GRS Gabriel Roeder Smith & Company
Consultants & Actuaries

PUBLIC EMPLOYEES RETIREMENT ASSOCIATION OF MINNESOTA

# PUBLIC EMPLOYEES POLICE & FIRE PLAN

ACTUARIAL VALUATION REPORT AS OF JULY 1, 2015

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November 25, 2015

Public Employees Retirement Association of Minnesota
Trustees of the Public Employees Police & Fire Plan
St. Paul, Minnesota

Dear Trustees of the Public Employees Police & Fire Plan:

The results of the July 1, 2015 annual actuarial valuation of the Public Employees Police & Fire Plan are presented in this report. This report was prepared at the request of the Board and is intended for use by the Board and staff and those designated or approved by the Board. This report may be provided to parties other than the Plan only in its entirety. GRS is not responsible for the consequences of any unauthorized use of this report.

The purpose of the valuation is to measure the Plan's funding progress and to determine the required contribution rate for the fiscal year beginning July 1, 2015. Note that we have not attempted to quantify the impact of GASB Statements No. 67 and No. 68 in this report.

The valuation was based upon information furnished by the Public Employees Retirement Association of Minnesota (PERA), concerning benefits, financial transactions, plan provisions and active members, terminated members, retirees and beneficiaries. We checked for internal and year-to-year consistency, but did not otherwise audit the data. We are not responsible for the accuracy or completeness of the information provided by PERA.

Actuarial assumptions, including discount rates, mortality tables and others identified in this report, are prescribed by Minnesota Statutes Section 356.215, the Legislative Commission on Pensions and Retirement (LCPR), and the Trustees. These parties are responsible for selecting the Plan's funding policy, actuarial valuation methods, asset valuation methods, and assumptions. The policies, methods and assumptions used in this valuation are those that have been so prescribed and are described in the Actuarial Basis of this report. PERA is solely responsible for communicating to GRS any changes required thereto.

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

Actuarial standards do not require the actuary to evaluate the ability of the plan sponsor or other contributing entity to make required contributions to the plan when due. Such an evaluation was not within the scope of this project and is not within the actuary's domain of expertise. Consequently, the actuary performed no such evaluation.

This report should not be relied on for any purpose other than the purpose described herein. Determinations of the financial results associated with the benefits described in this report in a manner other than the intended purpose may produce significantly different results.

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

Brian B. Murphy and Bonita J. Wurst are Members of the American Academy of Actuaries (MAAA) and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein. In addition, Mr. Murphy meets the requirements of "approved actuary" under Minnesota Statutes Section 356.215, Subdivision 1, Paragraph (c).

This report has been prepared by actuaries who have substantial experience valuing public employee retirement systems. To the best of our knowledge and belief, the information contained in this report is accurate and fairly presents the actuarial position of the Public Employees Police & Fire Plan as of the valuation date and was performed in accordance with the requirements of Minnesota Statutes Section 356.215, and the requirements of the Standards for Actuarial Work established by the LCPR. 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 and with applicable statutes.

We are available to answer any questions or provide further details.

Respectfully submitted,

Brian B. Murphy

Brian B. Murphy, FSA, EA, MAAA

Bonita J. Wurst

Bonita J. Wurst, ASA, EA, MAAA

BBM/BJW:ah

# Other Observations

**General Implications of Contribution Allocation Procedure or Funding Policy on Future Expected Plan Contributions and Funded Status**

Given the plan's contribution allocation procedure, if there are no changes in benefits or contributions and all actuarial assumptions are met (including the assumption of the plan earning 8.0% on the actuarial value of assets), it is expected that:

(1) The unfunded actuarial accrued liabilities will be fully amortized after 56 years, and
(2) The funded status of the plan will increase gradually towards a 100% funded ratio.
(3) The unfunded liability will grow initially as a dollar amount before beginning to decline.

**Limitations of Funded Status Measurements**

Unless otherwise indicated, a funded status measurement presented in this report is based upon the actuarial accrued liability and the actuarial value of assets. Unless otherwise indicated, with regard to any funded status measurements presented in this report:

(1) The measurement is inappropriate for assessing the sufficiency of plan assets to cover the estimated cost of settling the plan's benefit obligations, in other words of transferring the obligations to a unrelated third party in an arm's length market value type transaction.
(2) The measurement is dependent upon the actuarial cost method which, in combination with the plan's amortization policy, affects the timing and amounts of future contributions. The amounts of future contributions will most certainly differ from those assumed in this report due to future actual experience differing from assumed experience based upon the actuarial assumptions. A funded status measurement in this report of 100% is not synonymous with no required future contributions. If the funded status were 100%, the plan would still require future normal cost contributions (i.e., contributions to cover the cost of the active membership accruing an additional year of service credit).
(3) The measurement would produce a different result if the market value of assets were used instead of the actuarial value of assets, unless the market value of assets is used in the measurement.

# Contents

# Summary of Valuation Results

## Contributions

The following table summarizes important contribution information as described in the Development of Costs section.

| Contributions | Actuarial Valuation as of July 1, 2015 | Actuarial Valuation as of July 1, 2014 |
|---|---|---|
| Statutory Contributions - Chapter 353 (% of Payroll) | 29.59% | 28.73% |
| Required Contributions - Chapter 356 (% of Payroll) | 32.29% | 33.85% |
| Sufficiency / (Deficiency) | (2.70)% | (5.12)% |

The contribution deficiency decreased from (5.12)% of payroll to (2.70)% of payroll. The primary reasons for the decreased contribution deficiency are the recognition of deferred gains on assets from prior years, the increase in the statutory contribution rate, and the assumed 2.5% postretirement benefit increase delay from 2024 to 2035.

Based on the actuarial value of assets, statutory contributions are not sufficient to fully amortize the unfunded actuarial accrued liability over the statutory amortization period of 26 years. Based on current statutory contributions, the actuarial value of assets, and other methods and assumptions described in this report, the unfunded liability will be eliminated in 56 years. On a market value of assets basis, contributions are deficient by 0.69% of payroll.

The Plan Assets section provides detail on the plan assets used for the valuation including a development of the Actuarial Value of Assets (AVA). The Market Value of Assets (MVA) earned approximately 4.4% for the plan year ending June 30, 2015. The AVA earned approximately 12.4% for the plan year ending June 30, 2015 as compared to the assumed rate of 8.0%. The assumed rate is mandated by Minnesota Statutes.

Participant reconciliation and statistics are detailed in the Membership Data section. The Actuarial Basis section includes a summary of plan provisions and actuarial methods and assumptions used for the calculations in this report.

Accounting information prepared according to the Governmental Accounting Standards Board (GASB) Statements No. 67 and No. 68 will be provided in a separate report.

# Summary of Valuation Results

A summary of principal valuation results from the current valuation and the prior valuation follows. Any changes in plan provisions, actuarial assumptions or valuation methods and procedures between the two valuations are described after the summary.

| | Actuarial Valuation as of | |
|---|---|---|
| | **July 1, 2015** | **July 1, 2014** |
| **Contributions for FYE 2014** (*% of Payroll*) | | |
| Statutory - Chapter 353 | 29.59% | 28.73% |
| Required - Chapter 356 | 32.29% | 33.85% |
| Sufficiency / (Deficiency) | (2.70)% | (5.12)% |
| | | |
| **Funding Ratios** (*dollars in thousands*) | | |
| Assets | | |
| - Current assets (AVA) | $ 7,076,271 | $ 6,525,019 |
| - Current assets (MVA) | 7,348,704 | 7,273,100 |
| Accrued Benefit Funding Ratio | | |
| - Current benefit obligations | $ 8,170,932 | $ 7,870,571 |
| - Funding ratio (AVA) | 86.60% | 82.90% |
| - Funding ratio (MVA) | 89.94% | 92.41% |
| Accrued Liability Funding Ratio | | |
| - Actuarial accrued liability | $ 8,460,477 | $ 8,151,328 |
| - Funding ratio (AVA) | 83.64% | 80.05% |
| - Funding ratio (MVA) | 86.86% | 89.23% |
| Projected Benefit Funding Ratio | | |
| - Current and expected future assets | $ 9,866,672 | $ 9,076,083 |
| - Current and expected future benefit obligations | 10,231,775 | 9,736,229 |
| - Projected benefit funding ratio (AVA) | 96.43% | 93.22% |
| | | |
| **Participant Data** | | |
| Active members | | |
| - Number | 11,157 | 10,879 |
| - Projected annual earnings *(000s)* * | 876,232 | 829,374 |
| - Average projected annual earnings * | 78,635 | 76,334 |
| - Average age | 40.4 | 40.4 |
| - Average service | 12.4 | 12.4 |
| Service retirements | 7,121 | 7,002 |
| Survivors | 1,894 | 1,886 |
| Disability retirements | 1,194 | 1,151 |
| Deferred retirements | 1,560 | 1,481 |
| Terminated other non-vested | 995 | 975 |
| **Total** | **23,921** | **23,374** |

** These values exclude 11 members (14 in 2014) who were merged into PERA P&F in 2012 from the Minneapolis Police and Minneapolis Fire Retirement Funds whose benefits are not pay related.*

# Summary of Valuation Results

## Effects of Changes

The following changes in plan provisions, actuarial assumptions, and methods were recognized as of July 1, 2015:

- The discount rate was changed from 8.0% through June 30, 2017 and 8.5% thereafter to 8.0% for all years.
- The inflation assumption was changed from 3.00% to 2.75%.
- The payroll growth assumption was changed from 3.75% to 3.50%.
- Assumed increases in member salaries were decreased by 0.25% at all ages.
- The assumed post-retirement benefit increase rate was changed from 1.0% per year through 2023 and 2.5% per year thereafter to 1.0% per year through 2034 and 2.5% per year thereafter. See page 4 for additional detail about this assumption.

Refer to the Actuarial Basis section of this report for a complete description of these changes.

The combined impact of the above changes was to decrease the accrued liability by $51.4 million and increase the required contribution by 0.2% of pay, as follows:

| | Before Assumption Changes | Reflecting Assumption Changes |
|---|---|---|
| Normal Cost Rate, % of Pay | 21.2% | 21.9% |
| Amortization of Unfunded Accrued Liability, % of pay | 10.8% | 10.3% |
| Expenses (% of Pay) | 0.1% | 0.1% |
| Total Required Contribution, % of Pay | 32.1% | 32.3% |
| | | |
| Accrued Liability Funding Ratio | 83.1% | 83.6% |
| Projected Benefit Funding Ratio | 96.7% | 96.4% |
| | | |
| Unfunded Accrued Liability (in billions) | $1.4 | $1.4 |

# Summary of Valuation Results

## Valuation of Future Post-Retirement Benefit Increases

Benefit recipients receive a future annual compounding 1.0% post-retirement benefit increase. If the funding ratio reaches 90% (based on a 2.5% post-retirement benefit increase assumption) for two consecutive years, the benefit increase will revert to 2.5%. If after reverting to a 2.5% benefit increase, the funding ratio declines to less than 80% for one year or less than 85% for two consecutive years, the benefit increase rate will decrease to 1.0%. Benefit increases already granted, however, will not be affected.

To determine an assumption regarding a future change in the post-retirement benefit increase, we performed a projection of liabilities and assets based on the following methods and assumptions:

- Future investment returns and liability discount rates of 8.00%;
- Open group; stable active population (new member profile based on average new members hired in recent years);
- The post-retirement benefit increase rate is assumed to be 1.0% per year until the funding ratio threshold required to pay a 2.5% post-retirement benefit increase is reached; and
- Current statutory contribution levels (i.e., not including potential contribution increases under the contribution stabilizer statutes).

Based on these assumptions and methods, the projection indicates that this plan is expected to attain the funding ratio threshold required to pay a 2.5% post-retirement benefit increase in the year 2034, and that the plan would begin paying 2.5% benefit increases on January 1, 2035. This assumption is reflected in our calculations. This is only an assumption; actual timing will depend on actual experience.

# Summary of Valuation Results

## Risk Measures Summary *( Dollars in Thousands)*

| Valuation Date (6/30) | (1) Accrued Liabilities (AAL) | (2) Market Value of Assets | (3) Market Value Unfunded AAL | (4) Valuation Payroll | (5) Market Value Funded Ratio (2)/(1) | (6) Retiree Liabilities | (7) RetLiab/ AAL (6)/(1) | (8) AAL/ Payroll (1)/(4) | (9) Assets/ Payroll (2)/(4) |
|---|---|---|---|---|---|---|---|---|---|
| 2010 | $5,963,672 | $4,453,757 | $1,509,915 | $740,101 | 74.7% | $3,299,576 | 55.3% | 805.8% | 601.8% |
| 2011 | 6,363,546 | 5,317,032 | 1,046,514 | 775,806 | 83.6% | 3,529,604 | 55.5% | 820.2% | 685.4% |
| 2012 | 7,403,295 | 5,772,047 | 1,631,248 | 794,417 | 78.0% | 4,366,115 | 59.0% | 931.9% | 726.6% |
| 2013 | 7,304,032 | 6,346,741 | 957,291 | 796,188 | 86.9% | 4,333,475 | 59.3% | 917.4% | 797.1% |
| 2014 | 8,151,328 | 7,273,100 | 878,228 | 820,333 | 89.2% | 4,888,411 | 60.0% | 993.7% | 886.6% |
| 2015 | 8,460,477 | 7,348,704 | 1,111,773 | 845,076 | 86.9% | 5,000,871 | 59.1% | 1001.1% | 869.6% |

| Valuation Date (6/30) | (10) Portfolio StdDev | (11) Std Dev % of Pay (9) x (10) | (12) Unfunded/ Payroll | (13) Non-Investment Cash Flow (NICF) | (14) NICF/ Assets (13)/(2) | (15) Market Rate of Return | (16) 5-year Trailing Average |
|---|---|---|---|---|---|---|---|
| 2010 | | | 204.0% | $(149,485) | -3.4% | 15.7% | N/A |
| 2011 | | | 134.9% | (161,687) | -3.0% | 23.0% | N/A |
| 2012 | | | 205.3% | (190,432) | -3.3% | 2.3% | 2.3% |
| 2013 | | | 120.2% | (230,072) | -3.6% | 14.2% | 6.2% |
| 2014 | | | 107.1% | (232,048) | -3.2% | 18.5% | 14.5% |
| 2015 | 14.1% | 122.6% | 131.6% | (242,036) | -3.3% | 4.4% | 12.2% |

*(5). The Funded ratio is the most widely known measure of a plan's financial strength, but the trend in the funded ratio is much more important than the absolute ratio. The funded ratio should trend to 100%. As it approaches 100%, it is important to re-evaluate the level of investment risk in the portfolio and potentially to re-evaluate the assumed rate of return.*
*(6) and (7). The ratio of Retiree liabilities to total accrued liabilities gives an indication of the maturity of the system. As the ratio increases, cash flow needs increase, and the liquidity needs of the portfolio change. A ratio on the order of 50% indicates a maturing system.*
*(8) and (9) The ratios of liabilities and assets to payroll gives an indication of both maturity and volatility. Many systems have ratios between 500% and 700%. Ratios significantly above that range may indicate difficulty in supporting the benefit level as a level % of payroll.*
*(10) and (11). The portfolio standard deviation measures the volatility of investment return. When multiplied by the ratio of assets to payroll it gives the effect of a one standard deviation asset move as a percent of payroll. This figure helps users understand the difficulty of dealing with investment volatility and the challenges volatility brings to sustainability.*
*(12) The ratio of unfunded liability to payroll gives an indication of the plan sponsor's ability to actually pay off the unfunded liability. A ratio above approximately 300% or 400% may indicate difficulty in discharging the unfunded liability within a reasonable time frame.*
*(13) and (14) The ratio of Non-Investment Cash Flow to assets is an important measure of sustainability. Negative ratios are common and expected for a maturing system. In the longer term, this ratio should be on the order of approximately -4%. A ratio that is significantly more negative than that for an extended period could be a leading indicator of potential exhaustion of assets.*
*(15) and (16) Investment return is probably the largest single risk that most systems face. The year by year return and the 5 year geometric average give an indicator of the realism of the systems assumed return. Of course past performance is not a guarantee of future results.*

# Supplemental Information

The remainder of the report includes information supporting the results presented in the previous sections.

- **Plan assets** presents information about the plan's assets as reported by the Public Employees Retirement Association of Minnesota. The assets represent the portion of total fund liabilities that has been funded.
- **Membership data** presents and describes the membership data used in the valuation.
- **Development of costs** shows the liabilities for plan benefits and the derivation of the contribution amount.
- **Actuarial basis** describes the plan provisions, as well as the methods and assumptions used to value the plan. The valuation is based on the premise that the plan is ongoing.
- **Additional schedules** shows the Schedule of Funding Progress and Schedule of Contributions.
- **Glossary** defines the terms used in this report.

# Plan Assets

## Statement of Fiduciary Net Position *(Dollars in Thousands)*

| | Market Value | |
|---|---|---|
| **Assets in Trust** | **June 30, 2015** | **June 30, 2014** |
| Cash, equivalents, short term securities | $ 141,036 | $ 188,577 |
| Fixed income | 1,727,568 | 1,696,489 |
| Equity | 4,563,032 | 4,458,764 |
| SBI alternative | 905,931 | 917,040 |
| Other | 0 | 0 |
| **Total Assets in Trust** | **$ 7,337,567** | **$ 7,260,870** |
| Assets receivable | 14,267 * | 15,304 ** |
| Amounts payable | (3,130) | (3,074) |
| **Net Assets Held in Trust for Pension Benefits** | **$ 7,348,704** | **$ 7,273,100** |

* *Includes $11.534 million contribution from Minneapolis to be paid by July 15, 2015.*
** *Includes $11.534 million contribution from Minneapolis to be paid by July 15, 2014.*

# Plan Assets

## Reconciliation of Plan Assets *(Dollars in Thousands)*

The following exhibit shows the revenue, expenses and resulting assets of the Fund as reported by the Public Employees Retirement Association for the prior two fiscal years.

| Change in Assets | | Market Value | |
|---|---|---|---|
| **Year Ending** | | **June 30, 2015** | **June 30, 2014** |
| 1. | Fund balance at market value at beginning of year | **$ 7,273,100** | **$ 6,346,741** |
| 2. | Contributions | | |
| | a. Member | 88,733 | 81,213 |
| | b. Employer | 144,317 * | 132,632 ** |
| | c. Other sources | 9,000 | 9,000 |
| | d. Total contributions | 242,050 | 222,845 |
| 3. | Investment income | | |
| | a. Investment income/(loss) | 327,786 | 1,168,495 |
| | b. Investment expenses | (10,230) | (10,106) |
| | c. Net subtotal | 317,556 | 1,158,389 |
| 4. | Other | 84 | 18 |
| **5.** | **Total income:** *(2.d.) + (3.c.) + (4.)* | **$ 559,690** | **$ 1,381,252** |
| 6. | Benefits Paid | | |
| | a. Annuity benefits | (481,330) | (452,462) |
| | b. Refunds | (1,953) | (1,633) |
| | c. Total benefits paid | (483,283) | (454,095) |
| 7. | Expenses | | |
| | a. Other | 0 | 0 |
| | b. Administrative | (803) | (798) |
| | c. Total expenses | (803) | (798) |
| **8.** | **Total disbursements:** *(6.c.) + (7.c.)* | **(484,086)** | **(454,893)** |
| **9.** | **Fund balance at market value at end of year** | **$ 7,348,704** | **$ 7,273,100** |
| 10. | Approximate return on market value of assets | 4.4% | 18.6% |

* *Includes $11.534 million contribution from Minneapolis to be paid by July 15, 2015.*
** *Includes $11.534 million contribution from Minneapolis to be paid by July 15, 2014.*

# Plan Assets

## Actuarial Asset Value *(Dollars in Thousands)*

| | | June 30, 2015 | June 30, 2014 |
|---|---|---|---|
| 1. Market value of assets available for benefits | | **$ 7,348,704** | **$ 7,273,100** |
| 2. Determination of average balance | | | |
| a. Total assets available at beginning of year | | 7,273,100 | 6,346,741 |
| b. Total assets available at end of year | | 7,348,704 | 7,273,100 |
| c. Net investment income for fiscal year | | 317,556 | 1,158,388 |
| d. Average balance *[a. + b. - c.] / 2* | | 7,152,124 | 6,230,727 |
| 3. Expected return *[8.0% * 2.d.]* | | 572,170 | 498,458 |
| 4. Actual return | | 317,556 | 1,158,388 |
| 5. Current year asset gain/(loss) *[4. - 3.]* | | (254,614) | 659,930 |
| 6. Unrecognized asset returns | | | |
| | **Original Amount** | **Unrecognized Amount** | |
| a. Year ended June 30, 2015 | (254,614) | (203,691) | N/A |
| b. Year ended June 30, 2014 | 659,930 | 395,958 | 527,944 |
| c. Year ended June 30, 2013 | 354,260 | 141,704 | 212,556 |
| d. Year ended June 30, 2012 | (307,690) | (61,538) | (123,076) |
| e. Year ended June 30, 2011 | 653,285 | N/A | 130,657 |
| f. Unrecognized return adjustment | | 272,433 | 748,081 |
| 7. **Actuarial value at end of year** *(1. - 6.f.)* | | **$ 7,076,271** | **$ 6,525,019** |
| 8. Approximate return on actuarial value of assets during fiscal year | | 12.4% | 14.2% |
| 9. Ratio of actuarial value of assets to market value of assets | | 0.96 | 0.90 |

# Membership Data

## Distribution of Active Members**

| | Years of Service as of June 30, 2015 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Age** | **<3*** | **3 - 4** | **5 - 9** | **10 - 14** | **15 - 19** | **20 - 24** | **25 - 29** | **30 - 34** | **35+** | **Total** |
| < 25 | 248 | 7 | | | | | | | | **255** |
| Avg. Earnings | 38,979 | 58,980 | | | | | | | | **39,528** |
| 25 - 29 | 679 | 238 | 171 | | | | | | | **1,088** |
| Avg. Earnings | 47,921 | 62,815 | 68,330 | | | | | | | **54,387** |
| 30 - 34 | 476 | 243 | 953 | 234 | | | | | | **1,906** |
| Avg. Earnings | 50,472 | 65,271 | 72,657 | 76,316 | | | | | | **66,624** |
| 35 - 39 | 224 | 113 | 537 | 815 | 198 | | | | | **1,887** |
| Avg. Earnings | 47,953 | 65,373 | 72,879 | 78,328 | 80,064 | | | | | **72,578** |
| 40 - 44 | 113 | 57 | 296 | 522 | 995 | 121 | | | | **2,104** |
| Avg. Earnings | 48,447 | 59,167 | 72,465 | 77,740 | 84,062 | 87,723 | | | | **78,485** |
| 45 - 49 | 68 | 32 | 155 | 298 | 689 | 615 | 179 | | | **2,036** |
| Avg. Earnings | 54,075 | 60,318 | 71,612 | 77,124 | 83,998 | 89,038 | 92,966 | | | **82,988** |
| 50 - 54 | 34 | 8 | 56 | 116 | 279 | 354 | 392 | 58 | | **1,297** |
| Avg. Earnings | 54,960 | 48,566 | 70,202 | 79,110 | 83,164 | 89,044 | 95,940 | 94,040 | | **87,242** |
| 55 - 59 | 9 | 6 | 27 | 53 | 91 | 97 | 112 | 51 | 6 | **452** |
| Avg. Earnings | 55,918 | 58,662 | 75,368 | 79,603 | 85,098 | 92,606 | 95,557 | 100,982 | 107,367 | **89,231** |
| 60 - 64 | | 2 | 9 | 20 | 18 | 14 | 20 | 18 | 7 | **108** |
| Avg. Earnings | | 66,389 | 50,354 | 81,344 | 87,950 | 79,327 | 95,334 | 96,042 | 104,739 | **85,881** |
| 65 - 69 | | | 2 | 2 | 1 | 2 | 1 | 1 | 3 | **12** |
| Avg. Earnings | | | 14,837 | 72,234 | 63,731 | 75,464 | 62,319 | 98,580 | 81,253 | **66,122** |
| 70+ | | | 1 | | | | | | | **1** |
| Avg. Earnings | | | 14,556 | | | | | | | **14,556** |
| **Total** | **1,851** | **706** | **2,207** | **2,060** | **2,271** | **1,203** | **704** | **128** | **16** | **11,146** |
| **Avg. Earnings** | **47,809** | **63,437** | **72,078** | **77,876** | **83,647** | **89,060** | **95,058** | **97,123** | **101,321** | **74,543** |

* *This exhibit does not reflect service earned in other PERA or Combined Service Annuity benefits. It should not be relied upon as an indicator of non-vested status.*

** *This exhibit excludes 11 members who were merged into PERA P&F in 2012 from the Minneapolis Police and Minneapolis Fire Retirement Funds whose benefits are not pay related.*

In each cell, the top number is the count of active participants for the age/service combination and the bottom number is average valuation earnings for the fiscal year ending on the valuation date.

# Membership Data

## Distribution of Service Retirements

| | Years Retired as of June 30, 2015 | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Age** | **<1** | **1 - 4** | **5 - 9** | **10 - 14** | **15 - 19** | **20 - 24** | **25+** | **Total** |
| <50 | | | | | | | | |
| Avg. Benefit | | | | | | | | |
| 50 - 54 | 111 | 375 | | 1 | | | | **487** |
| Avg. Benefit | 46,636 | 49,312 | | 59,803 | | | | **48,723** |
| 55 - 59 | 103 | 640 | 355 | | | | | **1,098** |
| Avg. Benefit | 58,820 | 58,200 | 47,649 | | | | | **54,847** |
| 60 - 64 | 32 | 366 | 557 | 426 | 18 | | | **1,399** |
| Avg. Benefit | 52,212 | 55,770 | 54,563 | 47,888 | 62,063 | | | **52,889** |
| 65 - 69 | 12 | 102 | 253 | 604 | 504 | 2 | 2 | **1,479** |
| Avg. Benefit | 42,083 | 51,162 | 47,395 | 51,619 | 52,560 | 64,000 | 64,000 | **51,142** |
| 70 - 74 | | 20 | 47 | 156 | 690 | 95 | | **1,008** |
| Avg. Benefit | | 31,974 | 34,570 | 42,545 | 57,364 | 49,045 | | **52,720** |
| 75 - 79 | | 5 | 4 | 42 | 379 | 300 | 13 | **743** |
| Avg. Benefit | | 41,043 | 20,337 | 34,561 | 59,229 | 57,266 | 38,992 | **56,356** |
| 80 - 84 | | 3 | 2 | 5 | 160 | 200 | 114 | **484** |
| Avg. Benefit | | 25,457 | 24,127 | 43,476 | 56,418 | 54,839 | 53,563 | **54,634** |
| 85 - 89 | | 2 | 1 | 1 | 42 | 123 | 124 | **293** |
| Avg. Benefit | | 26,099 | 1,320 | 5,917 | 57,516 | 56,166 | 56,894 | **56,104** |
| 90+ | | 1 | | | 22 | 49 | 58 | **130** |
| Avg. Benefit | | 55,221 | | | 52,801 | 55,874 | 45,126 | **50,554** |
| **Total** | **258** | **1,514** | **1,219** | **1,235** | **1,815** | **769** | **311** | **7,121** |
| **Avg. Benefit** | **51,980** | **54,424** | **50,085** | **48,543** | **56,331** | **55,372** | **52,776** | **53,089** |

In each cell, the top number is the count of retired participants for the age/years retired combination and the bottom number is the average annual benefit amount.

# Membership Data

## Distribution of Survivors

| | Years Since Death as of June 30, 2015 | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Age | <1 | 1 - 4 | 5 - 9 | 10 - 14 | 15 - 19 | 20 - 24 | 25+ | Total |
| <45 | 4 | 71 | 52 | 14 | 5 | | | **146** |
| Avg. Benefit | 11,656 | 16,644 | 14,396 | 16,203 | 20,367 | | | **15,792** |
| 45 - 49 | 5 | 4 | 4 | 6 | 3 | 1 | | **23** |
| Avg. Benefit | 44,700 | 26,524 | 34,759 | 38,795 | 42,143 | 46,690 | | **38,023** |
| 50 - 54 | 3 | 13 | 15 | 4 | 3 | 3 | 1 | **42** |
| Avg. Benefit | 42,942 | 40,090 | 35,837 | 33,032 | 29,229 | 35,898 | 26,387 | **36,701** |
| 55 - 59 | 3 | 16 | 17 | 13 | 8 | 2 | 5 | **64** |
| Avg. Benefit | 28,222 | 27,218 | 35,755 | 36,613 | 34,274 | 52,937 | 41,632 | **34,253** |
| 60 - 64 | 8 | 44 | 24 | 13 | 15 | 9 | 9 | **122** |
| Avg. Benefit | 36,392 | 30,935 | 33,339 | 33,108 | 39,802 | 36,419 | 32,926 | **33,639** |
| 65 - 69 | 9 | 42 | 43 | 27 | 33 | 26 | 19 | **199** |
| Avg. Benefit | 36,449 | 34,457 | 31,505 | 32,142 | 34,580 | 37,864 | 32,560 | **33,880** |
| 70 - 74 | 19 | 60 | 48 | 43 | 49 | 20 | 12 | **251** |
| Avg. Benefit | 30,740 | 28,565 | 33,149 | 30,025 | 35,890 | 32,708 | 34,022 | **31,877** |
| 75 - 79 | 13 | 56 | 35 | 29 | 55 | 18 | 25 | **231** |
| Avg. Benefit | 34,463 | 30,012 | 35,276 | 31,218 | 32,326 | 32,549 | 36,316 | **32,642** |
| 80 - 84 | 13 | 61 | 49 | 41 | 66 | 34 | 24 | **288** |
| Avg. Benefit | 32,194 | 28,050 | 32,120 | 30,582 | 31,268 | 34,522 | 29,115 | **30,880** |
| 85 - 89 | 7 | 49 | 42 | 42 | 64 | 47 | 31 | **282** |
| Avg. Benefit | 37,298 | 31,351 | 31,846 | 31,218 | 27,817 | 30,452 | 25,195 | **29,924** |
| 90+ | 2 | 20 | 28 | 26 | 90 | 40 | 40 | **246** |
| Avg. Benefit | 34,233 | 26,571 | 25,830 | 24,227 | 31,015 | 28,835 | 26,681 | **28,313** |
| **Total** | **86** | **436** | **357** | **258** | **391** | **200** | **166** | **1,894** |
| **Avg. Benefit** | **33,523** | **28,041** | **29,827** | **30,067** | **31,970** | **32,855** | **30,197** | **30,411** |

In each cell, the top number is the count of survivors for the age/years since death combination and the bottom number is the average annual benefit amount.

# Membership Data

## Distribution of Disability Retirements

| | Years Disabled* as of June 30, 2015 | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Age** | **<1** | **1 - 4** | **5 - 9** | **10 - 14** | **15 - 19** | **20 - 24** | **25+** | **Total** |
| < 45 | 13 | 46 | 18 | 9 | | | | **86** |
| Avg. Benefit | 40,506 | 36,644 | 30,663 | 28,458 | | | | **35,120** |
| 45 - 49 | 13 | 36 | 28 | 19 | 9 | | | **105** |
| Avg. Benefit | 48,151 | 41,248 | 38,062 | 33,651 | 31,584 | | | **39,050** |
| 50 - 54 | 8 | 42 | 30 | 35 | 19 | 5 | | **139** |
| Avg. Benefit | 57,520 | 45,915 | 38,076 | 37,624 | 34,941 | 38,964 | | **41,053** |
| 55 - 59 | 13 | 28 | 39 | 47 | 30 | 1 | | **158** |
| Avg. Benefit | 45,745 | 48,041 | 41,962 | 40,122 | 43,025 | 47,513 | | **43,040** |
| 60 - 64 | 4 | 18 | 50 | 110 | 39 | 7 | | **228** |
| Avg. Benefit | 48,638 | 39,409 | 47,156 | 49,047 | 43,250 | 46,751 | | **46,802** |
| 65 - 69 | 3 | 7 | 17 | 99 | 120 | 11 | | **257** |
| Avg. Benefit | 53,976 | 46,568 | 37,698 | 49,198 | 52,938 | 48,700 | | **50,146** |
| 70 - 74 | | 3 | 6 | 17 | 77 | 28 | 1 | **132** |
| Avg. Benefit | | 55,302 | 53,852 | 47,382 | 52,934 | 54,593 | 61,023 | **52,728** |
| 75+ | | | 2 | 2 | 19 | 42 | 24 | **89** |
| Avg. Benefit | | | 71,167 | 29,401 | 55,821 | 51,134 | 51,502 | **52,196** |
| **Total** | **54** | **180** | **190** | **338** | **313** | **94** | **25** | **1,194** |
| **Avg. Benefit** | **47,479** | **42,474** | **41,371** | **45,054** | **49,248** | **50,867** | **51,883** | **45,889** |

** Based on effective date as provided by PERA; "Years Disabled" may reflect years since age 65 for members over age 65.*

In each cell, the top number is the count of disabled participants for the age/years disabled combination and the bottom number is the average annual benefit amount.

# Membership Data

## Reconciliation of Members

| | Terminated | | Recipients | | | |
|---|---|---|---|---|---|---|---|
| | Actives | Deferred Retirement | Other Non-Vested | Service Retirement | Disability Retirement | Survivor | Total |
| **Members on 7/1/2014** | **10,879** | **1,481** | **975** | **7,002** | **1,151** | **1,886** | **23,374** |
| New members | 728 | 0 | 0 | 0 | 0 | 0 | 728 |
| Return to active | 47 | (30) | (17) | 0 | 0 | 0 | 0 |
| Terminated non-vested | (67) | 0 | 67 | 0 | 0 | 0 | 0 |
| Service retirements | (174) | (92) | 0 | 266 | 0 | 0 | 0 |
| Terminated deferred | (185) | 185 | 0 | 0 | 0 | 0 | 0 |
| Terminated refund/transfer | (17) | (28) | (21) | 0 | 0 | 0 | (66) |
| Deaths | (8) | (5) | 0 | (147) | (14) | (80) | (254) |
| New beneficiary | 0 | 0 | 0 | 0 | 0 | 95 | 95 |
| Disabled | (45) | 0 | 0 | 0 | 45 | 0 | 0 |
| Data adjustments | (1) | 49 | (9) | 0 | 12 | (7) | 44 |
| Net change | 278 | 79 | 20 | 119 | 43 | 8 | 547 |
| **Members on 6/30/2015** | **11,157** | **1,560** | **995** | **7,121** | **1,194** | **1,894** | **23,921** |

| Terminated Member Statistics | Deferred Retirement | Other Non-Vested | Total |
|---|---|---|---|
| Number | 1,560 | 995 | 2,555 |
| Average age | 46.2 | 45.2 | 45.8 |
| Average service | 8.5 | 0.7 | 5.5 |
| Average annual benefit, with augmentation to Normal Retirement Date and 30% Combined Service Annuity (CSA) load | $25,842 | N/A | $25,842 |
| Average refund value, with 30% CSA load | $33,544 | $2,617 | $21,500 |

# Development of Costs

## Actuarial Valuation Balance Sheet *(Dollars in Thousands)*

The actuarial balance sheet is based on the principle that the long-term projected benefit obligations of the plan should be ideally equal to the long-term resources available to fund those obligations. The resources available to meet projected obligations for current members consist of current Fund assets plus the present value of anticipated future contributions intended to fund benefits for current members. In the exhibit below, B.2 is the estimated present value of contributions to fund the normal cost rate for current members until their respective termination dates. Item B.1 is the present value of the total 29.59% statutory contribution net of normal cost and anticipated plan expenses during the period from the valuation date to the statutory unfunded amortization date.

The contributions made in excess of amounts required for current benefit payments are accumulated as a reserve to help meet benefit payments in later years. It is this reserve system which permits the establishment of a level rate of contribution each year.

| | | | June 30, 2015 |
|---|---|---|---|
| A. Actuarial Value of Assets | | | $ 7,076,271 |
| B. Expected Future Assets | | | |
| 1. Present value of expected future statutory supplemental contributions* | | | 1,019,103 |
| 2. Present value of future normal cost contributions | | | 1,771,298 |
| 3. Total expected future assets: *(1.) + (2.)* | | | $ 2,790,401 |
| C. Total Current and Expected Future Assets *(A.+ B.3)* | | | $ 9,866,672 |
| D. Current Benefit Obligations** | | | |
| 1. Benefit recipients | **Non-Vested** | **Vested** | **Total** |
| a. Service retirements | $ 0 | $ 3,992,655 | $ 3,992,655 |
| b. Disability retirements | 0 | 553,492 | 553,492 |
| c. Survivors | 0 | 454,724 | 454,724 |
| 2. Deferred retirements with augmentation | 0 | 308,309 | 308,309 |
| 3. Former members without vested rights | 1,541 | 0 | 1,541 |
| 4. Active members | 63,987 | 2,796,224 | 2,860,211 |
| 5. Total current benefit obligations | $ 65,528 | $ 8,105,404 | $ 8,170,932 |
| E. Expected Future Benefit Obligations | | | $ 2,060,843 |
| F. Total Current and Expected Future Benefit Obligations*** | | | $ 10,231,775 |
| G. Unfunded Current Benefit Obligations: *(D.5.) - (A.)* | | | $ 1,094,661 |
| H. Unfunded Current and Future Benefit Obligations: *(F.) - (C.)* | | | $ 365,103 |
| I. Accrued Benefit Funding Ratio: *(A.)/(D.5.)* | | | 86.60% |
| J. Projected Benefit Funding Ratio: *(C.)/(F.)* | | | 96.43% |

* *Per the LCPR Standards for Actuarial Work, calculated assuming the current contribution toward the unfunded liability continues for the entire amortization period.*

** *Present value of credited projected benefits (projected compensation, current service).*

*** *Present value of projected benefits (projected compensation, projected service).*

# Development of Costs

## Determination of Unfunded Actuarial Accrued Liability and Supplemental Contribution Rate (*Dollars in Thousands)*

| | Actuarial Present Value of Projected Benefits | Actuarial Present Value of Future Normal Costs | Actuarial Accrued Liability |
|---|---|---|---|
| A. Determination of Actuarial Accrued Liability (AAL) | | | |
| 1. Active members | | | |
| a. Retirement annuities | $ 4,289,164 | $ 1,354,531 | $ 2,934,633 |
| b. Disability benefits | 444,691 | 266,037 | 178,654 |
| c. Survivor's benefits | 61,238 | 39,451 | 21,787 |
| d. Deferred retirements | 121,614 | 100,829 | 20,785 |
| e. Refunds* | 4,347 | 10,450 | (6,103) |
| f. Total | $ 4,921,054 | $ 1,771,298 | $ 3,149,756 |
| 2. Deferred retirements with future augmentation | 308,309 | 0 | 308,309 |
| 3. Former members without vested rights | 1,541 | 0 | 1,541 |
| 4. Annuitants | 5,000,871 | 0 | 5,000,871 |
| 5. Total | $10,231,775 | $ 1,771,298 | $ 8,460,477 |
| B. Determination of Unfunded Actuarial Accrued Liability (UAAL) | | | |
| 1. Actuarial accrued liability | | | $ 8,460,477 |
| 2. Current assets (AVA) | | | 7,076,271 |
| 3. Unfunded actuarial accrued liability | | | $ 1,384,206 |
| C. Determination of Supplemental Contribution Rate** | | | |
| 1. Present value of future payrolls through the amortization date of June 30, 2041 | | | $ 13,498,053 |
| 2. Supplemental contribution rate: *(B.3.) / (C.1.)* | | | 10.25% *** |

* *Includes non-vested refunds and non-married survivor benefits only.*

** *The amortization of the Unfunded Actuarial Accrued Liability (UAAL) using the current amortization method results in initial payments less than the "interest only" payment on the UAAL. Payments less than the interest only amount will result in the UAAL increasing for an initial period of time.*

*** *The amortization factor as of July 1, 2015 is 15.40466.*

# Development of Costs

## Changes in Unfunded Actuarial Accrued Liability (UAAL) *(Dollars in Thousands)*

| | Year Ending June 30, 2015 | | |
|---|---|---|---|
| | Actuarial Accrued Liability | Current Assets | Unfunded Actuarial Accrued Liability |
| A. Unfunded actuarial accrued liability at beginning of year | $ 8,151,328 | $ 6,525,019 | $ 1,626,309 |
| B. Changes due to interest requirements and current rate of funding | | | |
| 1. Normal cost, including expenses | $ 176,133 | $ 0 | $ 176,133 |
| 2. Benefit payments | (483,283) | (483,283) | 0 |
| 3. Contributions | 0 | 242,050 | (242,050) |
| 4. Interest on A., B.1., B.2. and B.3. | 672,611 | 512,352 | 160,259 |
| 5. Total *(B.1. + B.2. + B.3. + B.4.)* | 365,461 | 271,119 | 94,342 |
| C. Expected unfunded actuarial accrued liability at end of year *(A. + B.5.)* | | | $ 1,720,651 |
| D. Increase (decrease) due to actuarial losses (gains) because of experience deviations from expected | | | |
| 1. Age and service retirements | | | $ (7,735) |
| 2. Disability retirements | | | (3,471) |
| 3. Death-in-service benefits | | | (860) |
| 4. Withdrawals | | | (3,335) |
| 5. Salary increases | | | (26,800) |
| 6. Investment income | | | (280,133) |
| 7. Mortality of annuitants | | | 13,700 |
| 8. Other items | | | 23,626 |
| 9. Total | | | (285,008) |
| E. Unfunded actuarial accrued liability at end of year before plan amendments and changes in actuarial assumptions *(C. + D.5.)* | | | $ 1,435,643 |
| F. Change in unfunded actuarial accrued liability due to changes in plan provisions | | | $ 0 |
| G. Change in unfunded actuarial accrued liability due to changes in actuarial assumptions | | | (51,437) |
| H. Change in unfunded actuarial accrued liability due to changes in decrement timing and miscellaneous methodology | | | 0 |
| I. Unfunded actuarial accrued liability at end of year *(E. + F. + G. + H.)** | | | $ 1,384,206 |

** The unfunded actuarial accrued liability on a market value of assets basis is $1,111,773.*

# Development of Costs

## Determination of Contribution Sufficiency/(Deficiency) *(Dollars in Thousands)*

The required contribution is defined in Minnesota statutes as the sum of normal cost, a supplemental contribution to amortize the UAAL, and an allowance for expenses.

| | Percent of Payroll | Dollar Amount |
|---|---|---|
| A. Statutory contributions - Chapter 353 | | |
| 1. Employee contributions | 10.80% | $ 94,633 |
| 2. Employer contributions | 16.20% | 141,950 |
| 3. Minneapolis Police contributions*** | 1.02% | 8,890 |
| 4. Minneapolis Fire contributions*** | 0.54% | 4,757 |
| 5. Virginia Fire contributions | 0.00% | 30 |
| 6. State contributions**** | 1.03% | 9,000 |
| 7. Total | 29.59% | $ 259,260 |
| B. Required contributions - Chapter 356 | | |
| 1. Normal cost | | |
| a. Retirement benefits | 16.79% | $ 147,119 |
| b. Disability benefits | 3.33% | 29,179 |
| c. Survivors | 0.52% | 4,556 |
| d. Deferred retirement benefits | 1.18% | 10,340 |
| e. Refunds* | 0.12% | 1,051 |
| f. Total | 21.94% | $ 192,245 |
| 2. Supplemental contribution amortization of Unfunded Actuarial Accrued Liability by June 30, 2041 | 10.25% | $ 89,814 |
| 3. Allowance for expenses | 0.10% | $ 876 |
| 4. Total | 32.29% ** | $ 282,935 |
| C. Contribution Sufficiency/(Deficiency) *(A.7. - B.4.)* | (2.70)% | $ (23,675) |

Note: Projected annual payroll for fiscal year beginning on the valuation date: $876,232.

* *Includes non-vested refunds and non-married survivor benefits only.*
** *The required contribution on a market value of assets basis is 30.28% of payroll.*
*** *Contributions due July 15, 2016. 2015 contributions are included in assets as receivable contributions.*
**** *Contributions paid until both PERA P&F and MSRS State Patrol reach 90% funding (on a Market Value of Assets basis).*

# Development of Costs

## Special Groups – Minneapolis Police Relief Association (000s)

The Minneapolis Police Relief Association was consolidated with the P&F Plan on December 30, 2011, per 2011 legislation. The annual employer contribution after consolidation is defined as the amount necessary to amortize on a level dollar basis the estimated unfunded present value of benefits at consolidation by December 31, 2031. Contributions are payable annually on July 15th.

The employer contribution to be made annually on July 15th beginning in 2013 and ending in 2015 is $7,612,423 (previously calculated). Due to the change in P&F's statutory discount rate, the contribution amount was recalculated. The employer contribution to be made annually on July 15th beginning in 2016 and ending in 2031 is $8,890,272 (previously calculated).

**Year Ending June 30, 2015**

| Group | Number | Annual Benefits | Average Age | Present Value of Projected Benefits |
|---|---|---|---|---|
| Active Members | 1 | N/A | 61.9 | $ 655 |
| Service Retirements | 469 | $ 28,784 | 73.9 | 271,531 |
| Disability Retirements | 11 | 559 | 72.3 | 4,982 |
| Survivors | 224 | 7,687 | 80.2 | 52,324 |
| **Total** | **705** | **$37,030** | **75.9** | **$329,492** |

# Development of Costs

## Special Groups – Minneapolis Firefighters' Relief Association (000s)

The Minneapolis Firefighters' Relief Association was consolidated with the P&F Plan on December 30, 2011, per 2011 legislation. The annual employer contribution after consolidation is defined as the amount necessary to amortize on a level dollar basis the estimated unfunded present value of benefits at consolidation by December 31, 2031. Contributions are payable annually on July 15th.

The employer contribution to be made annually on July 15th beginning in 2013 and ending in 2015 is \$3,921,787 (previously calculated). Due to the change in P&F's statutory discount rate, the contribution amount was recalculated. The employer contribution to be made annually on July 15th beginning in 2016 and ending in 2031 is \$4,757,457 (previously calculated).

**Year Ending June 30, 2015**

| Group | Number | Annual Benefits | Average Age | Present Value of Projected Benefits |
|---|---|---|---|---|
| Active Members | 10 | N/A | 61.0 | $ 6,454 |
| Service Retirements | 278 | $ 17,499 | 74.9 | 155,872 |
| Disability Retirements | 39 | 2,380 | 72.6 | 19,264 |
| Survivors | 163 | 5,716 | 79.9 | 39,539 |
| Total | **490** | **$ 25,595** | **76.1** | **$221,129** |

# Development of Costs

## Special Groups – Virginia Fire Department Relief Association (000s)

The Virginia Fire Department Relief Association was consolidated with the P&F Plan on June 29, 2012. The annual employer contribution after consolidation is defined as the amount necessary to amortize on a level dollar basis the estimated unfunded present value of benefits at consolidation by December 31, 2020.

The employer contribution to be made annually beginning in 2012 and ending in 2014 is $25,431 (previously calculated). Due to the change in P&F's statutory discount rate, the contribution amount was recalculated. The employer contribution to be made annually beginning in 2015 and ending in 2020 is $29,611 (previously calculated).

**Year Ending June 30, 2015**

| Group | Number | Annual Benefits* | Average Age | Present Value of Projected Benefits |
|---|---|---|---|---|
| Service Retirements | 6 | $ 161 | 82 | $ 1,081 |
| Survivors | 4 | 63 | 85.8 | 337 |
| Total | **10** | **$ 224** | **83.5** | **$1,418** |

* *Benefit amounts were provided by PERA for all members. Surviving spouses will receive a benefit equal to 50% of the annuitant benefit amount.*

# Development of Costs

## Special Groups – Fairmont Police Department Relief Association (000s)

The Fairmont Police Department Relief Association was consolidated with the P&F Plan on June 29, 2012. The assets exceeded the present value of future benefits at consolidation by $462,639 (previously calculated). PERA credited these assets to an interest bearing suspense account within the P&F Fund and the account will be used to offset any increase in liability for this group of members due to any changes in P&F's statutory discount rate until June 30, 2015. After June 30, 2015, the account will be paid to the City of Fairmont.

**Year Ending June 30, 2015**

| Group | Number | Annual Benefits* | Average Age | Present Value of Projected Benefits |
|---|---|---|---|---|
| Service Retirements | 9 | $ 568 | 73.9 | $ 5,235 |
| Survivors | 3 | 116 | 84.8 | 653 |
| Total | **12** | **$ 684** | **76.6** | **$5,888** |

* *Benefit amounts were provided by PERA for all members. Surviving spouses will receive an annual benefit equal to 35 times the unit value.*

# Actuarial Basis

## Actuarial Methods

All actuarial methods are prescribed by Minnesota Statutes, the Legislative Commission on Pensions and Retirement, or the Board of Trustees. Different methodologies may also be reasonable and results based on other methodologies would produce different results.

**Actuarial Cost Method**

An actuarial cost method is a set of techniques used by the actuary to develop contribution levels under a retirement plan. The actuarial cost method used in this valuation for all purposes is the Entry Age Actuarial Cost Method. Under this method, a normal cost is developed by amortizing the actuarial value of benefits expected to be received by each active participant (as a level percentage of pay) over the total working lifetime of that participant, from hire to termination. Age as of the valuation date was calculated based on the dates of birth provided by the Fund. Entry age for valuation purposes was calculated as the age on the valuation date minus the provided years of service on the valuation date.

To the extent that current assets and future normal costs do not support participants' expected future benefits, an unfunded actuarial accrued liability ("UAAL") develops. The UAAL is amortized over the statutory amortization period using level percent of payroll assuming payroll increases. The total contribution developed under this method is the sum of normal cost, expenses, and the payment toward the UAAL.

**Valuation of Future Post-Retirement Benefit Increases**

If the plan has reached the funding ratio threshold required to pay a 2.5% benefit increase, Minnesota Statutes require the 2.5% benefit increase rate to be reflected in the liability calculations. If the plan has not yet reached the funding ratio threshold required to pay a 2.5% benefit increase, Minnesota Statutes require a projection to be performed to determine the expected attainment of the funding ratio threshold, and the expected reversion to a 2.5% benefit increase rate must be reflected in the liability calculations.

**Funding Objective**

The fundamental financing objective of the Fund is to establish contribution rates which, when expressed as a percentage of active member payroll, will remain approximately level from generation to generation and meet the required deadline for full funding.

**Decrement Timing**

All decrements are assumed to occur mid-year.

# Actuarial Basis

## Actuarial Methods (Concluded)

**Asset Valuation Method**

The assets are valued based on a five-year moving average of expected and market values (five-year average actuarial value) determined as follows:

- At the end of each plan year, an average asset value is calculated as the average of the market asset value at the beginning and end of the fiscal year net of investment income for the fiscal year;
- The investment gain or (loss) is taken as the excess of actual investment income over the expected investment income based on the average asset value as calculated above;
- The investment gain or (loss) so determined is recognized over five years at 20% per year; and
- The asset value is the sum of the market asset value plus the scheduled recognition of investment gains or (losses) during the current and the preceding four fiscal years.

**Payment on the Unfunded Actuarial Accrued Liability**

Payment equals a level percentage of payroll each year to the statutory amortization date of June 30, 2041 assuming payroll increases of 3.50% per annum. If there is a negative Unfunded Actuarial Accrued Liability, the surplus amount is amortized over 30 years as a level percentage of payroll. If the unfunded liability increases due to changes in benefits, assumptions, or methods, the statutory amortization date will be re-determined. Projected payroll is multiplied by 0.959 in the determination of the present value of future payroll to account for timing differences (as required by the Standards for Actuarial Work).

**Changes in Methods since Prior Valuation**

Based on direction from the LCPR's actuary, the July 1, 2014 entry age normal accrued liability and normal cost were calculated using an equivalent single interest rate of 8.41% due to the statutory select and ultimate discount rate structure. This method is no longer needed since the discount rate was changed from the select and ultimate assumptions to 8.00% for all years effective July 1, 2015

# Actuarial Basis

## Summary of Actuarial Assumptions

The following assumptions were used in valuing the liabilities and benefits under the plan. All actuarial assumptions are prescribed by Minnesota Statutes, the Legislative Commission on Pensions and Retirement (LCPR), or the Board of Trustees. These parties are responsible for selecting the assumptions used for this valuation. The assumptions prescribed are based on the last experience study, dated November 2010, prepared by a former actuary, and an economic assumption review dated September 11, 2014.

The Allowance for Combined Service Annuity was also based on a recommendation by a former actuary. We are unable to judge the reasonableness of this assumption without performing a substantial amount of additional work beyond the scope of the assignment.

| | |
|---|---|
| Investment return | 8.00% per annum. |
| Benefit increases after retirement | 1.00% per annum through 2034 and 2.5% per annum thereafter. |
| Salary increases | Reported salary at valuation date increased according to the rate table, to current fiscal year and annually for each future year. Prior fiscal year salary is annualized for members with less than one year of service earned during the year. |
| Inflation | 2.75% per year |
| Payroll growth | 3.50% per year. |
| Mortality rates | |
| Healthy pre-retirement | RP-2000 employee generational mortality table projected with mortality improvement scale AA, white collar adjustment, set back two years for males and females. |
| Healthy post-retirement | RP-2000 annuitant generational mortality table projected with mortality improvement scale AA, white collar adjustment.<br><br>The RP-2000 employee mortality table as published by the Society of Actuaries (SOA) contains mortality rates for ages 15 to 70 and the annuitant mortality table contains mortality rates for ages 50 to 95. We have applied the annuitant mortality table for active members beyond age 70 until the assumed retirement age and the employee mortality table for annuitants younger than age 50. |
| Disabled | RP-2000 healthy annuitant mortality table, white collar adjustment, set forward eight years for males and females. |
| Retirement | Members retiring from active status are assumed to retire according to the age related rates shown in the rate table. Members who have attained the highest assumed retirement age are assumed to retire in one year. |
| Withdrawal | Select and Ultimate rates based on actual experience. Ultimate rates after the third year are shown in rate table. Select rates in the first three years are: |

| Year | Select Withdrawal Rates |
|---|---|
| 1 | 8.00% |
| 2 | 5.00% |
| 3 | 3.50% |

# Actuarial Basis

## Summary of Actuarial Assumptions (Continued)

| | |
|---|---|
| Disability | Age-related rates based on experience; see table of sample rates. All incidences are assumed to be duty-related. |
| Allowance for combined service annuity | Liabilities for former members are increased by 30.00% to account for the effect of some participants having eligibility for a Combined Service Annuity. |
| Administrative expenses | Prior year administrative expenses expressed as percentage of prior year projected payroll. |
| Refund of contributions | Account balances accumulate interest until normal retirement date and are discounted back to the valuation date. All employees withdrawing after becoming eligible for a deferred benefit take the larger of their contributions accumulated with interest or the value of their deferred benefit. |
| Commencement of deferred benefits | Members receiving deferred annuities (including current terminated deferred members) are assumed to begin receiving benefits at age 55. |
| Percentage married | 85% of male and 65% of female active members are assumed to be married. Actual marital status is used for members in payment status. |
| Age of spouse | Wives are assumed to be three years younger than their husbands for male members, and husbands are assumed to be four years older than their wives for female members. For members in payment status, actual spouse date of birth is used, if provided. |
| Eligible children | Retiring members are assumed to have no dependent children. |
| Form of payment | Married members retiring from active status are assumed to elect subsidized joint and survivor form of annuity as follows:<br><br>Males: 10% elect 25% Joint & Survivor option<br>20% elect 50% Joint & Survivor option<br>20% elect 75% Joint & Survivor option<br>35% elect 100% Joint & Survivor option<br>Females: 5% elect 25% Joint & Survivor option<br>15% elect 50% Joint & Survivor option<br>5% elect 75% Joint & Survivor option<br>15% elect 100% Joint & Survivor option<br><br>Remaining married members and unmarried members are assumed to elect the Straight Life option.<br><br>Members receiving deferred annuities (including current terminated deferred members) are assumed to elect a straight life annuity. |
| Eligibility testing | Eligibility for benefits is determined based upon the age nearest birthday and service on the date the decrement is assumed to occur. |
| Decrement operation | Withdrawal decrements do not operate during retirement eligibility. |
| Service credit accruals | It is assumed that members accrue one year of service credit per year. |

# Actuarial Basis

## Summary of Actuarial Assumptions (Continued)

| | |
|---|---|
| Unknown data for certain members | To prepare this report, GRS has used and relied on participant data supplied by the Fund. Although GRS has reviewed the data in accordance with Actuarial Standards of Practice No. 23, GRS has not verified or audited any of the data or information provided.<br><br>In cases where submitted data was missing or incomplete, the following assumptions were applied:<br><br><u>Data for active members:</u><br><br>There were 22 members reported with a salary less than $100. We used prior year salary (14 members), if available; otherwise high five salary with a 10% load to account for salary increases (7 members). If neither prior year salary nor high five salary was available, we assumed a value of $35,000 (1 member). Note former members of either Minneapolis Police or Minneapolis Fire are excluded from these salary counts as salary is not used to calculate the benefit.<br><br>There were also 98 members reported without a gender. We assumed male gender. No members were reported without a date of birth.<br><br><u>Data for terminated members:</u><br><br>We calculated benefits for these members using the reported Average Salary and credited service. If Average Salary was not reported (4 members), we assumed a value of $24,000. If credited service was not reported (15 members), we used elapsed time from hire date to termination date (5 members); otherwise we assumed nine years of service (10 members). If termination date was invalid or not reported (10 members), we assumed the termination date was equal to the hire date plus credited service, otherwise the valuation date.<br><br>There were 7 members reported without a gender; male was assumed.<br><br>No members were reported without a date of birth.<br><br><u>Data for inactive members:</u><br><br>There were no members with missing or invalid dates of birth. There were 16 members reported without a gender. We assumed retirees are male and beneficiaries are female. |
| Changes in actuarial assumptions | The discount rate was changed from 8.0% through June 30, 2017 and 8.5% thereafter to 8.0% for all years.<br><br>The inflation assumption was changed from 3.00% to 2.75%<br><br>The payroll growth assumption was changed from 3.75% to 3.50%.<br><br>Assumed increases in member salaries were decreased by 0.25% at all ages.<br><br>The assumed post-retirement benefit increase rate was changed from 1.0% per year through 2023 and 2.5% per year thereafter to 1.0% per year through 2034 and 2.5% per year thereafter. See page 4 for additional detail about this assumption. |

# Actuarial Basis

## Summary of Actuarial Assumptions (Continued)

| | Rate (%)* | | | | | |
|---|---|---|---|---|---|---|
| | Healthy Post-Retirement Mortality** | | Healthy Pre-Retirement Mortality** | | Disability Mortality | |
| Age | Male | Female | Male | Female | Male | Female |
| 20 | 0.03% | 0.02% | 0.03% | 0.02% | 0.04% | 0.02% |
| 25 | 0.04 | 0.02 | 0.04 | 0.02 | 0.05 | 0.04 |
| 30 | 0.04 | 0.03 | 0.04 | 0.02 | 0.08 | 0.06 |
| 35 | 0.06 | 0.05 | 0.05 | 0.04 | 0.11 | 0.08 |
| 40 | 0.09 | 0.06 | 0.08 | 0.06 | 0.17 | 0.13 |
| 45 | 0.13 | 0.10 | 0.11 | 0.08 | 0.57 | 0.29 |
| 50 | 0.60 | 0.24 | 0.17 | 0.13 | 0.57 | 0.47 |
| 55 | 0.54 | 0.35 | 0.24 | 0.20 | 0.92 | 0.74 |
| 60 | 0.66 | 0.56 | 0.35 | 0.31 | 1.58 | 1.24 |
| 65 | 1.16 | 0.91 | 0.56 | 0.50 | 2.67 | 2.09 |
| 70 | 1.93 | 1.52 | 0.85 | 0.76 | 4.75 | 3.50 |

* *Generally, mortality rates are expected to increase as age increases. Due to the combination of pre-retirement rates, post-retirement rates, the white collar adjustment, and Projection Scale AA, the prescribed mortality tables have a few ages where assumed mortality decreases slightly instead of increases. We have used the rates as prescribed, but we note that although the prescribed assumption is reasonable in total, it may not be reasonable at every age. If the rates were reasonably adjusted so that they decreased at all ages, we would not expect the valuation results to be materially different.*

***These rates were adjusted for mortality improvements using Projection Scale AA.*

| | Withdrawal Rates After Third Year | | Disability Retirement | |
|---|---|---|---|---|
| Age | Male | Female | Male | Female |
| 20 | 6.01% | 6.01% | 0.11% | 0.11% |
| 25 | 3.24 | 3.24 | 0.13 | 0.13 |
| 30 | 1.90 | 1.90 | 0.16 | 0.16 |
| 35 | 1.46 | 1.46 | 0.19 | 0.19 |
| 40 | 1.26 | 1.26 | 0.29 | 0.29 |
| 45 | 0.91 | 0.91 | 0.54 | 0.54 |
| 50 | 0.50 | 0.50 | 1.04 | 1.04 |
| 55 | 0.11 | 0.11 | 2.03 | 2.03 |
| 60 | 0.00 | 0.00 | 0.00 | 0.00 |

# Actuarial Basis

## Summary of Actuarial Assumptions (Concluded)

| Age | Retirement |
|---|---|
| 50 | 13% |
| 51 | 10 |
| 52 | 10 |
| 53 | 10 |
| 54 | 13 |
| 55 | 30 |
| 56 | 20 |
| 57 | 20 |
| 58 | 20 |
| 59 | 20 |
| 60 | 25 |
| 61 | 25 |
| 62 | 35 |
| 63 | 35 |
| 64 | 35 |
| 65 | 50 |
| 66 | 50 |
| 67 | 50 |
| 68 | 50 |
| 69 | 50 |
| 70+ | 100 |

| Salary Scale | |
|---|---|
| Year | Increase |
| 1 | 12.75% |
| 2 | 10.75% |
| 3 | 8.75% |
| 4 | 7.75% |
| 5 | 6.25% |
| 6 | 5.85% |
| 7 | 5.55% |
| 8 | 5.35% |
| 9 | 5.15% |
| 10 | 5.05% |
| 11 | 4.95% |
| 12 | 4.85% |
| 13 | 4.75% |
| 14 | 4.65% |
| 15 | 4.55% |
| 16 | 4.55% |
| 17 | 4.55% |
| 18 | 4.55% |
| 19 | 4.55% |
| 20 | 4.55% |
| 21 | 4.45% |
| 22 | 4.35% |
| 23+ | 4.25% |

# Actuarial Basis

## Summary of Plan Provisions – Police & Fire Plan

Following is a summary of the major plan provisions used in the valuation of this report. PERA is solely responsible for the validity, accuracy and comprehensiveness of this information. If any of the plan provisions shown below are not accurate and complete, the valuation results may differ significantly from those shown in this report and may require a revision of this report.

| | |
|---|---|
| **Plan year** | July 1 through June 30. |
| **Eligibility** | All full-time and certain part-time police officers and fire fighters, and certain paramedics, who are not contributing to any other local retirement fund. |
| **Contributions** | **Member** / **Employer**<br>Percent of Salary<br>January 1, 2015 & later: Member 10.80, Employer 16.20<br>Member contributions are "picked up" according to the provisions of Internal Revenue Code 414(h). |
| **State contributions** | $9 million paid annually on October 1 until both PERA P&F and MSRS State Patrol become 90% funded (on a Market Value of Assets basis). |
| **Allowable service** | Police and Fire service during which member contributions were made. May also include certain leaves of absence and military service. |
| **Salary** | Includes amounts deducted for deferred compensation or supplemental retirement plans, net income from fees and sick leave payments funded by the employer. Excludes unused annual leaves and sick leave payments, severance payments, Workers' Compensation benefits and employer-paid flexible spending accounts, cafeteria plans, healthcare expense accounts, day-care expenses, fringe benefits and the cost of insurance coverage. |
| **Average salary** | Average of the five highest successive years of salary. Average Salary is based on all Allowable Service if less than five years. |
| **Vesting** | |

| | Vesting Percent if First Hired | | |
|---|---|---|---|
| **Years of Service** | **Before 7/1/2010** | **After 6/30/2010 & before 7/1/2014** | **After 6/30/2014** |
| <3 | 0% | 0% | 0% |
| 3 – 4 | 100 | 0 | 0 |
| 5 | 100 | 50 | 0 |
| 6 | 100 | 60 | 0 |
| 7 | 100 | 70 | 0 |
| 8 | 100 | 80 | 0 |
| 9 | 100 | 90 | 0 |
| 10 | 100 | 100 | 50 |
| 11 | 100 | 100 | 55 |
| 12 | 100 | 100 | 60 |
| 13 | 100 | 100 | 65 |
| 14 | 100 | 100 | 70 |
| 15 | 100 | 100 | 75 |
| 16 | 100 | 100 | 80 |
| 17 | 100 | 100 | 85 |
| 18 | 100 | 100 | 90 |
| 19 | 100 | 100 | 95 |
| 20+ | 100 | 100 | 100 |

# Actuarial Basis

## Summary of Plan Provisions – Police & Fire Plan (Continued)

**Retirement**

Normal retirement benefit

| | |
|---|---|
| Age/service requirement | Age 55 and at least partially vested. Proportionate Retirement Annuity is available at age 65 and one year of Allowable Service. |
| Amount | 3.0% of Average Salary for each year of Allowable Service (up to 33 years if hired after June 30, 2014), pro-rata for completed months. A pro-rata share of member contributions will be refunded at retirement for excess service. |

Early retirement

| | |
|---|---|
| Age/service requirement | Age 50 and at least partially vested. |
| Amount | Normal Retirement Benefit based on Allowable Service and Average Salary at retirement date and 0.10% (0.20% for members enrolled in the plan after June 30, 2007) reduction for each month the member is under age 55. If the effective date of retirement is after June 30, 2019, the reduction is 5/12% for each month that the member is under age 55 at the time of retirement. The change in early retirement factors will be phased-in over a five-year period for retirements occurring between July 1, 2014 and June 30, 2019. |
| Form of payment | Life annuity with return on death of any balance of contributions over aggregate monthly payments. Actuarially equivalent options are:<br><br>25%, 50%, 75% or 100% Joint and Survivor with bounce back feature. The Joint and Survivor options are determined on an actuarially equivalent basis, but with no actuarial reduction for the bounce back feature. |
| Benefit Increases | Benefit recipients receive a future annual 1.0% post-retirement benefit increase. The annual adjustment will equal 2.5% any time the Fund exceeds a 90% funded ratio for two consecutive years. If the adjustment is increased to 2.5% and the funded ratio falls below 80% for one year or 85% for two consecutive years the post-retirement benefit increase will be lowered to 1.0%.<br><br>A benefit recipient who has been receiving a benefit for at least 12 full months as of June 30 will receive a full increase. Members receiving benefits for at least one month but less than 12 full months as of June 30 will receive a pro rata increase. For retirements after May 31, 2014, the first increase will be delayed two years.<br><br>Members retired under laws in effect before July 1, 1973 receive an additional lump sum payment each year. In 1989, this lump sum payment is the greater of \$25 times each full year of Allowable Service or the difference between \$400 times each full year of Allowable Service and the sum of benefits paid from any Minnesota public pension plan plus cash payments from the Social Security Administration for the preceding fiscal year July 1, 1988 through June 30, 1989. In each following year, the lump sum payment will increase by the same percentage increase that is applied to regular annuities paid from the Fund. Effective January 1, 2002, annual lump sum payment is divided by 12 and paid as a monthly life annuity in the annuity form elected. |

# Actuarial Basis

## Summary of Plan Provisions – Police & Fire Plan (Continued)

**Disability**

<u>Duty disability benefit</u>

| | |
|---|---|
| Age/service requirement | Physically or mentally unable to perform normal duties as a police officer or fire fighter as a direct result of an act of duty specific to protecting property and personal safety of others. Members age 55 or older with 20 or more years of Allowable Service are not eligible to apply for duty disability benefits. |
| Amount | 60.00%, plus an additional 3.00% for each year of service in excess of 20 years, of Average Salary paid until Normal Retirement Age, or for 60 months, whichever is later. The retirement benefit is then recalculated but is never lower than the disability benefit.<br><br>If a member became disabled prior to July 1, 1997 but did not commence their benefit before July 1, 1997, the benefit is calculated under the laws in effect before July 1, 1997, and an actuarial increase shall be made for the change in post-retirement interest rates from 5.00% to 6.00%. |

<u>Regular disability benefit</u>

| | |
|---|---|
| Age/service requirement | Physically or mentally unable to perform normal duties as a police officer or fire fighter with one year of Allowable Service. Members age 55 or older with 15 or more years of Allowable Service are not eligible to apply for regular disability benefits. |
| Amount | 45.00% of Average Salary, paid until Normal Retirement Age, or for 60 months, whichever is later. The retirement benefit is then recalculated but is never lower than the disability benefit. Benefits for total and permanent regular disability are calculated as 3.00% of Average Salary for each year of Allowable Service, with a minimum of 45.00% of Average Salary.<br><br>If a member became disabled prior to July 1, 1997 but did not commence his or her benefit before July 1, 1997, the benefit payable is calculated under the laws in effect before July 1, 1997, and an actuarial increase shall be made for the change in post-retirement interest rates from 5.00% to 6.00%. |
| Benefit increases | Same as for retirement. |

<u>Retirement benefit</u>

| | |
|---|---|
| Age/service requirement | Upon cessation of disability benefits. |
| Amount | Any optional annuity continues. Otherwise, the larger of the disability benefit paid before age 55 or the normal retirement benefit available at age 55, or an actuarially equivalent optional annuity. |
| Form of payment | Same as for retirement. |
| Benefit increases | Same as for retirement. |

# Actuarial Basis

## Summary of Plan Provisions – Police & Fire Plan (Continued)

**Death**

Surviving spouse benefit

| | |
|---|---|
| Age/service requirement | Death of active member or regular disabled member with surviving spouse whose disability benefit accrued before July 1, 2007, who is vested at death (service requirement is waived if death occurs in the line of duty). |
| Amount | 50.00% of salary (60.00% if death occurs in the line of duty after June 30, 2007) averaged over last six months. Benefit paid until spouse's death but no payments while spouse is remarried prior to July 1, 1991.<br><br>If a member becomes deceased prior to July 1, 1997 and the beneficiary was not eligible to commence their survivor benefits before July 1, 1997, the benefit payable is calculated under the laws in effect before July 1, 1997, and an actuarial increase shall be made for the change in the post-retirement interest rates from 5.00% to 6.00%. |
| Benefit increases | Same as for retirement. |

Surviving dependent children's benefit

| | |
|---|---|
| Age/service requirement | Non-duty related death of active member or regular disabled member with eligible dependent child. |
| Amount | 10.00% of salary averaged over last six months for each child. Family benefit minimum (including spouse's benefit) of 50.00% of salary and maximum of 70.00% of salary. Benefits paid until child marries, dies, or attains age 18 (age 23 if full-time student). |

Duty disability surviving spouse benefit

| | |
|---|---|
| Age/service requirement | Member who is totally and permanently disabled who dies before age 55 or within five years of the effective date of the disability benefit, whichever is later. |
| Amount | 60.00% of salary averaged over last six months. Benefits paid until spouse's death but no payments while spouse is remarried prior to July 1, 1991. |
| Benefit increases | Same as for retirement. |

# Actuarial Basis

## Summary of Plan Provisions – Police & Fire Plan (Continued)

**Death (Continued)**

Duty disability surviving dependent children's benefit

| | |
|---|---|
| Age/service requirement | Death of a member with an eligible dependent child who was disabled in the line of duty and died as a direct result of the disability. |
| Amount | 10.00% of salary averaged over last six months for each child. Family benefit minimum (including spouse's benefit) of 60.00% of salary and maximum of 80.00% of salary. Benefits paid until child marries, dies, or attains age 18 (age 23 if full-time student).<br><br>If a member became deceased prior to July 1, 1997 and the beneficiary was not eligible to commence their survivor benefits before July 1, 1997, the benefit payable is calculated under the laws in effect before July 1, 1997, and an actuarial increase shall be made for the change in the post-retirement interest rates from 5.00% to 6.00%. |

Surviving spouse optional annuity

| | |
|---|---|
| Age/service requirement | Active member dies before age 55. Benefits commence when member would have been age 55 or as early as age 50 if qualified for early retirement, benefits commence immediately if member had 30 years of service. |
| Amount | Survivor's payment of the 100% joint and survivor benefit the member could have elected if terminated. Alternatively, spouse may elect refund of deceased's contributions with interest if there are no dependent children.<br><br>If a member became deceased prior to July 1, 1997 and the beneficiary was not eligible to commence their survivor benefits before July 1, 1997, the benefit payable is calculated under the laws in effect before July 1, 1997, and an actuarial increase shall be made for the change in the post-retirement interest rates from 5.00% to 6.00%. |
| Benefit increases | Same as for retirement. |

# Actuarial Basis

## Summary of Plan Provisions – Police & Fire Plan (Continued)

| | |
|---|---|
| **Termination** | |
| Refund of contributions | |
| Age/service requirement | Termination of public service. |
| Amount | If member terminated before July 1, 2011, member's contributions credited with 6% interest compounded annually prior to July 1, 2011 and 4% interest thereafter. If member terminated after June 30, 2011, member's contributions credited with 4% interest compounded annually.<br><br>A deferred annuity may be elected in lieu of a refund if vested. |
| Deferred benefit | |
| Age/service requirement | Partially or fully vested. |
| Amount | Benefit computed under law in effect at termination and increased by the following percentage (augmentation) compounded annually for terminations prior to 2012:<br><br>(a.) 0.00% before July 1, 1971;<br>(b.) 5.00% from July 1, 1971 to January 1, 1981;<br>(c.) 3.00% (2.50% if hired after June 30, 2006) thereafter until the earlier of January 1 of the year following attainment of age 55 and January 1, 2012;<br>(d.) 5.00% (2.50% if hired after June 30, 2006) thereafter until the earlier of the date the annuity begins and January 1, 2012; and<br>(e.) 1.00% from January 1, 2012 thereafter.<br><br>Members who terminate after 2011 will receive no future augmentation.<br><br>If a member terminated employment prior to July 1, 1997 but was not eligible to commence their pension before July 1, 1997, the benefit payable is calculated under the laws in effect before July 1, 1997 and an actuarial increase shall be made for the change in the post-retirement interest rates from 5.00% to 6.00%. |
| Form of payment | Same as for retirement. |
| **Optional form conversion factors** | Actuarially equivalent factors based on RP-2000 for healthy annuitants, white collar adjustment, projected to 2027 using scale AA, no setbacks, blended 90% males, and 7.0% post-retirement interest. The post-retirement interest rate assumption will change to 6.5% on the earlier of the effective date of the next mortality adjustment or July 1, 2017. |

# Actuarial Basis

## Summary of Plan Provisions – Police & Fire Plan (Concluded)

| | |
|---|---|
| **Combined service annuity** | Members are eligible for combined service benefits if they:<br>(a.) Meet minimum retirement age for each plan participated in and total public service meets the vesting requirements of each plan; or<br>(b.) Have three or more years of service under PERA and the covered fund(s) (if hired prior to July 1, 2010).<br><br>Other requirements for combined service include:<br>(a.) Member must have at least six months of allowable service credit in each plan worked under;<br>(b.) Member may not be in receipt of a benefit from another plan.<br><br>Members who meet the above requirements must have their benefit based on the following:<br>(a.) Allowable service in all covered plans is combined in order to determine eligibility for early retirement.<br>(b.) Average salary is based on the high five consecutive years during their entire service in all covered plans. |
| **Changes in plan provisions** | The post-retirement benefit increase to be paid after attainment of the 90% funding threshold was changed from inflation up to 2.5%, to a fixed rate of 2.5%. |

# Actuarial Basis

## Summary of Plan Provisions – Minneapolis Police Relief Association

| | |
|---|---|
| **Normal retirement benefit** | Monthly benefits are equal to the number of units multiplied by the unit values described herein. Units are based on service, as follows:<br><br>**Service** / **Units**<br>20 / 35.0 units<br>21 / 36.6 units<br>22 / 38.2 units<br>23 / 39.8 units<br>24 / 41.4 units<br>25 or more / 43.0 units<br><br>Members must be at least age 50 with 5 years of service to receive this benefit. |
| **Unit values** | **Calendar Year** / **Unit Value**<br>2012 / $ 104.651<br>2013 / 109.011<br>2014 / 114.825<br>2015 / 124.031<br><br>Unit values after 2015 are assumed to increase 1.0% per year through 2034 and 2.5% thereafter. |
| **Surviving spouse's benefit** | Annual benefit based on 23 units for the surviving spouse of an active or retired member. Upon retirement, members may choose an alternative form of payment that provides 50%, 75%, or 100% of their benefit to their spouse after their death. The units are adjusted if one of these alternate forms is selected. |
| **Surviving children's benefit** | Annual benefit based on 8 units for each surviving child of an active or retired member. Benefits continue to age 18 or if the child is a full-time student, to age 22. The total benefit for surviving children and spouse combined is limited to 41 units. |
| **Contributions** | Member and employer contributions equal to 8% of the monthly unit value multiplied by 80 are required for each member. After 25 years of service, member contributions are paid to a separate health insurance account. |
| **Benefit increases** | Benefit recipients receive a future annual 1.0% post-retirement benefit increase. The annual adjustment will equal 2.5% any time the Fund exceeds a 90% funded ratio for two consecutive years. If the adjustment is increased to 2.5% and the funded ratio falls below 80% for one year or 85% for two consecutive years the post-retirement benefit increase will be lowered to 1.0%. |

# Actuarial Basis

## Summary of Plan Provisions – Minneapolis Firefighters' Relief Association

**Normal retirement benefit**

Monthly benefits are equal to the number of units multiplied by the unit values described herein. Units are based on service, as follows:

| Service | Units |
|---|---|
| 15 | 25.0 units |
| 16 | 26.6 units |
| 17 | 28.2 units |
| 18 | 29.8 units |
| 19 | 31.4 units |
| 20 | 35.0 units |
| 21 | 36.6 units |
| 22 | 38.2 units |
| 23 | 39.8 units |
| 24 | 41.4 units |
| 25 or more | 43.0 units |

Members must be at least age 50 with 5 years of service to receive this benefit.

Members may choose among alternative survivor payment forms which modify the number of units payable to the member and their spouse. A member who is single at the time of retirement and who has at least 25 years of service may choose to receive 43.3 units on the condition of a reduced survivor payment to any future spouse.

**Unit values**

| Calendar Year | Unit Value |
|---|---|
| 2013 | 100.775 |
| 2014 | 104.264 |
| 2015 | 124.031 |

Unit values after 2015 are assumed to increase 1.0% per year through 2034 and 2.5% thereafter.

**Disability benefit**

Annual benefit based on 41 units for the disabled member.

**Surviving spouse's benefit**

Annual benefit based on 23 units for the surviving spouse of an active or retired member and 22 units for the surviving spouse of a disabled member. Upon retirement, members may choose an alternative form of payment that provides 50%, 75% or 100% of their benefit to their spouse after their death. The units are adjusted if one of these alternate forms is selected.

**Surviving children's benefit**

Annual benefit based on 8 units for each surviving child of an active or retired member. Benefits continue to age 18 or if the child is a full-time student, to age 22. The total benefit for surviving children and spouse combined is limited to 43 units.

**Contributions**

Member and employer contributions equal to 8% of the monthly unit value multiplied by 80 are required for each member. After 25 years of service, member contributions are paid to a separate health insurance account.

**Benefit increases**

Benefit recipients receive a future annual 1.0% post-retirement benefit increase. The annual adjustment will equal 2.5% any time the Fund exceeds a 90% funded ratio for two consecutive years. If the adjustment is increased to 2.5% and the funded ratio falls below 80% for one year or 85% for two consecutive years the post-retirement benefit increase will be lowered to 1.0%.

# Additional Schedules

## Schedule of Funding Progress[1] *(Dollars in Thousands)*

| Actuarial Valuation Date | Actuarial Value of Assets (a) | Actuarial Accrued Liability (AAL) (b) | Unfunded (Overfunded) AAL (UAAL) (b) - (a) | Funded Ratio (a)/(b) | Actual Covered Payroll (Previous FY) (c) | UAAL as a Percentage of Covered Payroll [(b)-(a)]/(c) |
|---|---|---|---|---|---|---|
| 7-1-1993 | $ 1,118,342 | $ 1,009,226 | $ (109,116) | 110.81 % | $ 253,666 | (43.02) % |
| 7-1-1994 | 1,234,961 | 1,099,221 | (135,740) | 112.35 | 277,566 | (48.90) |
| 7-1-1995 | 1,385,901 | 1,196,795 | (189,106) | 115.80 | 293,919 | (64.34) |
| 7-1-1996 | 1,633,010 | 1,334,202 | (298,808) | 122.40 | 316,189 | (94.50) |
| 7-1-1997 | 1,974,635 | 1,556,483 | (418,152) | 126.87 | 346,319 | (120.74) |
| 7-1-1998 | 2,337,313 | 1,741,344 | (595,969) | 134.22 | 375,131 | (158.87) |
| 7-1-1999 | 3,679,551 | 3,004,637 | (674,914) | 122.46 | 352,066 | (191.70) |
| 7-1-2000 | 4,145,351 | 3,383,187 | (762,164) | 122.53 | 392,796 | (194.04) |
| 7-1-2001 | 4,472,041 | 3,712,360 | (759,681) | 120.46 | 500,839 | (151.68) |
| 7-1-2002 | 4,672,679 | 3,886,311 | (786,368) | 120.23 | 522,153 | (150.60) |
| 7-1-2003 | 4,683,115 | 4,390,953 | (292,162) | 106.65 | 560,503 | (52.12) |
| 7-1-2004 | 4,746,834 | 4,692,190 | (54,644) | 101.16 | 551,266 | (9.91) |
| 7-1-2005 | 4,814,961 | 4,956,340 | 141,379 | 97.15 | 580,723 | 24.35 |
| 7-1-2006 | 5,017,951 | 5,260,564 | 242,613 | 95.39 | 618,435 | 39.23 |
| 7-1-2007 | 5,198,922 | 5,669,347 | 470,425 | 91.70 | 648,342 | 72.56 |
| 7-1-2008 | 5,233,015 | 5,918,061 | 685,046 | 88.42 | 703,701 | 97.35 |
| 7-1-2009 | 5,239,855 | 6,296,274 | 1,056,419 | 83.22 | 733,164 | 144.09 |
| 7-1-2010 | 5,188,339 | 5,963,672 | 775,333 | 87.00 | 740,101 | 104.76 |
| 7-1-2011 | 5,274,602 | 6,363,546 | 1,088,944 | 82.89 | 775,806 | 140.36 |
| 7-1-2012 | 5,797,868 | 7,403,295 | 1,605,427 | 78.31 | 794,417 [2] | 202.09 |
| 7-1-2013 | 5,932,945 | 7,304,032 | 1,371,087 | 81.23 | 796,188 [2] | 172.21 |
| 7-1-2014 | 6,525,019 | 8,151,328 | 1,626,309 | 80.05 | 820,333 [3] | 198.25 |
| 7-1-2015 | 7,076,271 | 8,460,477 | 1,384,206 | 83.64 | 845,076 [4] | 163.80 |

[1] *Information prior to 2012 provided by prior actuary. See prior reports for additional detail.*
[2] *Assumed equal to actual member contributions divided by 9.60%.*
[3] *Assumed equal to actual member contributions divided by 9.90%.*
[4] *Assumed equal to actual member contributions divided by 10.50%.*

# Additional Schedules

## Schedule of Contributions from the Employer and Other Contributing Entities[1]

*(Dollars in Thousands)*

| Plan Year Ended June 30 | Actuarially Required Contribution Rate (a) | Actual Covered Payroll (b) | Actual Member Contributions (c) | Annual Required Contributions [(a)x(b)] - (c) = (d) | Actual Employer Contributions[5] (e) | Percentage Contributed (e)/(d) |
|---|---|---|---|---|---|---|
| 1993 | 18.60% | $ 253,666 | $ 20,406 | $ 26,776 | $ 30,434 | 113.66% |
| 1994 | 17.45 | 277,566 | 21,806 | 26,629 | 32,536 | 122.18 |
| 1995 | 17.28 | 293,919 | 22,356 | 28,433 | 33,548 | 117.99 |
| 1996 | 16.49 | 316,189 | 24,065 | 28,075 | 36,066 | 128.46 |
| 1997 | 15.11 | 346,319 | 26,354 | 25,975 | 39,508 | 152.10 |
| 1998 | 15.69 | 375,131 | 28,552 | 30,306 | 42,786 | 141.18 |
| 1999 | 12.32 | 352,066 | 30,897 | 12,478 | 46,280 | 370.89 |
| 2000 | 12.87 | 392,796 | 31,214 | 19,339 | 53,178 | 274.98 |
| 2001 | 12.21 | 500,839 | 31,341 | 29,811 | 52,960 | 177.65 |
| 2002 | 12.61 | 522,153 | 33,801 | 32,042 | 90,664 | 282.95 |
| 2003 | 15.52 | 560,503 | 34,751 | 35,424 | 50,917 | 143.74 |
| 2004 | 19.47 | 551,266 | 36,313 | 71,019 | 52,770 | 74.30 |
| 2005 | 21.99 | 580,723 | 37,873 | 89,828 | 55,802 | 62.12 |
| 2006 | 24.36 | 618,435 | 42,970 | 107,681 | 63,603 | 59.07 |
| 2007 | 25.76 | 648,342 | 50,688 | 116,325 | 74,707 | 64.22 |
| 2008 | 28.82 | 703,701 | 58,259 | 144,548 | 87,023 | 60.20 |
| 2009 | 28.41 | 733,164 | 67,701 | 140,591 | 101,548 | 72.23 |
| 2010 | 29.99 | 740,101 | 71,736 | 150,220 | 107,066 | 71.27 |
| 2011 | 25.52 | 775,806 | 73,702 | 124,284 | 109,604 | 88.19 |
| 2012 | 28.78 | 794,417 [2] | 76,264 | 152,369 | 121,891 | 80.00 |
| 2013 | 33.37 | 796,188 [2] | 76,434 | 189,254 | 125,995 | 66.57 |
| 2014 | 29.89 | 820,333 [3] | 81,213 | 163,985 | 141,632 | 86.37 |
| 2015 | 33.85 | 845,076 [4] | 88,733 | 197,325 | 153,317 | 77.70 |
| 2016 | 32.29 | | | | | |

[1] *Information prior to 2012 provided by prior actuary. See prior reports for additional detail.*
[2] *Assumed equal to actual member contributions divided by 9.60%.*
[3] *Assumed equal to actual member contributions divided by 9.90%.*
[4] *Assumed equal to actual member contributions divided by 10.50%.*
[5] *Includes contributions from other sources (if applicable).*

# Glossary of Terms

***Accrued Benefit Funding Ratio*** The ratio of assets to Current Benefit Obligations.

***Accrued Liability Funding Ratio*** The ratio of assets to Actuarial Accrued Liability.

***Actuarial Accrued Liability (AAL)*** The difference between the Actuarial Present Value of Future Benefits, and the Actuarial Present Value of Future Normal Costs.

***Actuarial Assumptions*** Assumptions about future plan experience that affect costs or liabilities, such as: mortality, withdrawal, disablement, and retirement; future increases in salary; future rates of investment earnings; future investment and administrative expenses; characteristics of members not specified in the data, such as marital status; characteristics of future members; future elections made by members; and other items.

***Actuarial Cost Method*** A procedure for allocating the Actuarial Present Value of Future Benefits between the Actuarial Present Value of Future Normal Costs and the Actuarial Accrued Liability.

***Actuarial Equivalent*** Of equal Actuarial Present Value, determined as of a given date and based on a given set of Actuarial Assumptions.

***Actuarial Present Value (APV)*** The amount of funds required to provide a payment or series of payments in the future. It is determined by discounting the future payments with an assumed interest rate and with the assumed probability each payment will be made.

***Actuarial Present Value of Projected Benefits*** The Actuarial Present Value of amounts which are expected to be paid at various future times to active members, retired members, beneficiaries receiving benefits, and inactive, non-retired 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.

***Actuarial Valuation*** The determination, as of a valuation date, of the Normal Cost, Actuarial Accrued Liability, Actuarial Value of Assets, and related Actuarial Present Values for a plan. An Actuarial Valuation for a governmental retirement system typically also includes calculations of items needed for compliance with GASB No. 25, such as the Funded Ratio and the Annual Required Contribution (ARC).

***Actuarial Value of Assets*** The value of the assets as of a given date, used by the actuary for valuation purposes. This may be the market or fair value of plan assets or a smoothed value in order to reduce the year-to-year volatility of calculated results, such as the funded ratio and the actuarially required contribution (ARC).

# Glossary of Terms (Continued)

***Amortization Method*** A method for determining the Amortization Payment. 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. The stream of payments increases at the rate at which total covered payroll of all active members is assumed to increase.

***Amortization Payment*** That portion of the plan contribution or ARC which is designed to pay interest on and to amortize the Unfunded Actuarial Accrued Liability.

***Amortization Period*** The period used in calculating the Amortization Payment.

***Annual Required Contribution (ARC)*** The employer's periodic required contributions, expressed as a dollar amount or a percentage of covered plan compensation, determined under GASB No. 25. The ARC consists of the Employer Normal Cost and Amortization Payment.

***Augmentation*** Annual increases to deferred benefits.

***Closed Amortization Period*** A specific number of years that is reduced by one each year, and 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.

***Current Benefit Obligations*** The present value of benefits earned to the valuation date, based on current service and including future salary increases to retirement.

***Employer Normal Cost*** The portion of the Normal Cost to be paid by the employer. This is equal to the Normal Cost less expected member contributions.

***Expected Assets*** The present value of anticipated future contributions intended to fund benefits for current members.

***Experience Gain/Loss*** A measure of the difference between actual experience and that expected based upon a set of Actuarial Assumptions, during the period between two actuarial valuations. To the extent that actual experience differs from that assumed, Unfunded Actuarial Accrued Liabilities emerge which may be larger or smaller than projected. Gains are due to favorable experience, e.g., the assets earn more than projected, salaries do not increase as fast as assumed, members retire later than assumed, etc. Favorable experience means actual results produce actuarial liabilities not as large as projected by the actuarial assumptions. On the other hand, losses are the result of unfavorable experience, i.e., actual results that produce Unfunded Actuarial Accrued Liabilities which are larger than projected.

# Glossary of Terms (Concluded)

| | |
|---|---|
| ***GASB*** | Governmental Accounting Standards Board. |
| ***GASB No. 25 and GASB No. 27*** | These are the governmental accounting standards that set the accounting rules for public retirement systems and the employers that sponsor or contribute to them. Statement No. 27 sets the accounting rules for the employers that sponsor or contribute to public retirement systems, while Statement No. 25 sets the rules for the systems themselves. |
| ***GASB No. 50*** | The accounting standard governing a state or local governmental employer's accounting for pensions. |
| ***GASB No. 67 and GASB No. 68*** | Statements No. 67 and No. 68, issued in June 2012, replace the requirements of Statements No. 25 and No. 27, respectively. Statement No. 68 sets the accounting rules for the employers that sponsor or contribute to public retirement systems, while Statement No. 67 sets the rules for the systems themselves. Accounting information prepared according to Statements No. 67 and No. 68 will be provided in a separate report. |
| ***Normal Cost*** | The annual cost assigned, under the Actuarial Cost Method, to the current plan year. |
| ***Projected Benefit Funding Ratio*** | The ratio of the sum of Actuarial Value of Assets and Expected Assets to the Actuarial Present Value of Projected Benefits. |
| ***Unfunded Actuarial Accrued Liability*** | The difference between the Actuarial Accrued Liability and Actuarial Value of Assets. |
| ***Valuation Date*** | The date as of which the Actuarial Present Value of Future Benefits are determined. The benefits expected to be paid in the future are discounted to this date. |