           |
| 2020                 | 387              | 4.88%             | 74,343                | 2.04%             | 75.1           |



## Section 2: Actuarial Valuation Results

### DENVER PUBLIC SCHOOLS DIVISION Service Retiree Data Statistics: 2011 – 2020

| As of<br>December 31 | Service Retirees |                   | Average Annual Amount |                   | Average<br>Age <sup>1</sup> |
|----------------------|------------------|-------------------|-----------------------|-------------------|-----------------------------|
|                      | Number           | Percent<br>Change | \$ Amount             | Percent<br>Change |                             |
| 2011                 | 5,804            | --                | \$37,075              | --                | 73.4                        |
| 2012                 | 5,915            | 1.91%             | 37,693                | 1.67%             | 73.6                        |
| 2013                 | 6,060            | 2.45%             | 38,374                | 1.81%             | 73.8                        |
| 2014                 | 6,203            | 2.36%             | 38,683                | 0.81%             | 74.0                        |
| 2015                 | 6,317            | 1.84%             | 39,124                | 1.14%             | 74.2                        |
| 2016                 | 6,456            | 2.20%             | 40,008                | 2.26%             | 74.3                        |
| 2017                 | 6,551            | 1.47%             | 40,111                | 0.26%             | 74.5                        |
| 2018                 | 6,659            | 1.65%             | 40,167                | 0.14%             | 74.6                        |
| 2019                 | 6,664            | 0.08%             | 39,812                | (0.88%)           | 74.8                        |
| 2020                 | 6,662            | (0.03%)           | 40,141                | 0.83%             | 75.1                        |

<sup>1</sup> Average age shown for years prior to 2014 represents only retirees with a DPS benefit structure.

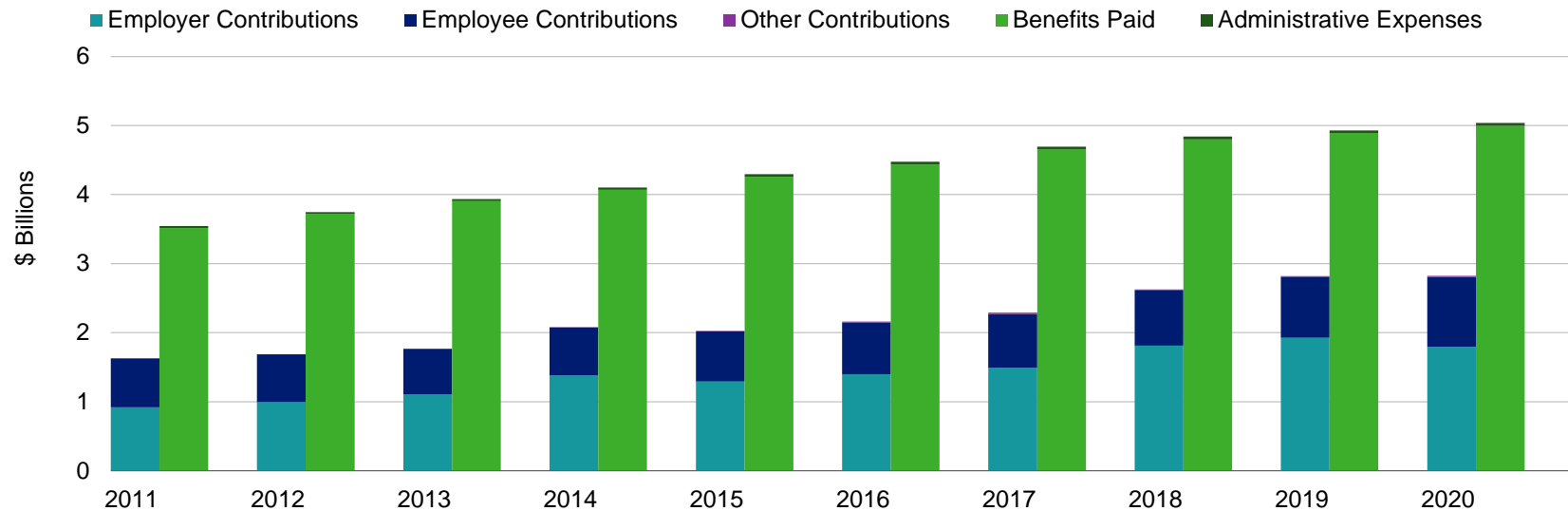
## Section 2: Actuarial Valuation Results

### Financial Information

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

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

Comparison of Contributions with Benefits Paid  
for Years Ended December 31, 2011 – 2020  
ALL DIVISION TRUST FUNDS



## Section 2: Actuarial Valuation Results

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

### STATE DIVISION

#### Determination of Actuarial Value of Assets for Year Ended December 31, 2020 and December 31, 2019

|     |  | 2020                               |                         | 2019                    |                         |
|-----|--|------------------------------------|-------------------------|-------------------------|-------------------------|
| 1   | Market value of assets available for benefits                  |                                    |                         | <b>\$17,660,157,424</b> | <b>\$15,819,842,540</b> |
| 2   | Calculation of unrecognized return <sup>1</sup>                | <b>Original Amount<sup>2</sup></b> | <b>% Not Recognized</b> |                         | <b>% Not Recognized</b> |
| (a) | Year ended December 30, 2020                                   | \$1,506,035,982                    | 75%                     | \$1,129,526,987         |                         |
| (b) | Year ended December 30, 2019                                   | 1,762,120,556                      | 50%                     | 881,060,278             | 75% \$1,321,590,417     |
| (c) | Year ended December 30, 2018                                   | (1,558,865,478)                    | 25%                     | (389,716,370)           | 50% (779,432,739)       |
| (d) | Year ended December 30, 2017                                   | 1,422,540,317                      |                         | 0                       | 25% <u>355,635,079</u>  |
| (e) | Total unrecognized return                                      |                                    |                         | \$1,620,870,895         | \$897,792,757           |
| 3   | Actuarial value of assets: <b>(1) – (2e)</b>                   |                                    |                         | <b>\$16,039,286,529</b> | <b>\$14,922,049,783</b> |
| 4   | Actuarial value as a percent of market value: <b>(3) ÷ (1)</b> |                                    |                         | 90.8%                   | 94.3%                   |

<sup>1</sup> Recognition at 25% per year over four years.

<sup>2</sup> Total return minus expected return on a market value basis.

## Section 2: Actuarial Valuation Results

### SCHOOL DIVISION

#### Determination of Actuarial Value of Assets for Year Ended December 31, 2020 and December 31, 2019

|     |  | 2020                               |                         | 2019                    |                         |
|-----|--|------------------------------------|-------------------------|-------------------------|-------------------------|
| 1   | Market value of assets available for benefits                  |                                    | <b>\$30,372,888,017</b> |                         | <b>\$26,936,490,370</b> |
| 2   | Calculation of unrecognized return <sup>1</sup>                | <b>Original Amount<sup>2</sup></b> | <b>% Not Recognized</b> |                         | <b>% Not Recognized</b> |
| (a) | Year ended December 30, 2020                                   | \$2,604,065,858                    | 75%                     | \$1,953,049,394         |                         |
| (b) | Year ended December 30, 2019                                   | 2,987,411,135                      | 50%                     | 1,493,705,568           | 75%                     |
| (c) | Year ended December 30, 2018                                   | (2,619,821,688)                    | 25%                     | (654,955,422)           | 50%                     |
| (d) | Year ended December 30, 2017                                   | 2,375,316,244                      |                         | <u>0</u>                | 25%                     |
| (e) | Total unrecognized return                                      |                                    |                         | \$2,791,799,540         | \$1,524,476,568         |
| 3   | Actuarial value of assets: <b>(1) – (2e)</b>                   |                                    |                         | <b>\$27,581,088,477</b> | <b>\$25,412,013,802</b> |
| 4   | Actuarial value as a percent of market value: <b>(3) ÷ (1)</b> |                                    |                         | 90.8%                   | 94.3%                   |

<sup>1</sup> Recognition at 25% per year over four years.

<sup>2</sup> Total return minus expected return on a market value basis.

## Section 2: Actuarial Valuation Results

### LOCAL GOVERNMENT DIVISION

#### Determination of Actuarial Value of Assets for Year Ended December 31, 2020 and December 31, 2019

|     |  | 2020                               |                         | 2019          |                         |
|-----|--|------------------------------------|-------------------------|---------------|-------------------------|
| 1   | Market value of assets available for benefits                  |                                    | <b>\$5,135,806,651</b>  |               | <b>\$4,545,959,241</b>  |
| 2   | Calculation of unrecognized return <sup>1</sup>                | <b>Original Amount<sup>2</sup></b> | <b>% Not Recognized</b> |               | <b>% Not Recognized</b> |
| (a) | Year ended December 30, 2020                                   | \$440,700,610                      | 75%                     | \$330,525,458 |                         |
| (b) | Year ended December 30, 2019                                   | 505,873,155                        | 50%                     | 252,936,578   | 75%                     |
| (c) | Year ended December 30, 2018                                   | (442,744,097)                      | 25%                     | (110,686,024) | 50%                     |
| (d) | Year ended December 30, 2017                                   | 398,404,373                        |                         | 0             | 25%                     |
| (e) | Total unrecognized return                                      |                                    |                         | \$472,776,012 | \$257,633,911           |
| 3   | Actuarial value of assets: <b>(1) – (2e)</b>                   |                                    | <b>\$4,663,030,639</b>  |               | <b>\$4,288,325,330</b>  |
| 4   | Actuarial value as a percent of market value: <b>(3) ÷ (1)</b> |                                    | 90.8%                   |               | 94.3%                   |

<sup>1</sup> Recognition at 25% per year over four years.

<sup>2</sup> Total return minus expected return on a market value basis.

## Section 2: Actuarial Valuation Results

### JUDICIAL DIVISION

#### Determination of Actuarial Value of Assets for Year Ended December 31, 2020 and December 31, 2019

|     |  | 2020                               |                         | 2019         |                         |
|-----|--|------------------------------------|-------------------------|--------------|-------------------------|
| 1   | Market value of assets available for benefits                  |                                    | <b>\$414,097,923</b>    |              | <b>\$362,108,323</b>    |
| 2   | Calculation of unrecognized return <sup>1</sup>                | <b>Original Amount<sup>2</sup></b> | <b>% Not Recognized</b> |              | <b>% Not Recognized</b> |
| (a) | Year ended December 30, 2020                                   | \$35,364,699                       | 75%                     | \$26,523,524 |                         |
| (b) | Year ended December 30, 2019                                   | 39,427,447                         | 50%                     | 19,713,724   | 75%                     |
| (c) | Year ended December 30, 2018                                   | (34,306,520)                       | 25%                     | (8,576,630)  | 50%                     |
| (d) | Year ended December 30, 2017                                   | 30,479,769                         |                         | 0            | 25%                     |
| (e) | Total unrecognized return                                      |                                    |                         | \$37,660,618 | \$20,037,267            |
| 3   | Actuarial value of assets: <b>(1) – (2e)</b>                   |                                    | <b>\$376,437,305</b>    |              | <b>\$342,071,056</b>    |
| 4   | Actuarial value as a percent of market value: <b>(3) ÷ (1)</b> |                                    | 90.9%                   |              | 94.5%                   |

<sup>1</sup> Recognition at 25% per year over four years.

<sup>2</sup> Total return minus expected return on a market value basis.

## Section 2: Actuarial Valuation Results

### DENVER PUBLIC SCHOOLS DIVISION

#### Determination of Actuarial Value of Assets for Year Ended December 31, 2020 and December 31, 2019

|     |  | 2020                               |                         | 2019                   |                         |
|-----|--|------------------------------------|-------------------------|------------------------|-------------------------|
| 1   | Market value of assets available for benefits                  |                                    | <b>\$4,055,819,315</b>  |                        | <b>\$3,616,649,237</b>  |
| 2   | Calculation of unrecognized return <sup>1</sup>                | <b>Original Amount<sup>2</sup></b> | <b>% Not Recognized</b> |                        | <b>% Not Recognized</b> |
| (a) | Year ended December 30, 2020                                   | \$347,934,915                      | 75%                     | \$260,951,186          |                         |
| (b) | Year ended December 30, 2019                                   | 403,799,043                        | 50%                     | 201,899,522            | 75%                     |
| (c) | Year ended December 30, 2018                                   | (356,414,000)                      | 25%                     | (89,103,500)           | 50%                     |
| (d) | Year ended December 30, 2017                                   | 326,971,460                        |                         | 0                      | 25%                     |
| (e) | Total unrecognized return                                      |                                    |                         | \$373,747,208          | \$206,385,147           |
| 3   | Actuarial value of assets: <b>(1) – (2e)</b>                   |                                    |                         | <b>\$3,682,072,107</b> | <b>\$3,410,264,090</b>  |
| 4   | Actuarial value as a percent of market value: <b>(3) ÷ (1)</b> |                                    |                         | 90.8%                  | 94.3%                   |

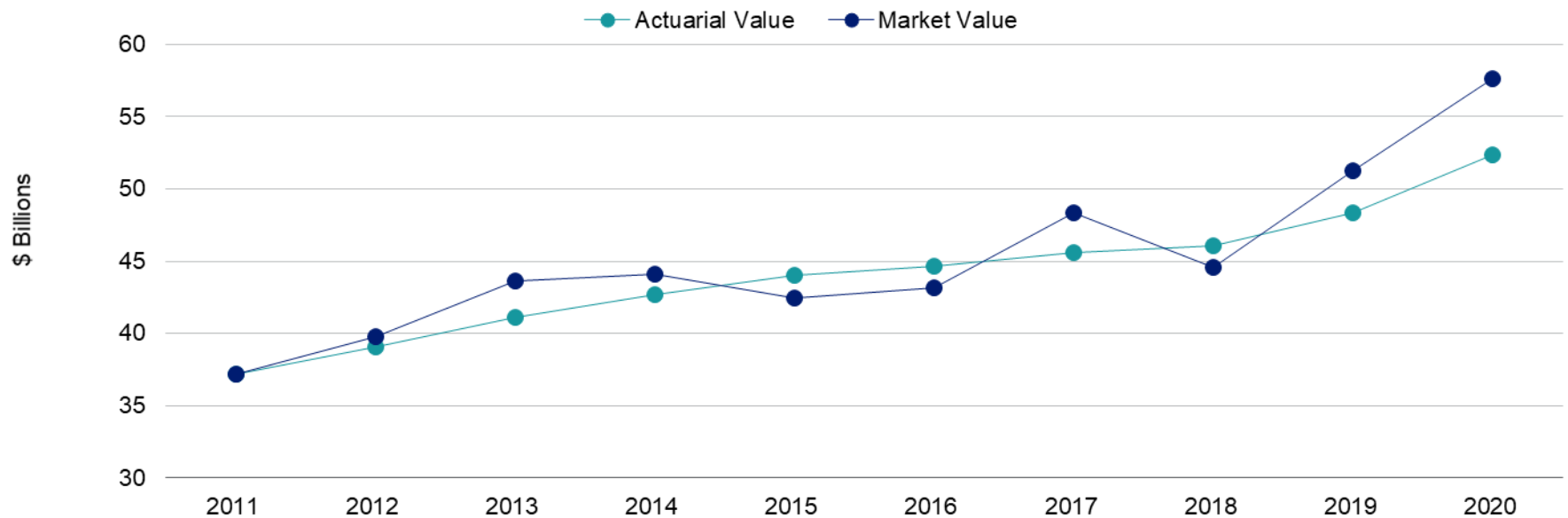
<sup>1</sup> Recognition at 25% per year over four years.

<sup>2</sup> Total return minus expected return on a market value basis.

## Section 2: Actuarial Valuation Results

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

Actuarial Value of Assets vs. Market Value of Assets as of December 31, 2011 – 2020  
ALL DIVISION TRUST FUNDS





## Section 2: Actuarial Valuation Results

### Actuarial Experience

To calculate any actuarially determined contribution (ADC), assumptions are made about future events that affect the amount and timing of benefits to be paid and assets to be accumulated. Each year actual experience is measured against the assumptions. If overall experience is more favorable than anticipated (an actuarial gain), the ADC will decrease relative to the previous year. On the other hand, the ADC will increase if overall actuarial experience is less favorable than expected (an actuarial loss).

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

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

The total gain is \$2.5 billion, which includes \$2.8 billion from investment gains and \$0.3 billion in net losses from all other sources. The net experience variation from individual sources other than investments was 0.36% of the actuarial accrued liability. A discussion of the major components of the actuarial experience is on the following pages.

#### Actuarial Experience for Year Ended December 31, 2020

| Item   | State Division      | School Division      | Local Government Division | Judicial Division  | Denver Public Schools Division | Total                |
|--|---------------------|----------------------|---------------------------|--------------------|--------------------------------|----------------------|
| <b>1</b> Net gain/(loss) from investments <sup>1</sup>       | \$848,047,819       | \$1,447,267,437      | \$244,236,967             | \$19,194,050       | \$195,535,778                  | \$2,754,282,051      |
| <b>2</b> Net gain/(loss) from administrative expenses        | 1,195,718           | (1,371,539)          | 411,310                   | 139,665            | 455,518                        | 830,672              |
| <b>3</b> Net gain/(loss) from liability and other experience | <u>(21,156,542)</u> | <u>(219,130,856)</u> | <u>(11,108,307)</u>       | <u>(2,966,752)</u> | <u>(46,885,663)</u>            | <u>(301,248,120)</u> |
| <b>4</b> Net experience gain/(loss):<br><b>1 + 2 + 3</b>     | \$828,086,995       | \$1,226,765,042      | \$233,539,970             | \$16,366,963       | \$149,105,633                  | \$2,453,864,603      |

<sup>1</sup> Details on next page

## Section 2: Actuarial Valuation Results

### Investment Experience

A major component of projected asset growth is the assumed rate of return. The assumed return should represent the expected long-term rate of return, based on PERA's investment policy. PERA's total fund annualized rate of return on a market value basis was 17.4% (17.1% for the Division Trust Fund assets) for the year ended December 31, 2020.

For valuation purposes, the assumed rate of return on the actuarial value of assets is 7.25%. The actual rate of return on an actuarial basis for the 2020 plan year was 13.08%. Since the actual return for the year was more than the assumed return, PERA experienced an actuarial gain during the year ended December 31, 2020 with regard to its investments.

#### Investment Experience – ALL DIVISION TRUST FUND

|  | Year Ended<br>December 31, 2020 |                        | Year Ended<br>December 31, 2019 |                        |
|--|---------------------------------|------------------------|---------------------------------|------------------------|
|  | Market Value                    | Actuarial Value        | Market Value                    | Actuarial Value        |
| <b>1</b> Value assets at the beginning of year           | \$51,281,049,711                | \$48,374,724,061       | \$44,539,736,729                | \$46,046,154,761       |
| <b>2</b> Contributions during the plan year              | 2,821,736,738                   | 2,821,736,738          | 2,820,184,424                   | 2,820,184,424          |
| <b>3</b> Contributions receivable                        | 0                               | 0                      | 0                               | 0                      |
| <b>4</b> Benefits and expense during the plan year       | 5,035,737,751                   | 5,035,737,751          | 4,930,147,529                   | 4,930,147,529          |
| <b>5</b> Value of assets at the end of year              | 57,638,769,330                  | 52,341,915,057         | 51,281,049,711                  | 48,374,724,061         |
| <b>6</b> Net investment income: <b>5 – 1 – 2 – 3 + 4</b> | \$8,571,720,632                 | \$6,181,192,009        | \$8,851,276,087                 | \$4,438,532,405        |
| <b>7</b> Average value of assets: <b>1 + [2 – 4] x ½</b> | \$50,174,049,205                | \$47,267,723,555       | \$43,484,755,177                | \$44,991,173,209       |
| <b>8</b> Rate of return: <b>6 ÷ 7</b>                    | 17.08%                          | 13.08%                 | 20.35%                          | 9.87%                  |
| <b>9</b> Assumed rate of return                          | 7.25%                           | 7.25%                  | 7.25%                           | 7.25%                  |
| <b>10</b> Expected investment income: <b>7 x 9</b>       | \$3,637,618,567                 | \$3,426,909,958        | \$3,152,644,750                 | \$3,261,860,058        |
| <b>11</b> Actuarial gain/(loss): <b>6 – 10</b>           | <u>\$4,934,102,065</u>          | <u>\$2,754,282,051</u> | <u>\$5,698,631,337</u>          | <u>\$1,176,672,347</u> |

## Section 2: Actuarial Valuation Results

Because actuarial planning is long term, it is useful to see how the assumed investment rate of return has followed actual experience over time. The chart below shows the rate of return on an actuarial basis compared to the actual market value investment return for the last 30 years, including averages over select time periods.

### Investment Return – ALL DIVISION TRUST FUND Market Value vs. Actuarial Value: 1991 - 2020

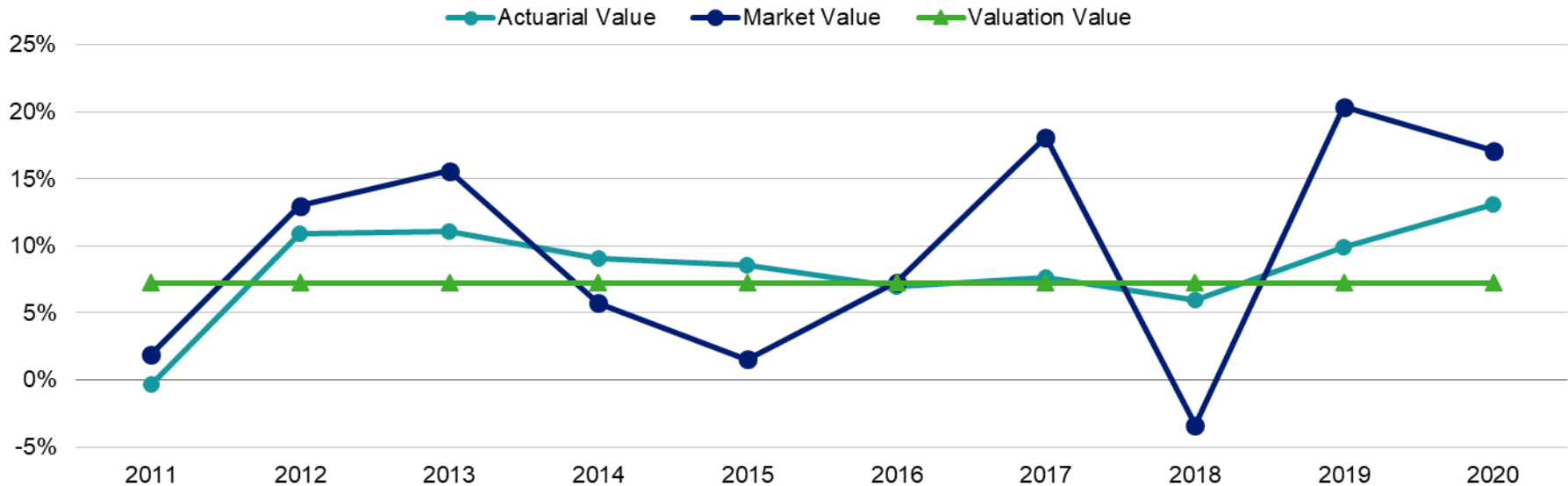
| Year Ended December 31 | Market Value | Actuarial Value | Year Ended December 31 | Market Value                         | Actuarial Value | Year Ended December 31 | Market Value | Actuarial Value |
|------------------------|--------------|-----------------|------------------------|--------------------------------------|-----------------|------------------------|--------------|-----------------|
| 1991                   | 20.1%        | 9.2%            | 2001                   | (7.7%)                               | 6.1%            | 2011                   | 1.9%         | (0.3%)          |
| 1992                   | 6.4%         | 7.4%            | 2002                   | (11.8%)                              | (0.1%)          | 2012                   | 12.9%        | 10.9%           |
| 1993                   | 14.9%        | 10.1%           | 2003                   | 24.1%                                | 0.3%            | 2013                   | 15.6%        | 11.1%           |
| 1994                   | 1.1%         | 8.0%            | 2004                   | 14.1%                                | 3.0%            | 2014                   | 5.7%         | 9.0%            |
| 1995                   | 24.6%        | 11.9%           | 2005                   | 9.6%                                 | 8.8%            | 2015                   | 1.5%         | 8.6%            |
| 1996                   | 13.6%        | 13.2%           | 2006                   | 15.6%                                | 10.6%           | 2016                   | 7.3%         | 6.9%            |
| 1997                   | 20.1%        | 14.8%           | 2007                   | 10.0%                                | 11.3%           | 2017                   | 18.1%        | 7.7%            |
| 1998                   | 15.7%        | 17.5%           | 2008                   | (26.0%)                              | 2.1%            | 2018                   | (3.5%)       | 5.9%            |
| 1999                   | 19.0%        | 16.6%           | 2009                   | 17.4%                                | 0.9%            | 2019                   | 20.3%        | 9.9%            |
| 2000                   | 0.2%         | 12.5%           | 2010                   | 14.0%                                | 0.9%            | 2020                   | 17.4%        | 13.1%           |
|                        |              |                 |                        | Most recent five-year average return |                 |                        | 11.5%        | 8.7%            |
|                        |              |                 |                        | Most recent ten-year average return  |                 |                        | 9.4%         | 8.2%            |
|                        |              |                 |                        | Most recent 15-year average return   |                 |                        | 7.8%         | 7.2%            |
|                        |              |                 |                        | Most recent 20-year average return   |                 |                        | 7.1%         | 6.2%            |
|                        |              |                 |                        | Most recent 30-year average return   |                 |                        | 9.1%         | 8.2%            |

Note: For 1991-2020, investment returns on a market value basis were provided by PERA.

## Section 2: Actuarial Valuation Results

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

Market and Actuarial Rates of Return for Years Ended December 31, 2011 – 2020  
ALL DIVISION TRUST FUNDS



## Section 2: Actuarial Valuation Results

### Non-Investment Experience

#### Administrative Expenses

- Administrative expenses for the year ended December 31, 2020 totaled \$39,377,196, as compared to the assumption of \$38,797,498. This resulted in a gain of \$830,672 the year, when adjusted for timing.

#### Other Experience

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

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

The Plan has experienced demographic losses over the past few years. An experience study dated October 28, 2020 was completed based upon the experience covering the period January 1, 2016 through December 31, 2019. All changes to assumptions that were adopted by the Board of Trustees on November 20, 2020 are effective as of the December 31, 2020 measurement date.

## Section 2: Actuarial Valuation Results

The net loss from the liability and other experience for the year ended December 31, 2020 amounted to \$0.3 billion, which is 0.36% of the actuarial accrued liability.

### Experience Due to Changes in Demographics for Year Ended December 31, 2020

| Item                        | State Division        | School Division        | Local Government Division | Judicial Division    | Denver Public Schools Division | Total                  |
|-----------------------------|-----------------------|------------------------|---------------------------|----------------------|--------------------------------|------------------------|
| Age and service retirements | (\$26,119,326)        | (\$47,832,086)         | (\$5,757,192)             | (\$3,382,274)        | (\$7,884,157)                  | (\$90,975,035)         |
| Disability retirements      | (532,002)             | (2,881,248)            | (181,172)                 | 122,129              | (762,265)                      | (4,234,558)            |
| Deaths                      | 77,748,291            | 70,559,267             | 5,642,079                 | 1,265,004            | 9,088,808                      | 164,303,449            |
| Withdrawals                 | (77,229,764)          | (198,124,275)          | (17,724,467)              | (36,335)             | (3,405,233)                    | (296,520,074)          |
| New members                 | (63,638,797)          | (70,057,064)           | (14,092,282)              | (4,015,977)          | (24,694,183)                   | (176,498,303)          |
| Pay increases               | 13,921,097            | 45,346,866             | 2,140,644                 | 2,562,300            | (39,178,360)                   | 24,792,547             |
| Other                       | <u>54,693,959</u>     | <u>(16,142,316)</u>    | <u>18,864,083</u>         | <u>518,401</u>       | <u>19,949,727</u>              | <u>77,883,854</u>      |
| <b>Total gain/(loss)</b>    | <b>(\$21,156,542)</b> | <b>(\$219,130,856)</b> | <b>(\$11,108,307)</b>     | <b>(\$2,966,752)</b> | <b>(\$46,885,663)</b>          | <b>(\$301,248,120)</b> |

## Section 2: Actuarial Valuation Results

### Contributions

An additional source of gain or loss that is separately identified and amortized over a period equal to the remaining years of the legacy UAAL amortization is the gain or loss due to contribution excess or deficiency.

#### Contribution Deficiency or Excess for Year Ended December 31, 2020

| Item  | State Division         | School Division        | Local Government Division | Judicial Division   | Denver Public Schools Division |
|---|------------------------|------------------------|---------------------------|---------------------|--------------------------------|
| <b>1 Actuarially determined employer contribution rate for 2020:</b>                      |                        |                        |                           |                     |                                |
| <b>(a)</b> Total normal cost rate   | 12.11%                 | 12.95%                 | 11.53%                    | 17.09%              | 12.28%                         |
| <b>(b)</b> Less member contribution rate  | (9.18%)                | (9.13%)                | (8.00%)                   | (9.13%)             | (9.13%)                        |
| <b>(c)</b> Employer normal cost rate <b>1(a) + 1(b)</b>                                   | 2.93%                  | 3.82%                  | 3.53%                     | 7.96%               | 3.14%                          |
| <b>(d)</b> UAAL contribution rate   | <u>20.76%</u>          | <u>19.55%</u>          | <u>9.48%</u>              | <u>14.09%</u>       | <u>7.27%</u>                   |
| <b>(e)</b> Actuarially Determined Contribution rate: <b>1(c) + 1(d)</b>                   | 23.69%                 | 23.37%                 | 13.01%                    | 22.05%              | 10.42%                         |
| <b>2</b> Covered payroll for 2020   | \$3,089,161,069        | \$5,146,117,910        | \$698,059,659             | \$54,780,086        | \$771,347,604                  |
| <b>3 Expected contribution for 2020:</b>  |                        |                        |                           |                     |                                |
| <b>(a)</b> Employer (based on the ADC)  | 731,822,257            | 1,202,647,756          | 90,817,562                | 12,079,009          | 80,374,420                     |
| <b>(b)</b> Member   | <u>283,584,986</u>     | <u>469,840,565</u>     | <u>55,844,773</u>         | <u>5,001,422</u>    | <u>70,424,036</u>              |
| <b>(c)</b> Total: <b>3(a) + 3(b)</b>  | <b>\$1,015,407,243</b> | <b>\$1,672,488,321</b> | <b>\$146,662,335</b>      | <b>\$17,080,431</b> | <b>\$150,798,456</b>           |
| <b>4 Actual contribution for 2020:</b>  |                        |                        |                           |                     |                                |
| <b>(a)</b> Employer   | 626,943,850            | 1,020,832,715          | 85,169,653                | 10,112,951          | 50,888,256                     |
| <b>(b)</b> Member   | 326,739,485            | 536,793,876            | 66,956,377                | 7,691,224           | 75,454,239                     |
| <b>(c)</b> Direct distribution  | 0                      | 0                      | 0                         | 0                   | 0                              |
| <b>(d)</b> Purchased service/disaffiliation payments                                      | <u>28,475,258</u>      | <u>35,579,863</u>      | <u>8,889,610</u>          | <u>1,054,434</u>    | <u>1,515,338</u>               |
| <b>(e)</b> Total: <b>4(a) + 4(b) + 4(c) – 4(d)</b>  | <b>\$925,208,077</b>   | <b>\$1,522,046,728</b> | <b>\$143,236,420</b>      | <b>\$16,749,741</b> | <b>\$124,827,157</b>           |
| <b>5 Contribution deficiency/(excess), adjusted for interest: (3(c) – 4(e)) * 1.03625</b> | <b>\$93,468,886</b>    | <b>\$155,895,101</b>   | <b>\$3,550,104</b>        | <b>\$342,678</b>    | <b>\$26,912,759</b>            |

## Section 2: Actuarial Valuation Results

### Changes in the Actuarial Accrued Liability

The actuarial accrued liability for all Division Trust Funds combined as of December 31, 2020, is \$83,318,533,788, an increase of \$5,133,968,608, or 6.57%, from the actuarial accrued liability as of the prior valuation date. The change in liability is due to assumptions changes adopted by the Board at the November 20, 2020, Board meeting, to be effective for this December 31, 2020 actuarial valuation, and interest, accumulation and payment of benefits, and actuarial experience (as discussed in the previous subsection).

### Actuarial Assumptions

The assumption changes reflected in this report are:

- The inflation assumption was lowered from 2.40% to 2.30%.
- The payroll growth assumption was updated from 3.50% to 3.00%.
- The individual salary increase assumptions were updated to include increases to the merit and seniority (and productivity) portion of the individual salary increases based on age plus the revised inflation assumption. The salary increase assumptions for the Judicial Division is now based on service.
- Separate termination rates were established for School and DPS Divisions (previously these groups used the same rates). The select termination rates were primarily decreased and updated to be applied on a unisex basis, while the current select period was retained. The ultimate termination rates were also primarily decreased; however, the ultimate termination rates are still sex-distinct.
- The disability retirement rates were updated as follows:
  - State and Local Government Divisions (other than State Troopers) were combined to develop a new assumption and a uniform decrease of 19% was applied to the current composite disability retirement rates.
  - School, DPS, and Judicial Divisions were combined to develop a new assumption and a uniform decrease of 19% was applied to the current composite disability retirement rates.
- The active retirement rates were updated to include various modifications at several ages throughout most divisions. Additionally, increased rates were added for the first five years of eligibility for unreduced retirement, for members whose first eligibility for unreduced retirement is between age 55 and 64.



## Section 2: Actuarial Valuation Results

- The mortality assumptions were updated as follows:
  - Pre-Retirement:
    - State and Local Government Divisions (other than State Troopers): PubG-2010 General Employee table with generational projection using scale MP-2019.
    - State and Local Government Divisions (State Troopers): PubS-2010 Public Safety Employee table with generational projection using scale MP-2019.
    - School and DPS Divisions: PubT-2010 Teacher Employee table with generational projection using scale MP-2019.
    - Judicial Division: PubG-2010(A) Above-Median General Employee table with generational projection using scale MP-2019.
  - Post-Retirement Non-Disabled – Retirees:
    - State and Local Government Divisions (other than State Troopers): PubG-2010 General Healthy Retiree table with adjustments for credibility and gender. For males, the adjustments are 94% of the rates prior to age 80 and 90% of the rates for ages 80 and older, with generational projection using scale MP-2019. For females, the adjustments are 87% of the rates prior to age 80 and 107% of the rates for ages 80 and older, with generational projection using scale MP-2019.
    - State and Local Government Divisions (State Troopers): PubS-2010 Public Safety Healthy Retiree table, with generational projection using scale MP-2019.
    - School and DPS Divisions: PubT-2010 Teacher Healthy Retiree table with adjustments for credibility and gender. For males, the adjustments are 112% of the rates prior to age 80 and 94% of the rates for ages 80 and older, with generational projection using scale MP-2019. For females, the adjustments are 83% of the rates prior to age 80 and 106% of the rates for ages 80 and older, with generational projection using scale MP-2019.
    - Judicial Division: PubG-2010(A) General Above-Median Healthy Retiree table, with generational projection using scale MP-2019.
  - Post-Retirement Non-Disabled – Beneficiaries:
    - All Divisions: Pub-2010 Contingent Survivor table with adjustments for credibility and gender. For males, the adjustments are 97% of the rates for all ages, with generational projection using scale MP-2019. For females, the adjustments are 105% of the female rates for all ages, with generational projection using scale MP-2019.
  - Disabled Retirees:
    - All Divisions except State Troopers: PubNS-2010 Non-Public Safety Disabled Retiree table using 99% of the rates for all ages with generational projection using scale MP-2019.
    - State Troopers in the State and Local Government Divisions: PubS-2010 Public Safety Disabled Retiree table with generational projection using scale MP-2019.

## Section 2: Actuarial Valuation Results

- For future benefit recipients, the mortality rates used to determine factors for money purchase benefits, reduced service benefits for members who were not eligible to retire as of January 1, 2011, and co-beneficiary payment options are based upon the collective experience of all PERA divisions. For members, the rates are based upon the gender-distinct PubG-2010 Juvenile, Employee, and Healthy Retiree mortality tables, projected to 2023 using the MP-2019 projection scale. For surviving spouses, the rates are based upon the gender-distinct PubG-2010 Juvenile, Employee, and Contingent Survivor mortality tables, projected to 2023 using scale MP-2019. Unisex factors are then developed using a male/female blend based upon factor type, benefit tier, and/or benefit structure.
- These changes increased the total actuarial accrued liability by \$3.1 billion and increased the total normal cost by \$172.3 million.

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

## Plan Provisions

The Automatic Adjustment Provision (AAP) assessment of SB 18-200, performed as of December 31, 2020, increases employer and member contribution rates each by 0.50% of salary and reduces the AI cap by 0.25% (from 1.25% to 1.00%), beginning July 1, 2022.

SB 20-057 provides, as of July 1, 2020, the “State Trooper” benefit structure, for new or existing employees of the Division of Fire Prevention and Control in the Department of Public Safety classified as firefighter I through firefighter VII, within the State Division Membership.

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

## Section 2: Actuarial Valuation Results

### Cash Flow

Cash flow is the difference between contributions and benefit payments, refunds, and expenses. Negative cash flow indicates that the payments made from the Plan exceed contributions made to the Plan

#### STATE DIVISION History of Cash Flow: 2011 – 2020

| As of December 31 | Contributions and Other Additions <sup>1</sup> | Benefit Payments and Other Deductions | Administrative Expenses | Total Disbursements | Net Cash Flow for the Year <sup>2</sup> | Market Value of Assets | Net Cash Flow as Percent of Market Value |
|-------------------|--|---------------------------------------|-------------------------|---------------------|---|------------------------|--|
| 2011              | \$555,140,010                                  | (\$1,249,998,860)                     | (\$8,685,322)           | (\$1,258,684,182)   | (\$703,544,172)                         | \$12,001,769,795       | (5.9%)                                   |
| 2012              | 571,470,636                                    | (1,306,616,975)                       | (8,567,960)             | (1,315,184,935)     | (743,714,299)                           | 12,766,458,781         | (5.8%)                                   |
| 2013              | 623,076,397                                    | (1,370,336,426)                       | (9,779,692)             | (1,380,116,118)     | (757,039,721)                           | 13,935,753,759         | (5.4%)                                   |
| 2014              | 671,762,176                                    | (1,418,924,953)                       | (10,066,516)            | (1,428,991,469)     | (757,229,293)                           | 13,956,630,097         | (5.4%)                                   |
| 2015              | 722,662,803                                    | (1,486,924,073)                       | (10,778,521)            | (1,497,702,594)     | (775,039,791)                           | 13,391,398,092         | (5.8%)                                   |
| 2016              | 765,158,202                                    | (1,549,111,043)                       | (11,270,928)            | (1,560,381,971)     | (795,223,769)                           | 13,538,772,410         | (5.9%)                                   |
| 2017              | 822,220,289                                    | (1,618,673,714)                       | (11,744,733)            | (1,630,418,447)     | (808,198,158)                           | 15,105,378,385         | (5.4%)                                   |
| 2018              | 915,127,973                                    | (1,678,897,880)                       | (11,901,923)            | (1,690,799,803)     | (775,671,830)                           | 13,837,862,906         | (5.6%)                                   |
| 2019              | 958,983,810                                    | (1,703,671,352)                       | (11,294,106)            | (1,714,965,458)     | (755,981,648)                           | 15,819,842,540         | (4.8%)                                   |
| 2020              | 964,116,633                                    | (1,736,962,744)                       | (11,385,187)            | (1,748,347,931)     | (784,231,298)                           | 17,660,157,424         | (4.4%)                                   |

<sup>1</sup> Includes member and employer contributions, the direct distribution allocation, as well as any purchased service credits during the year.

<sup>2</sup> Equal to Contributions and Other Additions + Total Disbursements.

## Section 2: Actuarial Valuation Results

### SCHOOL DIVISION History of Cash Flow: 2011 – 2020

| As of December 31 | Contributions and Other Additions <sup>1</sup> | Benefit Payments and Other Deductions | Administrative Expenses | Total Disbursements | Net Cash Flow for the Year <sup>2</sup> | Market Value of Assets | Net Cash Flow as Percent of Market Value |
|-------------------|--|---------------------------------------|-------------------------|---------------------|---|------------------------|--|
| 2011              | \$864,653,805                                  | (\$1,822,348,954)                     | (\$16,321,845)          | (\$1,838,670,799)   | (\$974,016,994)                         | \$19,247,853,318       | (5.1%)                                   |
| 2012              | 895,773,249                                    | (1,921,463,511)                       | (16,087,408)            | (1,937,550,919)     | (1,041,777,670)                         | 20,636,677,134         | (5.0%)                                   |
| 2013              | 955,240,310                                    | (2,020,523,076)                       | (18,522,707)            | (2,039,045,783)     | (1,083,805,473)                         | 22,682,339,114         | (4.8%)                                   |
| 2014              | 1,029,538,024                                  | (2,117,766,894)                       | (19,289,856)            | (2,137,056,750)     | (1,107,518,726)                         | 22,846,249,402         | (4.8%)                                   |
| 2015              | 1,111,049,048                                  | (2,217,629,742)                       | (20,865,372)            | (2,238,495,114)     | (1,127,446,066)                         | 22,062,123,913         | (5.1%)                                   |
| 2016              | 1,181,421,769                                  | (2,318,086,171)                       | (21,990,705)            | (2,340,076,876)     | (1,158,655,107)                         | 22,465,387,820         | (5.2%)                                   |
| 2017              | 1,237,200,737                                  | (2,434,471,331)                       | (23,018,690)            | (2,457,490,021)     | (1,220,289,284)                         | 25,204,919,910         | (4.8%)                                   |
| 2018              | 1,450,188,672                                  | (2,495,428,206)                       | (23,560,475)            | (2,518,988,681)     | (1,068,800,009)                         | 23,304,910,906         | (4.6%)                                   |
| 2019              | 1,567,275,836                                  | (2,553,523,246)                       | (22,618,898)            | (2,576,142,144)     | (1,008,866,308)                         | 26,936,490,370         | (3.7%)                                   |
| 2020              | 1,558,431,913                                  | (2,617,017,587)                       | (22,778,633)            | (2,639,796,220)     | (1,081,364,307)                         | 30,372,888,017         | (3.6%)                                   |

<sup>1</sup> Includes member and employer contributions, the direct distribution allocation, as well as any purchased service credits during the year.

<sup>2</sup> Equal to Contributions and Other Additions + Total Disbursements.

## Section 2: Actuarial Valuation Results

### LOCAL GOVERNMENT DIVISION History of Cash Flow: 2011 – 2020

| As of December 31 | Contributions and Other Additions <sup>1</sup> | Benefit Payments and Other Deductions | Administrative Expenses | Total Disbursements | Net Cash Flow for the Year <sup>2</sup> | Market Value of Assets | Net Cash Flow as Percent of Market Value |
|-------------------|--|---------------------------------------|-------------------------|---------------------|---|------------------------|--|
| 2011              | \$152,028,478                                  | (\$205,313,953)                       | (\$2,156,333)           | (\$207,470,286)     | (\$55,441,808)                          | \$2,875,755,598        | (1.9%)                                   |
| 2012              | 155,096,241                                    | (241,367,090)                         | (2,034,615)             | (243,401,705)       | (88,305,464)                            | 3,154,896,908          | (2.8%)                                   |
| 2013              | 115,319,671                                    | (255,297,491)                         | (2,020,798)             | (257,318,289)       | (141,998,618)                           | 3,493,354,525          | (4.1%)                                   |
| 2014              | 301,832,863                                    | (259,117,301)                         | (2,090,929)             | (261,208,230)       | 40,624,633                              | 3,733,495,817          | 1.1%                                     |
| 2015              | 119,961,560                                    | (267,449,300)                         | (2,252,600)             | (269,701,900)       | (149,740,340)                           | 3,639,914,028          | (4.1%)                                   |
| 2016              | 124,622,164                                    | (273,485,113)                         | (2,394,530)             | (275,879,643)       | (151,257,479)                           | 3,748,369,298          | (4.0%)                                   |
| 2017              | 132,855,191                                    | (293,053,988)                         | (2,541,497)             | (295,595,485)       | (162,740,294)                           | 4,249,852,277          | (3.8%)                                   |
| 2018              | 136,453,253                                    | (306,861,804)                         | (2,620,564)             | (309,482,368)       | (173,029,115)                           | 3,935,921,050          | (4.4%)                                   |
| 2019              | 144,228,970                                    | (316,604,169)                         | (2,475,697)             | (319,079,866)       | (174,850,896)                           | 4,545,959,241          | (3.8%)                                   |
| 2020              | 152,398,997                                    | (324,063,766)                         | (2,458,507)             | (326,522,273)       | (174,123,276)                           | 5,135,806,651          | (3.4%)                                   |

<sup>1</sup> Includes member and employer contributions and any purchased service credits during the year.

<sup>2</sup> Equal to Contributions and Other Additions + Total Disbursements.

## Section 2: Actuarial Valuation Results

### JUDICIAL DIVISION History of Cash Flow: 2011 – 2020

| As of December 31 | Contributions and Other Additions <sup>1</sup> | Benefit Payments and Other Deductions | Administrative Expenses | Total Disbursements | Net Cash Flow for the Year <sup>2</sup> | Market Value of Assets | Net Cash Flow as Percent of Market Value |
|-------------------|--|---------------------------------------|-------------------------|---------------------|---|------------------------|--|
| 2011              | \$10,649,363                                   | (\$17,472,918)                        | (\$61,185)              | (\$17,534,103)      | (\$6,884,740)                           | \$220,962,997          | (3.1%)                                   |
| 2012              | 12,203,758                                     | (18,258,046)                          | (60,842)                | (18,318,888)        | (6,115,130)                             | 242,877,176            | (2.5%)                                   |
| 2013              | 11,407,028                                     | (19,094,113)                          | (69,291)                | (19,163,404)        | (7,756,376)                             | 272,159,709            | (2.8%)                                   |
| 2014              | 11,504,588                                     | (20,003,229)                          | (71,858)                | (20,075,087)        | (8,570,499)                             | 278,860,041            | (3.1%)                                   |
| 2015              | 15,003,372                                     | (21,365,942)                          | (77,178)                | (21,443,120)        | (6,439,748)                             | 276,563,143            | (2.3%)                                   |
| 2016              | 14,694,746                                     | (23,009,443)                          | (80,752)                | (23,090,195)        | (8,395,449)                             | 287,888,462            | (2.9%)                                   |
| 2017              | 15,132,874                                     | (25,451,584)                          | (85,589)                | (25,537,173)        | (10,404,299)                            | 328,458,690            | (3.2%)                                   |
| 2018              | 14,399,835                                     | (26,532,248)                          | (86,385)                | (26,618,633)        | (12,218,798)                            | 305,303,696            | (4.0%)                                   |
| 2019              | 23,616,936                                     | (28,123,790)                          | (84,063)                | (28,207,853)        | (4,590,917)                             | 362,108,323            | (1.3%)                                   |
| 2020              | 20,372,261                                     | (29,575,922)                          | (87,487)                | (29,663,409)        | (9,291,148)                             | 414,097,923            | (2.2%)                                   |

<sup>1</sup> Includes member and employer contributions, the direct distribution allocation, as well as any purchased service credits during the year

<sup>2</sup> Equal to Contributions and Other Additions + Total Disbursements

## Section 2: Actuarial Valuation Results

### DENVER PUBLIC SCHOOLS DIVISION History of Cash Flow: 2011 – 2020

| As of December 31 | Contributions and Other Additions <sup>1</sup> | Benefit Payments and Other Deductions | Administrative Expenses | Total Disbursements | Net Cash Flow for the Year <sup>2</sup> | Market Value of Assets | Net Cash Flow as Percent of Market Value |
|-------------------|--|---------------------------------------|-------------------------|---------------------|---|------------------------|--|
| 2011              | \$52,935,400                                   | (\$228,172,519)                       | (\$1,914,095)           | (\$230,086,614)     | (\$177,151,214)                         | \$2,818,096,176        | (6.3%)                                   |
| 2012              | 56,330,139                                     | (234,836,300)                         | (1,919,047)             | (236,755,347)       | (180,425,208)                           | 2,992,217,469          | (6.0%)                                   |
| 2013              | 68,757,802                                     | (245,141,932)                         | (2,239,708)             | (247,381,640)       | (178,623,838)                           | 3,265,768,053          | (5.5%)                                   |
| 2014              | 65,254,237                                     | (256,978,880)                         | (2,377,366)             | (259,356,246)       | (194,102,009)                           | 3,254,063,981          | (6.0%)                                   |
| 2015              | 58,876,010                                     | (265,098,162)                         | (2,599,429)             | (267,697,591)       | (208,821,581)                           | 3,094,338,946          | (6.7%)                                   |
| 2016              | 71,501,564                                     | (272,199,954)                         | (2,754,331)             | (274,954,285)       | (203,452,721)                           | 3,108,232,941          | (6.5%)                                   |
| 2017              | 84,177,678                                     | (281,932,605)                         | (2,857,244)             | (284,789,849)       | (200,612,171)                           | 3,452,666,927          | (5.8%)                                   |
| 2018              | 111,853,890                                    | (293,092,149)                         | (2,919,143)             | (296,011,292)       | (184,157,402)                           | 3,155,738,171          | (5.8%)                                   |
| 2019              | 126,078,872                                    | (289,038,929)                         | (2,713,279)             | (291,752,208)       | (165,673,336)                           | 3,616,649,237          | (4.6%)                                   |
| 2020              | 126,416,934                                    | (288,740,535)                         | (2,667,382)             | (291,407,917)       | (164,990,983)                           | 4,055,819,315          | (4.1%)                                   |

<sup>1</sup> Includes member and employer contributions, the direct distribution allocation, as well as any purchased service credits during the year.

<sup>2</sup> Equal to Contributions and Other Additions + Total Disbursements.

## Section 2: Actuarial Valuation Results

### Development of Unfunded/(Overfunded) Actuarial Accrued Liability

Development of Unfunded/(Overfunded) Actuarial Accrued Liability for Year Ended December 31, 2020

| Item   | State Division   | School Division  | Local Government Division | Judicial Division | Denver Public Schools Division | Total            |
|--|------------------|------------------|---------------------------|-------------------|--------------------------------|------------------|
| <b>1</b> Unfunded/(overfunded) actuarial accrued liability at December 31, 2019              | \$10,795,598,437 | \$17,013,047,333 | \$1,028,108,000           | \$119,967,084     | \$853,120,265                  | \$29,809,841,119 |
| <b>2</b> Normal cost at beginning of year  | 352,957,298      | 659,116,070      | 76,792,284                | 8,997,850         | 91,472,378                     | 1,189,335,880    |
| <b>3</b> Total contributions   | (964,116,633)    | (1,558,431,913)  | (152,398,997)             | (20,372,261)      | (126,416,934)                  | (2,821,736,738)  |
| <b>4</b> Interest on:  |                  |                  |                           |                   |                                |                  |
| <b>(a)</b> Unfunded actuarial accrued liability and normal cost                              | 808,270,291      | 1,281,231,847    | 80,105,271                | 9,349,958         | 68,482,967                     | 2,247,440,334    |
| <b>(b)</b> Total contributions   | (34,949,228)     | (56,493,157)     | (5,524,464)               | (738,494)         | (4,582,613)                    | (102,287,956)    |
| <b>(c)</b> Total interest: <b>4(a) + 4(b)</b>  | 773,321,063      | 1,224,738,690    | 74,580,807                | 8,611,464         | 63,900,354                     | 2,145,152,378    |
| <b>5</b> Expected unfunded/(overfunded) actuarial accrued liability: <b>1 + 2 + 3 + 4(c)</b> | \$10,957,760,165 | \$17,338,470,180 | \$1,027,082,094           | \$117,204,137     | \$882,076,063                  | \$30,322,592,639 |
| <b>6</b> Changes due to:   |                  |                  |                           |                   |                                |                  |
| <b>(a)</b> (Gain)/loss   | (828,086,995)    | (1,226,765,042)  | (233,539,970)             | (16,366,963)      | (149,105,633)                  | (2,453,864,603)  |
| <b>(b)</b> Assumptions   | 947,845,612      | 1,839,281,320    | 202,330,333               | 930,344           | 117,503,086                    | 3,107,890,695    |
| <b>(c)</b> Funding method  | 0                | 0                | 0                         | 0                 | 0                              | 0                |
| <b>(d)</b> Plan provisions   | 0                | 0                | 0                         | 0                 | 0                              | 0                |
| <b>(e)</b> Total changes: <b>6(a) + 6(b) + 6(c) + 6(d)</b>                                   | 119,758,617      | 612,516,278      | (31,209,637)              | (15,436,619)      | (31,602,547)                   | 654,026,092      |
| <b>7</b> Unfunded/(overfunded) actuarial accrued liability at end of year: <b>5 + 6(e)</b>   | \$11,077,518,782 | \$17,950,986,458 | \$995,872,457             | \$101,767,518     | \$850,473,516                  | \$30,976,618,731 |



## Section 2: Actuarial Valuation Results

### DC Supplement

Beginning January 1, 2021, the employer contribution rates are adjusted to include the DC Supplement, which is calculated separately for the State and Local Government Divisions. The DC Supplement, to be paid to the State and Local Government Trust Funds by all State and Local Government employers, is designed to compensate for employer contribution amounts paid to the DC Plan participant accounts that otherwise would have gone to the State and Local Government Division Trust Funds as payment toward the UAAL, if the DC choice were not available. The DC Supplement is determined considering this DB Plan shortfall with regard to only the employer contributions of DC Plan members who commenced employment on or after January 1, 2019.

#### Determination of DC Supplement for Year Beginning January 1, 2022

| For the year beginning January 1, 2022 |  | State Division | Local Government Division |
|--|--|----------------|---------------------------|
| 1                                      | UAAL shortfall <sup>1</sup>            | 6.95%          | 4.45%                     |
| 2                                      | Total DC payroll for 2020 <sup>2</sup> | \$46,604,883   | \$5,063,328               |
| 3                                      | DC supplement, adjusted for interest   | 3,356,129      | 233,169                   |
| 4                                      | Projected DC payroll                   | 163,411,568    | 5,063,328                 |
| 5                                      | Projected DB payroll                   | 3,334,606,805  | 755,322,115               |
| 6                                      | DC supplement rate: <b>3 / (4 + 5)</b> | 0.10%          | 0.03%                     |

<sup>1</sup> Based on Normal Costs determined as of the December 31, 2020 actuarial valuation.

<sup>2</sup> Represents salary earned in 2020 by DC Plan participants hired on or after January 1, 2019, projected to January 1, 2022.

## Section 2: Actuarial Valuation Results

### Statutory Employer Contributions

The statutory employer contribution rates for each division are shown in the following table:

| Division Trust Fund                | Employer Contribution Rate        |                           |
|------------------------------------|-----------------------------------|---------------------------|
|                                    | In Effect on<br>December 31, 2020 | Effective<br>July 1, 2022 |
| State (General Members)            | 10.90%                            | 11.40%                    |
| State (State Troopers)             | 13.60%                            | 14.10%                    |
| School                             | 10.90%                            | 11.40%                    |
| Local Government (General Members) | 10.50%                            | 11.00%                    |
| Local Government (State Troopers)  | 13.60%                            | 14.10%                    |
| Judicial                           | 9.69% <sup>1</sup>                | 14.91%                    |
| Denver Public Schools              | 10.90%                            | 11.40%                    |

<sup>1</sup> Pursuant to HB 20-1394, the employer rate for the Judicial Division is decreased by 5.0% effective July 1, 2020, for the State's 2020-21 and 2021-22 fiscal years. Since this contribution rate modification does not apply to judges employed by the Denver County Court, a weighted employer contribution rate is shown.

The results of the 2020 AAP Assessment increases employer contribution rates, effective July 1, 2022, by 0.50% for all division trust funds.

The DC Supplement provisions increases employer contribution rates effective January 1, 2022, by 0.10% and 0.03%, for the State and Local Government Division Trust Funds, respectively.

For each division, 1.02% of the statutory rates shown above is allocated to the Health Care Trust Funds for each active member. In addition, 1.00% of the statutory rates shown above is allocated to the Annual Increase Reserve on behalf of the active members who began membership on or after January 1, 2007. In addition to the statutory rates shown above, AED contributions and SAED contributions are to be made by all employers. Those amounts are continued in each division until the Division's actuarial funded ratio exceeds 103%. At that time, the amount of the AED and SAED will each be reduced by 0.5% of payroll. The 2021 AED and SAED contribution rates by division are shown in the tables on the following page:

## Section 2: Actuarial Valuation Results

| Division Trust Fund   | 2021 AED Rate | 2021 SAED Rate |
|-----------------------|---------------|----------------|
| State                 | 5.00%         | 5.00%          |
| School                | 4.50%         | 5.50%          |
| Local Government      | 2.20%         | 1.50%          |
| Judicial              | 4.20%         | 4.20%          |
| Denver Public Schools | 4.50%         | 5.50%          |

The AED and SAED contributions will increase for the Judicial Division according to the following schedule:

| Year           | Judicial Division |       |
|----------------|-------------------|-------|
|                | AED               | SAED  |
| 2022           | 4.60%             | 4.60% |
| 2023 and later | 5.00%             | 5.00% |

For the DPS Division Trust Fund, the statutory rates (including AED and SAED contributions) are being offset annually by an amount equivalent to that which Denver Public Schools pays to finance principal and interest payments on Pension Certificates of Participation (PCOPs) issued in 1997 and 2008 and refinanced during 2011, 2012, and 2013.

SB 18-200 initiated an annual Direct Distribution from the State treasury of \$225 million, effective July 1, 2018, for the State, School, Judicial and DPS Division Trust Funds until each division receiving such distribution is 100% funded. Amounts to each division are allocated based on the reported payroll as of December 31, of the prior year. In addition to the employer and member statutory contribution rates, these amounts are considered in the number of years to amortize the UAAL.

SB 18-200 also initiated an Automatic Adjustment Provision (AAP), which is intended to keep PERA on track to achieve full funding in 30 years (i.e., by December 31, 2047). If PERA is ahead or behind the 30-year schedule to reach full funding, the following four components can adjust automatically:

- Member contribution rates
- Employer contribution rates
- AI cap used to determine amounts paid to benefit recipients
- Direct distribution from the State

## Section 2: Actuarial Valuation Results

The following chart describes how the AAP operates, dependent on the resulting ratio of actual contribution dollars received versus expected dollars based on the actuarially determined contribution:

### Automatic Adjustment Provision

| Component                          | AAP Ratio < 98%   | AAP Ratio > 120%   |
|------------------------------------|---|--|
| AI cap                             | Decrease by up to 0.25% in one year, not to fall below 0.5%             | Increase by up to 0.25% in one year, not to exceed 2%                          |
| Employer contributions             | Increase by up to 0.5% in one year, not to exceed an additional 2%      | Decrease by up to 0.5% in one year, not to fall below 2018 levels <sup>1</sup> |
| Member contributions               | Increase by up to 0.5% in one year, not to exceed an additional 2%      | Decrease by up to 0.5% in one year, not to fall below 2018 levels <sup>1</sup> |
| Direct distribution from the State | Increase by up to \$20 million in one year, not to exceed \$225 million | Decrease by up to \$20 million in one year                                     |

<sup>1</sup> Cannot fall below the contribution rates in effect immediately prior to the passage of SB 18-200.

The AAP Ratio, which is outlined in *Section 2*, is the ratio of the Blended Total Contribution Rate to the Blended Total Required Contribution.

The AAP Ratio resulting from the AAP assessment performed as of December 31, 2019, was greater than 98%, and therefore no additional AAP adjustments to contribution rates or the AI cap were required to occur as of July 1, 2021. The AAP assessment performed as of December 31, 2020, is less than 98%, and therefore increases employer and member contributions each by 0.50% of salary and reduces the AI cap by 0.25%, beginning July 1, 2022.

## Section 2: Actuarial Valuation Results

### Actuarially Determined Contribution

For each Plan, the amount of the actuarially determined contribution is comprised of an employer normal cost payment and a payment on the unfunded/(overfunded) actuarial accrued liability. This total amount is divided by the projected payroll for active members to determine the actuarially determined contribution.

PERA's pension funding policy is included in *Section 4, Exhibit III*. The methodology used to calculate the actuarially determined contributions for the pension plans is based on closed (layered) amortization periods of 30 years. The length of the amortization periods are as follows:

- The legacy UAAL as of December 31, 2017, is being amortized over a closed 30-year period (27 years remaining as of December 31, 2020).
- Contribution deficiencies/surpluses are amortized over the remaining period of the legacy UAAL.
- Experience gains and losses are amortized over 30 years from the date of the valuation.
- Assumption changes are amortized over 30 years from the date of the valuation.
- Other changes in the UAAL are amortized over 30 years from the date of the valuation.
- Benefit changes are amortized over a period determined by the Board to represent the anticipated duration of the payments of the change, not to exceed 25 years.

The contribution requirements as of December 31, 2020 are based on the data previously described, the actuarial assumptions and Plan provisions described in *Section 4*, including all changes affecting future costs adopted at the time of the actuarial valuation, actuarial gains and losses, and changes in the actuarial assumptions. The valuation reflects the recently revised benefit and contribution provisions enacted in June 2020 under SB 20-057, which also are noted within Section 4.

Contribution rates for the year ending December 31, 2022, are derived from the results of the December 31, 2020, annual actuarial valuation.

## Section 2: Actuarial Valuation Results

### Schedule of Computed Employer Contribution Rates for the 2022 Plan Year Based upon the Results of the December 31, 2020 Actuarial Funding Valuation

| Item  | State Division | School Division | Local Government Division | Judicial Division <sup>1</sup> | Denver Public Schools Division |
|---|----------------|-----------------|---------------------------|--------------------------------|--------------------------------|
| <b>Normal cost rates</b>  |                |                 |                           |                                |                                |
| Service retirement benefits   | 8.35%          | 10.35%          | 8.43%                     | 14.98%                         | 8.87%                          |
| Disability retirement benefits  | 0.33%          | 0.22%           | 0.31%                     | 0.39%                          | 0.21%                          |
| Survivor benefits   | 0.26%          | 0.20%           | 0.27%                     | 0.50%                          | 0.18%                          |
| Termination withdrawals   | 2.77%          | 2.83%           | 2.62%                     | 1.01%                          | 3.28%                          |
| Refunds   | 0.86%          | 0.70%           | 0.84%                     | 0.07%                          | 0.39%                          |
| Administrative expense load   | 0.40%          | 0.40%           | 0.40%                     | 0.40%                          | 0.40%                          |
| Total normal cost   | 12.97%         | 14.70%          | 12.87%                    | 17.35%                         | 13.33%                         |
| Member contributions  | (10.58%)       | (10.50%)        | (8.50%)                   | (12.85%)                       | (10.50%)                       |
| <b>Employer normal cost</b>   | <b>2.39%</b>   | <b>4.20%</b>    | <b>4.37%</b>              | <b>4.50%</b>                   | <b>2.83%</b>                   |
| Percentage available to amortize unfunded actuarial accrued liabilities | 16.95%         | 15.13%          | 8.15%                     | 15.22%                         | 4.86%                          |
| Effective amortization period   | 33 years       | 43 years        | 29 years                  | 13 years                       | 16 years                       |
| Total employer contribution rate for actuarially funded benefits        | 11.00%         | 10.90%          | 10.50%                    | 12.06%                         | 10.90%                         |
| Amortization Equalization Disbursement                                  | 5.00%          | 4.50%           | 2.20%                     | 4.60%                          | 4.50%                          |
| Supplemental Amortization Equalization Disbursement                     | 5.00%          | 5.50%           | 1.50%                     | 4.60%                          | 5.50%                          |
| Less Health Care Trust Fund   | (1.02%)        | (1.02%)         | (1.02%)                   | (1.02%)                        | (1.02%)                        |
| Less Annual Increase Reserve  | (0.64%)        | (0.55%)         | (0.66%)                   | (0.52%)                        | (0.69%)                        |
| Less PCOP credit  | N/A            | N/A             | N/A                       | N/A                            | (11.50%)                       |
| <b>Employer contribution rate for DB plan</b>                           | <b>19.34%</b>  | <b>19.33%</b>   | <b>12.52%</b>             | <b>19.72%</b>                  | <b>7.69%</b>                   |
| DC Supplement   | 0.10%          | N/A             | 0.03%                     | N/A                            | N/A                            |

<sup>1</sup>Reflects the 5.0% increase in the Judicial Division member contribution rate and the 5.0% decrease in the Judicial Division employer contribution rate effective July 1, 2020, for the State's 2020-21 and 2021-22 fiscal years, pursuant to HB 20-1394. Since this contribution rate modification does not apply to judges employed by the Denver County Court, weighted member and employer contribution rates are shown.

## Section 2: Actuarial Valuation Results

### Actuarially Determined Contribution by Division

#### STATE DIVISION Actuarially Determined Contribution

|  | 12/31/2020 Valuation Date -<br>Contribution for the 2022<br>Plan Year |                           | 12/31/2019 Valuation Date -<br>Contribution for the 2021<br>Plan Year |                           |
|--|---|---------------------------|---|---------------------------|
|  | Amount  | % of Payroll <sup>1</sup> | Amount  | % of Payroll <sup>1</sup> |
| <b>1</b> Total normal cost   | \$406,835,552   | 12.57%                    | \$352,988,357   | 11.26%                    |
| <b>2</b> Administrative expenses   | 12,949,929  | 0.40%                     | 12,539,783  | 0.40%                     |
| <b>3</b> Expected employee contributions                                 | <u>(342,525,631)</u>  | <u>(10.58%)</u>           | <u>(323,093,990)</u>  | <u>(10.31%)</u>           |
| <b>4</b> Employer normal cost: <b>1 + 2 + 3</b>                          | \$77,259,850  | 2.39%                     | \$42,434,150  | 1.35%                     |
| <b>5</b> Actuarial accrued liability                                     | \$27,116,805,311  |                           | \$25,717,648,220  |                           |
| <b>6</b> Actuarial value of assets                                       | <u>16,039,286,529</u>   |                           | <u>14,922,049,783</u>   |                           |
| <b>7</b> Unfunded/(overfunded) actuarial accrued liability: <b>5 – 6</b> | \$11,077,518,782  |                           | \$10,795,598,437  |                           |
| <b>8</b> Payment on unfunded/(overfunded) actuarial accrued liability    | 681,798,787   | 21.06%                    | 617,492,339   | 19.70%                    |
| <b>9</b> Actuarially determined contribution: <b>4 + 8</b>               | <u>\$759,058,637</u>  | <u>23.45%</u>             | <u>\$659,926,489</u>  | <u>21.05%</u>             |
| <b>10</b> Projected payroll  | \$3,237,482,335   |                           | \$3,134,945,853   |                           |

<sup>1</sup> The underlying calculations involve more precision than what is presented and the rounded numbers shown may not add as a result.

## Section 2: Actuarial Valuation Results

### STATE DIVISION Unfunded Actuarial Accrued Liability Amortization Schedule

| Description  | Original Balance | Outstanding Balance as of 12/31/2019 | 1/1/2020 Amortization Payment | Outstanding Balance as of 12/31/2020 | 1/1/2021 Amortization Payment | Amortization Period as of 12/31/2020 <sup>1</sup> |
|--|------------------|--------------------------------------|-------------------------------|--------------------------------------|-------------------------------|---|
| December 31, 2017 legacy UAAL (revised funding policy effective December 31, 2018) | \$10,525,675,196 | \$10,839,557,080                     | \$600,787,458                 | \$10,981,080,420                     | \$654,991,045                 | 27 years  |
| December 31, 2018 contribution deficiency  | 117,830,228      | 119,509,079                          | 6,623,846                     | 121,069,412                          | 7,221,455                     | 27 years  |
| December 31, 2018 UAAL base  | 401,011,824      | 407,168,872                          | 22,115,040                    | 412,970,235                          | 24,149,062                    | 28 years  |
| December 31, 2019 contribution deficiency  | 21,085,848       | 21,085,848                           | 1,168,693                     | 21,361,149                           | 1,274,133                     | 27 years  |
| December 31, 2019 plan change  | (480,596,769)    | (480,596,769)                        | (28,517,686)                  | (484,854,817)                        | (30,935,867)                  | 24 years  |
| December 31, 2019 UAAL base  | (111,125,673)    | (111,125,673)                        | (5,921,130)                   | (112,831,872)                        | (6,475,947)                   | 29 years  |
| December 31, 2020 contribution deficiency  | 93,468,886       | N/A                                  | N/A                           | 93,468,886                           | 5,575,160                     | 27 years  |
| December 31, 2020 assumption change  | 947,845,612      | N/A                                  | N/A                           | 947,845,612                          | 53,451,570                    | 30 years  |
| December 31, 2020 UAAL base  | (902,590,243)    | N/A                                  | N/A                           | (902,590,243)                        | (50,899,498)                  | 30 years  |
| <b>Total</b>   |                  | <b>\$10,795,598,437</b>              | <b>\$596,256,221</b>          | <b>\$11,077,518,782</b>              | <b>\$658,351,113</b>          |   |
| Total with interest to middle of the year  |                  |                                      | <b>\$617,492,339</b>          |                                      | <b>\$681,798,787</b>          |   |
| Projected payroll  |                  |                                      | <b>\$3,134,945,853</b>        |                                      | <b>\$3,237,482,335</b>        |   |
| Total as a percentage of projected payroll   |                  |                                      | <b>19.70%</b>                 |                                      | <b>21.06%</b>                 |   |
| Equivalent single amortization period  |                  |                                      |                               |                                      |                               | <b>25 years</b>                                   |

<sup>1</sup> State Division reflects an adjustment for the impact of AED and SAED as well as DC Supplement (for members hired on or after January 1, 2019) contributions received from employers on the estimated pensionable payroll of employees electing to participate in the defined contribution plan.



## Section 2: Actuarial Valuation Results

### SCHOOL DIVISION Actuarially Determined Contribution

|  | 12/31/2020 Valuation Date -<br>Contribution for the 2022<br>Plan Year |                           | 12/31/2019 Valuation Date -<br>Contribution for the 2021<br>Plan Year |                           |
|--|---|---------------------------|---|---------------------------|
|  | Amount  | % of Payroll <sup>1</sup> | Amount  | % of Payroll <sup>1</sup> |
| <b>1</b> Total normal cost   | \$774,920,927   | 14.30%                    | \$661,136,727   | 12.33%                    |
| <b>2</b> Administrative expenses   | 21,681,262  | 0.40%                     | 21,454,262  | 0.40%                     |
| <b>3</b> Expected employee contributions                                 | <u>(569,133,138)</u>  | <u>(10.50%)</u>           | <u>(549,765,475)</u>  | <u>(10.25%)</u>           |
| <b>4</b> Employer normal cost: <b>1 + 2 + 3</b>                          | \$227,469,051   | 4.20%                     | \$132,825,514   | 2.48%                     |
| <b>5</b> Actuarial accrued liability                                     | \$45,532,074,935  |                           | \$42,425,061,135  |                           |
| <b>6</b> Actuarial value of assets                                       | <u>27,581,088,477</u>   |                           | <u>25,412,013,802</u>   |                           |
| <b>7</b> Unfunded/(overfunded) actuarial accrued liability: <b>5 – 6</b> | \$17,950,986,458  |                           | \$17,013,047,333  |                           |
| <b>8</b> Payment on unfunded/(overfunded) actuarial accrued liability    | 1,102,491,587   | 20.34%                    | 972,341,879   | 18.13%                    |
| <b>9</b> Actuarially determined contribution: <b>4 + 8</b>               | <u>\$1,329,960,638</u>  | <u>24.54%</u>             | <u>\$1,105,167,393</u>  | <u>20.61%</u>             |
| <b>10</b> Projected payroll  | \$5,420,315,602   |                           | \$5,363,565,610   |                           |

<sup>1</sup> The underlying calculations involve more precision than what is presented and the rounded numbers shown may not add as a result.

## Section 2: Actuarial Valuation Results

### SCHOOL DIVISION Unfunded Actuarial Accrued Liability Amortization Schedule

| Description  | Original Balance | Outstanding Balance as of 12/31/2019 | 1/1/2020 Amortization Payment | Outstanding Balance as of 12/31/2020 | 1/1/2021 Amortization Payment | Amortization Period as of 12/31/2020 |
|--|------------------|--------------------------------------|-------------------------------|--------------------------------------|-------------------------------|--------------------------------------|
| December 31, 2017 legacy UAAL (revised funding policy effective December 31, 2018) | \$16,266,169,194 | \$16,751,236,040                     | \$928,444,995                 | \$16,969,943,396                     | \$1,012,210,142               | 27 years                             |
| December 31, 2018 contribution deficiency  | 261,157,378      | 264,878,362                          | 14,681,006                    | 268,336,664                          | 16,005,539                    | 27 years                             |
| December 31, 2018 UAAL base  | 726,883,907      | 738,044,324                          | 40,086,265                    | 748,560,018                          | 43,773,185                    | 28 years                             |
| December 31, 2019 contribution deficiency  | 94,217,771       | 94,217,771                           | 5,222,063                     | 95,447,897                           | 5,693,203                     | 27 years                             |
| December 31, 2019 plan change  | (829,604,881)    | (829,604,881)                        | (49,227,155)                  | (836,955,111)                        | (53,401,412)                  | 24 years                             |
| December 31, 2019 UAAL base  | (5,724,283)      | (5,724,283)                          | (305,008)                     | (5,812,172)                          | (333,588)                     | 29 years                             |
| December 31, 2020 contribution deficiency  | 155,895,101      | N/A                                  | N/A                           | 155,895,101                          | 9,298,711                     | 27 years                             |
| December 31, 2020 assumption change  | 1,839,281,320    | N/A                                  | N/A                           | 1,839,281,320                        | 103,722,034                   | 30 years                             |
| December 31, 2020 UAAL base  | (1,283,710,655)  | N/A                                  | N/A                           | (1,283,710,655)                      | (72,391,906)                  | 30 years                             |
| <b>Total</b>   |                  | <b>\$17,013,047,333</b>              | <b>\$938,902,166</b>          | <b>\$17,950,986,458</b>              | <b>\$1,064,575,908</b>        |                                      |
| Total with interest to middle of the year  |                  |                                      | <b>\$972,341,879</b>          |                                      | <b>\$1,102,491,587</b>        |                                      |
| Projected payroll  |                  |                                      | <b>\$5,363,565,610</b>        |                                      | <b>\$5,420,315,602</b>        |                                      |
| Total as a percentage of projected payroll   |                  |                                      | <b>18.13%</b>                 |                                      | <b>20.34%</b>                 |                                      |
| Equivalent single amortization period  |                  |                                      |                               |                                      |                               | <b>27 years</b>                      |

## Section 2: Actuarial Valuation Results

### LOCAL GOVERNMENT DIVISION Actuarially Determined Contribution

|  | 12/31/2020 Valuation Date -<br>Contribution for the 2022<br>Plan Year |                           | 12/31/2019 Valuation Date -<br>Contribution for the 2021<br>Plan Year |                           |
|--|---|---------------------------|---|---------------------------|
|  | Amount  | % of Payroll <sup>1</sup> | Amount  | % of Payroll <sup>1</sup> |
| <b>1</b> Total normal cost   | \$91,469,689  | 12.47%                    | \$76,671,628  | 10.74%                    |
| <b>2</b> Administrative expenses   | 2,933,290   | 0.40%                     | 2,855,671   | 0.40%                     |
| <b>3</b> Expected employee contributions                                 | <u>(62,368,282)</u>   | <u>(8.50%)</u>            | <u>(60,683,015)</u>   | <u>(8.50%)</u>            |
| <b>4</b> Employer normal cost: <b>1 + 2 + 3</b>                          | \$32,034,697  | 4.37%                     | \$18,844,284  | 2.64%                     |
| <b>5</b> Actuarial accrued liability                                     | \$5,658,903,096   |                           | \$5,316,433,330   |                           |
| <b>6</b> Actuarial value of assets                                       | <u>4,663,030,639</u>  |                           | <u>4,288,325,330</u>  |                           |
| <b>7</b> Unfunded/(overfunded) actuarial accrued liability: <b>5 – 6</b> | \$995,872,457   |                           | \$1,028,108,000   |                           |
| <b>8</b> Payment on unfunded/(overfunded) actuarial accrued liability    | 61,208,518  | 8.35%                     | 58,569,333  | 8.20%                     |
| <b>9</b> Actuarially determined contribution: <b>4 + 8</b>               | <u>\$93,243,215</u>   | <u>12.72%</u>             | <u>\$77,413,617</u>   | <u>10.84%</u>             |
| <b>10</b> Projected payroll  | \$733,322,442   |                           | \$713,917,829   |                           |

<sup>1</sup> The underlying calculations involve more precision than what is presented and the rounded numbers shown may not add as a result.

## Section 2: Actuarial Valuation Results

### LOCAL GOVERNMENT DIVISION Unfunded Actuarial Accrued Liability Amortization Schedule

| Description  | Original Balance | Outstanding Balance as of 12/31/2019 | 1/1/2020 Amortization Payment | Outstanding Balance as of 12/31/2020 | 1/1/2021 Amortization Payment | Amortization Period as of 12/31/2020 <sup>1</sup> |
|--|------------------|--------------------------------------|-------------------------------|--------------------------------------|-------------------------------|---|
| December 31, 2017 legacy UAAL (revised funding policy effective December 31, 2018) | \$1,036,519,103  | \$1,067,428,719                      | \$59,162,730                  | \$1,081,365,273                      | \$64,500,445                  | 27 years  |
| December 31, 2018 contribution deficiency  | 17,830,660       | 18,084,712                           | 1,002,354                     | 18,320,829                           | 1,092,787                     | 27 years  |
| December 31, 2018 plan change  | (5,566,395)      | (5,615,713)                          | (341,860)                     | (5,656,207)                          | (370,211)                     | 23 years  |
| December 31, 2018 UAAL base  | 105,508,259      | 107,128,210                          | 5,818,580                     | 108,654,578                          | 6,353,742                     | 28 years  |
| December 31, 2019 contribution deficiency  | (6,326,553)      | (6,326,553)                          | (350,652)                     | (6,409,154)                          | (382,288)                     | 27 years  |
| December 31, 2019 plan change  | (100,004,591)    | (100,004,591)                        | (5,934,080)                   | (100,890,623)                        | (6,437,265)                   | 24 years  |
| December 31, 2019 UAAL base  | (52,586,784)     | (52,586,784)                         | (2,801,991)                   | (53,394,190)                         | (3,064,541)                   | 29 years  |
| December 31, 2020 contribution deficiency  | 3,550,104        | N/A                                  | N/A                           | 3,550,104                            | 211,754                       | 27 years  |
| December 31, 2020 assumption change  | 202,330,334      | N/A                                  | N/A                           | 202,330,334                          | 11,409,953                    | 30 years  |
| December 31, 2020 UAAL base  | (251,998,487)    | <u>N/A</u>                           | <u>N/A</u>                    | <u>(251,998,487)</u>                 | <u>(14,210,874)</u>           | 30 years  |
| <b>Total</b>   |                  | <b>\$1,028,108,000</b>               | <b>\$56,555,081</b>           | <b>\$995,872,457</b>                 | <b>\$59,103,502</b>           |   |
| Total with interest to middle of the year  |                  |                                      | <b>\$58,569,333</b>           |                                      | <b>\$61,208,518</b>           |   |
| Projected payroll  |                  |                                      | <b>\$713,917,829</b>          |                                      | <b>\$733,322,442</b>          |   |
| Total as a percentage of projected payroll   |                  |                                      | <b>8.20%</b>                  |                                      | <b>8.35%</b>                  |   |
| Equivalent single amortization period  |                  |                                      |                               |                                      |                               | <b>27 years</b>                                   |

<sup>1</sup> Local Government Division reflects an adjustment for the impact of AED and SAED as well as DC Supplement (for members hired on or after January 1, 2019) contributions received from employers on the estimated pensionable payroll of employees electing to participate in the defined contribution plan.

## Section 2: Actuarial Valuation Results

### JUDICIAL DIVISION Actuarially Determined Contribution

|  | 12/31/2020 Valuation Date -<br>Contribution for the 2022<br>Plan Year |                           | 12/31/2019 Valuation Date -<br>Contribution for the 2021<br>Plan Year |                           |
|--|---|---------------------------|---|---------------------------|
|  | Amount  | % of Payroll <sup>1</sup> | Amount  | % of Payroll <sup>1</sup> |
| <b>1</b> Total normal cost   | \$9,699,846   | 16.95%                    | \$9,095,966   | 16.36%                    |
| <b>2</b> Administrative expenses   | 228,839   | 0.40%                     | 222,349   | 0.40%                     |
| <b>3</b> Expected employee contributions                                 | <u>(7,351,455)</u>  | <u>(12.85%)</u>           | <u>(8,321,415)</u>  | <u>(14.97%)</u>           |
| <b>4</b> Employer normal cost: <b>1 + 2 + 3</b>                          | \$2,577,230   | 4.50%                     | \$996,900   | 1.79%                     |
| <b>5</b> Actuarial accrued liability                                     | \$478,204,823   |                           | \$462,038,140   |                           |
| <b>6</b> Actuarial value of assets                                       | <u>376,437,305</u>  |                           | <u>342,071,056</u>  |                           |
| <b>7</b> Unfunded/(overfunded) actuarial accrued liability: <b>5 – 6</b> | \$101,767,518   |                           | \$119,967,084   |                           |
| <b>8</b> Payment on unfunded/(overfunded) actuarial accrued liability    | 6,322,822   | 11.05%                    | 6,856,775   | 12.34%                    |
| <b>9</b> Actuarially determined contribution: <b>4 + 8</b>               | <u>\$8,900,052</u>  | <u>15.56%</u>             | <u>\$7,853,675</u>  | <u>14.13%</u>             |
| <b>10</b> Projected payroll  | \$57,209,766  |                           | \$55,587,276  |                           |

<sup>1</sup> The underlying calculations involve more precision than what is presented and the rounded numbers shown may not add as a result.

## Section 2: Actuarial Valuation Results

### JUDICIAL DIVISION Unfunded Actuarial Accrued Liability Amortization Schedule

| Description  | Original Balance | Outstanding Balance as of 12/31/2019 | 1/1/2020 Amortization Payment | Outstanding Balance as of 12/31/2020 | 1/1/2021 Amortization Payment | Amortization Period as of 12/31/2020 |
|--|------------------|--------------------------------------|-------------------------------|--------------------------------------|-------------------------------|--------------------------------------|
| December 31, 2017 legacy UAAL (revised funding policy effective December 31, 2018) | \$118,023,473    | \$121,543,003                        | \$6,736,577                   | \$123,129,892                        | \$7,344,357                   | 27 years                             |
| December 31, 2018 contribution deficiency  | 4,422,408        | 4,485,419                            | 248,606                       | 4,543,982                            | 271,036                       | 27 years                             |
| December 31, 2018 UAAL base  | 7,528,585        | 7,644,177                            | 415,187                       | 7,753,092                            | 453,374                       | 28 years                             |
| December 31, 2019 contribution deficiency  | (143,776)        | (143,776)                            | (7,969)                       | (145,653)                            | (8,688)                       | 27 years                             |
| December 31, 2019 plan change  | (8,063,590)      | (8,063,590)                          | (478,478)                     | (8,135,033)                          | (519,051)                     | 24 years                             |
| December 31, 2019 UAAL base  | (5,498,149)      | (5,498,149)                          | (292,959)                     | (5,582,566)                          | (320,409)                     | 29 years                             |
| December 31, 2020 contribution deficiency  | 342,678          | N/A                                  | N/A                           | 342,678                              | 20,440                        | 27 years                             |
| December 31, 2020 assumption change  | 930,344          | N/A                                  | N/A                           | 930,344                              | 52,465                        | 30 years                             |
| December 31, 2020 UAAL base  | (21,069,218)     | N/A                                  | N/A                           | (21,069,218)                         | (1,188,150)                   | 30 years                             |
| <b>Total</b>   |                  | <b>\$119,967,084</b>                 | <b>\$6,620,964</b>            | <b>\$101,767,518</b>                 | <b>\$6,105,374</b>            |                                      |
| Total with interest to middle of the year  |                  |                                      | <b>\$6,856,775</b>            |                                      | <b>\$6,322,822</b>            |                                      |
| Projected payroll  |                  |                                      | <b>\$55,587,276</b>           |                                      | <b>\$57,209,766</b>           |                                      |
| Total as a percentage of projected payroll   |                  |                                      | <b>12.34%</b>                 |                                      | <b>11.05%</b>                 |                                      |
| Equivalent single amortization period  |                  |                                      |                               |                                      |                               | <b>27 years</b>                      |

## Section 2: Actuarial Valuation Results

### DENVER PUBLIC SCHOOLS DIVISION Actuarially Determined Contribution

|  | 12/31/2020 Valuation Date -<br>Contribution for the 2022<br>Plan Year |                           | 12/31/2019 Valuation Date -<br>Contribution for the 2021<br>Plan Year |                           |
|--|---|---------------------------|---|---------------------------|
|  | Amount  | % of Payroll <sup>1</sup> | Amount  | % of Payroll <sup>1</sup> |
| <b>1</b> Total normal cost   | \$105,523,355   | 12.93%                    | \$91,623,002  | 11.79%                    |
| <b>2</b> Administrative expenses   | 3,265,808   | 0.40%                     | 3,107,234   | 0.40%                     |
| <b>3</b> Expected employee contributions                                 | <u>(85,727,453)</u>   | <u>(10.50%)</u>           | <u>(79,622,880)</u>   | <u>(10.25%)</u>           |
| <b>4</b> Employer normal cost: <b>1 + 2 + 3</b>                          | \$23,061,710  | 2.83%                     | \$15,107,356  | 1.94%                     |
| <b>5</b> Actuarial accrued liability                                     | \$4,532,545,623   |                           | \$4,263,384,355   |                           |
| <b>6</b> Actuarial value of assets                                       | <u>3,682,072,107</u>  |                           | <u>3,410,264,090</u>  |                           |
| <b>7</b> Unfunded/(overfunded) actuarial accrued liability: <b>5 – 6</b> | \$850,473,516   |                           | \$853,120,265   |                           |
| <b>8</b> Payment on unfunded/(overfunded) actuarial accrued liability    | 52,452,431  | 6.42%                     | 48,763,382  | 6.28%                     |
| <b>9</b> Actuarially determined contribution: <b>4 + 8</b>               | <u>\$75,514,141</u>   | <u>9.25%</u>              | <u>\$63,870,738</u>   | <u>8.22%</u>              |
| <b>10</b> Projected payroll  | \$816,451,931   |                           | \$776,808,581   |                           |

<sup>1</sup> The underlying calculations involve more precision than what is presented and the rounded numbers shown may not add as a result.

## Section 2: Actuarial Valuation Results

### DENVER PUBLIC SCHOOLS DIVISION Unfunded Actuarial Accrued Liability Amortization Schedule

| Description  | Original Balance | Outstanding Balance as of 12/31/2019 | 1/1/2020 Amortization Payment | Outstanding Balance as of 12/31/2020 | 1/1/2021 Amortization Payment | Amortization Period as of 12/31/2020 |
|--|------------------|--------------------------------------|-------------------------------|--------------------------------------|-------------------------------|--------------------------------------|
| December 31, 2017 legacy UAAL (revised funding policy effective December 31, 2018) | \$830,756,647    | \$855,530,304                        | \$47,418,162                  | \$866,700,272                        | \$51,696,272                  | 27 years                             |
| December 31, 2018 contribution deficiency  | 48,781,251       | 49,476,289                           | 2,742,246                     | 50,122,261                           | 2,989,654                     | 27 years                             |
| December 31, 2018 UAAL base  | 94,971,312       | 96,429,481                           | 5,237,487                     | 97,803,414                           | 5,719,203                     | 28 years                             |
| December 31, 2019 contribution deficiency  | 24,046,028       | 24,046,028                           | 1,332,762                     | 24,359,978                           | 1,453,005                     | 27 years                             |
| December 31, 2019 plan change  | (76,021,953)     | (76,021,953)                         | (4,510,996)                   | (76,695,501)                         | (4,893,510)                   | 24 years                             |
| December 31, 2019 UAAL base  | (96,339,884)     | (96,339,884)                         | (5,133,296)                   | (97,819,066)                         | (5,614,292)                   | 29 years                             |
| December 31, 2020 contribution deficiency  | 26,912,759       | N/A                                  | N/A                           | 26,912,759                           | 1,605,272                     | 27 years                             |
| December 31, 2020 assumption change  | 117,503,086      | N/A                                  | N/A                           | 117,503,086                          | 6,626,316                     | 30 years                             |
| December 31, 2020 UAAL base  | (158,413,687)    | N/A                                  | N/A                           | (158,413,687)                        | (8,933,375)                   | 30 years                             |
| <b>Total</b>   |                  | <b>\$853,120,265</b>                 | <b>\$47,086,365</b>           | <b>\$850,473,516</b>                 | <b>\$50,648,545</b>           |                                      |
| Total with interest to middle of the year  |                  |                                      | <b>\$48,763,382</b>           |                                      | <b>\$52,452,431</b>           |                                      |
| Projected payroll  |                  |                                      | <b>\$776,808,581</b>          |                                      | <b>\$816,451,931</b>          |                                      |
| Total as a percentage of projected payroll   |                  |                                      | <b>6.28%</b>                  |                                      | <b>6.42%</b>                  |                                      |
| Equivalent single amortization period  |                  |                                      |                               |                                      |                               | <b>27 years</b>                      |



## Section 2: Actuarial Valuation Results

### Reconciliation of Actuarially Determined Contribution

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

#### Reconciliation of Actuarially Determined Contribution

|   | Item   | State Division <sup>1</sup> | School Division <sup>1</sup> | Local Government Division <sup>1</sup> | Judicial Division <sup>1</sup> | Denver Public Schools Division <sup>1</sup> |
|---|--|-----------------------------|------------------------------|--|--------------------------------|---|
| 1 | Prior valuation  | 21.05%                      | 20.61%                       | 10.84%                                 | 14.13%                         | 8.22%                                       |
| 2 | Increases/(decreases) due to:  |                             |                              |  |                                |   |
|   | Net effect of change in payroll and normal cost                              | 0.02%                       | 0.36%                        | 0.02%                                  | (0.25%)                        | (0.05%)                                     |
|   | Effect of contributions (more)/less than actuarially determined contribution | 0.16%                       | 0.16%                        | 0.03%                                  | 0.04%                          | 0.18%                                       |
|   | Effect of gains and losses on accrued liability and administrative expenses  | 0.06%                       | 0.22%                        | 0.10%                                  | 0.27%                          | 0.33%                                       |
|   | Effect of investment (gain)/loss   | (1.45%)                     | (1.47%)                      | (1.84%)                                | (1.85%)                        | (1.32%)                                     |
|   | Effect of plan changes   | (0.27%)                     | (0.25%)                      | 0.00%                                  | 2.12% <sup>2</sup>             | (0.25%)                                     |
|   | Effect of change in actuarial assumptions and methods                        | 3.99%                       | 4.95%                        | 3.71%                                  | 1.55%                          | 2.18%                                       |
|   | Net effect of other changes  | <u>(0.11%)</u>              | <u>(0.04%)</u>               | <u>(0.14%)</u>                         | <u>(0.45%)</u>                 | <u>(0.04%)</u>                              |
|   | Total Change   | 2.40%                       | 3.93%                        | 1.88%                                  | 1.43%                          | 1.03%                                       |
| 3 | Current valuation: <b>1 + 2</b>  | 23.45%                      | 24.54%                       | 12.72%                                 | 15.56%                         | 9.25%                                       |
| 4 | Statutory employer contribution rate   | 19.34%                      | 19.33%                       | 12.52%                                 | 19.72% <sup>3</sup>            | 7.69%                                       |
| 5 | Margin available [contribution sufficiency/(deficiency)]: <b>4 – 3</b>       | <u>(4.11%)</u>              | <u>(5.21%)</u>               | <u>(0.20%)</u>                         | <u>4.16%</u>                   | <u>(1.56%)</u>                              |

<sup>1</sup> The underlying calculations involve more precision than what is presented and the rounded numbers shown may not add as a result.

<sup>2</sup> Reflects the impact of the modifications to employer and member contribution provisions for the Judicial Division, pursuant to HB 20-1394.

<sup>3</sup> Reflects the 5.0% decrease in the Judicial Division employer contribution rate effective July 1, 2020, for the State's 2020-21 and 2021-22 fiscal years, pursuant to HB 20-1394. Since this contribution rate modification does not apply to judges employed by the Denver County Court, a weighted employer contribution rate is shown.

## Section 2: Actuarial Valuation Results

### Automatic Adjustment Provisions (AAP)

The automatic adjustment provision initiates automatic changes to member and employer contribution rates, the annual increase cap, and the direct distribution from the State under certain circumstances. Automatic changes are triggered when the ratio of the Blended Total Contribution Rate<sup>1</sup> to the Blended Total Required Contribution is less than 98% or greater than 120%. The table below calculates the Blended Total Contribution Rate and the Blended Total Required Contribution for the 2022 plan year.

#### Blended Total Contribution Rate<sup>1</sup> and Blended Total Required Contribution for the 2022 Plan Year

| Item   | State Division   | School Division  | Local Government Division | Judicial Division <sup>2</sup> | Denver Public Schools Division | Total Weighted Average |
|--|------------------|------------------|---------------------------|--------------------------------|--------------------------------|------------------------|
| 1 Unfunded actuarial accrued liability as of December 31, 2020                                     | \$11,077,518,782 | \$17,950,986,458 | \$ 995,872,457            | \$ 101,767,518                 | \$ 850,473,516                 | \$30,976,618,731       |
| 2 Member contribution rate   | 10.58%           | 10.50%           | 8.50%                     | 12.85%                         | 10.50%                         | 10.47%                 |
| 3 Employer contribution rate <sup>3,4</sup>  | 19.44%           | 19.33%           | 12.55%                    | 19.72%                         | 7.69%                          | 18.83%                 |
| 4 Actuarially determined employer contribution rate  | 23.45%           | 24.54%           | 12.72%                    | 15.56%                         | 9.25%                          | 23.32%                 |
| 5 Direct distribution rate   |                  |                  |                           |                                |                                | 2.13%                  |
| 6 Blended total contribution rate:<br><b>2 + 3 + 5</b>   |                  |                  |                           |                                |                                | 31.43%                 |
| 7 Blended total required contribution:<br><b>2 + 4</b>   |                  |                  |                           |                                |                                | 33.79%                 |
| 8 Ratio of blended total contribution rate to blended total required contribution:<br><b>6 ÷ 7</b> |                  |                  |                           |                                |                                | 93.02%                 |

<sup>1</sup> "Blended Total Contribution Rate" is used synonymously with the term "Blended Total Contribution Amount", which is defined in C.R.S. 24-51-413(1)(a).

<sup>2</sup> Reflects the 5.0% decrease in the Judicial Division employer contribution rate and the 5.0% increase in the Judicial Division member contribution rate, effective July 1, 2020 for the State's 2020-21 and 2021-22 fiscal years, pursuant to HB 20-1394. Since this contribution rate modification does not apply to judges employed by the Denver County Court, weighted member and employer contribution rates are shown.

<sup>3</sup> Statutory base contribution rates plus AED and SAED contributions less 1.02% HCTF contributions, PCOP credit for DPS Division, and 1% AIR contributions for post-2006 members.

<sup>4</sup> For State and Local Government Divisions, reflects the DC Supplement contribution rate.

## Section 2: Actuarial Valuation Results

### Automatic adjustment provisions effective July 1, 2022 - Before automatic adjustment provision

| Item                                      | State Division<br>General<br>Members   | School<br>Division | Local<br>Government<br>Division<br>General<br>Members | State Trooper<br>Members | Judicial<br>Division | Denver Public<br>Schools<br>Division |
|---|--|--------------------|---|--------------------------|----------------------|--------------------------------------|
| 1 Member contribution rate                | 10.50%   | 10.50%             | 8.50%   | 12.50%                   | 10.50%               | 10.50%                               |
| 2 Employer contribution rate <sup>1</sup> | 10.90%   | 10.90%             | 10.50%  | 13.60%                   | 14.41%               | 10.90%                               |
| 3 Annual increase cap                     | 1.25%  | 1.25%              | 1.25%   | 1.25%                    | 1.25%                | 1.25%                                |
| 4 Direct distribution amount              | \$225,000,000 spread across all divisions except for Local Government Division |                    |   |                          |                      |                                      |

<sup>1</sup> Statutory base contribution rates

### Automatic adjustment provisions effective July 1, 2022 - After automatic adjustment provision<sup>2</sup>

| Item                                      | State Division<br>General<br>Members   | School<br>Division | Local<br>Government<br>Division<br>General<br>Members | State Trooper<br>Members | Judicial<br>Division | Denver Public<br>Schools<br>Division |
|---|--|--------------------|---|--------------------------|----------------------|--------------------------------------|
| 1 Member contribution rate                | 11.00%   | 11.00%             | 9.00%   | 13.00%                   | 11.00%               | 11.00%                               |
| 2 Employer contribution rate <sup>1</sup> | 11.40%   | 11.40%             | 11.00%  | 14.10%                   | 14.91%               | 11.40%                               |
| 3 Annual increase cap                     | 1.00%  | 1.00%              | 1.00%   | 1.00%                    | 1.00%                | 1.00%                                |
| 4 Direct distribution amount              | \$225,000,000 spread across all divisions except for Local Government Division |                    |   |                          |                      |                                      |

<sup>1</sup> Statutory base contribution rates

<sup>2</sup> After reflecting the automatic adjustment provisions, the estimated ratio of blended total contribution rate to blended total required contribution is 97%.

## Section 2: Actuarial Valuation Results

### History of Employer Contributions

Critical information to assess the funding progress is the historical comparison of the actuarially determined contribution (annual required contribution prior to 2014) to the actual contributions. A history of the most recent years of contributions is shown below.

#### STATE DIVISION History of Employer Contributions: 2011 – 2020

| Plan Year<br>Ended<br>December 31 | Actuarially Determined Employer<br>Contribution (ADC) |                          | Actual Employer Contribution |                          |                        |
|-----------------------------------|---|--------------------------|------------------------------|--------------------------|------------------------|
|                                   | Amount  | Percentage of<br>Payroll | Amount <sup>1</sup>          | Percentage of<br>Payroll | Percent<br>Contributed |
| 2011                              | \$326,273,768   | 13.63% <sup>2</sup>      | \$277,122,403                | 11.58%                   | 84.9%                  |
| 2012                              | 393,991,090   | 16.52% <sup>2</sup>      | 328,055,004                  | 13.76%                   | 83.3%                  |
| 2013                              | 495,240,593   | 20.01%                   | 393,217,865                  | 15.89%                   | 79.4%                  |
| 2014                              | 524,474,957   | 20.45%                   | 434,388,378                  | 16.94%                   | 82.8%                  |
| 2015                              | 590,457,196   | 22.35%                   | 472,605,238                  | 17.89%                   | 80.0%                  |
| 2016                              | 604,746,141   | 22.31%                   | 508,966,375                  | 18.78%                   | 84.2%                  |
| 2017                              | 630,022,456   | 22.71%                   | 549,621,778                  | 19.81%                   | 87.2%                  |
| 2018                              | 762,391,572   | 26.30%                   | 645,732,724                  | 22.28%                   | 84.7%                  |
| 2019                              | 697,341,417   | 23.28%                   | 671,706,942                  | 22.42%                   | 96.3%                  |
| 2020                              | 731,822,257   | 23.69%                   | 626,943,850 <sup>3</sup>     | 20.29%                   | 85.7%                  |

<sup>1</sup> Beginning in 2018, the actual employer contribution amount includes a direct distribution from the State treasury.

<sup>2</sup> The State Division 2011 and 2012 Actuarially Determined Contributions have been adjusted to reflect the contribution rate swap of 2.5% of payroll for the period July 1, 2010 through June 30, 2012, decreasing the employer contribution rate.

<sup>3</sup> \$225,000,000 Direct Distribution suspended for 2020.

## Section 2: Actuarial Valuation Results

### SCHOOL DIVISION History of Employer Contributions: 2011 – 2020

| Plan Year<br>Ended<br>December 31 | Actuarially Determined Employer<br>Contribution (ADC) |                          | Actual Employer Contribution |                          |                        |
|-----------------------------------|---|--------------------------|------------------------------|--------------------------|------------------------|
|                                   | Amount  | Percentage of<br>Payroll | Amount <sup>1</sup>          | Percentage of<br>Payroll | Percent<br>Contributed |
| 2011                              | \$601,138,216   | 15.73%                   | \$534,230,314                | 13.98%                   | 88.9%                  |
| 2012                              | 672,155,545   | 17.60%                   | 564,444,062                  | 14.78%                   | 84.0%                  |
| 2013                              | 779,458,799   | 19.79%                   | 613,738,447                  | 15.58%                   | 78.7%                  |
| 2014                              | 798,425,826   | 19.65%                   | 673,043,013                  | 16.56%                   | 84.3%                  |
| 2015                              | 929,222,688   | 21.94%                   | 738,533,745                  | 17.44%                   | 79.5%                  |
| 2016                              | 972,507,903   | 22.36%                   | 794,872,295                  | 18.28%                   | 81.7%                  |
| 2017                              | 1,007,843,833   | 22.54%                   | 837,837,286                  | 18.74%                   | 83.1%                  |
| 2018                              | 1,283,586,925   | 26.80%                   | 1,027,918,101                | 21.46%                   | 80.1%                  |
| 2019                              | 1,204,135,246   | 23.59%                   | 1,104,066,065                | 21.63%                   | 91.7%                  |
| 2020                              | 1,202,647,756   | 23.37%                   | 1,020,832,715 <sup>2</sup>   | 19.84%                   | 84.9%                  |

<sup>1</sup> Beginning in 2018, the actual employer contribution amount includes a direct distribution from the State treasury.

<sup>2</sup> \$225,000,000 Direct Distribution suspended for 2020.

## Section 2: Actuarial Valuation Results

### LOCAL GOVERNMENT DIVISION History of Employer Contributions: 2011 – 2020

| Plan Year<br>Ended<br>December 31 | Actuarially Determined Employer<br>Contribution (ADC) |                          | Actual Employer Contribution |                          |                        |
|-----------------------------------|---|--------------------------|------------------------------|--------------------------|------------------------|
|                                   | Amount  | Percentage of<br>Payroll | Amount                       | Percentage of<br>Payroll | Percent<br>Contributed |
| 2011                              | \$64,491,578  | 8.98%                    | \$89,536,217                 | 12.47%                   | 138.8%                 |
| 2012                              | 51,267,141  | 9.79%                    | 83,815,949                   | 16.01%                   | 163.5%                 |
| 2013                              | 56,180,165  | 10.62%                   | 65,329,207                   | 12.35%                   | 116.3%                 |
| 2014                              | 63,667,135  | 11.78%                   | 252,545,073                  | 46.73%                   | 396.7%                 |
| 2015                              | 76,478,780  | 13.62%                   | 67,893,740                   | 12.09%                   | 88.8%                  |
| 2016                              | 72,865,069  | 11.98%                   | 72,162,542                   | 11.86%                   | 99.0%                  |
| 2017                              | 75,425,986  | 11.92%                   | 75,963,608                   | 12.00%                   | 100.7%                 |
| 2018                              | 94,324,433  | 14.27%                   | 77,578,359                   | 11.74%                   | 82.2%                  |
| 2019                              | 75,805,709  | 11.13%                   | 81,395,567                   | 11.95%                   | 107.4%                 |
| 2020                              | 90,817,562  | 13.01%                   | 85,169,653                   | 12.20%                   | 93.8%                  |

## Section 2: Actuarial Valuation Results

### JUDICIAL DIVISION History of Employer Contributions: 2011 – 2020

| Plan Year<br>Ended<br>December 31 | Actuarially Determined Employer<br>Contribution (ADC) |                          | Actual Employer Contribution |                          |                        |
|-----------------------------------|---|--------------------------|------------------------------|--------------------------|------------------------|
|                                   | Amount  | Percentage of<br>Payroll | Amount <sup>1</sup>          | Percentage of<br>Payroll | Percent<br>Contributed |
| 2011                              | \$6,362,439   | 16.30% <sup>2</sup>      | \$5,356,113                  | 13.72%                   | 84.2%                  |
| 2012                              | 7,137,427   | 18.28% <sup>2</sup>      | 5,839,873                    | 14.96%                   | 81.8%                  |
| 2013                              | 8,599,454   | 21.53%                   | 6,493,766                    | 16.26%                   | 75.5%                  |
| 2014                              | 8,625,480   | 20.07%                   | 6,954,101                    | 16.18%                   | 80.6%                  |
| 2015                              | 10,053,557  | 21.45%                   | 7,561,652                    | 16.13%                   | 75.2%                  |
| 2016                              | 10,747,986  | 22.07%                   | 7,859,965                    | 16.14%                   | 73.1%                  |
| 2017                              | 11,032,791  | 22.54%                   | 7,888,651                    | 16.12%                   | 71.5%                  |
| 2018                              | 13,767,896  | 27.26%                   | 9,477,029                    | 18.76%                   | 68.8%                  |
| 2019                              | 11,700,590  | 21.90%                   | 11,741,765                   | 21.98%                   | 100.4%                 |
| 2020                              | 12,079,009  | 22.05% <sup>3</sup>      | 10,112,951 <sup>4</sup>      | 18.46%                   | 83.7%                  |

<sup>1</sup> Beginning in 2018, the actual employer contribution amount includes a direct distribution from the State treasury.

<sup>2</sup> The Judicial Division 2011 and 2012 Actuarially Determined Contributions have been adjusted to reflect the contribution rate swap of 2.5% of payroll for the period July 1, 2010 through June 30, 2012, decreasing the employer contribution rate.

<sup>3</sup> The Judicial Division 2020 Actuarially Determined Contribution reflects the contribution rate swap of 5.0% of payroll for the period July 1, 2020 through December 31, 2020.

<sup>4</sup> \$225,000,000 Direct Distribution suspended for 2020.

## Section 2: Actuarial Valuation Results

### DENVER PUBLIC SCHOOLS DIVISION History of Employer Contributions: 2011 – 2020

| Plan Year<br>Ended<br>December 31 | Actuarially Determined Employer<br>Contribution (ADC) |                          | Actual Employer Contribution |                          |                        |
|-----------------------------------|---|--------------------------|------------------------------|--------------------------|------------------------|
|                                   | Amount  | Percentage of<br>Payroll | Amount <sup>1</sup>          | Percentage of<br>Payroll | Percent<br>Contributed |
| 2011                              | \$58,260,081  | 11.85%                   | \$11,721,571                 | 2.38%                    | 20.1%                  |
| 2012                              | 49,043,747  | 9.60%                    | 13,144,731                   | 2.57%                    | 26.8%                  |
| 2013                              | 63,145,188  | 11.53%                   | 23,103,723                   | 4.22%                    | 36.6%                  |
| 2014                              | 56,503,673  | 9.67%                    | 15,845,059                   | 2.71%                    | 28.0%                  |
| 2015                              | 68,695,272  | 11.06%                   | 5,307,691                    | 0.85%                    | 7.7%                   |
| 2016                              | 67,171,731  | 10.46%                   | 13,385,624                   | 2.08%                    | 19.9%                  |
| 2017                              | 67,662,786  | 10.28%                   | 23,478,032                   | 3.57%                    | 34.7%                  |
| 2018                              | 97,475,410  | 13.50%                   | 49,991,984                   | 6.92%                    | 51.3%                  |
| 2019                              | 82,019,787  | 11.14%                   | 57,552,584                   | 7.82%                    | 70.2%                  |
| 2020                              | 80,374,420  | 10.42%                   | 50,888,256 <sup>2</sup>      | 6.60%                    | 63.3%                  |

<sup>1</sup> Beginning in 2018, the actual employer contribution amount includes a direct distribution from the State treasury.

<sup>2</sup> \$225,000,000 Direct Distribution suspended for 2020.



## Section 2: Actuarial Valuation Results

### Additional Information

The other critical piece of information regarding PERA's financial status is the funded ratio. This ratio compares the actuarial value of assets to the actuarial accrued liabilities of each Division Trust Fund. Higher ratios may indicate a well-funded plan with a higher probability that assets will be sufficient to cover the plan's actuarial accrued liabilities. Lower ratios may indicate recent changes to benefit structures, funding of the plan below actuarial requirements, poor asset performance, or a variety of other factors. The charts that follow show the funded ratio calculated using the actuarial value of assets.

#### STATE DIVISION Schedule of Funding Progress

| As of December 31 | Actuarial Value of Assets (AVA) | Actuarial Accrued Liability (AAL) | Unfunded Actuarial Accrued Liability (UAAL) | Funded Ratio | Annual Covered Payroll | UAAL as a % of Covered Payroll |
|-------------------|---------------------------------|-----------------------------------|---|--------------|------------------------|--------------------------------|
| 2011              | \$12,010,044,704                | \$20,826,543,471                  | \$8,816,498,767                             | 57.7%        | \$2,393,791,402        | 368.3%                         |
| 2012              | 12,538,675,449                  | 21,191,495,125                    | 8,652,819,676                               | 59.2%        | 2,384,933,961          | 362.8%                         |
| 2013              | 13,129,459,956                  | 22,843,725,166                    | 9,714,265,210                               | 57.5%        | 2,474,965,482          | 392.5%                         |
| 2014              | 13,523,487,577                  | 23,408,321,153                    | 9,884,833,576                               | 57.8%        | 2,564,669,718          | 385.4%                         |
| 2015              | 13,882,819,694                  | 24,085,671,123                    | 10,202,851,429                              | 57.6%        | 2,641,866,650          | 386.2%                         |
| 2016              | 14,026,331,996                  | 25,669,915,820                    | 11,643,583,824                              | 54.6%        | 2,710,650,565          | 429.5%                         |
| 2017              | 14,256,409,942                  | 24,782,085,138                    | 10,525,675,196                              | 57.5%        | 2,774,207,203          | 379.4%                         |
| 2018              | 14,303,725,826                  | 25,509,851,980                    | 11,206,126,154                              | 56.1%        | 2,898,827,271          | 386.6%                         |
| 2019              | 14,922,049,783                  | 25,717,648,220                    | 10,795,598,437                              | 58.0%        | 2,995,452,821          | 360.4%                         |
| 2020              | 16,039,286,529                  | 27,116,805,311                    | 11,077,518,782                              | 59.1%        | 3,089,161,069          | 358.6%                         |

## Section 2: Actuarial Valuation Results

### SCHOOL DIVISION Schedule of Funding Progress

| As of December 31 | Actuarial Value of Assets (AVA) | Actuarial Accrued Liability (AAL) | Unfunded Actuarial Accrued Liability (UAAL) | Funded Ratio | Annual Covered Payroll | UAAL as a % of Covered Payroll |
|-------------------|---------------------------------|-----------------------------------|---|--------------|------------------------|--------------------------------|
| 2011              | \$19,266,110,172                | \$31,986,199,035                  | \$12,720,088,863                            | 60.2%        | \$3,821,603,410        | 332.8%                         |
| 2012              | 20,266,573,925                  | 32,619,033,148                    | 12,352,459,223                              | 62.1%        | 3,819,065,598          | 323.4%                         |
| 2013              | 21,369,379,750                  | 35,437,311,570                    | 14,067,931,820                              | 60.3%        | 3,938,649,818          | 357.2%                         |
| 2014              | 22,143,356,419                  | 36,386,532,173                    | 14,243,175,754                              | 60.9%        | 4,063,235,757          | 350.5%                         |
| 2015              | 22,871,661,446                  | 37,677,153,575                    | 14,805,492,129                              | 60.7%        | 4,235,290,282          | 349.6%                         |
| 2016              | 23,263,343,921                  | 41,352,968,451                    | 18,089,624,530                              | 56.3%        | 4,349,319,783          | 415.9%                         |
| 2017              | 23,780,045,308                  | 40,046,214,502                    | 16,266,169,194                              | 59.4%        | 4,471,356,847          | 363.8%                         |
| 2018              | 24,094,441,728                  | 41,598,399,420                    | 17,503,957,692                              | 57.9%        | 4,789,503,451          | 365.5%                         |
| 2019              | 25,412,013,802                  | 42,425,061,135                    | 17,013,047,333                              | 59.9%        | 5,104,430,888          | 333.3%                         |
| 2020              | 27,581,088,477                  | 45,532,074,935                    | 17,950,986,458                              | 60.6%        | 5,146,117,910          | 348.8%                         |

## Section 2: Actuarial Valuation Results

### LOCAL GOVERNMENT DIVISION Schedule of Funding Progress

| As of December 31 | Actuarial Value of Assets (AVA) | Actuarial Accrued Liability (AAL) | Unfunded Actuarial Accrued Liability (UAAL) | Funded Ratio | Annual Covered Payroll | UAAL as a % of Covered Payroll |
|-------------------|---------------------------------|-----------------------------------|---|--------------|------------------------|--------------------------------|
| 2011              | \$2,882,691,014                 | \$4,160,014,773                   | \$1,277,323,759                             | 69.3%        | \$718,169,015          | 177.9%                         |
| 2012              | 3,098,721,347                   | 4,157,620,538                     | 1,058,899,191                               | 74.5%        | 523,668,446            | 202.2%                         |
| 2013              | 3,291,297,571                   | 4,502,281,918                     | 1,210,984,347                               | 73.1%        | 529,003,436            | 228.9%                         |
| 2014              | 3,629,400,231                   | 4,610,967,519                     | 981,567,288                                 | 78.7%        | 540,468,037            | 181.6%                         |
| 2015              | 3,777,160,876                   | 4,780,697,981                     | 1,003,537,105                               | 79.0%        | 561,518,205            | 178.7%                         |
| 2016              | 3,879,197,057                   | 5,213,051,954                     | 1,333,854,897                               | 74.4%        | 608,222,609            | 219.3%                         |
| 2017              | 4,009,412,912                   | 5,045,932,015                     | 1,036,519,103                               | 79.5%        | 632,768,337            | 163.8%                         |
| 2018              | 4,070,679,098                   | 5,240,885,213                     | 1,170,206,115                               | 77.7%        | 660,998,127            | 177.0%                         |
| 2019              | 4,288,325,330                   | 5,316,433,330                     | 1,028,108,000                               | 80.7%        | 681,093,520            | 150.9%                         |
| 2020              | 4,663,030,639                   | 5,658,903,096                     | 995,872,457                                 | 82.4%        | 698,059,659            | 142.7%                         |

## Section 2: Actuarial Valuation Results

### JUDICIAL DIVISION Schedule of Funding Progress

| As of December 31 | Actuarial Value of Assets (AVA) | Actuarial Accrued Liability (AAL) | Unfunded Actuarial Accrued Liability (UAAL) | Funded Ratio | Annual Covered Payroll | UAAL as a % of Covered Payroll |
|-------------------|---------------------------------|-----------------------------------|---|--------------|------------------------|--------------------------------|
| 2011              | \$221,514,844                   | \$319,437,250                     | \$97,922,406                                | 69.3%        | \$39,033,369           | 250.9%                         |
| 2012              | 238,806,614                     | 326,897,142                       | 88,090,528                                  | 73.1%        | 39,045,008             | 225.6%                         |
| 2013              | 256,800,478                     | 351,598,057                       | 94,797,579                                  | 73.0%        | 39,941,730             | 237.3%                         |
| 2014              | 270,866,145                     | 371,253,240                       | 100,387,095                                 | 73.0%        | 42,976,979             | 233.6%                         |
| 2015              | 286,890,898                     | 401,965,650                       | 115,074,752                                 | 71.4%        | 46,869,730             | 245.5%                         |
| 2016              | 297,888,464                     | 447,117,414                       | 149,228,950                                 | 66.6%        | 48,699,531             | 306.4%                         |
| 2017              | 310,084,726                     | 428,108,199                       | 118,023,473                                 | 72.4%        | 48,947,607             | 241.1%                         |
| 2018              | 315,970,361                     | 447,756,933                       | 131,786,572                                 | 70.6%        | 50,505,856             | 260.9%                         |
| 2019              | 342,071,056                     | 462,038,140                       | 119,967,084                                 | 74.0%        | 53,427,351             | 224.5%                         |
| 2020              | 376,437,305                     | 478,204,823                       | 101,767,518                                 | 78.7%        | 54,780,086             | 185.8%                         |

## Section 2: Actuarial Valuation Results

### DENVER PUBLIC SCHOOLS DIVISION Schedule of Funding Progress

| As of December 31 | Actuarial Value of Assets (AVA) | Actuarial Accrued Liability (AAL) | Unfunded Actuarial Accrued Liability (UAAL) | Funded Ratio | Annual Covered Payroll | UAAL as a % of Covered Payroll |
|-------------------|---------------------------------|-----------------------------------|---|--------------|------------------------|--------------------------------|
| 2011              | \$2,804,705,933                 | \$3,442,527,012                   | \$637,821,079                               | 81.5%        | \$491,646,251          | 129.7%                         |
| 2012              | 2,936,695,129                   | 3,495,549,312                     | 558,854,183                                 | 84.0%        | 510,872,366            | 109.4%                         |
| 2013              | 3,075,894,894                   | 3,785,871,992                     | 709,977,098                                 | 81.2%        | 547,659,912            | 129.6%                         |
| 2014              | 3,151,455,921                   | 3,816,092,735                     | 664,636,814                                 | 82.6%        | 584,319,269            | 113.7%                         |
| 2015              | 3,207,326,956                   | 3,905,240,456                     | 697,913,500                                 | 82.1%        | 621,114,573            | 112.4%                         |
| 2016              | 3,220,935,045                   | 4,246,430,437                     | 1,025,495,392                               | 75.9%        | 642,177,158            | 159.7%                         |
| 2017              | 3,257,769,807                   | 4,088,526,454                     | 830,756,647                                 | 79.7%        | 658,198,306            | 126.2%                         |
| 2018              | 3,261,337,748                   | 4,248,602,214                     | 987,264,466                                 | 76.8%        | 722,040,073            | 136.7%                         |
| 2019              | 3,410,264,090                   | 4,263,384,355                     | 853,120,265                                 | 80.0%        | 736,263,798            | 115.9%                         |
| 2020              | 3,682,072,107                   | 4,532,545,623                     | 850,473,516                                 | 81.2%        | 771,347,604            | 110.3%                         |

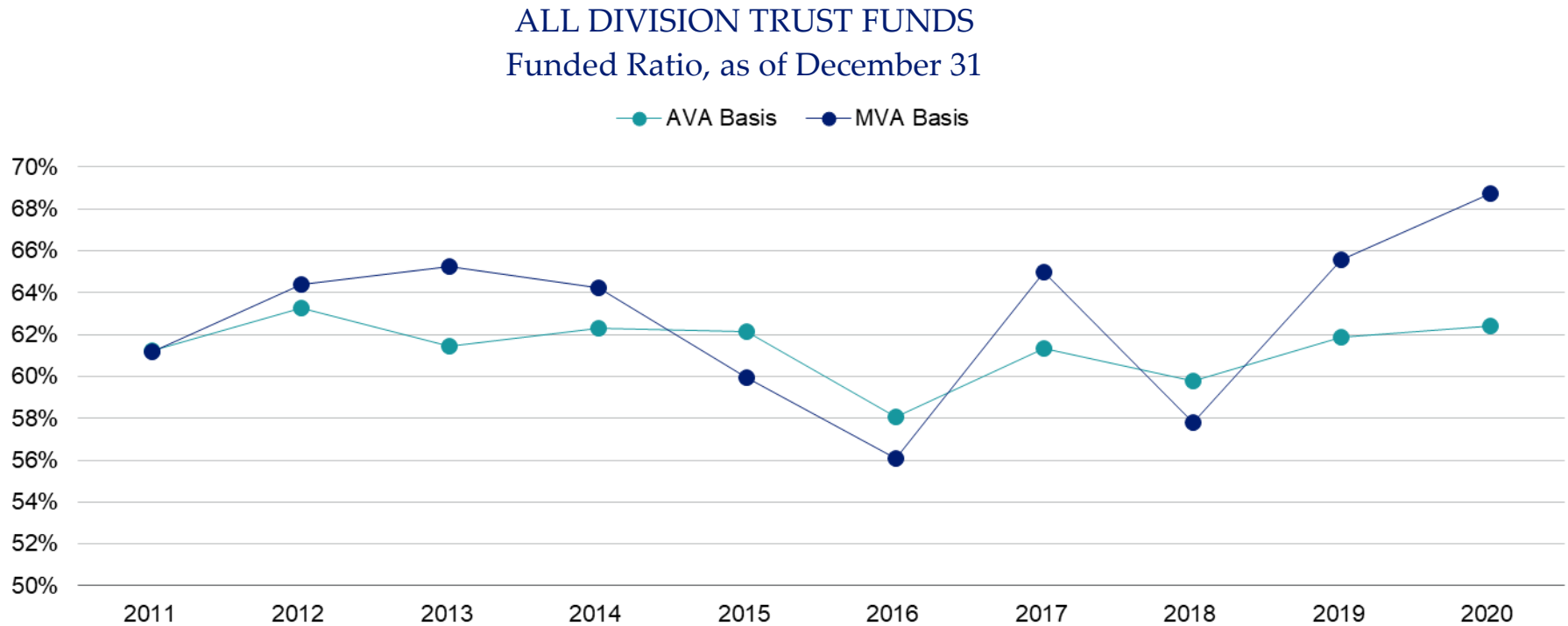
## Section 2: Actuarial Valuation Results

### ALL DIVISION TRUST FUNDS Schedule of Funding Progress

| As of December 31 | Actuarial Value of Assets (AVA) | Actuarial Accrued Liability (AAL) | Unfunded Actuarial Accrued Liability (UAAL) | Funded Ratio | Annual Covered Payroll | UAAL as a % of Covered Payroll |
|-------------------|---------------------------------|-----------------------------------|---|--------------|------------------------|--------------------------------|
| 2011              | \$37,185,066,667                | \$60,734,721,541                  | \$23,549,654,874                            | 61.2%        | \$7,464,243,447        | 315.5%                         |
| 2012              | 39,079,472,464                  | 61,790,595,265                    | 22,711,122,801                              | 63.2%        | 7,277,585,379          | 312.1%                         |
| 2013              | 41,122,832,649                  | 66,920,788,703                    | 25,797,956,054                              | 61.5%        | 7,530,220,378          | 342.6%                         |
| 2014              | 42,718,566,293                  | 68,593,166,820                    | 25,874,600,527                              | 62.3%        | 7,795,669,760          | 331.9%                         |
| 2015              | 44,025,859,870                  | 70,850,728,785                    | 26,824,868,915                              | 62.1%        | 8,106,659,440          | 330.9%                         |
| 2016              | 44,687,696,483                  | 76,929,484,076                    | 32,241,787,593                              | 58.1%        | 8,359,069,646          | 385.7%                         |
| 2017              | 45,613,722,695                  | 74,390,866,308                    | 28,777,143,613                              | 61.3%        | 8,585,478,300          | 335.2%                         |
| 2018              | 46,046,154,761                  | 77,045,495,760                    | 30,999,340,999                              | 59.8%        | 9,121,874,778          | 339.8%                         |
| 2019              | 48,374,724,061                  | 78,184,565,180                    | 29,809,841,119                              | 61.9%        | 9,570,668,378          | 311.5%                         |
| 2020              | 52,341,915,057                  | 83,318,533,788                    | 30,976,618,731                              | 62.8%        | 9,759,466,328          | 317.4%                         |

## Section 2: Actuarial Valuation Results

The chart below shows the funded ratio for the total of all Division Trust Funds calculated using both the actuarial value of assets and the market value of assets.



## Section 2: Actuarial Valuation Results

### GFOA Solvency Test

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

#### STATE DIVISION Solvency Test as of December 31

| As of<br>December 31 | Aggregate Accrued Liabilities         |  |  | Actuarial Value of<br>Plan Assets | Portion of Accrued Liabilities Covered by<br>Plan Assets |       |      |
|----------------------|---------------------------------------|--|--|-----------------------------------|--|-------|------|
|                      | (1)<br>Active Member<br>Contributions | (2)<br>Retirees,<br>Beneficiaries, and<br>Inactive Members | (3)<br>Employer-Financed<br>Portion of Active<br>Members |                                   | (1)  | (2)   | (3)  |
| 2011                 | \$2,629,639,816                       | \$13,710,392,567   | \$4,486,511,088  | \$12,010,044,704                  | 100.0%   | 68.4% | 0.0% |
| 2012                 | 2,668,942,433                         | 14,191,468,725   | 4,331,083,967  | 12,538,675,449                    | 100.0%   | 69.5% | 0.0% |
| 2013                 | 2,675,468,549                         | 15,296,367,708   | 4,871,888,909  | 13,129,459,956                    | 100.0%   | 68.3% | 0.0% |
| 2014                 | 2,688,513,975                         | 15,846,199,642   | 4,873,607,536  | 13,523,487,577                    | 100.0%   | 68.4% | 0.0% |
| 2015                 | 2,685,014,226                         | 16,470,370,315   | 4,930,286,582  | 13,882,819,694                    | 100.0%   | 68.0% | 0.0% |
| 2016                 | 2,678,311,640                         | 17,933,226,454   | 5,058,377,726  | 14,026,331,996                    | 100.0%   | 63.3% | 0.0% |
| 2017                 | 2,668,406,361                         | 17,395,422,937   | 4,718,255,840  | 14,256,409,942                    | 100.0%   | 66.6% | 0.0% |
| 2018                 | 2,682,956,087                         | 18,095,951,346   | 4,730,944,547  | 14,303,725,826                    | 100.0%   | 64.2% | 0.0% |
| 2019                 | 2,737,022,568                         | 18,157,928,730   | 4,822,696,922  | 14,922,049,783                    | 100.0%   | 67.1% | 0.0% |
| 2020                 | 2,820,780,289                         | 18,876,015,731   | 5,420,009,291  | 16,039,286,529                    | 100.0%   | 70.0% | 0.0% |



## Section 2: Actuarial Valuation Results

### SCHOOL DIVISION Solvency Test as of December 31

| As of<br>December 31 | Aggregate Accrued Liabilities         |  |  |                                   | Portion of Accrued Liabilities Covered by<br>Plan Assets |       |      |
|----------------------|---------------------------------------|--|--|-----------------------------------|--|-------|------|
|                      | (1)<br>Active Member<br>Contributions | (2)<br>Retirees,<br>Beneficiaries, and<br>Inactive Members | (3)<br>Employer-Financed<br>Portion of Active<br>Members | Actuarial Value of<br>Plan Assets | (1)  | (2)   | (3)  |
| 2011                 | \$3,783,336,053                       | \$20,666,020,619   | \$7,536,842,363  | \$19,266,110,172                  | 100.0%   | 74.9% | 0.0% |
| 2012                 | 3,823,347,689                         | 21,466,077,782   | 7,329,607,677  | 20,266,573,925                    | 100.0%   | 76.6% | 0.0% |
| 2013                 | 3,881,145,368                         | 23,301,640,854   | 8,254,525,348  | 21,369,379,750                    | 100.0%   | 75.1% | 0.0% |
| 2014                 | 3,915,705,391                         | 24,247,868,140   | 8,222,958,642  | 22,143,356,419                    | 100.0%   | 75.2% | 0.0% |
| 2015                 | 4,003,251,233                         | 25,133,167,683   | 8,540,734,659  | 22,871,661,446                    | 100.0%   | 75.1% | 0.0% |
| 2016                 | 4,108,960,910                         | 27,922,422,826   | 9,321,584,715  | 23,263,343,921                    | 100.0%   | 68.6% | 0.0% |
| 2017                 | 4,212,088,158                         | 26,937,539,293   | 8,896,587,051  | 23,780,045,308                    | 100.0%   | 72.6% | 0.0% |
| 2018                 | 4,344,573,744                         | 27,922,414,342   | 9,331,411,334  | 24,094,441,728                    | 100.0%   | 70.7% | 0.0% |
| 2019                 | 4,551,131,706                         | 28,014,054,562   | 9,859,874,867  | 25,412,013,802                    | 100.0%   | 74.5% | 0.0% |
| 2020                 | 4,748,884,792                         | 29,376,412,086   | 11,406,778,057   | 27,581,088,477                    | 100.0%   | 77.7% | 0.0% |

## Section 2: Actuarial Valuation Results

### LOCAL GOVERNMENT DIVISION Solvency Test as of December 31

| As of<br>December 31 | Aggregate Accrued Liabilities         |  |  |                                   | Portion of Accrued Liabilities Covered by<br>Plan Assets |        |       |
|----------------------|---------------------------------------|--|--|-----------------------------------|--|--------|-------|
|                      | (1)<br>Active Member<br>Contributions | (2)<br>Retirees,<br>Beneficiaries, and<br>Inactive Members | (3)<br>Employer-Financed<br>Portion of Active<br>Members | Actuarial Value of<br>Plan Assets | (1)  | (2)    | (3)   |
| 2011                 | \$666,794,291                         | \$2,330,542,885  | \$1,162,677,597  | \$2,882,691,014                   | 100.0%   | 95.1%  | 0.0%  |
| 2012                 | 528,029,133                           | 2,750,955,523  | 878,635,882  | 3,098,721,347                     | 100.0%   | 93.4%  | 0.0%  |
| 2013                 | 533,003,238                           | 2,991,177,371  | 978,101,309  | 3,291,297,571                     | 100.0%   | 92.2%  | 0.0%  |
| 2014                 | 534,694,536                           | 3,114,435,619  | 961,837,364  | 3,629,400,231                     | 100.0%   | 99.4%  | 0.0%  |
| 2015                 | 533,262,306                           | 3,275,092,726  | 972,342,949  | 3,777,160,876                     | 100.0%   | 99.0%  | 0.0%  |
| 2016                 | 545,507,394                           | 3,573,343,965  | 1,094,200,595  | 3,879,197,057                     | 100.0%   | 93.3%  | 0.0%  |
| 2017                 | 544,524,644                           | 3,482,526,035  | 1,018,881,336  | 4,009,412,912                     | 100.0%   | 99.5%  | 0.0%  |
| 2018                 | 549,498,715                           | 3,679,914,640  | 1,011,471,858  | 4,070,679,098                     | 100.0%   | 95.7%  | 0.0%  |
| 2019                 | 565,273,471                           | 3,713,892,020  | 1,037,267,839  | 4,288,325,330                     | 100.0%   | 100.0% | 0.9%  |
| 2020                 | 579,210,635                           | 3,895,852,003  | 1,183,840,458  | 4,663,030,639                     | 100.0%   | 100.0% | 15.9% |

## Section 2: Actuarial Valuation Results

### JUDICIAL DIVISION Solvency Test as of December 31

| As of<br>December 31 | Aggregate Accrued Liabilities         |  |  |                                   | Portion of Accrued Liabilities Covered by<br>Plan Assets |       |      |
|----------------------|---------------------------------------|--|--|-----------------------------------|--|-------|------|
|                      | (1)<br>Active Member<br>Contributions | (2)<br>Retirees,<br>Beneficiaries, and<br>Inactive Members | (3)<br>Employer-Financed<br>Portion of Active<br>Members | Actuarial Value of<br>Plan Assets | (1)  | (2)   | (3)  |
| 2011                 | \$54,688,241                          | \$186,420,121  | \$78,328,888   | \$221,514,844                     | 100.0%   | 89.5% | 0.0% |
| 2012                 | 57,762,144                            | 193,773,713  | 75,361,285   | 238,806,614                       | 100.0%   | 93.4% | 0.0% |
| 2013                 | 59,347,907                            | 208,235,801  | 84,014,349   | 256,800,478                       | 100.0%   | 94.8% | 0.0% |
| 2014                 | 60,973,005                            | 214,541,387  | 95,738,848   | 270,866,145                       | 100.0%   | 97.8% | 0.0% |
| 2015                 | 60,118,183                            | 232,302,854  | 109,544,613  | 286,890,898                       | 100.0%   | 97.6% | 0.0% |
| 2016                 | 58,119,195                            | 273,416,269  | 115,581,950  | 297,888,464                       | 100.0%   | 87.7% | 0.0% |
| 2017                 | 54,972,648                            | 277,541,632  | 95,593,919   | 310,084,726                       | 100.0%   | 91.9% | 0.0% |
| 2018                 | 57,922,275                            | 286,044,533  | 103,790,125  | 315,970,361                       | 100.0%   | 90.2% | 0.0% |
| 2019                 | 57,144,769                            | 304,173,187  | 100,720,184  | 342,071,056                       | 100.0%   | 93.7% | 0.0% |
| 2020                 | 58,778,792                            | 318,646,517  | 100,779,514  | 376,437,305                       | 100.0%   | 99.7% | 0.0% |

## Section 2: Actuarial Valuation Results

### DENVER PUBLIC SCHOOLS DIVISION Solvency Test as of December 31

| As of<br>December 31 | Aggregate Accrued Liabilities         |  |  |                                   | Portion of Accrued Liabilities Covered by<br>Plan Assets |        |       |
|----------------------|---------------------------------------|--|--|-----------------------------------|--|--------|-------|
|                      | (1)<br>Active Member<br>Contributions | (2)<br>Retirees,<br>Beneficiaries, and<br>Inactive Members | (3)<br>Employer-Financed<br>Portion of Active<br>Members | Actuarial Value of<br>Plan Assets | (1)  | (2)    | (3)   |
| 2011                 | \$333,550,047                         | \$2,435,504,442  | \$673,472,523  | \$2,804,705,933                   | 100.0%   | 100.0% | 5.3%  |
| 2012                 | 348,739,324                           | 2,479,706,314  | 667,103,674  | 2,936,695,129                     | 100.0%   | 100.0% | 16.2% |
| 2013                 | 364,126,482                           | 2,672,260,182  | 749,485,328  | 3,075,894,894                     | 100.0%   | 100.0% | 5.3%  |
| 2014                 | 379,240,340                           | 2,665,352,277  | 771,500,118  | 3,151,455,921                     | 100.0%   | 100.0% | 13.9% |
| 2015                 | 394,305,861                           | 2,732,879,071  | 778,055,524  | 3,207,326,956                     | 100.0%   | 100.0% | 10.3% |
| 2016                 | 402,849,242                           | 2,999,767,090  | 843,814,105  | 3,220,935,045                     | 100.0%   | 93.9%  | 0.0%  |
| 2017                 | 419,239,199                           | 2,867,253,544  | 802,033,711  | 3,257,769,807                     | 100.0%   | 99.0%  | 0.0%  |
| 2018                 | 438,007,813                           | 2,941,987,529  | 868,606,872  | 3,261,337,748                     | 100.0%   | 96.0%  | 0.0%  |
| 2019                 | 461,074,750                           | 2,906,773,493  | 895,536,112  | 3,410,264,090                     | 100.0%   | 100.0% | 4.7%  |
| 2020                 | 501,422,397                           | 2,975,191,020  | 1,055,932,206  | 3,682,072,107                     | 100.0%   | 100.0% | 19.5% |

## Section 2: Actuarial Valuation Results

### ALL DIVISION TRUST FUNDS Solvency Test as of December 31

| As of<br>December 31 | Aggregate Accrued Liabilities         |  |  |                                   | Portion of Accrued Liabilities Covered by<br>Plan Assets |       |      |
|----------------------|---------------------------------------|--|--|-----------------------------------|--|-------|------|
|                      | (1)<br>Active Member<br>Contributions | (2)<br>Retirees,<br>Beneficiaries, and<br>Inactive Members | (3)<br>Employer-Financed<br>Portion of Active<br>Members | Actuarial Value of<br>Plan Assets | (1)  | (2)   | (3)  |
| 2011                 | \$7,468,008,448                       | \$39,328,880,634   | \$13,937,832,459   | \$37,185,066,667                  | 100.0%   | 75.6% | 0.0% |
| 2012                 | 7,426,820,723                         | 41,081,982,057   | 13,281,792,485   | 39,079,472,464                    | 100.0%   | 77.0% | 0.0% |
| 2013                 | 7,513,091,544                         | 44,469,681,916   | 14,938,015,243   | 41,122,832,649                    | 100.0%   | 75.6% | 0.0% |
| 2014                 | 7,579,127,247                         | 46,088,397,065   | 14,925,642,508   | 42,718,566,293                    | 100.0%   | 76.2% | 0.0% |
| 2015                 | 7,675,951,809                         | 47,843,812,649   | 15,330,964,327   | 44,025,859,870                    | 100.0%   | 76.0% | 0.0% |
| 2016                 | 7,793,748,381                         | 52,702,176,604   | 16,433,559,091   | 44,687,696,483                    | 100.0%   | 70.0% | 0.0% |
| 2017                 | 7,899,231,010                         | 50,960,283,441   | 15,531,351,857   | 45,613,722,695                    | 100.0%   | 74.0% | 0.0% |
| 2018                 | 8,072,958,634                         | 52,926,312,390   | 16,046,224,736   | 46,046,154,761                    | 100.0%   | 71.7% | 0.0% |
| 2019                 | 8,371,647,264                         | 53,096,821,992   | 16,716,095,924   | 48,374,724,061                    | 100.0%   | 75.3% | 0.0% |
| 2020                 | 8,709,076,905                         | 55,442,117,357   | 19,167,339,526   | 52,341,915,057                    | 100.0%   | 78.7% | 0.0% |

## Section 2: Actuarial Valuation Results

### Summary of Actuarial Valuation Results

Liabilities as of December 31, 2020

| Determination of Unfunded Actuarial Accrued Liability                  | State Division          | School Division         | Local Government Division | Judicial Division    | Denver Public Schools Division | Total                   |
|--|-------------------------|-------------------------|---------------------------|----------------------|--------------------------------|-------------------------|
| 1 Present value of future benefits, active members                     |                         |                         |                           |                      |                                |                         |
| a. Retirement benefits   | \$9,639,726,748         | \$19,613,579,363        | \$2,087,832,180           | \$224,152,233        | \$1,970,390,163                | \$33,535,680,687        |
| b. Disability benefits   | 187,379,049             | 216,859,731             | 39,830,110                | 3,445,671            | 29,106,052                     | 476,620,613             |
| c. Death benefits  | 166,649,398             | 228,914,761             | 39,437,607                | 5,126,211            | 25,274,569                     | 465,402,546             |
| d. Withdrawal benefits   | <u>1,186,213,590</u>    | <u>2,178,660,729</u>    | <u>258,163,314</u>        | <u>6,210,158</u>     | <u>390,841,521</u>             | <u>4,020,089,312</u>    |
| e. Total   | \$11,179,968,785        | \$22,238,014,584        | \$2,425,263,211           | \$238,934,273        | \$2,415,612,305                | \$38,497,793,158        |
| 2 Inactive vested members  | 589,665,691             | 1,008,626,049           | 243,302,173               | 4,262,292            | 115,136,215                    | 1,960,992,420           |
| 3 Inactive non-vested members  | 175,451,932             | 277,746,002             | 55,447,756                | 134,547              | 47,509,123                     | 556,289,360             |
| 4 Retirees and beneficiaries   | <u>18,110,898,108</u>   | <u>28,090,040,035</u>   | <u>3,597,102,074</u>      | <u>314,249,678</u>   | <u>2,812,545,682</u>           | <u>52,924,835,577</u>   |
| 5 Actuarial present value of projected benefits: <b>1e + 2 + 3 + 4</b> | \$30,055,984,516        | \$51,614,426,670        | \$6,321,115,214           | \$557,580,790        | \$5,390,803,325                | \$93,939,910,515        |
| 6 Actuarial present value of future normal costs, active members       |                         |                         |                           |                      |                                |                         |
| a. Retirement benefits   | \$1,954,767,451         | \$4,401,491,892         | \$448,492,240             | \$69,908,385         | \$575,582,103                  | \$7,450,242,071         |
| b. Disability benefits   | 81,358,397              | 93,327,937              | 16,931,172                | 1,924,856            | 13,824,970                     | 207,367,332             |
| c. Death benefits  | 58,686,388              | 84,167,188              | 14,298,440                | 2,238,523            | 11,248,052                     | 170,638,591             |
| d. Withdrawal benefits   | <u>844,366,969</u>      | <u>1,503,364,718</u>    | <u>182,490,266</u>        | <u>5,304,203</u>     | <u>257,602,577</u>             | <u>2,793,128,733</u>    |
| e. Total   | \$2,939,179,205         | \$6,082,351,735         | \$662,212,118             | \$79,375,967         | \$858,257,702                  | \$10,621,376,727        |
| 7 <b>Actuarial accrued liability: 5 – 6e</b>                           | <b>\$27,116,805,311</b> | <b>\$45,532,074,935</b> | <b>\$5,658,903,096</b>    | <b>\$478,204,823</b> | <b>\$4,532,545,623</b>         | <b>\$83,318,533,788</b> |
| 8 Actuarial value of assets  | <u>16,039,286,529</u>   | <u>27,581,088,477</u>   | <u>4,663,030,639</u>      | <u>376,437,305</u>   | <u>3,682,072,107</u>           | <u>52,341,915,057</u>   |
| 9 <b>Unfunded/(overfunded) actuarial accrued liability: 7 – 8</b>      | <b>\$11,077,518,782</b> | <b>\$17,950,986,458</b> | <b>\$995,872,457</b>      | <b>\$101,767,518</b> | <b>\$850,473,516</b>           | <b>\$30,976,618,731</b> |

## Section 2: Actuarial Valuation Results

### Actuarial Balance Sheet

An overview of the Division Trust Funds is given by an Actuarial Balance Sheet. First, the amount and timing of all future payments that will be made by the Division Trust Funds for current participants is determined. Then these payments are discounted at the valuation interest rate to the date of the valuation, thereby determining the present value, referred to as the “liability” of the Division Trust Funds.

Second, this liability is compared to the assets. The “assets” for this purpose include the net amount of assets already accumulated by the Division Trust Funds, the present value of future member contributions, the present value of future employer normal cost contributions, and the present value of future employer amortization payments for the unfunded actuarial accrued liability.

#### Actuarial Balance Sheet

|  | State Division          | School Division         | Local Government Division | Judicial Division    | Denver Public Schools Division | Total                   |
|--|-------------------------|-------------------------|---------------------------|----------------------|--------------------------------|-------------------------|
| <b>Liabilities:</b>  |                         |                         |                           |                      |                                |                         |
| • Present value of benefits for retired members            | \$17,898,421,264        | \$27,891,817,445        | \$3,557,014,690           | \$289,371,514        | \$2,789,605,866                | \$52,426,230,779        |
| • Present value of benefits for survivors                  | 212,476,844             | 198,222,590             | 40,087,384                | 24,878,164           | 22,939,816                     | 498,604,798             |
| • Present value of benefits for inactive members           | 765,117,623             | 1,286,372,051           | 298,749,929               | 4,396,839            | 162,645,338                    | 2,517,281,780           |
| • Present value of benefits for active members             | <u>11,179,968,785</u>   | <u>22,238,014,584</u>   | <u>2,425,263,211</u>      | <u>238,934,273</u>   | <u>2,415,612,305</u>           | <u>38,497,793,158</u>   |
| <b>Total liabilities</b>                                   | <b>\$30,055,984,516</b> | <b>\$51,614,426,670</b> | <b>\$6,321,115,214</b>    | <b>\$557,580,790</b> | <b>\$5,390,803,325</b>         | <b>\$93,939,910,515</b> |
| <b>Assets:</b>   |                         |                         |                           |                      |                                |                         |
| • Total valuation value of assets                          | \$16,039,286,529        | \$27,581,088,477        | \$4,663,030,639           | \$376,437,305        | \$3,682,072,107                | \$52,341,915,057        |
| • Present value of future member contributions             | 2,666,580,760           | 4,827,052,253           | 492,134,706               | 55,880,672           | 749,447,022                    | \$8,791,095,413         |
| <b>Present value of future employer contributions for:</b> |                         |                         |                           |                      |                                |                         |
| • Entry age normal costs                                   | 272,598,445             | 1,255,299,482           | 170,077,412               | 23,495,295           | 108,810,680                    | \$1,830,281,314         |
| • Unfunded actuarial accrued liability                     | <u>11,077,518,782</u>   | <u>17,950,986,458</u>   | <u>995,872,457</u>        | <u>101,767,518</u>   | <u>850,473,516</u>             | <u>\$30,976,618,731</u> |
| <b>Total of current and future assets</b>                  | <b>\$30,055,984,516</b> | <b>\$51,614,426,670</b> | <b>\$6,321,115,214</b>    | <b>\$557,580,790</b> | <b>\$5,390,803,325</b>         | <b>\$93,939,910,515</b> |

## Section 2: Actuarial Valuation Results

### Risk

The actuarial valuation results depend on a single set of assumptions; however, there is a risk that emerging results may differ significantly as actual experience proves to be different than projected from the current assumptions.

We have not been engaged to perform a detailed analysis of the potential range of the impact of risks relative to PERA's future financial condition, but have included a brief discussion of some of the risks that may affect the Division Trust Funds. A more detailed assessment of the risks could provide a better understanding of the risks inherent in the Division Trust Funds. This assessment may include scenario testing, sensitivity testing, stress testing, and stochastic modeling. Annually, pursuant to Section 24-51-614, C.R.S. from the Office of the State Auditor and at PERA's request, the actuary prepares a document called the Signal Light report. The purpose of the Signal Light report is to help assess the Division Trust Funds' funding progress and to provide information to assess whether the funding mechanisms promote sustainability. PERA has expanded the Signal Light report to include stochastic modeling and other enhancements to provide a more detailed risk assessment.

It is important to note that this actuarial valuation is based on plan assets as of December 31, 2020. PERA's actuarial funded status does not reflect short term fluctuations of the market, but rather is based on the market values on the last day of each plan year. While it is impossible to determine how the market will perform over the next several months, and how that will affect the results of next year's valuation, Segal is available to prepare projections of potential outcomes upon request.

A detailed risk assessment, including stochastic modeling, would provide additional useful information. PERA has undergone significant benefit changes, including the Automatic Adjustment Provision that is expected to allow PERA to achieve full funding in 30 years. Stochastic modeling is critical in order to monitor the likelihood of achieving PERA's funding goals. A detailed risk assessment could model funded percentages, effective amortization periods and projected actuarially determined contributions based upon PERA's target asset allocation and capital market assumptions. The results would allow PERA to assess the likelihood of positive or negative occurrences.

The following risks could significantly affect the Plans' future condition:

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

The assets total approximately \$58 billion. If the actual market value return for the Plan Year were 1% different from the assumed (either higher or lower), the projected unfunded actuarial liability would change by about \$580 million.

If the prior year's investment performance resulted in a market value of assets that is 10% different from the current value, it would result in a change of \$5.8 billion in the asset value. A 10% increase in assets would cause the unfunded liability (market value basis) to decrease from \$25.7 billion to \$19.9 billion. Likewise, a 10% decrease in the asset value, would cause the unfunded liability to increase from \$25.7 billion to \$31.5 billion.



## Section 2: Actuarial Valuation Results

The market value rate of return over the last ten years has ranged from a low of (3.5%) to a high of 20.3%.

- The projected year that the funded ratio reaches 100% for each Division Trust Fund is dependent upon investment returns, as well as future changes in demographics, growth in active membership, benefit structure, and projected contributions. The following table demonstrates the sensitivity of investment returns and these elements on the projected number of years to full funding. The projected number of years until the funded ratio reaches 100% is determined under three scenarios:
  - The December 31, 2019 actuarial valuation results
  - The December 31, 2020 actuarial valuation, reflecting the revised actuarial assumptions, greater than expected 2020 investment return and other plan experience
  - The December 31, 2020 actuarial valuation, reflecting the anticipated adjustments to take effect during 2022, resulting from the automatic adjustment provisions enacted through SB18-200.
- At the direction of PERA, these deterministic projections of all Division Trust Funds reflect the lower cost benefit structure for new members and use the following assumptions:
  - All actuarial assumptions, including achieving 7.25% investment returns are realized.
  - Active membership growth for State and Judicial is 0.25% each year.
  - Active membership growth for School, Local Government, and Denver Public Schools is 1.00% per year.
  - New entrants have the same demographic mix as new hires over the last five years.
  - Projected Payroll for new entrants is assumed to grow at 3.00% per year.

### Projected number of years until the funded ratio reaches 100%

|  | State Division | School Division | Local Government Division | Judicial Division | Denver Public Schools Division |
|--|----------------|-----------------|---------------------------|-------------------|--------------------------------|
| December 31, 2019 actuarial valuation results <sup>1</sup>   | 22             | 24              | 14                        | 12                | 11                             |
| December 31, 2020 actuarial valuation results <sup>1,2</sup>   | 23             | 26              | 11                        | 8                 | 8                              |
| December 31, 2020 actuarial valuation results including the anticipated adjustments to take effect July 1, 2022, resulting from the automatic adjustment provisions <sup>1,2,3</sup> | 20             | 22              | 8                         | 7                 | 7                              |

<sup>1</sup> Includes impact of AAP adjustments effective July 1, 2020 and legislative changes pursuant to HB 20-1379 and HB 20-1394, effective July 1, 2020.

<sup>2</sup> Includes impact of revised actuarial assumptions effective December 31, 2020, and reflects 2020 plan experience.

<sup>3</sup> Includes impact of AAP adjustments effective July 1, 2022.

## Section 2: Actuarial Valuation Results

To provide an illustration of the potential risk of varied investment return outcomes, below is a table showing the number of years until the funded ratio reaches 100% for the School Division Trust Fund as of December 31, 2020 under the various return scenarios (used for both assumed investment return and to discount liabilities of the plan) that correspond to the confidence levels (probabilities of investment return) as indicated.

### School Division Projected Number of Years Until the Funded Ratio Reaches 100%<sup>1</sup>

| Probability of achieving at least the rate of return displayed (or better), per annum <sup>2</sup> | Long-Term Expected Investment Return and Discount Rate |       |       |       |        |
|--|--|-------|-------|-------|--------|
|  | 4.35%  | 6.18% | 7.25% | 8.63% | 10.47% |
| 95%  | Infinite   |       |       |       |        |
| 75%  |  | 49    |       |       |        |
| 53%  |  |       | 22    |       |        |
| 25%  |  |       |       | 9     |        |
| 5%   |  |       |       |       | 2      |

<sup>1</sup> Reflects the results and experience of the December 31, 2020 Actuarial Funding Valuation, the revised actuarial assumptions, and the effect of the automatic adjustment provisions pursuant to SB 18-200.

<sup>2</sup> Results reflecting 50-year probability outlooks (Monte Carlo simulations), based on 30-year capital market assumptions, provided by the Board's investment consultants, at the time the Board last reviewed and confirmed the long-term expected rate of return/discount rate of 7.25%.

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

The actuarial valuation includes an expectation of future improvement in life expectancy. Emerging plan experience that does not match these expectations will result in either an increase or decrease in the actuarially determined contribution. A 10% reduction in the assumed mortality rates results in an increase in the liabilities of roughly 3% for most plans. For PERA, a 3% liability increase would result in an increase in the unfunded accrued liability from \$25.7 billion to \$28.2 billion.

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

Examples of this risk include:

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

## Section 2: Actuarial Valuation Results

- **Maturity Measures**

The risk associated with a pension plan increases as it becomes more mature, meaning that as the retiree population increases, the active membership represents a smaller portion of the liabilities of the plan. When this happens, there is a greater risk that fluctuations in the experience of the non-active participants or of the assets of the plan can result in large swings in the contribution requirements.

- Currently the Plan has a total retirees and survivors to active participant ratio of 0.64. For the prior year, benefits paid were \$2.2 billion more than contributions received. As the Plans mature, more cash will be needed from the investment portfolio to meet benefit payments.
- As of December 31, 2020, the retired life actuarial accrued liability represents 64% of the total actuarial accrued liability. In addition, the actuarial accrued liability for inactive vested and non-vested participants represents 3% of the total. The higher the non-active actuarial accrued liability is as a percent of the total liability, the greater the danger of volatility in results.

# Section 3: Supplemental Information

## Exhibit A: Membership Data

Membership data was provided on electronic files sent by PERA staff. 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.

### Division Trust Funds Number of Members

| Item  | State Division | School Division | Local Government Division | Judicial Division | Denver Public Schools Division | Total          |
|---|----------------|-----------------|---------------------------|-------------------|--------------------------------|----------------|
| 1. Retirees and survivors (includes deferred survivors) | 41,988         | 70,397          | 8,198                     | 416               | 7,134                          | 128,133        |
| 2. Terminated members entitled to future benefits       | 7,802          | 19,413          | 2,730                     | 14                | 2,237                          | 32,196         |
| 3. Inactive members                                     | 83,941         | 144,066         | 27,245                    | 5                 | 14,661                         | 269,918        |
| 4. Active members                                       |                |                 |                           |                   |                                |                |
| • Vested  |                |                 |                           |                   |                                |                |
| General members   | 30,129         | 69,489          | 6,254                     | 268               | 7,800                          | 113,940        |
| State Trooper members                                   | 702            | 0               | 1                         | 0                 | 0                              | 703            |
| • Non-Vested  |                |                 |                           |                   |                                |                |
| General members   | 22,023         | 49,932          | 6,489                     | 76                | 6,893                          | 85,413         |
| State Trooper members                                   | <u>789</u>     | <u>0</u>        | <u>13</u>                 | <u>0</u>          | <u>0</u>                       | <u>802</u>     |
| • Total actives   | 53,643         | 119,421         | 12,757                    | 344               | 14,693                         | 200,858        |
| 5. Grand total: 1 + 2 + 3 + 4                           | <u>187,374</u> | <u>353,297</u>  | <u>50,930</u>             | <u>779</u>        | <u>38,725</u>                  | <u>631,105</u> |

## Section 3: Supplemental Information

### Exhibit B: Membership Data by Benefit Tier

| Item   | Division Trust Funds<br>Number of Members |                       |                           |                   |                                |
|--|---|-----------------------|---------------------------|-------------------|--------------------------------|
|  | State Division                            | School Division       | Local Government Division | Judicial Division | Denver Public Schools Division |
| <b>1. Active members</b>                                       |   |                       |                           |                   |                                |
| • PERA benefit structure hired prior to 1/1/2007               | 15,851                                    | 38,819                | 3,259                     | 163               | 759                            |
| • DPS benefit structure  | 91  | 709                   | 4                         | 0                 | 2,425                          |
| • PERA benefit structure hired after 12/31/2006                | 37,701                                    | 79,893                | 9,494                     | 181               | 11,509                         |
| <b>2. Terminated vested members</b>                            |   |                       |                           |                   |                                |
| • PERA benefit structure hired prior to 1/1/2007               | 5,174                                     | 12,897                | 1,961                     | 9                 | 269                            |
| • DPS benefit structure  | 36  | 173                   | 1                         | 0                 | 963                            |
| • PERA benefit structure hired after 12/31/2006                | 2,592                                     | 6,343                 | 768                       | 5                 | 1,005                          |
| <b>3. Inactive members</b>                                     |   |                       |                           |                   |                                |
| • PERA benefit structure hired prior to 1/1/2007               | 33,499                                    | 48,780                | 9,490                     | 1                 | 289                            |
| • DPS benefit structure  | 7   | 46                    | 2                         | 0                 | 765                            |
| • PERA benefit structure hired after 12/31/2006                | 50,435                                    | 95,240                | 17,753                    | 4                 | 13,607                         |
| <b>4. Retirees and survivors (includes deferred survivors)</b> |   |                       |                           |                   |                                |
| • PERA benefit structure hired prior to 1/1/2007               | 40,313                                    | 68,193                | 7,801                     | 394               | 161                            |
| • DPS benefit structure  | 33  | 125                   | 1                         | 1                 | 6,672                          |
| • PERA benefit structure hired after 12/31/2006                | 1,642                                     | 2,079                 | 396                       | 21                | 301                            |
| <b>5. Grand total: 1 + 2 + 3 + 4</b>                           | <b><u>187,374</u></b>                     | <b><u>353,297</u></b> | <b><u>50,930</u></b>      | <b><u>779</u></b> | <b><u>38,725</u></b>           |

## Section 3: Supplemental Information

### Exhibit C: Schedule of Active Member Data as of December 31, 2020

#### State Division

| Age          | Years of Service |               |              |              |              |              |            | Total         | Valuation Payroll      |
|--------------|------------------|---------------|--------------|--------------|--------------|--------------|------------|---------------|------------------------|
|              | Under 5          | 5 - 9         | 10 - 14      | 15 - 19      | 20 - 24      | 25 - 29      | 30 +       |               |                        |
| Under 20     | 156              | 0             | 0            | 0            | 0            | 0            | 0          | 156           | \$2,532,450            |
| 20 - 24      | 1,727            | 11            | 0            | 0            | 0            | 0            | 0          | 1,738         | 54,667,906             |
| 25 - 29      | 3,973            | 553           | 3            | 0            | 0            | 0            | 0          | 4,529         | 203,491,660            |
| 30 - 34      | 3,890            | 1,808         | 353          | 11           | 0            | 0            | 0          | 6,062         | 315,015,104            |
| 35 - 39      | 3,100            | 2,044         | 1,182        | 279          | 18           | 0            | 0          | 6,623         | 377,938,368            |
| 40 - 44      | 2,293            | 1,616         | 1,279        | 957          | 312          | 16           | 0          | 6,473         | 396,364,424            |
| 45 - 49      | 3,211            | 1,570         | 1,183        | 1,055        | 885          | 304          | 20         | 8,228         | 506,963,112            |
| 50 - 54      | 1,731            | 1,291         | 1,082        | 977          | 938          | 667          | 175        | 6,861         | 448,597,781            |
| 55 - 59      | 1,241            | 1,024         | 1,059        | 918          | 779          | 482          | 281        | 5,784         | 365,774,953            |
| 60           | 228              | 178           | 200          | 167          | 134          | 88           | 65         | 1,060         | 65,392,296             |
| 61           | 183              | 161           | 179          | 153          | 129          | 74           | 64         | 943           | 57,453,195             |
| 62           | 202              | 159           | 166          | 164          | 109          | 67           | 64         | 931           | 56,762,291             |
| 63           | 162              | 140           | 156          | 132          | 110          | 61           | 54         | 815           | 49,624,512             |
| 64           | 140              | 146           | 143          | 108          | 87           | 60           | 54         | 738           | 44,080,358             |
| 65           | 90               | 113           | 125          | 112          | 59           | 56           | 28         | 583           | 35,567,960             |
| 66           | 81               | 96            | 82           | 72           | 59           | 26           | 35         | 451           | 24,994,497             |
| 67           | 77               | 71            | 67           | 62           | 51           | 29           | 22         | 379           | 20,593,950             |
| 68           | 68               | 57            | 59           | 39           | 30           | 16           | 16         | 285           | 14,800,299             |
| 69           | 53               | 37            | 37           | 32           | 25           | 14           | 15         | 213           | 10,927,710             |
| 70 & up      | 206              | 134           | 131          | 118          | 73           | 52           | 77         | 791           | 37,618,243             |
| <b>Total</b> | <b>22,812</b>    | <b>11,209</b> | <b>7,486</b> | <b>5,356</b> | <b>3,798</b> | <b>2,012</b> | <b>970</b> | <b>53,643</b> | <b>\$3,089,161,069</b> |

|  |       |  |       |
|--|-------|--|-------|
| Average Age (General Members):                             | 45.55 | Average Age (State Trooper Members):                             | 38.98 |
| Average Service (General Members):                         | 9.10  | Average Service (State Trooper Members):                         | 7.81  |
| Average Expected Remaining Service Life (General Members): | 9.14  | Average Expected Remaining Service Life (State Trooper Members): | 13.70 |

## Section 3: Supplemental Information

### School Division

| Age          | Years of Service |               |               |               |              |              |              | Total          | Valuation Payroll      |
|--------------|------------------|---------------|---------------|---------------|--------------|--------------|--------------|----------------|------------------------|
|              | Under 5          | 5 - 9         | 10 - 14       | 15 - 19       | 20 - 24      | 25 - 29      | 30 +         |                |                        |
| Under 20     | 783              | 0             | 0             | 0             | 0            | 0            | 0            | 783            | \$8,033,031            |
| 20 - 24      | 4,781            | 79            | 0             | 0             | 0            | 0            | 0            | 4,860          | 114,220,955            |
| 25 - 29      | 8,511            | 1,888         | 25            | 0             | 0            | 0            | 0            | 10,424         | 374,613,483            |
| 30 - 34      | 6,416            | 4,857         | 1,024         | 41            | 0            | 0            | 0            | 12,338         | 504,878,948            |
| 35 - 39      | 5,882            | 3,876         | 3,460         | 1,053         | 25           | 0            | 0            | 14,296         | 627,031,404            |
| 40 - 44      | 8,840            | 3,406         | 2,929         | 3,353         | 837          | 26           | 0            | 19,391         | 841,608,411            |
| 45 - 49      | 4,770            | 3,171         | 2,559         | 2,644         | 2,505        | 594          | 23           | 16,266         | 816,832,806            |
| 50 - 54      | 3,490            | 2,684         | 2,597         | 2,515         | 2,140        | 1,758        | 247          | 15,431         | 791,394,310            |
| 55 - 59      | 2,747            | 1,925         | 2,012         | 2,437         | 1,733        | 1,047        | 514          | 12,415         | 579,663,919            |
| 60           | 486              | 362           | 317           | 419           | 331          | 155          | 69           | 2,139          | 90,396,576             |
| 61           | 424              | 297           | 306           | 412           | 272          | 142          | 71           | 1,924          | 79,363,055             |
| 62           | 404              | 257           | 275           | 321           | 246          | 129          | 55           | 1,687          | 69,229,890             |
| 63           | 393              | 229           | 257           | 268           | 239          | 107          | 48           | 1,541          | 60,059,074             |
| 64           | 347              | 213           | 205           | 204           | 158          | 90           | 50           | 1,267          | 47,888,477             |
| 65           | 247              | 180           | 135           | 170           | 117          | 80           | 22           | 951            | 35,116,412             |
| 66           | 220              | 125           | 91            | 115           | 81           | 56           | 31           | 719            | 25,723,953             |
| 67           | 181              | 119           | 76            | 97            | 47           | 40           | 18           | 578            | 20,487,334             |
| 68           | 189              | 76            | 58            | 52            | 36           | 34           | 19           | 464            | 13,552,225             |
| 69           | 159              | 85            | 49            | 41            | 36           | 22           | 16           | 408            | 11,962,210             |
| 70 & up      | 662              | 331           | 217           | 141           | 83           | 55           | 50           | 1,539          | 34,061,437             |
| <b>Total</b> | <b>49,932</b>    | <b>24,160</b> | <b>16,592</b> | <b>14,283</b> | <b>8,886</b> | <b>4,335</b> | <b>1,233</b> | <b>119,421</b> | <b>\$5,146,117,910</b> |

Average Age: 44.67  
 Average Service: 9.09  
 Average Expected Remaining Service Life: 9.82

## Section 3: Supplemental Information

### Local Government Division

| Age          | Years of Service |              |              |              |            |            |            | Total         | Valuation Payroll    |
|--------------|------------------|--------------|--------------|--------------|------------|------------|------------|---------------|----------------------|
|              | Under 5          | 5 - 9        | 10 - 14      | 15 - 19      | 20 - 24    | 25 - 29    | 30 +       |               |                      |
| Under 20     | 446              | 0            | 0            | 0            | 0          | 0          | 0          | 446           | \$3,247,090          |
| 20 - 24      | 596              | 15           | 0            | 0            | 0          | 0          | 0          | 611           | 13,613,750           |
| 25 - 29      | 943              | 125          | 4            | 0            | 0          | 0          | 0          | 1,072         | 44,355,688           |
| 30 - 34      | 919              | 360          | 67           | 5            | 0          | 0          | 0          | 1,351         | 71,389,129           |
| 35 - 39      | 693              | 392          | 175          | 96           | 13         | 0          | 0          | 1,369         | 81,170,943           |
| 40 - 44      | 757              | 377          | 232          | 180          | 74         | 8          | 0          | 1,628         | 100,457,484          |
| 45 - 49      | 527              | 297          | 226          | 260          | 133        | 58         | 2          | 1,503         | 100,376,053          |
| 50 - 54      | 457              | 267          | 211          | 274          | 160        | 104        | 23         | 1,496         | 102,851,246          |
| 55 - 59      | 420              | 225          | 208          | 269          | 147        | 88         | 51         | 1,408         | 90,777,031           |
| 60           | 83               | 42           | 34           | 42           | 31         | 18         | 19         | 269           | 16,261,545           |
| 61           | 81               | 43           | 40           | 35           | 20         | 16         | 9          | 244           | 13,261,593           |
| 62           | 68               | 26           | 38           | 33           | 22         | 15         | 7          | 209           | 12,737,053           |
| 63           | 50               | 28           | 31           | 37           | 20         | 8          | 10         | 184           | 11,468,682           |
| 64           | 52               | 39           | 24           | 21           | 16         | 11         | 4          | 167           | 9,130,576            |
| 65           | 54               | 20           | 22           | 26           | 13         | 11         | 4          | 150           | 7,067,772            |
| 66           | 44               | 22           | 14           | 13           | 7          | 6          | 4          | 110           | 5,149,581            |
| 67           | 38               | 19           | 12           | 10           | 5          | 2          | 2          | 88            | 3,144,477            |
| 68           | 41               | 18           | 7            | 11           | 5          | 2          | 1          | 85            | 3,298,077            |
| 69           | 35               | 8            | 13           | 6            | 4          | 3          | 3          | 72            | 2,733,689            |
| 70 & up      | 198              | 35           | 29           | 22           | 6          | 3          | 2          | 295           | 5,568,200            |
| <b>Total</b> | <b>6,502</b>     | <b>2,358</b> | <b>1,387</b> | <b>1,340</b> | <b>676</b> | <b>353</b> | <b>141</b> | <b>12,757</b> | <b>\$698,059,659</b> |

|  |       |  |       |
|--|-------|--|-------|
| Average Age (General Members):                             | 44.66 | Average Age (State Trooper Members):                             | 37.45 |
| Average Service (General Members):                         | 7.74  | Average Service (State Trooper Members):                         | 1.20  |
| Average Expected Remaining Service Life (General Members): | 8.87  | Average Expected Remaining Service Life (State Trooper Members): | 8.02  |



## Section 3: Supplemental Information

### Judicial Division

| Age          | Years of Service |           |           |           |           |           |           | Total      | Valuation Payroll   |
|--------------|------------------|-----------|-----------|-----------|-----------|-----------|-----------|------------|---------------------|
|              | Under 5          | 5 - 9     | 10 - 14   | 15 - 19   | 20 - 24   | 25 - 29   | 30 +      |            |                     |
| Under 20     | 0                | 0         | 0         | 0         | 0         | 0         | 0         | 0          | -                   |
| 20 - 24      | 0                | 0         | 0         | 0         | 0         | 0         | 0         | 0          | -                   |
| 25 - 29      | 0                | 0         | 0         | 0         | 0         | 0         | 0         | 0          | -                   |
| 30 - 34      | 1                | 2         | 0         | 0         | 0         | 0         | 0         | 3          | \$280,130           |
| 35 - 39      | 7                | 6         | 4         | 0         | 0         | 0         | 0         | 17         | 2,350,114           |
| 40 - 44      | 20               | 8         | 8         | 3         | 0         | 0         | 0         | 39         | 5,992,067           |
| 45 - 49      | 16               | 13        | 6         | 8         | 2         | 0         | 0         | 45         | 7,042,087           |
| 50 - 54      | 18               | 12        | 21        | 13        | 3         | 4         | 1         | 72         | 11,611,951          |
| 55 - 59      | 7                | 10        | 19        | 13        | 9         | 3         | 4         | 65         | 10,761,446          |
| 60           | 1                | 3         | 2         | 1         | 2         | 0         | 3         | 12         | 2,048,654           |
| 61           | 2                | 2         | 4         | 1         | 2         | 2         | 2         | 15         | 2,541,384           |
| 62           | 1                | 1         | 3         | 4         | 0         | 1         | 0         | 10         | 1,561,034           |
| 63           | 0                | 1         | 3         | 0         | 3         | 1         | 0         | 8          | 1,378,713           |
| 64           | 0                | 4         | 4         | 1         | 4         | 0         | 1         | 14         | 2,324,957           |
| 65           | 1                | 0         | 1         | 1         | 0         | 0         | 1         | 4          | 661,764             |
| 66           | 0                | 0         | 1         | 3         | 2         | 1         | 1         | 8          | 1,296,446           |
| 67           | 0                | 0         | 2         | 2         | 1         | 2         | 0         | 7          | 1,128,009           |
| 68           | 0                | 0         | 3         | 1         | 2         | 3         | 1         | 10         | 1,556,285           |
| 69           | 1                | 0         | 0         | 2         | 1         | 0         | 0         | 4          | 535,738             |
| 70 & up      | 1                | 2         | 4         | 1         | 0         | 1         | 2         | 11         | 1,709,307           |
| <b>Total</b> | <b>76</b>        | <b>64</b> | <b>85</b> | <b>54</b> | <b>31</b> | <b>18</b> | <b>16</b> | <b>344</b> | <b>\$54,780,086</b> |

Average Age: 54.57  
 Average Service: 12.71  
 Average Expected Remaining Service Life: 10.80

## Section 3: Supplemental Information

### Denver Public Schools Division

| Age          | Years of Service |              |              |            |            |            |           | Total         | Valuation Payroll    |
|--------------|------------------|--------------|--------------|------------|------------|------------|-----------|---------------|----------------------|
|              | Under 5          | 5 - 9        | 10 - 14      | 15 - 19    | 20 - 24    | 25 - 29    | 30 +      |               |                      |
| Under 20     | 78               | 0            | 0            | 0          | 0          | 0          | 0         | 78            | \$1,229,735          |
| 20 - 24      | 664              | 5            | 0            | 0          | 0          | 0          | 0         | 669           | 17,502,701           |
| 25 - 29      | 1,588            | 314          | 2            | 0          | 0          | 0          | 0         | 1,904         | 82,291,570           |
| 30 - 34      | 1,313            | 995          | 181          | 2          | 0          | 0          | 0         | 2,491         | 130,949,162          |
| 35 - 39      | 824              | 783          | 529          | 41         | 3          | 0          | 0         | 2,180         | 127,343,456          |
| 40 - 44      | 1,233            | 579          | 437          | 210        | 37         | 1          | 0         | 2,497         | 134,197,745          |
| 45 - 49      | 426              | 359          | 322          | 216        | 158        | 17         | 1         | 1,499         | 91,251,428           |
| 50 - 54      | 291              | 261          | 299          | 176        | 161        | 59         | 12        | 1,259         | 76,943,070           |
| 55 - 59      | 214              | 202          | 238          | 130        | 127        | 74         | 25        | 1,010         | 58,390,634           |
| 60           | 25               | 30           | 36           | 20         | 17         | 11         | 5         | 144           | 7,276,260            |
| 61           | 44               | 26           | 34           | 20         | 19         | 3          | 2         | 148           | 7,557,636            |
| 62           | 31               | 37           | 34           | 17         | 19         | 5          | 3         | 146           | 6,726,449            |
| 63           | 18               | 26           | 42           | 9          | 18         | 7          | 3         | 123           | 5,879,281            |
| 64           | 26               | 20           | 35           | 19         | 7          | 6          | 4         | 117           | 5,684,167            |
| 65           | 21               | 17           | 20           | 13         | 10         | 2          | 2         | 85            | 4,131,072            |
| 66           | 18               | 15           | 25           | 12         | 4          | 0          | 1         | 75            | 3,453,915            |
| 67           | 16               | 8            | 8            | 8          | 7          | 2          | 2         | 51            | 2,281,474            |
| 68           | 10               | 14           | 9            | 2          | 3          | 1          | 2         | 41            | 1,794,005            |
| 69           | 14               | 8            | 11           | 2          | 6          | 0          | 1         | 42            | 1,750,596            |
| 70 & up      | 39               | 41           | 34           | 3          | 8          | 5          | 4         | 134           | 4,713,248            |
| <b>Total</b> | <b>6,893</b>     | <b>3,740</b> | <b>2,296</b> | <b>900</b> | <b>604</b> | <b>193</b> | <b>67</b> | <b>14,693</b> | <b>\$771,347,604</b> |

|  |       |   |       |
|--|-------|---|-------|
| Average Age (DPS Benefit Structure) :                            | 50.35 | Average Age (PERA Benefit Structure):                             | 39.18 |
| Average Service (DPS Benefit Structure):                         | 17.48 | Average Service (PERA Benefit Structure):                         | 5.18  |
| Average Expected Remaining Service Life (DPS Benefit Structure): | 8.28  | Average Expected Remaining Service Life (PERA Benefit Structure): | 10.14 |

## Section 3: Supplemental Information

### Exhibit D: Schedule of Benefit Recipients by Annual Benefit as of December 31, 2020

| Annual Benefit Range <sup>1</sup> | Number of Benefit Recipients <sup>2</sup> |                      |                           |                   |                                | Total                 |
|-----------------------------------|---|----------------------|---------------------------|-------------------|--------------------------------|-----------------------|
|                                   | State Division                            | School Division      | Local Government Division | Judicial Division | Denver Public Schools Division |                       |
| \$0 - \$4,999                     | 2,268                                     | 6,535                | 507                       | 5                 | 270                            | 9,585                 |
| \$5,000 - \$9,999                 | 2,777                                     | 6,558                | 712                       | 12                | 504                            | 10,563                |
| \$10,000 - \$24,999               | 8,899                                     | 14,713               | 1,975                     | 33                | 1,475                          | 27,095                |
| \$25,000 - \$49,999               | 14,776                                    | 20,519               | 2,636                     | 67                | 2,517                          | 40,515                |
| \$50,000 - \$99,999               | 11,938                                    | 21,201               | 2,084                     | 199               | 2,305                          | 37,727                |
| \$100,000 - \$149,999             | 1,075                                     | 663                  | 230                       | 94                | 57                             | 2,119                 |
| \$150,000 - \$199,999             | 97  | 39                   | 28                        | 4                 | 0                              | 168                   |
| \$200,000 - \$249,999             | 31  | 8                    | 6                         | 0                 | 0                              | 45                    |
| \$250,000 - \$299,999             | 3   | 2                    | 1                         | 0                 | 0                              | 6                     |
| \$300,000 +                       | 4   | 1                    | 1                         | 0                 | 0                              | 6                     |
| <b>Total Benefit Recipients:</b>  | <b><u>41,868</u></b>                      | <b><u>70,239</u></b> | <b><u>8,180</u></b>       | <b><u>414</u></b> | <b><u>7,128</u></b>            | <b><u>127,829</u></b> |

<sup>1</sup> Includes amounts paid under replacement benefit arrangements

<sup>2</sup> Does not include 304 deferred survivors

## Section 3: Supplemental Information

### Exhibit E: Schedule of Retirees, Beneficiaries, and Survivors Added to and Removed from the Benefit Payroll

| Divison                           | Added to Payroll |                | Removed from Payroll |                | Payroll - End of Year |                 | Average Annual Benefits | Increase in Average Benefit |
|-----------------------------------|------------------|----------------|----------------------|----------------|-----------------------|-----------------|-------------------------|-----------------------------|
|                                   | Number           | Annual Benefit | Number               | Annual Benefit | Number                | Annual Benefit  |                         |                             |
| <b>State</b>                      |                  |                |                      |                |                       |                 |                         |                             |
| • 12/31/2019                      | 1,805            | \$60,004,122   | 939                  | \$33,418,682   | 41,181                | \$1,644,019,948 | \$39,922                | (0.5%)                      |
| • 12/31/2020                      | 1,939            | \$63,669,828   | 1,252                | \$20,885,946   | 41,868                | \$1,686,803,830 | \$40,289                | 0.9%                        |
| <b>School</b>                     |                  |                |                      |                |                       |                 |                         |                             |
| • 12/31/2019                      | 3,149            | \$84,865,404   | 1,163                | \$39,402,271   | 68,362                | \$2,478,594,485 | \$36,257                | (1.1%)                      |
| • 12/31/2020                      | 3,506            | \$98,641,497   | 1,629                | \$15,175,838   | 70,239                | \$2,562,060,144 | \$36,476                | 0.6%                        |
| <b>Local Government</b>           |                  |                |                      |                |                       |                 |                         |                             |
| • 12/31/2019                      | 426              | \$13,283,210   | 137                  | \$4,898,210    | 7,933                 | \$298,036,860   | \$37,569                | (0.9%)                      |
| • 12/31/2020                      | 418              | \$13,867,438   | 171                  | \$544,659      | 8,180                 | \$311,359,639   | \$38,064                | 1.3%                        |
| <b>Judicial</b>                   |                  |                |                      |                |                       |                 |                         |                             |
| • 12/31/2019                      | 27               | \$2,115,235    | 8                    | \$400,305      | 399                   | \$28,264,642    | \$70,839                | 1.4%                        |
| • 12/31/2020                      | 25               | \$2,141,893    | 10                   | \$387,294      | 414                   | \$30,019,241    | \$72,510                | 2.4%                        |
| <b>Denver Public School</b>       |                  |                |                      |                |                       |                 |                         |                             |
| • 12/31/2019                      | 234              | \$6,854,297    | 241                  | \$9,248,121    | 7,143                 | \$276,115,436   | \$38,655                | (0.8%)                      |
| • 12/31/2020                      | 256              | \$7,957,106    | 271                  | \$5,910,106    | 7,128                 | \$278,162,436   | \$39,024                | 1.0%                        |
| <b>Total Division Trust Funds</b> |                  |                |                      |                |                       |                 |                         |                             |
| • 12/31/2019                      | 5,641            | \$167,122,268  | 2,488                | \$87,367,589   | 125,018               | \$4,725,031,371 | \$37,795                | (0.8%)                      |
| • 12/31/2020                      | 6,144            | \$186,277,762  | 3,333                | \$42,903,843   | 127,829               | \$4,868,405,290 | \$38,085                | 0.8%                        |

Note: Does not include 304 deferred survivors

## Section 3: Supplemental Information

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

| Year Ended December 31, 2020                                   | State Division          | School Division         | Local Government Division | Judicial Division    | Denver Public Schools Division | Total                   |
|--|-------------------------|-------------------------|---------------------------|----------------------|--------------------------------|-------------------------|
| <b>Net assets at market value at the beginning of the year</b> | <b>\$15,819,842,540</b> | <b>\$26,936,490,370</b> | <b>\$4,545,959,241</b>    | <b>\$362,108,323</b> | <b>\$3,616,649,237</b>         | <b>\$51,281,049,711</b> |
| • Employer contributions                                       | 626,943,850             | 1,020,832,715           | 85,169,653                | 10,112,951           | 50,888,256                     | 1,793,947,425           |
| • Nonemployer contributions                                    | 0                       | 0                       | 0                         | 0                    | 0                              | 0                       |
| • Member contributions   | 298,264,227             | 501,214,013             | 58,066,767                | 6,636,790            | 73,938,901                     | 938,120,698             |
| • Purchased service  | 28,475,258              | 35,579,863              | 8,889,610                 | 1,054,434            | 1,515,338                      | 75,514,503              |
| • Employer disaffiliation                                      | <u>0</u>                | <u>0</u>                | <u>0</u>                  | <u>0</u>             | <u>0</u>                       | <u>0</u>                |
| <b>Total contributions</b>                                     | <b>\$953,683,335</b>    | <b>\$1,557,626,591</b>  | <b>\$152,126,030</b>      | <b>\$17,804,175</b>  | <b>\$126,342,495</b>           | <b>\$2,807,582,626</b>  |
| <b>Net investment income / (loss)</b>                          | <b>2,624,546,182</b>    | <b>4,517,761,954</b>    | <b>763,970,686</b>        | <b>61,280,748</b>    | <b>604,161,062</b>             | <b>8,571,720,632</b>    |
| • Other additions  | <u>10,433,298</u>       | <u>805,322</u>          | <u>272,967</u>            | <u>2,568,086</u>     | <u>74,439</u>                  | <u>14,154,112</u>       |
| <b>Total additions</b>   | <b>\$3,588,662,815</b>  | <b>\$6,076,193,867</b>  | <b>\$916,369,683</b>      | <b>\$81,653,009</b>  | <b>\$730,577,996</b>           | <b>\$11,393,457,370</b> |
| • Retirees/cobeneficiary benefits                              | 1,660,235,677           | 2,519,895,420           | 305,158,383               | 29,068,496           | 276,536,388                    | 4,790,894,364           |
| • Survivor benefits  | <u>14,812,023</u>       | <u>15,613,609</u>       | <u>2,635,926</u>          | <u>341,272</u>       | <u>1,544,991</u>               | <u>34,947,821</u>       |
| <b>Total benefits</b>  | <b>\$1,675,047,700</b>  | <b>\$2,535,509,029</b>  | <b>\$307,794,309</b>      | <b>\$29,409,768</b>  | <b>\$278,081,379</b>           | <b>\$4,825,842,185</b>  |
| • Refunds of contributions                                     | 57,920,860              | 67,873,432              | 12,827,681                | 47,650               | 9,343,344                      | 148,012,967             |
| • Disability and life insurance premiums                       | 1,360,560               | 2,285,717               | 295,565                   | 28,310               | 293,635                        | 4,263,787               |
| • Administrative expenses                                      | 11,385,187              | 22,778,633              | 2,458,507                 | 87,487               | 2,667,383                      | 39,377,197              |
| • Other deductions   | <u>2,633,624</u>        | <u>11,349,409</u>       | <u>3,146,211</u>          | <u>90,194</u>        | <u>1,022,177</u>               | <u>18,241,615</u>       |
| <b>Total deductions</b>  | <b>\$1,748,347,931</b>  | <b>\$2,639,796,220</b>  | <b>\$326,522,273</b>      | <b>\$29,663,409</b>  | <b>\$291,407,918</b>           | <b>\$5,035,737,751</b>  |
| <b>Net increase in assets</b>                                  | <b>\$1,840,314,884</b>  | <b>\$3,436,397,647</b>  | <b>\$589,847,410</b>      | <b>\$51,989,600</b>  | <b>\$439,170,078</b>           | <b>\$6,357,719,619</b>  |
| <b>Net assets at end of year</b>                               | <b>\$17,660,157,424</b> | <b>\$30,372,888,017</b> | <b>\$5,135,806,651</b>    | <b>\$414,097,923</b> | <b>\$4,055,819,315</b>         | <b>\$57,638,769,330</b> |
| Annual increase reserve  | <u>219,789,334</u>      | <u>301,296,781</u>      | <u>58,830,893</u>         | <u>2,752,635</u>     | <u>51,758,821</u>              | <u>634,428,464</u>      |
| <b>Total net assets</b>  | <b>\$17,879,946,758</b> | <b>\$30,674,184,798</b> | <b>\$5,194,637,544</b>    | <b>\$416,850,558</b> | <b>\$4,107,578,136</b>         | <b>\$58,273,197,794</b> |

## Section 3: Supplemental Information

### Exhibit G: Development of the Fund through December 31, 2020

| Year Ended December 31 | Employer and Nonemployer Contributions | Member Contributions | Other Contributions | Net Investment Return | Admin. Expenses | Benefit Payments  | Market Value of Assets at Year-End | Actuarial Value of Assets at Year-End | Actuarial Value as a Percent of Market Value |
|------------------------|--|----------------------|---------------------|-----------------------|-----------------|-------------------|------------------------------------|---------------------------------------|--|
| 2011                   | \$917,966,618                          | \$708,208,908        | \$8,063,184         | \$662,618,450         | (\$29,138,780)  | (\$3,522,138,858) | \$37,164,437,884                   | \$37,185,066,667                      | 100.1%                                       |
| 2012                   | 995,299,619                            | 690,354,880          | 136,682             | 4,321,580,601         | (28,669,872)    | (3,717,322,398)   | 39,793,127,468                     | 39,079,472,464                        | 98.2%  |
| 2013                   | 1,101,883,008                          | 665,393,643          | 5,074,751           | 5,545,015,463         | (32,632,196)    | (3,908,686,678)   | 43,649,375,160                     | 41,122,832,649                        | 94.2%  |
| 2014                   | 1,382,775,624                          | 693,520,807          | 328,298             | 2,446,720,072         | (33,896,525)    | (4,069,524,098)   | 44,069,299,338                     | 42,718,566,293                        | 96.9%  |
| 2015                   | 1,291,902,066                          | 726,938,223          | 8,712,504           | 662,526,310           | (36,573,100)    | (4,258,467,219)   | 42,464,338,122                     | 44,025,859,870                        | 103.7%                                       |
| 2016                   | 1,397,246,801                          | 745,253,243          | 14,898,401          | 3,001,297,334         | (38,491,246)    | (4,435,891,724)   | 43,148,650,931                     | 44,687,696,483                        | 103.6%                                       |
| 2017                   | 1,493,726,236                          | 773,899,920          | 23,960,613          | 7,594,869,464         | (40,247,753)    | (4,653,583,222)   | 48,341,276,189                     | 45,613,722,695                        | 94.4%  |
| 2018                   | 1,810,698,197                          | 799,632,169          | 17,693,257          | (1,587,662,306)       | (41,088,490)    | (4,800,812,287)   | 44,539,736,729                     | 46,046,154,761                        | 103.4%                                       |
| 2019                   | 1,926,462,923                          | 883,594,876          | 10,126,625          | 8,851,276,087         | (39,186,043)    | (4,890,961,486)   | 51,281,049,711                     | 48,374,724,061                        | 94.3%  |
| 2020                   | 1,793,947,425                          | 1,013,635,201        | 14,154,112          | 8,571,720,632         | (39,377,197)    | (4,996,360,554)   | 57,638,769,330                     | 52,341,915,057                        | 90.8%  |

## Section 3: Supplemental Information

### Exhibit H: Definition of Pension Terms

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

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

## Section 3: Supplemental Information

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



## Section 3: Supplemental Information

|  |   |
|--|---|
| <b>Assumptions or Actuarial Assumptions (continued):</b> | <p><u>Withdrawal rates</u> - the rates at which employees of various ages are expected to leave employment for reasons other than death, disability, or retirement;</p> <p><u>Salary increase rates</u> - the rates of salary increase due to inflation and productivity growth.</p>  |
| <b>Closed Amortization Period:</b>                       | A specific number of years that is counted down by one each year, and therefore declines to zero with the passage of time. For example, if the amortization period is initially set at 30 years, it is 29 years at the end of one year, 28 years at the end of two years, etc. See Open Amortization Period.  |
| <b>Decrements:</b>                                       | Those causes/events due to which a member's status (active-inactive-retiree-beneficiary) changes, that is: death, retirement, disability, or withdrawal.  |
| <b>Defined Benefit Plan:</b>                             | A retirement plan in which benefits are defined by a formula applied to the member's compensation and/or years of service.  |
| <b>Defined Contribution Plan:</b>                        | A retirement plan, such as a 401(k) plan, a 403(b) plan, or a 457 plan, in which the contributions to the plan are assigned to an account for each member, the plan's earnings are allocated to each account, and each member's benefits are a direct function of the account balance.  |
| <b>Employer Normal Cost:</b>                             | The portion of the Normal Cost to be paid by the employer. This is equal to the Normal Cost less expected member contributions.   |
| <b>Experience Study:</b>                                 | A periodic review and analysis of the actual experience of the Fund that may lead to a revision of one or more actuarial assumptions. Actual rates of decrement and salary increases are compared to the actuarially assumed values and modified as deemed appropriate by the Actuary.  |
| <b>Funded Ratio:</b>                                     | The ratio of the actuarial value of assets (AVA) to the actuarial accrued liability (AAL). Plans sometimes calculate a market funded ratio, using the market value of assets (MVA), rather than the AVA.  |
| <b>Funding Period or Amortization Period:</b>            | The term "Funding Period" is used in two ways. First, it is the period used in calculating the Amortization Payment as a component of the ADC. Second, it is a calculated item: the number of years in the future that will theoretically be required to amortize (i.e., pay off or eliminate) the Unfunded Actuarial Accrued Liability, based on the statutory employer contribution rate, and assuming no future actuarial gains or losses. |
| <b>Investment Return:</b>                                | The rate of earnings of the Fund from its investments, including interest, dividends and capital gain and loss adjustments, computed as a percentage of the average value of the fund. For actuarial purposes, the investment return often reflects a smoothing of the capital gains and losses to avoid significant swings in the value of assets from one year to the next.   |
| <b>Margin:</b>   | The difference, whether positive or negative, between the statutory employer contribution rate and the Actuarially Determined Contribution (ADC).   |

## Section 3: Supplemental Information

|  |   |
|--|---|
| <b>Mark Value of Assets:</b>                       | Plan assets at the fair market value of assets.   |
| <b>Normal Cost:</b>                                | That portion of the Actuarial Present Value of pension plan benefits and expenses allocated to a valuation year by the Actuarial Cost Method. Any payment in respect of an Unfunded Actuarial Accrued Liability is not part of Normal Cost (see Amortization Payment). For pension plan benefits that are provided in part by employee contributions, Normal Cost refers to the total of employee contributions and employer Normal Cost unless otherwise specifically stated. Under the entry age normal cost method, the Normal Cost is intended to be the level cost (when expressed as a percentage of pay) needed to fund the benefits of a member from hire until ultimate termination, death, disability, or retirement. |
| <b>Open Amortization Period:</b>                   | An open amortization period is one which is used to determine the Amortization Payment but which does not change over time. If the initial period is set as 30 years, the same 30-year period is used in determining the Amortization Period each year. In theory, if an Open Amortization Period with level percentage of payroll is used to amortize the Unfunded Actuarial Accrued Liability, the UAAL will never decrease, but will become smaller each year, in relation to covered payroll, if the actuarial assumptions are realized.  |
| <b>Real Rate of Return:</b>                        | Nominal rate of return on investments, adjusted for inflation.  |
| <b>Unfunded Actuarial Accrued Liability:</b>       | The excess of the Actuarial Accrued Liability over the Actuarial Value of Assets. This value may be negative, in which case it may be expressed as a negative Unfunded Actuarial Accrued Liability, also called the Funding Surplus.  |
| <b>Valuation Date or Actuarial Valuation Date:</b> | The date as of which the value of assets is determined and as of which the Actuarial Present Value of Future Plan Benefits is determined. The expected benefits to be paid in the future are discounted to this date.   |

# Section 4: Actuarial Valuation Basis

## Exhibit I: Actuarial Assumptions and Actuarial Cost Method

|   |  |
|---|--|
| <b>Rationale for Assumptions</b>        | <p>The information and analysis used in selecting each assumption that has a significant effect on this actuarial valuation resulted from the <i>Public Employees' Retirement Association of Colorado Analysis of Actuarial Experience during the Period January 1, 2016 through December 31, 2019</i> dated October 28, 2020.</p> <p>The revised assumptions proposed in this report were adopted by the Board on November 20, 2020, effective for the December 31, 2020, actuarial valuation and measurement date.</p> <p>As a result of the 2019 Asset Liability Study, concluded at the November 15, 2019 Board meeting, the Board reaffirmed the 7.25% assumed long-term rate of investment return effective as of January 1, 2020.</p>   |
| <b>Long-Term Rate of Return</b>         | 7.25%, net of investment expenses  |
| <b>Price Inflation Assumption</b>       | 2.30%  |
| <b>Real Wage Inflation Assumption</b>   | 0.70%  |
| <b>Wage Inflation Assumption</b>        | 3.00%  |
| <b>Interest Credit</b>                  | 3.00% per annum on member contribution account balances  |
| <b>Expected Administrative Expenses</b> | 0.40%  |
| <b>Actuarial Cost Method</b>            | Entry Age Actuarial Cost Method. Entry Age is the age at date of employment or, if date is unknown, current age minus years of service. Normal Cost and Actuarial Accrued Liability are calculated on an individual basis and are allocated by salary, with Normal Cost determined using the plan of benefits applicable to each member.   |
| <b>Asset Valuation Method</b>           | The actuarial value of assets is determined using the "four-year smoothed value" asset valuation method. Under this method, investment gains and losses are recognized in equal portions over a four-year period. Investment gains and losses are determined by comparing the actual return on market value for a given period to the anticipated earnings over the same period if the market value at the beginning of the period, contributions, benefit payments, and administrative expenses during the period earned the expected rate of return for the portion of the period that each was expected to be included in, or excluded from, plan assets. The expected rate of return for this purpose is equal to the investment rate of return assumption at the beginning of the period. The resulting actuarial value of assets is not constrained to fall within a corridor around the market value of assets. |
| <b>Percent Married</b>                  | 100% of active members (80% for members of the DPS Division Trust Fund) are assumed to be married, with the wife 2 years younger than the husband.   |

## Section 4: Actuarial Valuation Basis

### Post-Retirement Benefit Increases [Annual Increases (AI)]

1.25% per year for members of the DPS Benefit Structure and members of the PERA Benefit Structure with membership prior to January 1, 2007. Increases for members of the PERA Benefit Structure with membership after December 31, 2006 are financed by the AIR. In the determination of the Actuarially Determined Contribution rate, as a percentage of covered payroll, the AIR is excluded from both assets and liabilities; thus, the rate at which benefits are assumed to increase for this group is 0.00%. The current AI maximum, or "AI cap" is subject to the Automatic Adjustment Provision.

### Withdrawal Assumption

For all but the Judicial Division, it is assumed that 35% of the vested members who terminate elect to withdraw their contributions and matching employer contributions while the remaining 65% elect to leave their contributions in the plan in order to be eligible for a benefit at their retirement date. For the Judicial Division, it is assumed that 100% of the vested members who terminate elect to leave their contributions in the plan in order to be eligible for a benefit at their retirement date. Current active members assumed to terminate service and leave their contributions in the plan in order to be eligible for a benefit at their retirement date are assumed to retire with a reduced benefit, if applicable, at an age based upon benefit structure, and/or service as shown in the following table:

| Assumed Age of Initial Benefit Receipt | Benefit Structure, State Trooper members, and/or Service                                    |
|--|---|
| 50                                     | PERA Benefit Structure Members (other than State Troopers) with 25 or More Years of Service |
| 50                                     | State Troopers with 20 or More Years of Service   |
| 55                                     | PERA Benefit Structure Members (other than State Troopers) with 20–25 Years of Service      |
| 60                                     | PERA Benefit Structure Members with Less than 20 Years of Service                           |
| 65                                     | DPS Benefit Structure Members   |

### Inactive Members

It is assumed that 100% of inactive members who terminated employment with less than five years of service elect to withdraw their contributions. Current inactive members in the PERA Benefit Structure who are assumed to leave their contributions in the plan in order to be eligible for a benefit at their retirement date are assumed to retire at age 62 with a pension benefit. Current inactive members in the DPS Benefit Structure who are assumed to leave their contributions in the plan in order to be eligible for a benefit at their retirement date are assumed to retire at age 65 with an unreduced pension benefit.

## Section 4: Actuarial Valuation Basis

### **Death Before Retirement**

For State and Local Government Divisions (General Members), pre-retirement mortality rates are based upon the PubG-2010 Employee table with generational projection using scale MP-2019.

For State and Local Government Divisions (State Trooper Members), pre-retirement mortality rates are based upon the PubS-2010 Employee table with generational projection using scale MP-2019.

For School and DPS Divisions, pre-retirement mortality rates are based upon the PubT-2010 Employee table with generational projection using scale MP-2019.

For the Judicial Division, pre-retirement mortality rates are based upon the PubG-2010(A) Above-Median Employee table with generational projection using scale MP-2019.

All mortality tables described above are benefit-weighted.

## Section 4: Actuarial Valuation Basis

### Death After Retirement

For the State and Local Government Divisions (General Members), post-retirement non-disabled retiree mortality rates are based upon the PubG-2010 Healthy Retiree table with adjustments for credibility and gender. For males, the adjustments are 94% of the rates prior to age 80 and 90% of the rates for ages 80 and older, with generational projection using scale MP-2019. For females, the adjustments are 87% of the rates prior to age 80 and 107% of the rates for ages 80 and older, with generational projection using scale MP-2019.

For the State and Local Government Divisions (State Trooper Members), the post-retirement non-disabled retiree mortality table is the unadjusted PubS-2010 Healthy Retiree table, with generational projection using scale MP-2019.

For the School and DPS Divisions, the post-retirement non-disabled retiree mortality table is the PubT-2010 Healthy Retiree table with adjustments for credibility and gender. For males, the adjustments are 112% of the rates prior to age 80 and 94% of the rates for ages 80 and older, with generational projection using scale MP-2019. For females, the adjustments are 83% of the rates prior to age 80 and 106% of the rates for ages 80 and older, with generational projection using scale MP-2019.

For the Judicial Division, the post-retirement non-disabled retiree mortality table is the unadjusted PubG-2010(A) Above-Median Healthy Retiree table, with generational projection using scale MP-2019.

For all Divisions, the post-retirement non-disabled beneficiary mortality table is the Pub-2010 Contingent Survivor table with adjustments for credibility and gender. For males, the adjustments are 97% of the rates for all ages, with generational projection using scale MP-2019. For females, the adjustments are 105% of the female rates for all ages, with generational projection using scale MP-2019.

For all Divisions except State Trooper Members, the disabled mortality rates are based upon the PubNS-2010 Disabled Retiree table using 99% of the rates for all ages with generational projection using scale MP-2019.

For State Trooper Members in the State and Local Government Divisions, the disabled mortality rates are based upon the unadjusted PubS-2010 Disabled Retiree table with generational projection using scale MP-2019.

For future benefit recipients, the mortality rates used to determine factors for money purchase benefits, reduced service benefits for members who were not eligible to retire as of January 1, 2011, and co-beneficiary payment options are based upon the collective experience of all PERA divisions. For members, the rates are based upon the gender-distinct PubG-2010 Juvenile, Employee, and Healthy Retiree mortality tables, projected to 2023 using the MP-2019 projection scale. For surviving spouses, the rates are based upon the gender-distinct PubG-2010 Juvenile, Employee, and Contingent Survivor mortality tables, projected to 2023 using scale MP-2019. Unisex factors are then developed using a male/female blend based upon factor type, benefit tier, and/or benefit structure.

All mortality tables described above are benefit-weighted.

## Section 4: Actuarial Valuation Basis

### Salary increases

Representative values of the assumed annual rates of future salary increases are shown in the following tables:

| State Division Trust Fund (General Members) |                   |                          |                |
|---|-------------------|--------------------------|----------------|
| Age   | Merit & Seniority | Inflation & Productivity | Total Increase |
| 20  | 7.90%             | 3.00%                    | 10.90%         |
| 25  | 5.50              | 3.00                     | 8.50           |
| 30  | 3.80              | 3.00                     | 6.80           |
| 35  | 2.90              | 3.00                     | 5.90           |
| 40  | 2.20              | 3.00                     | 5.20           |
| 45  | 1.60              | 3.00                     | 4.60           |
| 50  | 1.10              | 3.00                     | 4.10           |
| 55  | 0.70              | 3.00                     | 3.70           |
| 60  | 0.50              | 3.00                     | 3.50           |
| 65  | 0.30              | 3.00                     | 3.30           |
| 70  | 0.30              | 3.00                     | 3.30           |

| State and Local Government Division Trust Funds<br>(State Trooper Members) |                   |                          |                |
|--|-------------------|--------------------------|----------------|
| Age  | Merit & Seniority | Inflation & Productivity | Total Increase |
| 20   | 9.40%             | 3.00%                    | 12.40%         |
| 25   | 5.90              | 3.00                     | 8.90           |
| 30   | 3.80              | 3.00                     | 6.80           |
| 35   | 2.90              | 3.00                     | 5.90           |
| 40   | 2.20              | 3.00                     | 5.20           |
| 45   | 1.70              | 3.00                     | 4.70           |
| 50   | 1.30              | 3.00                     | 4.30           |
| 55   | 0.90              | 3.00                     | 3.90           |
| 60   | 0.60              | 3.00                     | 3.60           |
| 65   | 0.30              | 3.00                     | 3.30           |
| 70   | 0.20              | 3.00                     | 3.20           |

## Section 4: Actuarial Valuation Basis

### Salary increases (continued)

| School Division Trust Fund |                   |                          |                |
|----------------------------|-------------------|--------------------------|----------------|
| Age                        | Merit & Seniority | Inflation & Productivity | Total Increase |
| 20                         | 8.00%             | 3.00%                    | 11.00%         |
| 25                         | 5.60              | 3.00                     | 8.60           |
| 30                         | 4.00              | 3.00                     | 7.00           |
| 35                         | 3.30              | 3.00                     | 6.30           |
| 40                         | 2.70              | 3.00                     | 5.70           |
| 45                         | 2.10              | 3.00                     | 5.10           |
| 50                         | 1.60              | 3.00                     | 4.60           |
| 55                         | 1.20              | 3.00                     | 4.20           |
| 60                         | 0.80              | 3.00                     | 3.80           |
| 65                         | 0.50              | 3.00                     | 3.50           |
| 70                         | 0.40              | 3.00                     | 3.40           |

| Local Government Division Trust Fund (General Members) |                   |                          |                |
|--|-------------------|--------------------------|----------------|
| Age  | Merit & Seniority | Inflation & Productivity | Total Increase |
| 20   | 8.30%             | 3.00%                    | 11.30%         |
| 25   | 5.70              | 3.00                     | 8.70           |
| 30   | 3.80              | 3.00                     | 6.80           |
| 35   | 2.80              | 3.00                     | 5.80           |
| 40   | 2.20              | 3.00                     | 5.20           |
| 45   | 1.80              | 3.00                     | 4.80           |
| 50   | 1.50              | 3.00                     | 4.50           |
| 55   | 1.20              | 3.00                     | 4.20           |
| 60   | 0.90              | 3.00                     | 3.90           |
| 65   | 0.40              | 3.00                     | 3.40           |
| 70   | 0.20              | 3.00                     | 3.20           |



## Section 4: Actuarial Valuation Basis

### Salary increases (continued)

| Judicial Division Trust Fund |                   |                          |                |
|------------------------------|-------------------|--------------------------|----------------|
| Service                      | Merit & Seniority | Inflation & Productivity | Total Increase |
| 0                            | 2.30%             | 3.00%                    | 5.30%          |
| 5                            | 2.00              | 3.00                     | 5.00           |
| 10                           | 1.50              | 3.00                     | 4.50           |
| 15                           | 1.20              | 3.00                     | 4.20           |
| 20                           | 0.90              | 3.00                     | 3.90           |
| 25                           | 0.70              | 3.00                     | 3.70           |
| 30                           | 0.40              | 3.00                     | 3.40           |
| 35                           | 0.20              | 3.00                     | 3.20           |
| 40                           | 0.00              | 2.80                     | 2.80           |

| DPS Division Trust Fund |                   |                          |                |
|-------------------------|-------------------|--------------------------|----------------|
| Age                     | Merit & Seniority | Inflation & Productivity | Total Increase |
| 20                      | 8.50%             | 3.00%                    | 11.50%         |
| 25                      | 6.40              | 3.00                     | 9.40           |
| 30                      | 4.80              | 3.00                     | 7.80           |
| 35                      | 3.90              | 3.00                     | 6.90           |
| 40                      | 3.20              | 3.00                     | 6.20           |
| 45                      | 2.50              | 3.00                     | 5.50           |
| 50                      | 2.00              | 3.00                     | 5.00           |
| 55                      | 1.60              | 3.00                     | 4.60           |
| 60                      | 1.30              | 3.00                     | 4.30           |
| 65                      | 0.90              | 3.00                     | 3.90           |
| 70                      | 0.80              | 3.00                     | 3.80           |

## Section 4: Actuarial Valuation Basis

### Separations From Active Service

Representative values of the assumed annual rates of termination, death, and disability are shown in the following tables:

| State Division Trust Fund (General Members) |                      |         |                      |         |            |         |
|---|----------------------|---------|----------------------|---------|------------|---------|
| Age   | Ultimate Termination |         | Death <sup>(1)</sup> |         | Disability |         |
|   | Males                | Females | Males                | Females | Males      | Females |
| 20  | 30.00%               | 16.45%  | 0.039%               | 0.014%  | 0.008%     | 0.008%  |
| 25  | 13.60                | 12.30   | 0.033                | 0.011   | 0.008      | 0.008   |
| 30  | 7.10                 | 9.50    | 0.050                | 0.020   | 0.008      | 0.008   |
| 35  | 5.90                 | 7.30    | 0.067                | 0.031   | 0.024      | 0.024   |
| 40  | 4.75                 | 5.75    | 0.082                | 0.042   | 0.039      | 0.039   |
| 45  | 3.95                 | 4.95    | 0.100                | 0.055   | 0.076      | 0.076   |
| 50  | 3.66                 | 4.60    | 0.139                | 0.080   | 0.156      | 0.156   |
| 55  | 3.54                 | 4.50    | 0.214                | 0.129   | 0.203      | 0.203   |
| 60  | 3.50                 | 4.50    | 0.333                | 0.198   | 0.236      | 0.236   |
| 65  | 3.50                 | 4.50    | 0.473                | 0.286   | 0.236      | 0.236   |
| 70  | 3.50                 | 4.50    | 0.658                | 0.443   | 0.236      | 0.236   |

<sup>(1)</sup> 2020 mortality rates of the PubG-2010 Employee table (benefit-weighted). The mortality rates are projected forward from 2010 with generational mortality improvement using scale MP-2019.

The select termination assumptions for members with less than five years of service are shown in the following table:

| State Division Trust Fund<br>(General Members) |        |         |
|--|--------|---------|
| Service  | Males  | Females |
| 0  | 34.00% | 34.00%  |
| 1  | 21.00  | 21.00   |
| 2  | 16.00  | 16.00   |
| 3  | 12.00  | 12.00   |
| 4  | 10.00  | 10.00   |

## Section 4: Actuarial Valuation Basis

### Separations From Active Service (continued)

| Age | State and Local Government Division Trust Funds (State Trooper Members) |         |                      |         |            |         |
|-----|---|---------|----------------------|---------|------------|---------|
|     | Termination <sup>(1)</sup>  |         | Death <sup>(2)</sup> |         | Disability |         |
|     | Males   | Females | Males                | Females | Males      | Females |
| 20  | 7.30%   | 7.30%   | 0.043%               | 0.018%  | 0.01%      | 0.01%   |
| 25  | 5.15  | 5.15    | 0.044                | 0.024   | 0.02       | 0.02    |
| 30  | 3.65  | 3.65    | 0.057                | 0.036   | 0.04       | 0.04    |
| 35  | 2.98  | 2.98    | 0.067                | 0.048   | 0.06       | 0.06    |
| 40  | 2.62  | 2.62    | 0.073                | 0.057   | 0.10       | 0.10    |
| 45  | 2.50  | 2.50    | 0.083                | 0.066   | 0.25       | 0.25    |
| 50  | 2.50  | 2.50    | 0.112                | 0.087   | 0.30       | 0.30    |
| 55  | 2.50  | 2.50    | 0.171                | 0.129   | 0.30       | 0.30    |
| 60  | 2.50  | 2.50    | 0.275                | 0.179   | 0.30       | 0.30    |
| 65  | 2.50  | 2.50    | 0.414                | 0.221   | 0.30       | 0.30    |
| 70  | 2.50  | 2.50    | 0.717                | 0.411   | 0.30       | 0.30    |

<sup>(1)</sup> There are no select termination assumptions for State Trooper Members.

<sup>(2)</sup> 2020 mortality rates of the PubS-2010 Employee table (benefit-weighted). The mortality rates are projected forward from 2010 with generational mortality improvement using scale MP-2019.

## Section 4: Actuarial Valuation Basis

### Separations From Active Service (continued)

| Age | School Division Trust Fund (PERA Benefit Structure) |         |                      |         |            |         |
|-----|---|---------|----------------------|---------|------------|---------|
|     | Ultimate Termination                                |         | Death <sup>(1)</sup> |         | Disability |         |
|     | Males   | Females | Males                | Females | Males      | Females |
| 20  | 20.00%  | 17.00%  | 0.036%               | 0.014%  | 0.008%     | 0.008%  |
| 25  | 11.26   | 11.56   | 0.019                | 0.011   | 0.008      | 0.008   |
| 30  | 6.54  | 7.34    | 0.030                | 0.019   | 0.008      | 0.008   |
| 35  | 4.60  | 5.51    | 0.043                | 0.027   | 0.016      | 0.016   |
| 40  | 3.64  | 4.34    | 0.052                | 0.036   | 0.033      | 0.033   |
| 45  | 3.34  | 4.00    | 0.068                | 0.047   | 0.050      | 0.050   |
| 50  | 3.24  | 4.00    | 0.104                | 0.070   | 0.078      | 0.078   |
| 55  | 3.20  | 4.00    | 0.168                | 0.112   | 0.126      | 0.126   |
| 60  | 3.20  | 4.00    | 0.275                | 0.172   | 0.180      | 0.180   |
| 65  | 3.20  | 4.00    | 0.440                | 0.261   | 0.180      | 0.180   |
| 70  | 3.20  | 4.00    | 0.663                | 0.439   | 0.180      | 0.180   |

<sup>(1)</sup> 2020 mortality rates of the PubT-2010 Employee table (benefit-weighted). The mortality rates are projected forward from 2010 with generational mortality improvement using scale MP-2019.

The select termination assumptions for members with less than five years of service are shown in the following table:

| Service | School Division Trust Fund<br>(PERA Benefit Structure) |         |
|---------|--|---------|
|         | Males  | Females |
| 0       | 30.00%   | 30.00%  |
| 1       | 18.00  | 18.00   |
| 2       | 14.00  | 14.00   |
| 3       | 11.00  | 11.00   |
| 4       | 10.00  | 10.00   |

## Section 4: Actuarial Valuation Basis

### Separations From Active Service (continued)

| Age | DPS Division Trust Fund (PERA Benefit Structure) |         |                      |         |            |         |
|-----|--|---------|----------------------|---------|------------|---------|
|     | Ultimate Termination                             |         | Death <sup>(1)</sup> |         | Disability |         |
|     | Males  | Females | Males                | Females | Males      | Females |
| 20  | 19.20%   | 12.80%  | 0.036%               | 0.014%  | 0.008%     | 0.008%  |
| 25  | 11.20  | 10.80   | 0.019                | 0.011   | 0.008      | 0.008   |
| 30  | 7.70   | 9.40    | 0.030                | 0.019   | 0.008      | 0.008   |
| 35  | 6.60   | 7.80    | 0.043                | 0.027   | 0.016      | 0.016   |
| 40  | 6.00   | 6.40    | 0.052                | 0.036   | 0.033      | 0.033   |
| 45  | 6.00   | 6.00    | 0.068                | 0.047   | 0.050      | 0.050   |
| 50  | 6.00   | 5.40    | 0.104                | 0.070   | 0.078      | 0.078   |
| 55  | 6.00   | 5.00    | 0.168                | 0.112   | 0.126      | 0.126   |
| 60  | 6.00   | 5.00    | 0.275                | 0.172   | 0.180      | 0.180   |
| 65  | 6.00   | 5.00    | 0.440                | 0.261   | 0.180      | 0.180   |
| 70  | 6.00   | 5.00    | 0.663                | 0.439   | 0.180      | 0.180   |

<sup>(1)</sup> 2020 mortality rates of the PubT-2010 Employee table (benefit-weighted). The mortality rates are projected forward from 2010 with generational mortality improvement using scale MP-2019.

The select termination assumptions for members with less than five years of service are shown in the following table:

| Service | DPS Division Trust Fund<br>(PERA Benefit Structure) |         |
|---------|---|---------|
|         | Males   | Females |
| 0       | 26.00%  | 26.00%  |
| 1       | 19.00   | 19.00   |
| 2       | 14.00   | 14.00   |
| 3       | 12.00   | 12.00   |
| 4       | 10.00   | 10.00   |

## Section 4: Actuarial Valuation Basis

### Separations From Active Service (continued)

| Age | Local Government Division Trust Fund (General Members) |         |                      |         |            |         |
|-----|--|---------|----------------------|---------|------------|---------|
|     | Ultimate Termination                                   |         | Death <sup>(1)</sup> |         | Disability |         |
|     | Males  | Females | Males                | Females | Males      | Females |
| 20  | 30.00%   | 16.45%  | 0.039%               | 0.014%  | 0.008%     | 0.008%  |
| 25  | 13.60  | 12.30   | 0.033                | 0.011   | 0.008      | 0.008   |
| 30  | 7.10   | 9.50    | 0.050                | 0.020   | 0.008      | 0.008   |
| 35  | 5.90   | 7.30    | 0.067                | 0.031   | 0.024      | 0.024   |
| 40  | 4.75   | 5.75    | 0.082                | 0.042   | 0.039      | 0.039   |
| 45  | 3.95   | 4.95    | 0.100                | 0.055   | 0.076      | 0.076   |
| 50  | 3.66   | 4.60    | 0.139                | 0.080   | 0.156      | 0.156   |
| 55  | 3.54   | 4.50    | 0.214                | 0.129   | 0.203      | 0.203   |
| 60  | 3.50   | 4.50    | 0.333                | 0.198   | 0.236      | 0.236   |
| 65  | 3.50   | 4.50    | 0.473                | 0.286   | 0.236      | 0.236   |
| 70  | 3.50   | 4.50    | 0.658                | 0.443   | 0.236      | 0.236   |

<sup>(1)</sup> 2020 mortality rates of the PubG-2010 Employee table (benefit-weighted). The mortality rates are projected forward from 2010 with generational mortality improvement using scale MP-2019.

The select termination assumptions for members with less than five years of service are shown in the following table:

| Service | Local Government Division<br>Trust Fund (General Members) |         |
|---------|---|---------|
|         | Males   | Females |
| 0       | 34.00%  | 34.00%  |
| 1       | 21.00   | 21.00   |
| 2       | 16.00   | 16.00   |
| 3       | 12.00   | 12.00   |
| 4       | 10.00   | 10.00   |

## Section 4: Actuarial Valuation Basis

### Separations From Active Service (continued)

| Age | Judicial Division Trust Fund |         |                      |         |            |         |
|-----|------------------------------|---------|----------------------|---------|------------|---------|
|     | Termination <sup>(1)</sup>   |         | Death <sup>(2)</sup> |         | Disability |         |
|     | Males                        | Females | Males                | Females | Males      | Females |
| 30  | 1.50%                        | 1.50%   | 0.043%               | 0.017%  | 0.008%     | 0.008%  |
| 35  | 1.50                         | 1.50    | 0.058                | 0.028   | 0.016      | 0.016   |
| 40  | 1.50                         | 1.50    | 0.071                | 0.038   | 0.033      | 0.033   |
| 45  | 1.50                         | 1.50    | 0.086                | 0.050   | 0.050      | 0.050   |
| 50  | 1.50                         | 1.50    | 0.121                | 0.073   | 0.078      | 0.078   |
| 55  | 1.50                         | 1.50    | 0.186                | 0.118   | 0.126      | 0.126   |
| 60  | 1.50                         | 1.50    | 0.288                | 0.180   | 0.180      | 0.180   |
| 65  | 1.50                         | 1.50    | 0.409                | 0.261   | 0.180      | 0.180   |
| 70  | 1.50                         | 1.50    | 0.570                | 0.403   | 0.180      | 0.180   |

<sup>(1)</sup> There are no select termination assumptions for members in the Judicial Division Trust Fund.

<sup>(2)</sup> 2020 mortality rates of the PubG-2010(A) Above-Median Employee table (benefit-weighted). The mortality rates are projected forward from 2010 with generational mortality improvement using scale MP-2019.

## Section 4: Actuarial Valuation Basis

### Separations From Active Service (continued)

| Age | All Division Trust Funds (DPS Benefit Structure) |         |                      |         |            |         |
|-----|--|---------|----------------------|---------|------------|---------|
|     | Termination <sup>(1)</sup>                       |         | Death <sup>(2)</sup> |         | Disability |         |
|     | Males  | Females | Males                | Females | Males      | Females |
| 20  | 8.00%  | 10.00%  | 0.036%               | 0.014%  | 0.008%     | 0.008%  |
| 25  | 7.40   | 8.80    | 0.019                | 0.011   | 0.008      | 0.008   |
| 30  | 6.85   | 7.70    | 0.030                | 0.019   | 0.008      | 0.008   |
| 35  | 6.60   | 7.20    | 0.043                | 0.027   | 0.016      | 0.016   |
| 40  | 5.45   | 5.95    | 0.052                | 0.036   | 0.033      | 0.033   |
| 45  | 4.69   | 4.41    | 0.068                | 0.047   | 0.050      | 0.050   |
| 50  | 4.50   | 3.85    | 0.104                | 0.070   | 0.078      | 0.078   |
| 55  | 4.31   | 3.85    | 0.168                | 0.112   | 0.126      | 0.126   |
| 60  | 4.25   | 3.85    | 0.275                | 0.172   | 0.180      | 0.180   |
| 65  | 4.25   | 3.85    | 0.440                | 0.261   | 0.180      | 0.180   |
| 70  | 4.25   | 3.85    | 0.663                | 0.439   | 0.180      | 0.180   |

(1) There are no select termination assumptions for members in the DPS Benefit Structure.

(2) 2020 mortality rates of the PubT-2010 Employee table (benefit-weighted). The mortality rates are projected forward from 2010 with generational mortality improvement using scale MP-2019.



## Section 4: Actuarial Valuation Basis

### Retirement

Representative values of the assumed annual rates of service retirement are shown in the following tables:

| Age       | State Division Trust Fund (General Members) |         |                                  |         |
|-----------|---|---------|----------------------------------|---------|
|           | Eligible for Reduced Benefits               |         | Eligible for Unreduced Benefits* |         |
|           | Males                                       | Females | Males                            | Females |
| 50        | 9.5%  | 9.0%    | 56.0%                            | 48.0%   |
| 51        | 11.0  | 8.0     | 43.0                             | 35.0    |
| 52        | 11.0  | 8.0     | 38.0                             | 34.0    |
| 53        | 12.0  | 9.0     | 34.0                             | 28.0    |
| 54        | 12.0  | 12.0    | 33.0                             | 30.0    |
| 55        | 12.0  | 15.0    | 26.0                             | 25.0    |
| 56        | 9.5   | 11.0    | 19.0                             | 20.0    |
| 57        | 15.0  | 12.0    | 18.0                             | 19.0    |
| 58        | 15.0  | 15.0    | 17.0                             | 18.0    |
| 59        | 35.0  | 35.0    | 20.0                             | 18.0    |
| 60        | 7.5   | 8.0     | 20.0                             | 21.0    |
| 61        | 7.5   | 8.0     | 19.0                             | 18.0    |
| 62        | 7.5   | 9.0     | 23.0                             | 20.0    |
| 63        | 7.5   | 9.0     | 20.0                             | 18.0    |
| 64        | 7.5   | 9.0     | 22.0                             | 21.0    |
| 65        | 0.0   | 0.0     | 27.0                             | 27.0    |
| 66        | 0.0   | 0.0     | 29.0                             | 27.0    |
| 67        | 0.0   | 0.0     | 28.0                             | 25.0    |
| 68        | 0.0   | 0.0     | 24.0                             | 24.0    |
| 69        | 0.0   | 0.0     | 24.0                             | 24.0    |
| 70        | 0.0   | 0.0     | 24.0                             | 24.0    |
| 71        | 0.0   | 0.0     | 24.0                             | 24.0    |
| 72        | 0.0   | 0.0     | 24.0                             | 24.0    |
| 73        | 0.0   | 0.0     | 24.0                             | 24.0    |
| 74        | 0.0   | 0.0     | 24.0                             | 24.0    |
| 75 & over | 0.0   | 0.0     | 100.0                            | 100.0   |

\*Additional increase in rates during the first 5 years of unreduced retirement at ages 55-64 (in order from year 0 through year 4): Males – 30%, 13%, 13%, 13%, 13%; Females – 20%, 9%, 9%, 9%, 9%.

## Section 4: Actuarial Valuation Basis

### Retirement (continued)

| Age       | State and Local Government Division Trust Funds (State Trooper Members) |         |                                  |         |
|-----------|---|---------|----------------------------------|---------|
|           | Eligible for Reduced Benefits   |         | Eligible for Unreduced Benefits* |         |
|           | Males   | Females | Males                            | Females |
| 50        | 10.0%   | 10.0%   | 40.0%                            | 40.0%   |
| 51        | 10.0  | 10.0    | 28.0                             | 28.0    |
| 52        | 10.0  | 10.0    | 28.0                             | 28.0    |
| 53        | 10.0  | 10.0    | 28.0                             | 28.0    |
| 54        | 10.0  | 10.0    | 28.0                             | 28.0    |
| 55        | 5.0   | 5.0     | 28.0                             | 28.0    |
| 56        | 5.0   | 5.0     | 28.0                             | 28.0    |
| 57        | 5.0   | 5.0     | 28.0                             | 28.0    |
| 58        | 5.0   | 5.0     | 28.0                             | 28.0    |
| 59        | 5.0   | 5.0     | 28.0                             | 28.0    |
| 60        | 10.0  | 10.0    | 28.0                             | 28.0    |
| 61        | 10.0  | 10.0    | 28.0                             | 28.0    |
| 62        | 10.0  | 10.0    | 28.0                             | 28.0    |
| 63        | 10.0  | 10.0    | 28.0                             | 28.0    |
| 64        | 10.0  | 10.0    | 28.0                             | 28.0    |
| 65 & over | 0.0   | 0.0     | 100.0                            | 100.0   |

\*Additional increase in rates during the first year of unreduced retirement at ages 55-64: 20%.

## Section 4: Actuarial Valuation Basis

### Retirement (continued)

| Age       | School and DPS Division Trust Funds (PERA Benefit Structure) |         |                                  |         |
|-----------|--|---------|----------------------------------|---------|
|           | Eligible for Reduced Benefits                                |         | Eligible for Unreduced Benefits* |         |
|           | Males  | Females | Males                            | Females |
| 50        | 8.0%   | 7.0%    | 52.0%                            | 55.0%   |
| 51        | 8.0  | 7.0     | 43.0                             | 45.0    |
| 52        | 9.0  | 8.0     | 41.0                             | 41.0    |
| 53        | 9.0  | 10.0    | 39.0                             | 37.0    |
| 54        | 12.0   | 14.0    | 37.0                             | 34.0    |
| 55        | 9.0  | 12.0    | 27.0                             | 28.0    |
| 56        | 9.0  | 12.0    | 22.0                             | 24.0    |
| 57        | 9.0  | 12.0    | 21.0                             | 23.0    |
| 58        | 12.0   | 16.0    | 19.0                             | 22.0    |
| 59        | 24.0   | 34.0    | 21.0                             | 22.0    |
| 60        | 8.0  | 9.0     | 25.0                             | 24.0    |
| 61        | 9.0  | 9.0     | 24.0                             | 23.0    |
| 62        | 10.0   | 10.0    | 22.0                             | 26.0    |
| 63        | 10.0   | 10.0    | 22.0                             | 24.0    |
| 64        | 10.0   | 10.0    | 26.0                             | 24.0    |
| 65        | 0.0  | 0.0     | 28.0                             | 31.0    |
| 66        | 0.0  | 0.0     | 31.0                             | 29.0    |
| 67        | 0.0  | 0.0     | 25.0                             | 26.0    |
| 68        | 0.0  | 0.0     | 26.0                             | 25.0    |
| 69        | 0.0  | 0.0     | 26.0                             | 25.0    |
| 70        | 0.0  | 0.0     | 24.0                             | 28.0    |
| 71        | 0.0  | 0.0     | 24.0                             | 23.0    |
| 72        | 0.0  | 0.0     | 24.0                             | 23.0    |
| 73        | 0.0  | 0.0     | 24.0                             | 23.0    |
| 74        | 0.0  | 0.0     | 24.0                             | 23.0    |
| 75 & over | 0.0  | 0.0     | 100.0                            | 100.0   |

\*Additional increase in rates during the first 5 years of unreduced retirement at ages 55-64 (in order from year 0 through year 4):  
Males – 28%, 4%, 4%, 4%, 4%; Females – 28%, 10%, 10%, 10%, 10%.

## Section 4: Actuarial Valuation Basis

### Retirement (continued)

| Age       | Local Government Division Trust Fund (General Members) |         |                                  |         |
|-----------|--|---------|----------------------------------|---------|
|           | Eligible for Reduced Benefits                          |         | Eligible for Unreduced Benefits* |         |
|           | Males  | Females | Males                            | Females |
| 50        | 9.5%   | 9.0%    | 56.0%                            | 48.0%   |
| 51        | 11.0   | 8.0     | 43.0                             | 35.0    |
| 52        | 11.0   | 8.0     | 38.0                             | 34.0    |
| 53        | 12.0   | 9.0     | 34.0                             | 28.0    |
| 54        | 12.0   | 12.0    | 33.0                             | 30.0    |
| 55        | 12.0   | 15.0    | 26.0                             | 25.0    |
| 56        | 9.5  | 11.0    | 19.0                             | 20.0    |
| 57        | 15.0   | 12.0    | 18.0                             | 19.0    |
| 58        | 15.0   | 15.0    | 17.0                             | 18.0    |
| 59        | 35.0   | 35.0    | 20.0                             | 18.0    |
| 60        | 7.5  | 8.0     | 20.0                             | 21.0    |
| 61        | 7.5  | 8.0     | 19.0                             | 18.0    |
| 62        | 7.5  | 9.0     | 23.0                             | 20.0    |
| 63        | 7.5  | 9.0     | 20.0                             | 18.0    |
| 64        | 7.5  | 9.0     | 22.0                             | 21.0    |
| 65        | 0.0  | 0.0     | 27.0                             | 27.0    |
| 66        | 0.0  | 0.0     | 29.0                             | 27.0    |
| 67        | 0.0  | 0.0     | 28.0                             | 25.0    |
| 68        | 0.0  | 0.0     | 24.0                             | 24.0    |
| 69        | 0.0  | 0.0     | 24.0                             | 24.0    |
| 70        | 0.0  | 0.0     | 24.0                             | 24.0    |
| 71        | 0.0  | 0.0     | 24.0                             | 24.0    |
| 72        | 0.0  | 0.0     | 24.0                             | 24.0    |
| 73        | 0.0  | 0.0     | 24.0                             | 24.0    |
| 74        | 0.0  | 0.0     | 24.0                             | 24.0    |
| 75 & over | 0.0  | 0.0     | 100.0                            | 100.0   |

\*Additional increase in rates during the first 5 years of unreduced retirement at ages 55-64 (in order from year 0 through year 4):  
 Males – 30%, 13%, 13%, 13%, 13%; Females – 20%, 9%, 9%, 9%, 9%.

## Section 4: Actuarial Valuation Basis

### Retirement (continued)

| Age       | Judicial Division Trust Fund  |         |                                 |         |
|-----------|-------------------------------|---------|---------------------------------|---------|
|           | Eligible for Reduced Benefits |         | Eligible for Unreduced Benefits |         |
|           | Males                         | Females | Males                           | Females |
| 50        | 6.0%                          | 6.0%    | 6.0%                            | 6.0%    |
| 51        | 6.0                           | 6.0     | 6.0                             | 6.0     |
| 52        | 6.0                           | 6.0     | 6.0                             | 6.0     |
| 53        | 6.0                           | 6.0     | 6.0                             | 6.0     |
| 54        | 10.0                          | 10.0    | 10.0                            | 10.0    |
| 55        | 10.0                          | 10.0    | 10.0                            | 10.0    |
| 56        | 10.0                          | 10.0    | 10.0                            | 10.0    |
| 57        | 10.0                          | 10.0    | 10.0                            | 10.0    |
| 58        | 8.0                           | 8.0     | 8.0                             | 8.0     |
| 59        | 8.0                           | 8.0     | 8.0                             | 8.0     |
| 60        | 10.0                          | 10.0    | 10.0                            | 10.0    |
| 61        | 10.0                          | 10.0    | 10.0                            | 10.0    |
| 62        | 10.0                          | 10.0    | 10.0                            | 10.0    |
| 63        | 10.0                          | 10.0    | 10.0                            | 10.0    |
| 64        | 8.0                           | 8.0     | 8.0                             | 8.0     |
| 65        | 0.0                           | 0.0     | 20.0                            | 20.0    |
| 66        | 0.0                           | 0.0     | 20.0                            | 20.0    |
| 67        | 0.0                           | 0.0     | 20.0                            | 20.0    |
| 68        | 0.0                           | 0.0     | 20.0                            | 20.0    |
| 69        | 0.0                           | 0.0     | 20.0                            | 20.0    |
| 70        | 0.0                           | 0.0     | 40.0                            | 40.0    |
| 71        | 0.0                           | 0.0     | 40.0                            | 40.0    |
| 72        | 0.0                           | 0.0     | 40.0                            | 40.0    |
| 73        | 0.0                           | 0.0     | 40.0                            | 40.0    |
| 74        | 0.0                           | 0.0     | 40.0                            | 40.0    |
| 75 & over | 0.0                           | 0.0     | 100.0                           | 100.0   |

## Section 4: Actuarial Valuation Basis

### Retirement (continued)

| Age       | All Division Trust Funds (DPS Benefit Structure) |         |                                 |         |
|-----------|--|---------|---------------------------------|---------|
|           | Eligible for Reduced Benefits                    |         | Eligible for Unreduced Benefits |         |
|           | Males  | Females | Males                           | Females |
| 50        | 8.0%   | 5.0%    | 35.0%                           | 40.0%   |
| 51        | 8.0  | 7.0     | 35.0                            | 40.0    |
| 52        | 8.0  | 10.0    | 30.0                            | 30.0    |
| 53        | 10.0   | 10.0    | 30.0                            | 30.0    |
| 54        | 10.0   | 10.0    | 25.0                            | 30.0    |
| 55        | 10.0   | 10.0    | 30.0                            | 34.0    |
| 56        | 10.0   | 10.0    | 20.0                            | 24.0    |
| 57        | 10.0   | 10.0    | 26.0                            | 25.0    |
| 58        | 10.0   | 10.0    | 22.0                            | 20.0    |
| 59        | 15.0   | 14.0    | 26.0                            | 28.0    |
| 60        | 15.0   | 17.0    | 26.0                            | 25.0    |
| 61        | 16.0   | 17.0    | 18.0                            | 28.0    |
| 62        | 16.0   | 17.0    | 27.0                            | 30.0    |
| 63        | 16.0   | 17.0    | 40.0                            | 31.0    |
| 64        | 16.0   | 17.0    | 24.0                            | 42.0    |
| 65        | 0.0  | 0.0     | 38.0                            | 38.0    |
| 66        | 0.0  | 0.0     | 30.0                            | 35.0    |
| 67        | 0.0  | 0.0     | 30.0                            | 32.0    |
| 68        | 0.0  | 0.0     | 30.0                            | 27.0    |
| 69        | 0.0  | 0.0     | 30.0                            | 29.0    |
| 70        | 0.0  | 0.0     | 30.0                            | 28.0    |
| 71        | 0.0  | 0.0     | 30.0                            | 30.0    |
| 72        | 0.0  | 0.0     | 30.0                            | 30.0    |
| 73        | 0.0  | 0.0     | 30.0                            | 30.0    |
| 74        | 0.0  | 0.0     | 30.0                            | 30.0    |
| 75 & over | 0.0  | 0.0     | 100.0                           | 100.0   |

## Section 4: Actuarial Valuation Basis

### Single Life Retirement Values and Rates of Post-Retirement Mortality

| Age | Healthy Benefit Recipients (State/Local General Members) |         |  |          |   |          |                                |         |
|-----|--|---------|--|----------|---|----------|--------------------------------|---------|
|     | Rates of Post-Retirement Mortality                       |         | Present Value of \$1.00 Monthly for Life |          | Present Value of \$1.00 Monthly Increasing 1.25% Annually |          | Future Life Expectancy (Years) |         |
|     | Males  | Females | Males                                    | Females  | Males   | Females  | Males                          | Females |
| 50  | 0.262%   | 0.186%  | \$149.62                                 | \$153.74 | \$171.15  | \$176.72 | 34.17                          | 36.55   |
| 55  | 0.396  | 0.261   | 142.90                                   | 147.99   | 161.86  | 168.45   | 29.66                          | 31.91   |
| 60  | 0.603  | 0.356   | 134.59                                   | 140.46   | 150.76  | 158.10   | 25.31                          | 27.35   |
| 65  | 0.867  | 0.516   | 124.29                                   | 130.54   | 137.52  | 145.08   | 21.12                          | 22.86   |
| 70  | 1.342  | 0.837   | 111.48                                   | 117.74   | 121.73  | 129.05   | 17.10                          | 18.51   |
| 75  | 2.288  | 1.497   | 96.37                                    | 101.89   | 103.79  | 110.04   | 13.36                          | 14.37   |
| 80  | 3.951  | 3.388   | 79.95                                    | 83.06    | 84.93   | 88.38    | 10.07                          | 10.57   |
| 85  | 7.220  | 6.363   | 63.13                                    | 65.24    | 66.20   | 68.47    | 7.29                           | 7.56    |

| Age | Healthy Benefit Recipients (School/DPS) |         |  |          |   |          |                                |         |
|-----|---|---------|--|----------|---|----------|--------------------------------|---------|
|     | Rates of Post-Retirement Mortality      |         | Present Value of \$1.00 Monthly for Life |          | Present Value of \$1.00 Monthly Increasing 1.25% Annually |          | Future Life Expectancy (Years) |         |
|     | Males                                   | Females | Males                                    | Females  | Males   | Females  | Males                          | Females |
| 55  | 0.244%                                  | 0.168%  | \$145.95                                 | \$150.99 | \$165.73  | \$172.45 | 30.92                          | 33.51   |
| 60  | 0.417                                   | 0.254   | 137.58                                   | 143.93   | 154.49  | 162.58   | 26.35                          | 28.83   |
| 65  | 0.670                                   | 0.358   | 127.14                                   | 134.57   | 141.00  | 150.10   | 21.96                          | 24.21   |
| 70  | 1.121                                   | 0.579   | 114.20                                   | 122.14   | 124.97  | 134.33   | 17.78                          | 19.68   |
| 75  | 2.073                                   | 1.108   | 99.06                                    | 106.31   | 106.90  | 115.17   | 13.91                          | 15.33   |
| 80  | 3.324                                   | 2.815   | 83.16                                    | 87.22    | 88.48   | 93.07    | 10.57                          | 11.31   |
| 85  | 6.351                                   | 5.472   | 65.17                                    | 68.96    | 68.39   | 72.55    | 7.55                           | 8.11    |

## Section 4: Actuarial Valuation Basis

### Single Life Retirement Values and Rates of Post-Retirement Mortality (continued)

| Age | Healthy Benefit Recipients (Judicial) |         |  |          |   |          |                                |         |
|-----|---------------------------------------|---------|--|----------|---|----------|--------------------------------|---------|
|     | Rates of Post-Retirement Mortality    |         | Present Value of \$1.00 Monthly for Life |          | Present Value of \$1.00 Monthly Increasing 1.25% Annually |          | Future Life Expectancy (Years) |         |
|     | Males                                 | Females | Males                                    | Females  | Males   | Females  | Males                          | Females |
| 50  | 0.250%                                | 0.204%  | \$149.93                                 | \$153.25 | \$171.52  | \$176.15 | 34.20                          | 36.56   |
| 55  | 0.379                                 | 0.289   | 143.23                                   | 147.47   | 162.23  | 167.89   | 29.67                          | 31.96   |
| 60  | 0.575                                 | 0.395   | 134.89                                   | 139.99   | 151.07  | 157.64   | 25.29                          | 27.45   |
| 65  | 0.829                                 | 0.575   | 124.48                                   | 130.24   | 137.69  | 144.87   | 21.06                          | 23.02   |
| 70  | 1.292                                 | 0.934   | 111.46                                   | 117.84   | 121.63  | 129.34   | 16.99                          | 18.75   |
| 75  | 2.221                                 | 1.670   | 95.97                                    | 102.87   | 103.26  | 111.32   | 13.20                          | 14.73   |
| 80  | 4.038                                 | 3.072   | 78.85                                    | 85.92    | 83.66   | 91.65    | 9.84                           | 11.11   |
| 85  | 7.437                                 | 5.768   | 61.75                                    | 68.15    | 64.65   | 71.69    | 7.05                           | 8.02    |

| Age | Healthy Benefit Recipients ( State/Local Trooper Members) |         |  |          |   |          |                                |         |
|-----|---|---------|--|----------|---|----------|--------------------------------|---------|
|     | Rates of Post-Retirement Mortality                        |         | Present Value of \$1.00 Monthly for Life |          | Present Value of \$1.00 Monthly Increasing 1.25% Annually |          | Future Life Expectancy (Years) |         |
|     | Males   | Females | Males                                    | Females  | Males   | Females  | Males                          | Females |
| 45  | 0.124%  | 0.086%  | \$155.42                                 | \$157.18 | \$179.16  | \$181.78 | 38.23                          | 40.16   |
| 50  | 0.179   | 0.143   | 149.76                                   | 151.92   | 171.02  | 174.15   | 33.49                          | 35.36   |
| 55  | 0.299   | 0.271   | 142.33                                   | 145.13   | 160.82  | 164.72   | 28.83                          | 30.67   |
| 60  | 0.530   | 0.475   | 132.96                                   | 136.74   | 148.49  | 153.48   | 24.33                          | 26.16   |
| 65  | 0.890   | 0.745   | 121.57                                   | 126.43   | 134.04  | 140.18   | 20.06                          | 21.84   |
| 70  | 1.467   | 1.203   | 107.85                                   | 113.73   | 117.30  | 124.45   | 16.04                          | 17.73   |
| 75  | 2.576   | 2.097   | 91.89                                    | 98.81    | 98.53   | 106.65   | 12.35                          | 13.92   |
| 80  | 4.692   | 3.733   | 74.66                                    | 82.49    | 78.96   | 87.82    | 9.12                           | 10.55   |
| 85  | 8.530   | 6.557   | 57.84                                    | 65.96    | 60.39   | 69.31    | 6.49                           | 7.71    |



## Section 4: Actuarial Valuation Basis

### Single Life Retirement Values and Rates of Post-Retirement Mortality (continued)

| Disability Benefit Recipients (All Divisions except State/Local Trooper Members) |                                    |         |  |          |   |          |                                |         |
|--|------------------------------------|---------|--|----------|---|----------|--------------------------------|---------|
| Age  | Rates of Post-Retirement Mortality |         | Present Value of \$1.00 Monthly for Life |          | Present Value of \$1.00 Monthly Increasing 1.25% Annually |          | Future Life Expectancy (Years) |         |
|  | Males                              | Females | Males                                    | Females  | Males   | Females  | Males                          | Females |
| 40   | 0.795%                             | 0.721%  | \$139.38                                 | \$142.26 | \$158.56  | \$162.69 | 31.47                          | 33.92   |
| 45   | 1.013                              | 0.960   | 132.74                                   | 136.48   | 149.86  | 155.01   | 27.75                          | 30.21   |
| 50   | 1.485                              | 1.411   | 125.29                                   | 130.41   | 140.33  | 147.07   | 24.29                          | 26.80   |
| 55   | 2.047                              | 1.809   | 118.02                                   | 124.87   | 131.13  | 139.75   | 21.22                          | 23.79   |
| 60   | 2.583                              | 2.064   | 110.96                                   | 119.29   | 122.23  | 132.33   | 18.49                          | 20.97   |
| 65   | 3.045                              | 2.160   | 103.22                                   | 111.81   | 112.62  | 122.76   | 15.89                          | 18.03   |
| 70   | 3.613                              | 2.565   | 93.73                                    | 101.20   | 101.18  | 109.83   | 13.29                          | 14.92   |
| 75   | 4.685                              | 3.622   | 82.07                                    | 88.11    | 87.60   | 94.48    | 10.71                          | 11.89   |
| 80   | 6.689                              | 5.603   | 69.01                                    | 73.96    | 72.82   | 78.38    | 8.32                           | 9.18    |
| 85   | 9.997                              | 8.853   | 55.90                                    | 60.41    | 58.35   | 63.32    | 6.25                           | 6.96    |

| Disability Benefit Recipients (State/Local Trooper Members) |                                    |         |  |          |   |          |                                |         |
|---|------------------------------------|---------|--|----------|---|----------|--------------------------------|---------|
| Age   | Rates of Post-Retirement Mortality |         | Present Value of \$1.00 Monthly for Life |          | Present Value of \$1.00 Monthly Increasing 1.25% Annually |          | Future Life Expectancy (Years) |         |
|   | Males                              | Females | Males                                    | Females  | Males   | Females  | Males                          | Females |
| 40  | 0.217%                             | 0.190%  | \$156.61                                 | \$157.94 | \$181.44  | \$183.53 | 41.13                          | 43.17   |
| 45  | 0.246                              | 0.220   | 152.23                                   | 153.90   | 174.95  | 177.51   | 36.57                          | 38.57   |
| 50  | 0.330                              | 0.292   | 146.36                                   | 148.49   | 166.66  | 169.82   | 32.03                          | 34.02   |
| 55  | 0.469                              | 0.484   | 138.79                                   | 141.71   | 156.41  | 160.54   | 27.59                          | 29.59   |
| 60  | 0.766                              | 0.745   | 129.41                                   | 133.78   | 144.19  | 149.96   | 23.32                          | 25.39   |
| 65  | 1.199                              | 1.026   | 118.38                                   | 124.30   | 130.29  | 137.72   | 19.31                          | 21.38   |
| 70  | 1.784                              | 1.457   | 105.27                                   | 112.60   | 114.34  | 123.18   | 15.53                          | 17.53   |
| 75  | 2.954                              | 2.233   | 89.91                                    | 98.58    | 96.34   | 106.40   | 12.02                          | 13.88   |
| 80  | 5.148                              | 3.733   | 73.75                                    | 82.49    | 77.98   | 87.82    | 8.99                           | 10.55   |
| 85  | 8.602                              | 6.557   | 57.80                                    | 65.96    | 60.35   | 69.31    | 6.48                           | 7.71    |

## Section 4: Actuarial Valuation Basis

### Single Life Retirement Values and Rates of Post-Retirement Mortality (continued)

| Age | Beneficiaries (All Divisions)      |         |  |          |   |          |                                |         |
|-----|------------------------------------|---------|--|----------|---|----------|--------------------------------|---------|
|     | Rates of Post-Retirement Mortality |         | Present Value of \$1.00 Monthly for Life |          | Present Value of \$1.00 Monthly Increasing 1.25% Annually |          | Future Life Expectancy (Years) |         |
|     | Males                              | Females | Males                                    | Females  | Males   | Females  | Males                          | Females |
| 40  | 0.663%                             | 0.319%  | \$151.21                                 | \$157.38 | \$174.68  | \$182.99 | 39.10                          | 43.30   |
| 45  | 0.541                              | 0.271   | 148.00                                   | 154.03   | 169.74  | 177.82   | 35.24                          | 38.91   |
| 50  | 0.635                              | 0.323   | 142.80                                   | 149.09   | 162.42  | 170.68   | 31.17                          | 34.44   |
| 55  | 0.782                              | 0.491   | 136.26                                   | 142.79   | 153.52  | 161.94   | 27.17                          | 30.05   |
| 60  | 1.023                              | 0.696   | 128.13                                   | 135.26   | 142.84  | 151.79   | 23.27                          | 25.85   |
| 65  | 1.357                              | 0.913   | 118.16                                   | 125.91   | 130.20  | 139.63   | 19.49                          | 21.78   |
| 70  | 1.932                              | 1.286   | 105.98                                   | 114.01   | 115.32  | 124.80   | 15.87                          | 17.80   |
| 75  | 2.990                              | 2.064   | 91.89                                    | 99.54    | 98.69   | 107.47   | 12.50                          | 14.04   |
| 80  | 4.781                              | 3.535   | 76.56                                    | 83.13    | 81.16   | 88.50    | 9.50                           | 10.62   |
| 85  | 7.919                              | 6.356   | 60.92                                    | 65.91    | 63.77   | 69.23    | 6.95                           | 7.68    |

## Section 4: Actuarial Valuation Basis

### Exhibit II: Summary of Plan Provisions

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

|                                       |   |
|---------------------------------------|---|
| <b>Effective Date:</b>                | Established in 1931, most recently amended during 2015 to "true-up" the employer contribution rate of the DPS Division. The Denver Public Schools Retirement System (DPSRS) was merged into PERA effective January 1, 2010. As of that date, all liabilities and assets of DPSRS were transferred to, and became liabilities and assets of, the DPS Division of PERA, including the maintenance of a separate benefit structure for existing members. Therefore, if a DPS Division member terminates employment (without refund) and later is reemployed with an affiliated employer in the State Division, he or she may be building on a DPS Benefit Structure within that division. The benefit provisions of existing members of PERA on the merger date and all new hires, post-merger, are building a benefit under the PERA Benefit Structure.   |
| <b>DEFINITIONS</b>                    |   |
| <b>Affiliated Employers:</b>          | State agencies and institutions of higher education, political subdivisions of the state, all school districts, courts, cities and municipalities and any other public entities that affiliate with PERA.   |
| <b>Annual Increase Reserve (AIR):</b> | Applicable for PERA Benefit Structure members hired on or after January 1, 2007 and prior non-DPSRS members who became PERA members as of January 1, 2010. A portion of the employer contribution, currently equal to 1% of the salaries of affected members, is accumulated in the Annual Increase Reserve to be paid out in annual increases each July 1, to the extent affordable. A separate annual actuarial valuation determines the affordability and the percentage of annual increases to the eligible members within the groups previously defined. The maximum annual increase awarded, if any, by the PERA Board is the least of:<br>a) 1.25% of current benefits,<br>b) The average of the annual CPI-W increase determined each month published for the preceding calendar year, and<br>c) An increase that will exhaust 10% of the year-end market value of the Annual Increase Reserve.<br>Annual increases outlined in this section are subject to change as a result of the Automatic Adjustment Provision. |
| <b>Covered Members:</b>               | Employees of Affiliated Employers who work in a position subject to membership and for whom contributions are made.   |
| <b>Division:</b>                      | One of five separate divisions, which include: State, School, Local Government, Judicial and Denver Public Schools (DPS). Only local government entities can voluntarily affiliate with PERA and these entities are assigned to the Local Government Division. The financial activities of each division are accounted for in separate trust funds.   |

## Section 4: Actuarial Valuation Basis

|                                      |  |
|--------------------------------------|--|
| <b>Highest Average Salary (HAS):</b> | <p>For PERA Benefit Structure members not in the Judicial Division who are eligible for retirement as of January 1, 2011, one-twelfth of the average of the highest annual salaries upon which contributions were made during three periods of twelve consecutive months of Service Credit; or for a member with less than three years of Service Credit, one-twelfth of the average of the annual salaries upon which contributions were made. Annual salary increases recognized in the determination of HAS are limited to 15% a year for members who began membership prior to January 1, 2007. For members who began membership on or after January 1, 2007, the annual salary increases recognized in the determination of HAS are limited to 8% a year.</p> <p>For Judicial Division members one-twelfth of the highest annual salary upon which contributions were made during one period of twelve consecutive months of Service Credit.</p> <p>For DPS Benefit Structure members, who are eligible for retirement as of January 1, 2011, the greater of the average of the 36 months of highest annual salaries or the career average salary.</p> <p>For all members who are not eligible for retirement as of January 1, 2011, one-twelfth of the average of the highest annual salaries upon which contributions were made during three periods of twelve consecutive months of Service Credit; or for a member with less than three years of Service Credit, one-twelfth of the average of the annual salaries upon which contributions were made. Annual salary increases recognized in the determination of HAS are limited to 8% a year.</p> <p>Effective January 1, 2020 for members in the State, School, Local Government and DPS Divisions, all members who do not have five years of service credit on December 31, 2019 and new members hired on or after January 1, 2020, the number of years used in the highest average salary calculation will be increased from three years to five years.</p> <p>Effective January 1, 2020 for members in the Judicial Division, all members who do not have five years of service credit on December 31, 2019 and new members hired on or after January 1, 2020, the number of years used in the highest average salary calculation will be increased from one year to three years.</p> |
| <b>Interest Crediting Rate:</b>      | 3% per annum on member contribution account balances.  |
| <b>Service Credit:</b>               | The total of all earned, purchased, (disability) projected, and military service credit, which is used to determine benefit eligibility and amounts.   |
| <b>Vested Members:</b>               | DPS Benefit Structure: Members who accrue five or more years of Service Credit are vested for benefits.<br>PERA Benefit Structure: Members who accrue five or more years of Service Credit or attain age sixty-five are vested for benefits.   |
| <b>Salary:</b>                       | PERA-includable salary redefined under SB 18-200 for all members to include payouts of unused sick leave.<br>For new members hired on or after July 1, 2019, PERA-includable salary was redefined to include contributions to IRC Section 125 and 132 plans.   |
| <b>Member Contributions:</b>         | Member contributions, together with any purchased service credit payments and interest, are credited to individual Member Contribution Accounts.   |

## Section 4: Actuarial Valuation Basis

### Member Contributions (continued):

| Effective Date                         | Member Contribution Rates as a Percent of Salary <sup>1</sup> |  |                                |                       |
|--|---|--|--------------------------------|-----------------------|
|  | General Members   |  |                                | State Trooper Members |
|  | State, School, & DPS Divisions                                | Local Government Division <sup>2</sup> | Judicial Division <sup>3</sup> |                       |
| Prior to July 1, 2019                  | 8.00%   | 8.00%                                  | 8.00%                          | 10.00%                |
| July 1, 2019                           | 8.75%   | 8.00%                                  | 8.75%                          | 10.75%                |
| July 1, 2020 <sup>4</sup>              | 10.00%  | 8.50%                                  | 15.00%                         | 12.00%                |
| July 1, 2021                           | 10.50%  | 8.50%                                  | 15.50%                         | 12.50%                |
| On and after July 1, 2022 <sup>5</sup> | 11.00%  | 9.00%                                  | 11.00%                         | 13.00%                |

<sup>1</sup> Member contribution increases pursuant to SB 18-200.

<sup>2</sup> Pursuant to HB 19-1217, enacted May 20, 2019.

<sup>3</sup> Pursuant to HB 20-1394, enacted June 2020. Rates shown are unweighted, applicable to the majority of the Judicial Division membership.

<sup>4</sup> Based on the results of the 2018 AAP Assessment, member contribution rates increase by an additional 0.50% effective July 1, 2020.

<sup>5</sup> Based on the results of the 2020 AAP Assessment, member contribution rates increase by an additional 0.50% effective July 1, 2022.

Effective July 1, 2020, HB 20-1394 requires five percent of the Judicial Division base employer contribution rate to be paid by the members of the Judicial Division for the State's 2020-21 and 2021-22 fiscal years. This contribution rate modification does not apply to judges employed by the Denver County Court within the Judicial Division.

Effective January 1, 2011, retirees working for a PERA-affiliated employer and not working as state legislators, as judges participating in the Senior Judge Program, or in a position covered by an Optional Retirement Plan are required to make member contributions at the same rate as an active member. The contributions are not credited to the member's account, do not accrue a benefit, and are non-refundable.

Member contributions as outlined in this section are subject to change as a result of the Automatic Adjustment Provision.

### Employer Contributions:

State Division (General Members): 10.40% of salary on and after July 1, 2019

School Division: 10.40% of salary on and after July 1, 2019

State Trooper Members: 13.10% of salary on and after July 1, 2019

Local Government Division (General Members): 10.00% of salary on and after January 1, 2004

Judicial Division : 13.91% of salary on and after July 1, 2019

DPS Division: 10.40% of salary on and after July 1, 2019. Actual employer contributions are reduced by an amount equal to the principal payments plus interest at 8.5% necessary each year to finance the Pension

## Section 4: Actuarial Valuation Basis

### Employer Contributions (continued):

Certificates of Participation (PCOPs) issued in 1997 and 2008 and refinanced thereafter. The amount of the credit for 2019 was 14.00% of salary. The net DPS Division employer contribution rate for 2019 was 4.63% when including the AED and SAED as described below.

Effective July 1, 2020, all employer contribution rates increased 0.50%, pursuant to the results of the 2018 Automatic Adjustment Provision.

Effective July 1, 2022, all employer contribution rates increase 0.50%, pursuant to the results of the 2020 Automatic Adjustment Provision.

Effective July 1, 2020, HB 20-1394 requires five percent of the Judicial Division base employer contribution rate to be paid by the members of the Judicial Division for the State's 2020-21 and 2021-22 fiscal years. This contribution rate modification does not apply to judges employed by the Denver County Court within the Judicial Division.

Effective January 1, 2021, employer contribution rates for the State and Local Government Divisions increase by 0.05% and 0.02%, respectively, pursuant to C.R.S. § 24-51-415, regarding the DC Supplement.

Effective January 1, 2022, employer contribution rates for the State and Local Government Divisions increase by 0.10% and 0.03%, respectively, pursuant to C.R.S. § 24-51-415, regarding the DC Supplement.

The employer contribution rates of the State, School, Local Government, and Judicial Divisions include the contribution of 1.02% allocated to the Health Care Trust Fund.

The employer contribution rate of the DPS Division includes the contribution of 1.02% allocated to the DPS Health Care Trust Fund.

For PERA Benefit Structure members, hired on or after January 1, 2007, these contribution rates also include the 1.00% of payroll contribution earmarked for the Annual Increase Reserve.

Due to legislation in 2004 through 2006, employers are required to pay the statutory contribution, including AED and SAED amounts, on the payroll of working retirees.

Effective July 1, 2018 and on July 1st of each year thereafter until all divisions are 100% funded, PERA will receive an annual Direct Distribution from the State in the amount of \$225 million. PERA shall allocate the distributions in a manner that is proportionate to the annual payroll of each division, except there shall be no allocation to the Local Government Division.

Effective July 1, 2020, the enactment of HB 20-1379 suspended the Direct Distribution, which was payable on July 1, 2020, for the State's 2020-21 fiscal year.

Employer contributions are credited to the employer reserve of each division.

Contributions as outlined in this section are subject to change as a result of the Automatic Adjustment Provision.

### Amortization Equalization Disbursement (AED):

Beginning January 1, 2006 (January 1, 2010 for the DPS Division), each employer shall pay to PERA a disbursement equal to a percentage of total payroll in accordance with the following schedule:

| Year | Percentage of Total Payroll |                         |                   |
|------|-----------------------------|-------------------------|-------------------|
|      | State Division              | Schools & DPS Divisions | Judicial Division |
| 2006 | 0.50%                       | 0.50%                   | 0.50%             |

## Section 4: Actuarial Valuation Basis

### Amortization Equalization Disbursement (AED) (continued):

|              |       |       |       |
|--------------|-------|-------|-------|
| 2007         | 1.00% | 1.00% | 1.00% |
| 2008         | 1.40% | 1.40% | 1.40% |
| 2009         | 1.80% | 1.80% | 1.80% |
| 2010         | 2.20% | 2.20% | 2.20% |
| 2011         | 2.60% | 2.60% | 2.20% |
| 2012         | 3.00% | 3.00% | 2.20% |
| 2013         | 3.40% | 3.40% | 2.20% |
| 2014         | 3.80% | 3.80% | 2.20% |
| 2015         | 4.20% | 4.20% | 2.20% |
| 2016         | 4.60% | 4.50% | 2.20% |
| 2017         | 5.00% | 4.50% | 2.20% |
| 2018         | 5.00% | 4.50% | 2.20% |
| 2019         | 5.00% | 4.50% | 3.40% |
| 2020         | 5.00% | 4.50% | 3.80% |
| 2021         | 5.00% | 4.50% | 4.20% |
| 2022         | 5.00% | 4.50% | 4.60% |
| 2023 & after | 5.00% | 4.50% | 5.00% |

If, at any time, the actuarial funded ratio for a division is 103% or more, the amount of the disbursement shall be reduced by 0.5% of pay.

For the Local Government Division, the AED contributions are frozen at the 2010 levels. If, at any time, the actuarial funded ratio for a division is 103% or more, then the amount of the disbursement shall be reduced by 0.5% of pay.

### Supplemental Amortization Equalization Disbursement (SAED):

Beginning January 1, 2008 (January 1, 2010 for the DPS Division), each employer shall pay to PERA a supplemental disbursement equal to a percentage of total payroll in accordance with the following schedule:

| Year | Percentage of Total Payroll |                         |                   |
|------|-----------------------------|-------------------------|-------------------|
|      | State Division              | Schools & DPS Divisions | Judicial Division |
| 2008 | 0.50%                       | 0.50%                   | 0.50%             |
| 2009 | 1.00%                       | 1.00%                   | 1.00%             |
| 2010 | 1.50%                       | 1.50%                   | 1.50%             |

## Section 4: Actuarial Valuation Basis

### Supplemental Amortization Equalization Disbursement (SAED) (continued):

|              |       |       |       |
|--------------|-------|-------|-------|
| 2011         | 2.00% | 2.00% | 1.50% |
| 2012         | 2.50% | 2.50% | 1.50% |
| 2013         | 3.00% | 3.00% | 1.50% |
| 2014         | 3.50% | 3.50% | 1.50% |
| 2015         | 4.00% | 4.00% | 1.50% |
| 2016         | 4.50% | 4.50% | 1.50% |
| 2017         | 5.00% | 5.00% | 1.50% |
| 2018         | 5.00% | 5.50% | 1.50% |
| 2019         | 5.00% | 5.50% | 3.40% |
| 2020         | 5.00% | 5.50% | 3.80% |
| 2021         | 5.00% | 5.50% | 4.20% |
| 2022         | 5.00% | 5.50% | 4.60% |
| 2023 & after | 5.00% | 5.50% | 5.00% |

If, at any time, the actuarial funded ratio for a division is 103% or more, the amount of the disbursement shall be reduced by 0.5% of pay.

For the Local Government Division, the SAED contributions are frozen at the 2010 levels. If, at any time, the actuarial funded ratio for a division is 103% or more, then the amount of the disbursement shall be reduced by 0.5% of pay.

### Matching Contributions:

A match applied to individual Member Contribution Accounts when a refund is made or when a money purchase benefit is calculated. The match is applied to the account balance less:

1. Any amount paid for the purchase of service credit,
2. Any payments in lieu of member contributions, and
3. Any interest accrued on 1 and 2.

For members who receive a refund and meet the requirements for a service or reduced service retirement at the time the match is applied, or for payments made to survivors or beneficiaries of members who die before retirement, the match is 100% of eligible amounts.

For PERA Benefit Structure members who receive a refund prior to meeting the requirements for a service or reduced service retirement, the match is 50% of eligible amounts. Effective January 1, 2011, members must have five years of earned service credit in order to receive the 50% match on a refund. Contributions received prior to January 1, 2011, are matched regardless if the member has five years of service credit on the refund date.

For DPS Benefit Structure members who receive a refund prior to meeting the requirements for a service or reduced service retirement, no match is provided.



## Section 4: Actuarial Valuation Basis

### **DC Supplement:**

Beginning January 1, 2021, the employer contribution rates is adjusted to include the DC Supplement which is calculated separately for the State and Local Government Divisions. The DC Supplement, to be paid to the State and Local Government Trust Funds by all State and Local Government employers, is designed to compensate for the employer contribution amounts paid to DC Plan participant accounts that otherwise would have gone to the State and Local Government Division Trust Funds as payment toward the UAAL, if DC Choice was not available. The DC Supplement is determined considering this DB Plan shortfall with regard to only the employer contributions of DC Plan members who commenced employment on or after January 1, 2019.

The implementation of the DC Supplement provisions as of January 1, 2019, increased employer contribution rates effective January 1, 2021, by 0.05% and 0.02%, for the State and Local Government Division Trust Funds, respectively.

### **Blended Total Contribution Amount (or Rate):**

The weighted average (based upon the proportion of UAAL attributable to each division as of the most recent valuation date) of the total amounts paid by the employer and the member to PERA for each of the five Division Trust Funds, including the DC Supplement and the Direct Distribution, but not including the portions of employer contributions remitted to the Health Care Trust Fund and the Annual Increase Reserve.

### **Blended Total Required Contribution:**

The weighted average (based upon the proportion of UAAL attributable to each division as of the most recent valuation date) of the total of the actuarially determined contribution rates and member contribution rates of the five Division Trust Funds.

### **Automatic Adjustment Provision:**

The AAP adjustment is determined using the Blended Total Contribution Amount divided by the Blended Total Required Contribution. If the resulting ratio falls within an acceptable corridor (98% to 119%), no adjustments are made. If the resulting ratio does not achieve a minimum benchmark (is less than 98 percent), adjustments are applied in an equitable manner of impact.

An automatic adjustment will occur under the following conditions:

- If the resulting ratio is less than 98%, there will be adjustments of equitable impact, increasing the Employer Contribution Rate, increasing the Member Contribution Rate, decreasing the AI cap, and increasing the Direct Distribution (if permitted).
- If the resulting ratio is greater than or equal to 120%, there will be adjustments of equitable impact, decreasing the Employer Contribution Rate, decreasing the Member Contribution Rate, increasing the AI cap, and decreasing the Direct Distribution.

The AAP defines the limited amounts of total adjustment available in each category, and also the increments of adjustments that can occur in any one year. Multiple steps over multiple years are allowed for a required adjustment as is necessary, but cannot exceed the ultimate limits as set forth in statute, as detailed below:

- First adjustment cannot occur prior to July 1, 2020
- Adjustment (increase or decrease) to each of the Employer Contribution Rates and the Member Contribution Rates cannot exceed 0.50% in any one year, and
  - Cannot exceed 2.00% above the contribution rates reflecting SB 18-200 statutory reforms
  - Cannot fall below the 2017 contribution rates
- Adjustment (increase or decrease) to the AI rate cannot exceed 0.25% in any one year, and
  - Cannot exceed a 2.00% AI cap maximum

## Section 4: Actuarial Valuation Basis

### Automatic Adjustment Provision (continued):

- Cannot fall below a 0.50% AI cap minimum
- Adjustment to the Direct Distribution cannot exceed \$20 million in any one year, and
  - Cannot exceed the initial \$225 million amount
  - Can be reduced, with no floor
- Adjustments that are required because funding is below the 98% threshold will be made to an extent that will bring the revised ratio to 103% following the corrective efforts but in no event can the adjustments in one year be greater than the limit described above.
- Adjustments that are required because funding has reached the 120% threshold must not cause the ratio to fall below 103%.
  - The adjustments will be calculated with the annual actuarial valuation and will take effect July 1 of the following calendar year.

### PERA BENEFIT STRUCTURE

#### Refund of Member Contributions:

In the event a member leaves service for a reason other than death or retirement, member contribution accounts including interest plus matching employer contributions on eligible amounts with interest are refunded upon request.

#### Service Retirement Eligibility:

The Age and Service Credit requirements to be eligible for a full Service Retirement are listed below:

Members, except State Troopers, hired before July 1, 2005 who have 5 or more years of service credit as of January 1, 2011

| Age | Service Credit (Years)     |
|-----|----------------------------|
| 50  | 30                         |
| 55  | Age + Service = 80 or more |
| 60  | 20                         |
| 65  | 5                          |
| 65  | 60 payroll postings        |

Members, except State Troopers, hired on or after July 1, 2005 but before January 1, 2007, and who have 5 or more years of service credit as of January 1, 2011

| Age | Service Credit (Years)     |
|-----|----------------------------|
| Any | 35                         |
| 55  | Age + Service = 80 or more |
| 60  | 20                         |
| 65  | 5                          |
| 65  | 60 payroll postings        |

## Section 4: Actuarial Valuation Basis

### Service Retirement Eligibility (continued):

Members, except State Troopers, hired on or after July 1, 2007 but before January 1, 2011, regardless of service credit as of January 1, 2011, and those hired before January 1, 2011 who have less than 5 years of service credit

| Age | Service Credit (Years)     |
|-----|----------------------------|
| Any | 35                         |
| 55  | 30                         |
| 55  | Age + Service = 85 or more |
| 60  | 25                         |
| 65  | 5                          |
| 65  | 60 payroll postings        |

Members, except State Troopers, hired on or after January 1, 2011 but before January 1, 2017 and Members, except State Troopers, hired on or after January 1, 2017 but before January 1, 2020 whose last 10 years of service credit are in either the School or DPS Division

| Age | Service Credit (Years)     |
|-----|----------------------------|
| Any | 35                         |
| 58  | Age + Service = 88 or more |
| 65  | 5                          |
| 65  | 60 payroll postings        |

Members, except State Troopers, hired on or after January 1, 2017 but before January 1, 2020 whose last 10 years of service credit are not in either the School or DPS Divisions

| Age | Service Credit (Years)     |
|-----|----------------------------|
| Any | 35                         |
| 60  | Age + Service = 90 or more |
| 65  | 5                          |
| 65  | 60 payroll postings        |

## Section 4: Actuarial Valuation Basis

### Service Retirement Eligibility (continued):

Members, except State Troopers, hired on or after January 1, 2020

| Age | Service Credit (Years)     |
|-----|----------------------------|
| Any | 35                         |
| 64  | Age + Service = 94 or more |
| 65  | 5                          |
| 65  | 60 payroll postings        |

State Troopers hired before January 1, 2020

| Age | Service Credit (Years)     |
|-----|----------------------------|
| Any | 30                         |
| 50  | 25                         |
| 55  | 20                         |
| 60  | Age + Service = 80 or more |
| 65  | 5                          |
| 65  | 60 payroll postings        |

State Troopers hired on or after January 1, 2020

| Age | Service Credit (Years)     |
|-----|----------------------------|
| Any | 35                         |
| 55  | 25                         |
| 55  | Age + Service = 80 or more |
| 65  | 5                          |
| 65  | 60 payroll postings        |

## Section 4: Actuarial Valuation Basis

### Reduced Service Retirement Eligibility:

The Age and Service Credit requirements to be eligible for a Reduced Service Retirement are listed below:

Members, except State Troopers, hired before January 1, 2020

| Age | Service Credit (Years) |
|-----|------------------------|
| 50  | 25                     |
| 55  | 20                     |
| 60  | 5                      |

Members, except State Troopers, hired on or after January 1, 2020

| Age | Service Credit (Years) |
|-----|------------------------|
| 55  | 25                     |
| 60  | 5                      |

State Troopers hired before January 1, 2020

| Age | Service Credit (Years) |
|-----|------------------------|
| 50  | 20                     |
| 60  | 5                      |

State Troopers hired on or after January 1, 2020

| Age | Service Credit (Years) |
|-----|------------------------|
| 55  | 20                     |
| 60  | 5                      |

### Disability Retirement Eligibility:

Active members with five or more years of earned service credit and at least 6 months of this disability time earned in the most recent period of membership are eligible to apply for disability retirement. To be eligible, the member must be found to be totally and permanently disabled (mentally or physically) from regular and gainful employment. The service credit requirement is waived for State Trooper Members injured in the line of duty and for judges found to be disabled by the Colorado Supreme Court.

### Survivor Benefits Eligibility:

The qualified survivors of members who die before retirement with at least one year of service credit are eligible for monthly survivor benefits. The service credit requirement is waived if the death was job-related.

## Section 4: Actuarial Valuation Basis

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### **Service Retirement Benefit:**

State and Local Government General Members, State Trooper Members, School, and DPS Divisions and Members of the Judicial Division who were on the bench on and after July 1, 1973:

The greater of a) or b):

- a) 2.5% of HAS times years of Service Credit up to 40
- b) The money purchase benefit, which is actuarially determined based on the value of the member contribution account and matching employer contributions on the effective date of retirement.

Members age 65 with less than 5 years and less than 60 payroll postings are eligible for the money purchase benefit only.

In all cases, the benefit is limited to 100% of HAS.

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### **Reduced Service Retirement Benefit:**

For all members, except State Troopers, the service retirement benefit calculated above reduced 4% for each year after age 60, 3% for each year from age 55 to age 60, 6% for each year prior to 55, and proportionately for fractions of a year, from the effective date of reduced service retirement to the date the member would have been eligible for a service retirement benefit.

For State Troopers, the service retirement benefit calculated above reduced 4% for each year after age 60, 3% for each year from age 50 to age 60, and proportionately for fractions of a year, from the effective date of reduced service retirement to the date the member would have been eligible for a service retirement benefit.

Effective January 1, 2011, for all members that are not retirement eligible on January 1, 2011, the service retirement benefit calculated above shall be reduced using actuarial equivalent factors from the effective date of reduced service retirement to the date the member would have been eligible for a service retirement benefit.

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## Section 4: Actuarial Valuation Basis

### **Disability Retirement Benefit:**

If years of Service Credit at disability are greater than 20, the disability retirement benefit is calculated based on actual Service Credit at disability; otherwise, the disability retirement benefit is calculated based on actual Service Credit at disability plus Service Credit projected to age 65, but not to exceed a total of 20 years of Service Credit.

Benefits for disability retirees with an effective disability retirement date on or after July 1, 1988 and before January 1, 1999, who work after retirement will be reduced by one-third of the amount, if any, by which the initial annual PERA benefit plus earned income exceeds the annualized HAS.

Disability benefits are payable for as long as the disability retiree is disabled. Benefits cease upon recovery.

### **Survivor Benefits:**

If the deceased was not eligible for Reduced or Service Retirement at the time of death:

Benefits are payable in the following order:

- a) Qualified Children Under Age 23: 40% of HAS for one child, an equal share of 50% of HAS if there are two or more children.
- b) Spouse: If no qualified children in (a) exist:
  - i. less than 10 years of Service Credit, 25% of HAS, benefits begin at age 60; or
  - ii. 10 or more years of Service Credit, the greater of 25% of HAS or the benefit which would have been payable as a 100% joint and survivor option if the deceased member had been eligible for service retirement and retired on the date of death, benefits begin immediately.
- c) Qualified Children Age 23 or Over: If no persons in (a) or (b) exist, 40% of HAS for one child, an equal share of 50% of HAS if there are two or more children.
- d) Dependent Parents: If no persons in (a) to (c) exist, 25% of HAS for one dependent parent or 40% of HAS for two dependent parents (minimum of \$100 per month for each dependent parent). Benefits begin immediately and continue until the death of the parent(s).
- e) Named Beneficiary: If no persons in (a) to (d) exist, single payment equal to the member contribution account plus the appropriate matching contribution, plus interest.
- f) Estate of Deceased Member: If no persons in (a) to (e) exist, single payment equal to the member contribution account plus the appropriate matching contribution, plus interest.

If the deceased was eligible for Reduced or Service Retirement at the time of death:

The co-beneficiary is eligible for the amount that would have been payable had the member retired on the date of death and elected the 100% joint and survivor option. The order of payment is:

- a) Co-beneficiary - If the deceased member designated a co-beneficiary prior to death, that individual takes precedence in payment of benefits.
- b) Surviving Spouse
- c) Qualified Children
- d) Dependent Parents
- e) Named beneficiary
- f) Estate

## Section 4: Actuarial Valuation Basis

### Benefit Options:

Retirement and disability benefits are payable for the life of the retired member. Optional reduced benefits may be elected at the time of retirement to provide for continuation of 50% or 100% of a reduced benefit amount to a designated co-beneficiary. If the member retires any time after the date on which service retirement eligibility is first met, the reduction for 50% or 100% continuation option will be actuarially determined as of the date the member first became eligible for service retirement.

### Post-Retirement Benefit Increases:

Effective for 2020 and thereafter, the AI cap that may be awarded by the Board is 1.25%, subject to the Automatic Adjustment Provision as outlined above.

For PERA Benefit Structure members who began membership prior to January 1, 2007, eligibility for increase:

- For those retired prior to January 1, 2011 - Benefit recipients are eligible to receive an increase if the benefit recipient has been receiving benefits for at least seven months immediately preceding the July in which the AI is to be paid.
- For those retired on or after January 1, 2011 -
  - Full service retirees, disability retirees, reduced service retirees (eligible to retire as of January 1, 2011), and survivor benefit recipients are eligible to receive an increase if prior to the July in which the AI is to be paid, the benefit recipient has received benefit payments for 12 months, which is increased to a 36-month requirement for benefit recipients who had not yet received the first AI on or before May 1, 2018.
  - Reduced service retirees (not eligible to retire as of January 1, 2011) are eligible to receive an increase in July of the year in which the following conditions are met: (1) the retiree has received benefit payments for 12 months immediately preceding the July in which the AI is to be paid, and (2) as of January 1 of the year the AI is paid, the retiree has either reached age 60 or the applicable age and service Rule for unreduced service retirement. Reduced service retirees who had not yet received the first AI on or before May 1, 2018, are required to meet an additional condition (3) the retiree has received benefit payments for 36 months total.

Amount of Increase: The AI cap is awarded effective July 1 of each year depending on eligibility.

For PERA Benefit Structure members who began membership on or after January 1, 2007, eligibility for increase:

- Full service retirees, disability retirees, and survivor benefit recipients are eligible for an increase in July of the calendar year following the calendar year in which the benefit recipient has received benefit payments for 12 months, which is increased to a 36-month requirement for benefit recipients who had not yet received the first AI on or before May 1, 2018.



## Section 4: Actuarial Valuation Basis

### Post-Retirement Benefit Increases (continued):

- Reduced service retirees are eligible to receive an increase in July of the year in which the following conditions are met: (1) as of January 1 of the year the increase is to be paid, the retiree has received 12 months of benefit payments in the prior calendar year, and (2) as of January 1 of the year the increase is paid, the retiree has either reached age 60 or the applicable age and service Rule for unreduced service retirement. For reduced service retirees who had not yet received the first AI on or before May 1, 2018, condition (1) is increased to a 36-month total payment requirement as of January 1 of the year the increase is to be paid, with a continued requirement that the retiree has received 12 months of benefit payments in the prior calendar year.

Amount of Increase: The increase is the lower of the AI cap or the average of the CPI-W for each of the months during the prior calendar year. The present value of the increases granted to all benefit recipients in this group are limited to 10% of the total funds available in the Annual Increase Reserve in the division from which they retired or were a member before death. The increase is awarded effective July 1 of each year depending on eligibility.

### DPS BENEFIT STRUCTURE

#### Refund of Member Contributions:

In the event a member leaves service for a reason other than death or retirement, member contribution accounts including interest plus matching employer contributions on eligible amounts with interest are refunded upon request.

#### Service Retirement Eligibility:

The Age and Service Credit requirements to be eligible for a full Service Retirement are listed below: Members who have 5 or more years of service credit as of January 1, 2011

| Age | Service Credit (Years)                       |
|-----|--|
| 50  | 30   |
| 55  | 25 (must include 15 years of earned service) |
| 65  | 5  |

## Section 4: Actuarial Valuation Basis

| <b>Service Retirement Eligibility (continued):</b> | <p>Members who have less than 5 years of service credit as of January 1, 2011</p> <table border="1"> <thead> <tr> <th>Age</th> <th>Service Credit (Years)</th> </tr> </thead> <tbody> <tr> <td>Any</td> <td>35</td> </tr> <tr> <td>55</td> <td>30 (must include 20 years of earned service)</td> </tr> <tr> <td>55</td> <td>Age + Service = 85 or more</td> </tr> <tr> <td>60</td> <td>25</td> </tr> <tr> <td>65</td> <td>5</td> </tr> <tr> <td>65</td> <td>60 payroll postings</td> </tr> </tbody> </table>   | Age | Service Credit (Years) | Any | 35 | 55  | 30 (must include 20 years of earned service) | 55  | Age + Service = 85 or more | 60 | 25 | 65 | 5  | 65 | 60 payroll postings |
|--|---|-----|------------------------|-----|----|-----|--|-----|----------------------------|----|----|----|----|----|---------------------|
| Age  | Service Credit (Years)  |     |                        |     |    |     |  |     |                            |    |    |    |    |    |                     |
| Any  | 35  |     |                        |     |    |     |  |     |                            |    |    |    |    |    |                     |
| 55   | 30 (must include 20 years of earned service)  |     |                        |     |    |     |  |     |                            |    |    |    |    |    |                     |
| 55   | Age + Service = 85 or more  |     |                        |     |    |     |  |     |                            |    |    |    |    |    |                     |
| 60   | 25  |     |                        |     |    |     |  |     |                            |    |    |    |    |    |                     |
| 65   | 5   |     |                        |     |    |     |  |     |                            |    |    |    |    |    |                     |
| 65   | 60 payroll postings   |     |                        |     |    |     |  |     |                            |    |    |    |    |    |                     |
| <b>Reduced Service Retirement Eligibility:</b>     | <p>The Age and Service Credit requirements to be eligible for a Reduced Service Retirement are listed below:<br/>Members who have 5 or more years of service credit as of January 1, 2011</p> <table border="1"> <thead> <tr> <th>Age</th> <th>Service Credit (Years)</th> </tr> </thead> <tbody> <tr> <td>55</td> <td>15</td> </tr> <tr> <td>Any</td> <td>25</td> </tr> </tbody> </table> <p>Members who have less than 5 years of service credit as of January 1, 2011</p> <table border="1"> <thead> <tr> <th>Age</th> <th>Service Credit (Years)</th> </tr> </thead> <tbody> <tr> <td>50</td> <td>25</td> </tr> <tr> <td>55</td> <td>20</td> </tr> <tr> <td>60</td> <td>5</td> </tr> </tbody> </table> | Age | Service Credit (Years) | 55  | 15 | Any | 25   | Age | Service Credit (Years)     | 50 | 25 | 55 | 20 | 60 | 5                   |
| Age  | Service Credit (Years)  |     |                        |     |    |     |  |     |                            |    |    |    |    |    |                     |
| 55   | 15  |     |                        |     |    |     |  |     |                            |    |    |    |    |    |                     |
| Any  | 25  |     |                        |     |    |     |  |     |                            |    |    |    |    |    |                     |
| Age  | Service Credit (Years)  |     |                        |     |    |     |  |     |                            |    |    |    |    |    |                     |
| 50   | 25  |     |                        |     |    |     |  |     |                            |    |    |    |    |    |                     |
| 55   | 20  |     |                        |     |    |     |  |     |                            |    |    |    |    |    |                     |
| 60   | 5   |     |                        |     |    |     |  |     |                            |    |    |    |    |    |                     |
| <b>Disability Retirement Eligibility:</b>          | <p>Active members with five or more years of earned service credit and at least 6 months of this time earned in the most recent period of membership are eligible to apply for disability retirement. To be eligible, the member must be found to be totally and permanently disabled (mentally or physically) from regular and gainful employment.</p>   |     |                        |     |    |     |  |     |                            |    |    |    |    |    |                     |
| <b>Survivor Benefits Eligibility:</b>              | <p>The qualified survivors of members who die before retirement with at least five years of service credit and are active at time of death are eligible for monthly survivor benefits.</p>  |     |                        |     |    |     |  |     |                            |    |    |    |    |    |                     |
| <b>Service Retirement Benefit:</b>                 | <p>The greater of a) or b):</p> <ul style="list-style-type: none"> <li>a) 2.5% of HAS times years of Service Credit</li> <li>b) \$15 times first 10 years of service credit plus \$20 times service credit over 10 years plus an amount equal to annuitized member balance.*</li> </ul> <p>* May include matching dollars if eligible.</p>  |     |                        |     |    |     |  |     |                            |    |    |    |    |    |                     |

## Section 4: Actuarial Valuation Basis

### Reduced Service Retirement Benefit:

For those hired before July 1, 2005 the reduction factors are listed below:

| Age      | Service Credit (Years) | Reduction Amount  |
|----------|------------------------|---|
| Under 50 | 30 years               | 4% for each year prior to age 50  |
| Under 50 | 25 – 30 years          | Greater of: <ul style="list-style-type: none"> <li>• 4% for each year of service below 30 years</li> <li>• 4% for each year below age 50</li> </ul> |
| 50 – 55  | 25 – 30 years          | Lesser of: <ul style="list-style-type: none"> <li>• 4% for each year of service below 30 years</li> <li>• 4% for each year below age 50</li> </ul>  |
| Over 55  | 15 years               | Lesser of: <ul style="list-style-type: none"> <li>• 4% for each year of service below 25 years</li> <li>• 4% for each year below age 65</li> </ul>  |

For those hired on or after July 1, 2005 but before January 1, 2010, the reductions factors are listed below:

| Age      | Service Credit (Years) | Reduction Amount  |
|----------|------------------------|---|
| Under 50 | 30 years               | 6% for each year prior to age 50  |
| Under 50 | 25 – 30 years          | Greater of: <ul style="list-style-type: none"> <li>• 6% for each year of service below 30 years</li> <li>• 6% for each year below age 50</li> </ul> |
| 50 – 55  | 25 – 30 years          | Lesser of: <ul style="list-style-type: none"> <li>• 6% for each year of service below 30 years</li> <li>• 6% for each year below age 50</li> </ul>  |
| Over 55  | 15 years               | Lesser of: <ul style="list-style-type: none"> <li>• 6% for each year of service below 25 years</li> <li>• 6% for each year below age 65</li> </ul>  |

Effective January 1, 2011, for all members that are not retirement eligible on January 1, 2011, the service retirement benefit calculated above shall be reduced using actuarial equivalent factors, from the effective date of reduced service retirement to the date the member would have been eligible for a service retirement benefit.

### Disability Retirement Benefit:

If years of Service Credit at disability are greater than 20, the disability retirement benefit is calculated based on actual Service Credit at disability; otherwise, the disability retirement benefit is calculated based on actual Service Credit at disability plus Service Credit projected to age 65, but not to exceed a total of 20 years of Service Credit.

Disability benefits are payable for as long as the disability retiree is disabled. Benefits cease upon recovery.

## Section 4: Actuarial Valuation Basis

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### Survivor Benefits:

- a) Child: The greater of 10% of HAS for each child up to a limit of 30%, and \$160 (pro-rated) for each child up to a limit of \$480
- b) Spouse with eligible children: The greater of the difference between the child benefit above and 30% (40% if 15 years of service plus 2% for each year of service beyond 25 years) of HAS, and \$480
- c) Dependent Parents: The greater of 10% of HAS for each parent, and \$240 per parent
- d) Spouse (less than 15 years of service): The lesser of 30% of HAS, and \$480; payable at later of age 60 or when the last eligible child loses eligibility

Spouse (15 years of service or more): The greater of 30% of HAS, plus an additional 1% for each year of service over 15 years, and \$480; payable at later of age 50 or when last eligible child loses eligibility

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### Benefit Options:

Option A: Single life annuity (SLA) with residual refund of member contributions

Option B: SLA with guarantee period determined based on accumulated member contribution balance at retirement

Option C: 100% joint and survivor annuity (J&S) with 10 years certain (not available to members retiring after January 1, 2010)

Option D: Cash refund on annuity portion and SLA on pension portion (not available to members retiring after January 1, 2010)

Option E: 50% J&S with 10 years certain (not available to members retiring post January 1, 2010)

Option P2: 50% J&S with pop-up and residual refund of member contributions

Option P3: 100% J&S with pop-up and residual refund of member contributions

## Section 4: Actuarial Valuation Basis

**Post-Retirement Benefit Increases:** Effective for 2020 and thereafter, the AI cap that may be awarded by the Board is 1.25%, subject to the Automatic Adjustment Provision as outlined above.

For DPS Benefit Structure members, eligibility for increase:

- For those retired prior to January 1, 2011 - Benefit recipients are eligible to receive an increase if the benefit recipient has been receiving benefits for at least seven months immediately preceding the July in which the AI is to be paid.
- For those retired on or after January 1, 2011 -
  - Full service retirees, disability retirees, reduced service retirees (eligible to retire as of January 1, 2011), and survivor benefit recipients are eligible to receive an increase if prior to the July in which the AI is to be paid, the benefit recipient has received benefit payments for 12 months, which is increased to a 36-month requirement for benefit recipients who had not yet received the first AI on or before May 1, 2018.
  - Reduced service retirees (not eligible to retire as of January 1, 2011) are eligible to receive an increase in July of the year in which the following conditions are met: (1) the retiree has received benefit payments for 12 months immediately preceding the July in which the AI is to be paid, and (2) as of January 1 of the year the AI is paid, the retiree has either reached age 60 or the applicable age and service Rule for unreduced service retirement. Reduced service retirees who had not yet received the first AI on or before May 1, 2018, are required to meet an additional condition (3) the retiree has received benefit payments for 36 months total.

Amount of Increase: The AI cap is awarded effective July 1 of each year depending on eligibility.

## Section 4: Actuarial Valuation Basis

### Exhibit III: Colorado PERA Defined Benefit Pension Plan Funding Policy

#### I. Introduction

The Colorado Public Employees' Retirement Association (PERA) maintains five pre-funded, hybrid defined benefit pension plans [i.e., State Division Trust Fund, School Division Trust Fund, Local Government Division Trust Fund, Judicial Division Trust Fund, and Denver Public Schools (DPS) Division Trust Fund]. Each defined benefit pension plan is funded through PERA-affiliated employer contributions, member contributions, and the investment earnings resulting from those contributions. The fixed contribution rate at which each division's employers and members contribute is determined by the Colorado General Assembly and defined within the statutes governing PERA.

The purposes of this funding policy are to state the overall funding goals and annual actuarial metrics and to guide the PERA Board of Trustees (Board) when considering whether to pursue or support proposed contribution and benefit legislation. The policy also includes a brief list of governance responsibilities regarding the commissioning, collection, and review of actuarial information, as described in the Board's Governance Manual.

PERA also maintains two pre-funded defined benefit retiree health care subsidy plans (i.e., Health Care Trust Fund and DPS Health Care Trust Fund), classified as other postemployment benefit (OPEB) plans. On January 19, 2018, the Board approved a separate OPEB funding policy with regard to these plans recognizing the adoption and implementation of the Governmental Accounting Standards Board (GASB) Statement No. 74, applicable to OPEB.

It is the intention of the Board that this funding policy be considered a working document, reviewed periodically and, as necessary, altered in the future through formal action of the Board. The final page of this document contains the review and revision/adoption history pertaining to the funding policy of the PERA defined benefit pension plans.

#### II. Background

In response to the unfavorable investment market of 2008, and in addition to the funding policy adopted in November 2007, the Board set the following guiding principles in 2009 in the development of a comprehensive package to maintain long-term sustainability of the pension plans:

- Shared responsibility among members, retirees, and employers;
- Intergenerational equity;
- Preservation of the defined benefit plan;
- Preservation of portability through the maintenance of existing benefit structures for the different divisions; and
- Development of recommendations that would have little-to-no short-term impact on member behavior.

In 2009 and 2010, these guiding principles benefited the Board and all the stakeholders associated with the pension plan as solutions to the immediate funding situation were explored. The Board constructed a series of plan provision changes, enlisting the philosophy of the guiding principles – under the umbrella of shared responsibility – and communicated their recommendations to the General Assembly. Senate Bill 10-001 was the culmination of all the provisional and contribution changes that were to set PERA's course toward sustainability. Senate Bill

## Section 4: Actuarial Valuation Basis

10-001 also contained the following funding and annual increase requirements, which now are embedded in Colorado Statute and will be implemented regardless of the Board's pension funding policy:

- Per C.R.S. § 24-51-411(8), and § 24-51-411(9), the AED and the SAED are adjusted based on the year-end actuarial funded ratio within a particular division;
  - If a division trust fund's actuarial funded ratio:
    - Reaches 103%, a decrease in the AED and SAED is mandated, and,
    - Subsequently falls below 90%, an increase is mandated.
  - For the Local Government and Judicial Divisions, if the actuarial funded ratio reaches 90% and subsequently falls below 90%, an increase in the AED and SAED is mandated.
  - Increases in AED and SAED cannot exceed the statutory maximum allowable limitation.
- Per C.R.S. § 24-51-1009.5, if the combined pension divisions' trust fund actuarial funded ratio:
  - Reaches 103%, the upper limit of the annual increase shall be increased by one-quarter of one percent; and,
  - Subsequently falls below 90%, the upper limit of the annual increase shall be decreased by one-quarter of one percent.

These statutory elements, in addition to the current schedule of employer contribution rates, assist in the ongoing balance of shared responsibility. It is not the intention of this Board, through the development of this funding policy, to undermine or circumvent the work accomplished by Senate Bill 10-001, but rather to ensure continued fiduciary commitment through sound governance practices and recognition of these statutory funding policies.

The combined funding policy regarding PERA's pension and OPEB plans, adopted by the Board in November 2007, was in force with regard to the pension plans through December 30, 2014. On March 20, 2015, the Board approved a separate pension funding policy with regard to these plans, which reflects the guiding principles listed above. This pension funding policy is effective with the December 31, 2014 actuarial valuation, recognizes the adoption and implementation of the GASB Statement No. 67, applicable to pensions, and has been adopted and updated as indicated on the last page of the document.

This document is revised as of November 16, 2018, to reflect the Board's funding plan coming out of the September 2017 planning meeting with the intent to 1) propose pension reforms that would fully fund each of the five division trust funds within a 30-year period from first recognition, and 2) reset the 30-year closed amortization period for purposes of determining the Actuarially Determined Contribution (ADC) to mirror the funding period of the proposed changes, contingent on the passage of pension reform legislation. Given the June 4, 2018, enactment of Senate Bill 18-200, the Board was unable to affect the reinitialization of the 30-year period prior to finalization of the December 31, 2017, funding actuarial valuation results. Thus, as of the December 31, 2018, funding actuarial valuation, the 30-year closed amortization period is effective for amortizing the total unfunded actuarial accrued liability (UAAL) for each division trust fund as of December 31, 2017, in alignment with the initial recognition of the Senate Bill 18-200 pension forms. This action allows for a more accurate analysis of the "statutory contribution rate versus ADC rate" necessary to determine if the auto-adjust mechanism, also enacted through Senate Bill 18-200, is triggered for the following period.

### III. Funding Goals

- Preservation of the **defined benefit plan structure** of providing lifetime retirement benefits to the employees of PERA-affiliated employers, reflecting the fact that PERA members are not covered under Social Security.

## Section 4: Actuarial Valuation Basis

- Demonstration of **transparency and accountability** through the continued maintenance of a defined benefit pension plan funding policy for the stakeholders of PERA.
  - **Achievement of a combined divisions' trust fund actuarial funded ratio greater than or equal to 110%.** Once the 110% combined funded ratio is achieved, following (1) the complete discontinuance of AED and SAED contributions, and (2) the restoration of the annual increase to pre-2010 levels pursuant to C.R.S. § 24-51-1009.5, the Board will consider and/or support the following actions, as ordered, as long as the funded ratio, either combined or individual by division, does not fall below 100% after consideration of the proposed change:
    - Examination and possible action of de-risking the total trust fund, including all divisions
    - Reduction in the base contribution rate(s)
    - Adoption of a benefit enhancement, beyond restoration of the annual increase as described above.
- If the 110% combined funded ratio benchmark is attained through the assistance of certain funding arrangements where assets, outside of statutory contributions, are added to the plans, and results in additional tax-payer obligation, the payment method and duration of this debt should be considered prior to any supportive action taken regarding benefit enhancements.
- Dedication to the balance between:
    - **Contribution rate stability** – keeping contributions relatively stable over time, and
    - **Intergenerational equity** – allocating costs over the members' period of active service.
  - Dedication to the systematic **reduction of the UAAL**, subject to the required action by the state legislature as described in C.R.S. § 24-51-411(8), § 24-51-411(9), and § 24-51-1009.5, and as briefly summarized above in Section II.
  - Recognition that within a multiple-employer cost-sharing defined benefit plan there are **beneficial elements of pooled risk**, both in the accrual of plan liabilities, recognizing actuarial gains and loss by division, rather than by employer; and in the accumulation of plan assets through the engagement of an appropriate level of asset risk management.

### IV. Annual Actuarial Metrics

Below is a list of actuarial metrics to be assessed on an **annual basis as of the actuarial valuation date**. The Board recognizes that a single year's results may not be indicative of long-term trends and projected results.

- Funded ratios – Calculate and review by division:
  - The actuarial funded ratio based on the actuarial value of plan assets divided by the defined benefit pension plan's actuarial accrued liability (AAL), and
  - The market value funded ratio based on the market value of plan assets divided by the defined benefit pension plan's AAL.
- Funding period – To be determined for each division with respect to the applicable contribution rates. A funding period is the amortization period required to pay off that division's UAAL considering the resources available. Funding periods for each division will be determined in the annual actuarial valuation in relationship to both
  - Statutory contribution rates, and
  - ADC rates.
- Contribution rate comparison
  - Calculate and review by division.



## Section 4: Actuarial Valuation Basis

- Actuarial Projections
  - Perform and review, by division.
    - Actuarial projections considering appropriate benefit provisions, salary and demographic data, actuarial assumptions, membership growth, and statutory contribution rates in order to determine the sustainability of each division under their benefit provisions and statutory contribution rate structure.
    - Projection modeling that allows for the testing of projection results under various economic and demographic stress conditions.

### V. Funding Valuation Elements

Annually, the Board's actuary will perform an actuarial valuation for funding purposes, and calculate ADC rates against which to compare contribution rates mandated under State statute. The ADC will be the sum of a payment based on normal cost and a payment on the UAAL. The normal cost and the amount of payment on the UAAL are determined by the following three major components of a funding valuation:

- **Actuarial Cost Method:** This component determines the attribution method upon which the cost/liability of the retirement benefits are allocated to a given period, defining the normal cost or annual accrual rate associated with the projected benefits.
  - The Entry Age Cost Method (EA), as is used for PERA's annual actuarial valuation purposes, is to be used for the determination of the normal cost rate and the actuarial accrued liability for purposes of calculating the ADC.
  - Under this method, normal cost is calculated using benefits based on projected service and salary at retirement and is allocated over an individual's career as a level percent of payroll. Because EA normal cost rates are level for each participant, the normal cost pattern for the entire plan under EA is more stable in the face of demographic shifts in the workforce. It is this normal cost stability that makes the EA method the preferred funding method for the majority of public defined benefit pension plans.
- **Asset Valuation Method:** This component dictates the method by which the asset value used in the determination of the UAAL is determined, which could be a market value or a smoothed actuarial value of trust assets.
  - Because investment markets are volatile and defined benefit pension plans typically have long investment horizons, application of an asset-smoothing technique can be an effective tool to manage contribution volatility and provide a more consistent measure of funding over time. Asset-smoothing methods reduce the effect of short-term market volatility on contributions, while still tracking the overall movement of the market value of plan assets by recognizing the effects of investment gains and losses over a period of years.
  - The asset valuation method to be used shall be a four-year smoothed market value of assets. The difference between actual market value investment returns and the expected actuarial investment returns is recognized equally over a four-year period.
- **Amortization Method:** This component prescribes, in terms of duration and pattern, the systematic manner in which the difference between the actuarial accrued liability and the actuarial value of assets is reduced.
  - Once established for any component of the UAAL, the amortization period for that component will be closed and will decrease by one year annually.
  - The amortization payment will be determined on a level percentage of pay basis.
  - The length of the amortization periods will be as follows:
    - Existing UAAL on December 31, 2017 – 30 years.

## Section 4: Actuarial Valuation Basis

- Any increase (or decrease) in the UAAL existing as of December 31, 2017 – remaining period of the initial 30-year period from the date of the valuation.
- Annual future actuarial experience gains and losses – 30 years from the date of the valuation.
- Future assumption changes – 30 years from the date of the valuation.
- Future benefit enhancements/reductions – the number of years, as determined by the Board, to represent the anticipated duration of payment of the enhancement or, if a reduction, duration of the benefit to the plan. This determination will be based on the nature of the benefit change and the demographics of the membership group affected by the change, not to exceed 25 years from the date of the valuation.
- If any future annual actuarial valuation indicates a division has a negative UAAL, the ADC shall be set equal to the Normal Cost until such time as the funded ratio equals or exceeds 120%. At that time, the ADC shall be equal to the Normal Cost less an amount equal to 15 year amortization of the portion of the negative UAAL above the 120% funded ratio.
- The target amortization period noted above regarding new UAAL will be applied for funding benchmark and RSI reporting purposes. Alternative ADCs will be determined by division, by applying the layered amortization methodology as described above, using a 25-year closed period, a 20-year closed period, and a 15-year closed period, in lieu of the 30-year period, for amortization of new UAAL. These comparatives are to appear in the Comprehensive Annual Financial Report as a demonstration of the transparency and accountability funding goal delineated in Section III of this document.

In conjunction with the three major components discussed above, a number of actuarial assumptions are used to develop the annual actuarial metrics, as well as the ADC rates, and are described in detail in the annual actuarial valuation report. The actuarial assumptions are derived and proposed by the Board's actuary and adopted by the PERA Board of Trustees in conformity with the Actuarial Standards of Practice issued by the Actuarial Standards Board. The assumptions represent the Board's best estimate of anticipated experience under the benefit provisions of PERA and are intended to be long-term in nature. In the development of actuarial assumptions, the Board considers not only past experience but also trends, external economic forces, and future demographic and economic expectations.

- Actuarial Assumptions – Actuarial assumptions are generally grouped into two major categories:
  - Demographic assumptions, which include rates of termination, retirement, disability, mortality, etc., and
  - Economic assumptions, which include investment return, salary increase, payroll growth, and inflation, etc.

Actuarial assumptions do not impact the total cost of the plan (benefit payments and expenses), but rather the timing of prescribed contributions. To the extent that actuarial experience deviates from the assumptions, and actual contributions deviate from projected, experience gains and losses will occur. These gains (or losses) then serve to reduce (or increase) the projected future contributions necessary to achieve or sustain a certain actuarial standard. It is in this vein that the ADC rates may help indicate if the statutory contribution rates are adequate to meet the future cost requirements of the plan, although the ADC calculated in valuation results has limitations due to changing costs over time. Considering various benefit tiers currently in effect within the Colorado PERA defined benefit pension plan, the results of the actuarial projections will be the best indication of the adequacy of the statutorily prescribed pension contribution schedule.

### VI. Governance Policy/Processes

As delineated in the PERA Governance Manual, below is a list of specific actuarial and/or funding related studies, the frequency at which they should be commissioned/requested by the Board, and additional responsibilities relating to the studies:

## Section 4: Actuarial Valuation Basis

- **Actuarial Valuation** (perform annually) – The Board is responsible for reviewing PERA's annual actuarial valuation report; and submitting a summary report to the Legislative Audit Committee and the Joint Budget Committee of the General Assembly, together with any recommendations concerning such liabilities that have accrued. In addition, the Board, in consultation with their retained actuary, will provide recommendations to the Colorado General Assembly regarding any necessary adjustments to the statutory employer and member contribution rates.
- **Experience Analysis** (perform periodically, historically performed approximately every four years) – The Board is responsible for ensuring that an experience analysis is performed as prescribed, for reviewing the results of that study, and for approving the actuarial assumptions and methodologies to be used for all actuarial purposes relating to the defined benefit pension and OPEB plans.
- **Actuarial Audit** (perform every five years, or the appointment of a new actuarial firm will satisfy requirement) – The Board is responsible for ensuring that an actuarial audit is performed as prescribed and for reviewing the results of that audit.
- **Asset Liability Study** (perform at least every three to five years, or more frequently if necessary) – The Board is responsible for ensuring that a study of the relationship between the defined benefit trust assets and liabilities is performed as prescribed and for reviewing the results of that study.
- Review of the **Defined Benefit Pension Plan Funding Policy** and the **Defined Benefit OPEB Plan Funding Policy** (perform periodically) – The Board is responsible for the periodic review of the funding policies applicable to the defined benefit pension and OPEB plans, as is deemed necessary.

### VII. Glossary of Funding Policy Terms

- **Actuarial Accrued Liability (AAL):** The AAL is the value at a particular point in time of all past normal costs. This is the amount of assets the plan would have today if the current plan provisions, actuarial assumptions, and participant data had always been in effect, contributions equal to the normal cost had been made, and all actuarial assumptions had been met. For each of the PERA defined benefit plans, the AAL includes the balance in the affiliated annual increase reserve.
- **Actuarial Cost Method:** The actuarial cost method allocates a portion of the total cost (present value of benefits) to each year of service, both past service and future service.
- **Annual Increase Reserve (AIR):** As of January 1, 2007, an AIR was created for each division trust fund for the purpose of funding annual increases for PERA benefit structure members hired on or after January 1, 2007. A portion of the employer contribution, equal to one percent of the salaries of affected members, is accumulated in the AIR to be paid out in annual increases each July 1, to the extent affordable. Although invested with the affiliated division assets, the reserve balances are accounted for separately.
- **Asset Values:** For each of the PERA defined benefit plans, the actuarial and market asset values include the balance in the affiliated AIR.
  - **Actuarial Value of Assets (AVA):** The AVA is the market value of assets less the deferred investment gains or losses not yet recognized by the asset smoothing method.
  - **Market Value of Assets (MVA):** The MVA is the fair value of assets of the plan as reported in the plan's audited financial statements.

## Section 4: Actuarial Valuation Basis

- **Entry Age Normal Actuarial Cost Method (EAN):** The EAN actuarial cost method is a funding method that calculates the normal cost as a level percentage of pay or level dollar amount over the working lifetime of the plan's members.
- **Funded Ratio:** The funded ratio is the ratio of the plan assets to the plan's actuarial accrued liabilities.
  - Actuarial Value Funded Ratio: is the ratio of the AVA to the AAL.
  - Market Value Funded Ratio: is the ratio of the MVA to the AAL.
- **Normal Cost:** The normal cost is the cost allocated under the actuarial cost method to each year of active member service.
- **Present Value of Benefits (PVB) or total cost:** The PVB is the value at a particular point in time of all projected future benefit payments for current plan members, plus the balance in the affiliated AIR. The future benefit payments and the value of those payments are determined using actuarial assumptions regarding future events. Examples of these assumptions are estimates of retirement and termination patterns, salary increases, investment returns, etc.
- **Surplus:** A surplus refers to the positive difference, if any, between the AVA and the AAL.
- **Unfunded Actuarial Accrued Liability (UAAL):** The UAAL is the portion of the AAL that is not currently covered by the AVA. It is the positive difference between the AAL and the AVA.
- **Valuation Date:** The valuation date is the annual date upon which an actuarial valuation is performed; meaning that the trust assets and liabilities of the plan are valued as of that date. PERA's annual valuation date is December 31<sup>st</sup>.

**Adopted: March 20, 2015**

**Amended: January 19, 2018**

**Amended: November 16, 2018**

6022854v11/14923.001