# City of Madison Heights
# Police and Fire Retirement System

Actuarial Valuation Report
June 30, 2019

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February 5, 2020

Retirement Board
City of Madison Heights Police
   and Fire Retirement System
Madison Heights, Michigan

Dear Board Members:

***Submitted in this report*** are the results of the Sixty-Third Annual Actuarial Valuation of the City of Madison Heights Police and Fire Retirement System, based upon Act No. 345 of the Public Acts of 1937, as amended. The purpose of the June 30, 2019 valuation and gain/loss analysis is to measure funding progress in relation to the actuarial cost method and to determine employer contribution rates for the fiscal year ending June 30, 2021.  The results of the valuation are not applicable for other purposes.  No adjustments have been made for events after June 30, 2019.

The computed contribution rate shown on page B-1 may be considered as a minimum contribution rate that complies with the Board's funding policy.  Users of this report should be aware that contributions made at that rate do not guarantee benefit security.  Given the importance of benefit security to any retirement system, we suggest that contributions to the System in excess of those presented in this report be considered.

While this report includes status measures of the Retirement System, it does not include a more robust assessment of the risks of future experiences not meeting the actuarial assumptions.  Additional assessment of risks was outside the scope of this assignment.  We encourage a review and assessment of investment and other significant risks that may have a material effect on the plan's financial condition.

Calculations required for compliance with the Governmental Accounting Standards Board (GASB) Statement Nos. 67 and 68 were issued in a separate report dated September 6, 2019.

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

The valuation was based upon information, furnished by the System, concerning the Retirement System's benefits, financial transactions, and active members, terminated members, retirees and beneficiaries. We checked for internal and year-to-year consistency, but did not audit the data. We are not responsible for the accuracy or completeness of the data provided.
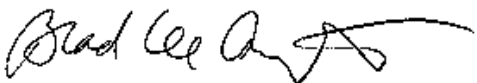
The valuation results summarized in this report involve actuarial calculations that require assumptions about future events. We believe that the assumptions and methods used in this report are reasonable and appropriate for the purpose for which they have been used. However, other assumptions and methods could also be reasonable and could result in materially different results. In addition, because it is not possible or practical to consider every possible contingency, we may use summary information, estimates or simplifications of calculations to facilitate the modeling of future events. We may also exclude factors or data that are deemed to be immaterial.  The actuarial method and assumptions used in the actuarial valuation are summarized in Section D of this report.  The assumptions are established by the Board after consulting with the actuary.

The findings in this report are based on data and other information through June 30, 2019.  Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as: plan experience differing from that anticipated by the economic and 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 the actuary's assignment, the actuary did not perform an analysis of the potential range of such future measurements.

This report has been prepared by actuaries who have substantial experience valuing public employee retirement systems.  To the best of our knowledge the information contained in this report is accurate and fairly presents the actuarial position of the City of Madison Heights Police and Fire Retirement System as of the valuation date.  All calculations have been made in conformity with generally accepted actuarial principles and practices, with the Actuarial Standards of Practice issued by the Actuarial Standards Board, and with applicable statutes.

Brad Lee Armstrong and Jamal Adora are independent of the plan sponsor, 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.


Respectfully submitted,

Brad Lee Armstrong, ASA, EA, FCA, MAAA

Jamal Adora, ASA, MAAA


BLA/JA:bd

# SECTION A

## BASIC FINANCIAL OBJECTIVE AND OPERATION OF THE RETIREMENT SYSTEM

# Basic Financial Objective and Operation of the Retirement System

***Benefit Promises Made Which Must Be Paid For***.  A retirement system is an orderly means of handing out, keeping track of, and financing contingent pension promises to a group of employees.  As each member of the retirement system acquires a unit of service credit each member is, in effect, handed an "IOU" which reads:  "The Employees Retirement System promises to pay you one unit of retirement benefits, payments in cash commencing when you retire."

The principal related financial question is:  When shall the money required to cover the "IOU" be contributed?  This year, when the benefit of the member's service is received?  Or, some future year when the "IOU" becomes a cash demand?

The constitution of the State of Michigan is directed to the question:

> "Financial benefits arising on account of service rendered in each fiscal year shall be funded during that year and such funding shall not be used for financing unfunded accrued liabilities."

Section 9(2) of Act 345 is also directed to the question:

> "Sec. 9(2). - - - For the purpose of creating and maintaining a fund for the payment of the pensions and other benefits payable hereunder the said city, village or municipality, subject to the provisions of this act, shall appropriate, at the end of such regular intervals as may be adopted, quarterly, semi-annually, or annually, an amount sufficient to maintain actuarially determined reserves covering pensions payable or which might be payable on account of service performed and to be performed by active members and pensions being paid retired members and beneficiaries - - - ."

This retirement system meets this constitutional requirement by having as its ***financial objective to establish and receive contributions, expressed as percents of active member payroll, which will remain approximately level from year to year*** and will not have to be increased for future generations of taxpayers.

Translated into actuarial terminology, a level percent-of-payroll contribution objective means that the contribution rate must be at least:

> ***Normal Cost*** (the current value of benefits likely to be paid on account of members' service being rendered in the current year)
>
> ... plus ...
>
> ***Interest on the Unfunded Actuarial Accrued Liability*** (the difference between the actuarial accrued liability and current system assets).
>
> ... plus ...
>
> ***Payment on the Unfunded Actuarial Accrued Liability*** (principal payments shall be determined using an amortization period of 30 years of less).

While this may meet a level percent-of-payroll contribution objective for an open plan, regular consideration should be given to increasing payments on the Unfunded Actuarial Accrued Liability until 100% funded status is reached.

A by-product of the level percent-of-payroll contribution objective is the accumulation of invested assets for varying periods of time. ***Invested assets are a by-product of level percent-of-payroll contributions, not the objective***. Investment income becomes a major contributor to the retirement system and the amount is directly related to the amount of contributions and investment performance.

If contributions to the retirement system are less than the preceding amount, the difference, plus investment earnings not realized thereon, will have to be contributed at some later time, or, benefits will have to be reduced, to satisfy the fundamental fiscal equation under which all retirement programs must operate; that is:

$$B = C + I - E$$

The aggregate amount of **B**enefit payments to any group of members and their beneficiaries cannot exceed the sum of:

The aggregate amount of **C**ontributions received on behalf of the group

... plus ...

**I**nvestment earnings on contributions received and not required for immediate payment of benefits

... minus ...

The **E**xpenses of operating the program.

There are retirement systems designed to defer the bulk of contributions far into the future. Lured by artificially low present contributions, the inevitable consequence of a relentlessly increasing contribution rate -- to a level greatly in excess of the level percent-of-payroll rate -- is ignored.

***This method of financing is prohibited in Michigan by the state constitution***.

***Computed Contribution Rate Needed to Finance Benefits***. From a given schedule of benefits and from the data furnished, the actuary calculates the contribution rate by means of an actuarial valuation - the technique of assigning monetary values to the risks assumed in operating a retirement system.
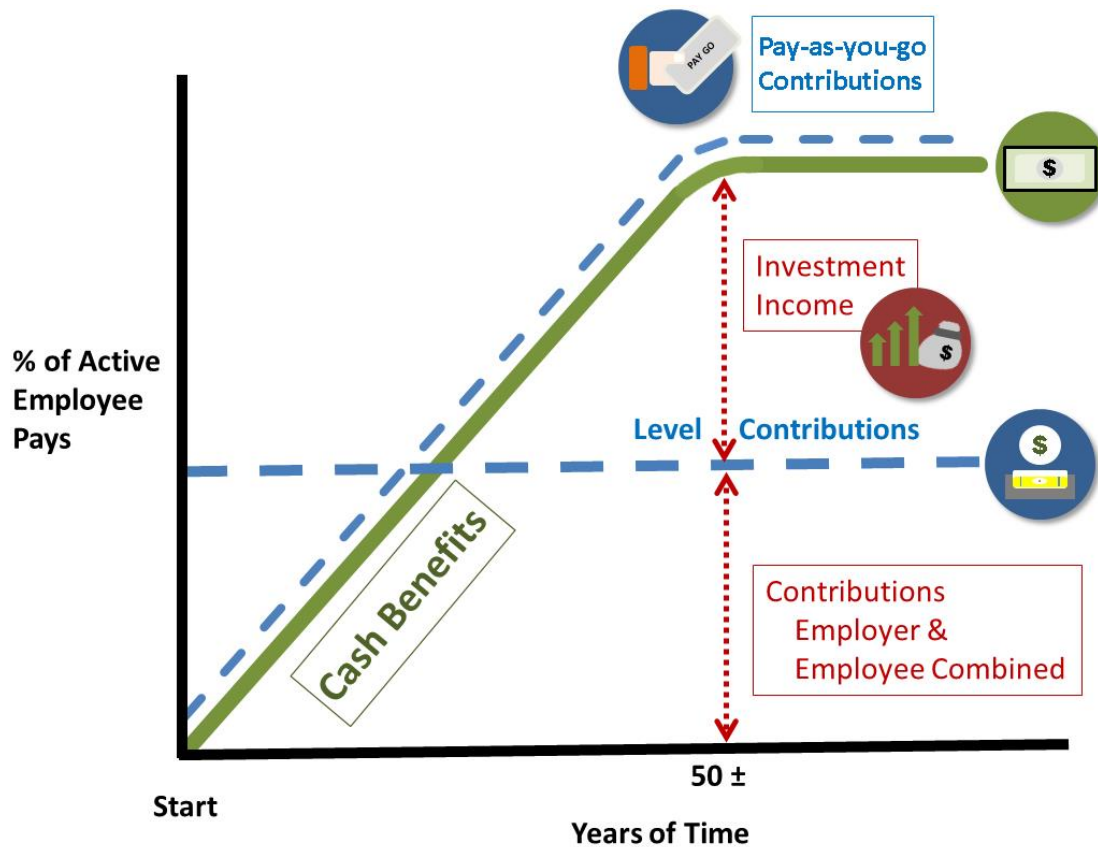
**CASH BENEFITS LINE.** This relentlessly increasing line is the fundamental reality of retirement plan financing. It happens each time a new benefit is added for future retirements (and happens regardless of the design for contributing for benefits).

**LEVEL CONTRIBUTION LINE.** Determining the level contribution line requires detailed assumptions concerning a variety of experiences in future decades, including:

- **Economic Risk Areas**
    - Rates of investment return
    - Rates of pay increase
    - Changes in active member group size
- **Non-Economic Risk Areas**
    - Ages at actual retirement
    - Rates of mortality
    - Rates of withdrawal of active members (turnover)
    - Rates of disability

# SECTION B

## VALUATION RESULTS

# City's Computed Contributions for the Fiscal Year Beginning July 1, 2020

| | Contributions Expressed as Percents of Annual Pay | | | | | |
| | Department | Police | | Fire | | |
| Contributions for | Heads | Command | Other | Command | Other | Totals |
|---|---|---|---|---|---|---|
| **NORMAL COST** | | | | | | |
| Age and service pensions | 21.95 % | 20.51 % | 17.46 % | 19.06 % | 16.56 % | 18.45 % |
| Disability pensions | 0.88 | 1.16 | 1.47 | 1.41 | 1.65 | 1.39 |
| Death pensions | 0.20 | 0.17 | 0.16 | 0.21 | 0.18 | 0.17 |
| Totals | 23.03 | 21.84 | 19.09 | 20.68 | 18.39 | 20.01 |
| | | | | | | |
| **MEMBERS' CONTRIBUTIONS** | | | | | | |
| Gross contributions | 8.90 | 8.90 | 8.90 | 8.90 | 8.90 | 8.90 |
| Less prospective refunds | 0.59 | 0.70 | 0.69 | 0.46 | 0.47 | 0.62 |
| Available for pensions | 8.31 | 8.20 | 8.21 | 8.44 | 8.43 | 8.28 |
| | | | | | | |
| **CITY'S NORMAL COST** | 14.72 | 13.64 | 10.88 | 12.24 | 9.96 | 11.73 |
| | | | | | | |
| **UNFUNDED ACTUARIAL ACCRUED LIABILITIES** | | | | | | |
| Retirees and beneficiaries | | | | | | 19.16 |
| Active members* | | | | | | 28.79 |
| Totals | | | | | | 47.95 |
| | | | | | | |
| **CITY'S TOTAL CONTRIBUTION (PENSIONS)** | | | | | | 59.68 % |
| | | | | | | |
| Administrative and Investment Expenses | | | | | | 5.93 % |
| | | | | | | |
| **CITY'S TOTAL CONTRIBUTION (PENSIONS & EXPENSES)** | | | | | | 65.61 % |

Retiree health insurance costs are not included in this report.

\* *Financed as a level percent-of-payroll over a closed period of 25 years.*

*In financing the actuarial accrued liabilities*, the funding value of assets, $43,297,793 were distributed as shown at the bottom of the page. Please see page C-10 for information concerning the reporting of assets, and page C-11 for the derivation of the funding value of assets.

| Market Value | Present Reserves Reported for | | |
| | Member Actuarial Accrued Liabilities | Retired Life Actuarial Liabilities | Totals |
|---|---|---|---|
| Employees Contributions | $ 6,820,538 | | $ 6,820,538 |
| Employer Contributions | (27,471,413) | $ 35,022,879 | 7,551,466 |
| Retired Benefit Payments | | 28,292,542 | 28,292,542 |
| Undistributed Investment Income | | 776,198 | 776,198 |
| Totals * | $ (20,650,875) | $ 64,091,619 | $ 43,440,744 |

*\* As reported.*

Assets were applied against actuarial accrued liabilities in determining unfunded actuarial accrued liabilities as follows:

| | Retired Lives | Active Members | Totals |
|---|---|---|---|
| Computed Actuarial Accrued Liabilities | $ 64,091,619 | $ 26,051,224 | $ 90,142,843 |
| Applied Assets (4-yr. smoothed market value) | 43,297,793 | 0 | 43,297,793 |
| Unfunded Actuarial Accrued Liabilities | $ 20,793,826 | $ 26,051,224 | $ 46,845,050 |

# Derivation of Experience Gain (Loss)
## Year Ended June 30, 2019

Actual experience will never (except by coincidence) coincide exactly with assumed experience. It is hoped that aggregate gains and losses will cancel each other over a period of years, but sizeable year-to-year fluctuations are common. Detail on the derivation of the experience gain (loss) is shown below, along with a year-by-year comparative schedule.

|  | Total |
|---|---|
| (1) UAAL* at start of year | $ 41,002,001 |
| (2) Employer normal cost from the last valuation | 552,340 |
| (3) Actual employer contributions | 3,262,858 |
| (4) Interest accrual: <br> $[(1) + 1/2 [(2) - (3)] ] \times .07$ | 2,775,272 |
| (5) Expected UAAL before changes: <br> (1) + (2) - (3) + (4) | $ 41,066,755 |
| (6) Change from the benefit provision application | - |
| (7) Change from the revised actuarial <br> assumptions and methods | 5,108,904 |
| (8) Expected UAAL after changes: <br> (5) + (6) + (7) | $ 46,175,659 |
| (9) Actual UAAL at end of year | 46,845,050 |
| (10) Gain (loss): (8) - (9) | (669,391) |
| (11) Actuarial accrued liability <br> at the start of the year | 83,976,488 |
| (12) Gain (loss) as a percent of actuarial <br> accrued liabilities at start of year | **(0.8)%** |

  * *Unfunded Actuarial Accrued Liabilities.*

| Valuation <br> Date <br> June 30, | Experience Gain (Loss) <br> as % of Beginning Accrued Liability <br> Total |
|---|---|
| 2010 | (2.1) |
| 2011 | (9.0) |
| 2012 | (8.5) |
| 2013 | (1.5) |
| 2014 | (2.3) |
| 2015 | (4.6) |
| 2016 | (2.3) |
| 2017 | (3.8) |
| 2018 | (1.7) |
| 2019 | (0.8) |

# Summary Statement of Retirement System Resources and Obligations

## Present Resources and Expected Future Resources*

A. Present valuation assets:

| | |
|---|---:|
| 1. Net assets from Retirement System financial statements | $ 43,440,744 |
| 2. Market value adjustment | (142,951) |
| 3. Valuation assets | 43,297,793 |

B. Actuarial present value of expected future employer contributions:

| | |
|---|---:|
| 1. For normal costs | 6,117,102 |
| 2. For unfunded actuarial accrued liability | 46,845,050 |
| 3. Total of (1) + (2) | 52,962,152 |

| | |
|---|---:|
| C. Actuarial present value of expected future member contributions | 4,964,307 |
| D. Total present and expected future resources | $ 101,224,252 |

*  Does not include administrative and investment expenses.

## Actuarial Present Value of Expected Future Benefit Payments

| | |
|---|---:|
| A. To retirees and beneficiaries | $ 64,091,619 |
| B. To vested terminated members | 1,761,728 |

C. To present active members:

| | |
|---|---:|
| 1. Allocated to service rendered prior to valuation date - actuarial accrued liability | 24,289,496 |
| 2. Allocated to service likely to be rendered after valuation date | 11,081,409 |
| 3. Total | 35,370,905 |
| D. Total actuarial present value of expected future benefit payments | $ 101,224,252 |

# Comparative Statement

| Valuation Date June 30 | Fiscal Year | Actuarial Accrued Liabilities & Reserves | Actuarial Accrued Assets | Funded Ratio | Unfunded Actuarial Accrued Liabilities & Reserves | | | City's Contribution Rate | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Dollars | Amortiz. Period | % of Payroll | Percents | Dollars Recommended | Actual |
| 2000 | 01-02 | $ 46,244,023 | $ 47,689,403 | 103.1 % | $ (1,445,380) | 15 | - % | 13.45 % | $ 727,203 | $ 845,881 |
| 2001 | 02-03 | 48,139,671 | 48,997,093 | 101.8 | (857,422) | 14 | - | 13.76 | 798,609 | 951,923 |
| 2002 # | 03-04 | 50,633,078 | 49,200,870 | 97.2 | 1,432,208 | 13 | 22.3 | 17.31 | 1,113,946 | 1,221,459 |
| 2003 # | 04-05 | 51,665,535 | 48,919,496 | 94.7 | 2,746,039 | 12 | 43.5 | 20.49 | 1,292,438 | 1,513,225 |
| 2004 *# | 05-06 | 56,133,839 | 48,976,377 | 87.2 | 7,157,462 | 20 | 102.4 | 23.15 | 1,618,638 | 1,656,681 |
| 2005 | 06-07 | 57,733,862 | 49,887,362 | 86.4 | 7,846,500 | 19 | 110.3 | 23.86 | 1,697,809 | 1,794,618 |
| 2006 @ | 07-08 | 59,879,584 | 51,533,008 | 86.1 | 8,346,576 | 25 | 118.2 | 22.88 | 1,615,365 | 1,745,795 |
| 2007 | 08-09 | 61,959,805 | 55,004,366 | 88.8 | 6,955,439 | 25 | 96.3 | 21.90 | 1,581,304 | 1,625,338 |
| 2008 * | 09-10 | 61,187,814 | 57,130,630 | 93.4 | 4,057,184 | 25 | 53.4 | 17.48 | 1,327,971 | 1,589,770 |
| 2009 @ | 10-11 | 63,175,083 | 56,156,781 | 88.9 | 7,018,302 | 30 | 93.6 | 18.82 | 1,411,463 | 1,391,859 |
| 2010 | 11-12 | 63,161,498 | 54,888,388 | 86.9 | 8,273,110 | 30 | 120.9 | 19.92 | 1,363,478 | 1,240,859 |
| 2011 # | 12-13 | 65,466,348 | 51,374,542 | 78.5 | 14,091,806 | 30 | 234.5 | 22.72 | 1,365,401 | 1,338,103 |
| 2012 | 13-14 | 67,929,700 | 47,691,751 | 70.2 | 20,237,949 | 30 | 356.5 | 27.82 | 1,711,368 | 1,566,747 |
| 2013 ** | 14-15 | 67,745,324 | 48,067,300 | 71.0 | 19,678,024 | 30 | 335.4 | 24.99 | 1,588,802 | 1,408,153 |
| 2014 @ | 15-16 | 70,493,480 | 49,322,706 | 70.0 | 21,170,774 | 30 | 380.7 | 27.94 | 1,683,896 | 1,698,569 |
| 2015 *# | 16-17 | 78,426,714 | 47,383,538 | 60.4 | 31,043,176 | 29 | 587.7 | 39.35 | 2,252,379 | 2,473,172 |
| 2016 * | 17-18 | 77,750,883 | 45,546,957 | 58.6 | 32,203,926 | 28 | 586.4 | 41.10 | 2,393,830 | 2,698,592 |
| 2017 * | 18-19 | 81,945,548 | 44,678,218 | 54.5 | 37,267,330 | 27 | 673.5 | 48.04 | 2,809,141 | 3,262,859 |
| 2018 * | 19-20 | 83,976,488 | 42,974,487 | 51.2 | 41,002,001 | 26 | 766.1 | 54.40 | 3,065,746 | |
| **2019** | **20-21** | **85,033,939** | **43,297,793** | **50.9** | **41,736,146** | **25** | **726.6** | **52.25** | **3,160,269** | |
| **2019 *** | **20-21** | **90,142,843** | **43,297,793** | **48.0** | **46,845,050** | **25** | **815.5** | **59.68** | **3,596,592** | |

* Revised actuarial assumptions and methods.          # Retirement System was amended.
** Changes in the application of the benefit provisions.          @ Amortization policy of Unfunded Actuarial Accrued Liabilities was changed.

The Ratio of Valuation Assets to Actuarial Accrued Liabilities is a traditional measure of a system's funding progress. Except in years when the system is amended or actuarial assumptions are revised, this ratio can be expected to increase gradually toward 100%.

The Ratio of Unfunded Actuarial Accrued Liabilities to Valuation Payroll is another relative index of condition. Unfunded actuarial accrued liabilities represent debt, while active member payroll represents the system's capacity to collect contributions to pay toward the debt. The lower the ratio, the greater the financial strength and vice-versa.

# Comments, Recommendation and Conclusion

**COMMENT A**: The overall actuarial experience was less favorable than anticipated as shown on page B-3 primarily due a recognized investment return rate of 5.2% compared to last year's assumed rate of 7%. These losses were partially offset by retirement experience (0 new retirees versus .2 expected) and lower salary increases than expected. Market performance from 2016 to 2019 was smoothed over four years by the Board's use of an asset smoothing technique for the purpose of adding more stability to the City's contribution rate. Unrecognized losses in investment return from 2016 has put upward pressure on the City's contribution rate in this report. However, the loss from 2016 has been fully recognized, and the actuarial value of assets is slightly lower than the market value of assets. The contribution rate in this valuation would decrease from 59.68% to 59.46% of payroll (excluding expenses) on a market value basis. Unrecognized gains in investment return from 2017 and 2018 are scheduled to be recognized in 2020 and 2021 valuations, which will put downward pressure on contribution rates. However, portions of slightly unfavorable returns from 2019 are scheduled to be recognized in 2020, 2021, and 2022 valuations.

**COMMENT B**: Assumption changes (including lowering the assumed rate of return from 7.00% to 6.75% and changes in the disabled, pre-retirement, and post-retirement mortality) resulted in an increase of approximately $5.1 million in liabilities and increased the employer contribution rate by 7.37% of payroll. The majority of the increase was due to the lowering of the assumed rate of return. The assumptions used are discussed in detail in Section D of this report.

**COMMENT C**: A 25-year closed amortization period was used for this valuation. Historical funded ratios are shown on page B-5. As of June 30, 2019, the Retirement System's funded ratio was 48.0% compared to 51.2% as of June 30, 2018. On a market value basis, the funded ratio would be 48.2% compared to 50.8% last year. These are both indications of a negative trend, which the assumption changes mentioned in Comment B are intended to address.

**COMMENT D**: The ratio of the funding value of assets to the market value of assets is 99.7%. Over time, this ratio is intended to stay near 100%. However, highly volatile markets can create distortions in this ratio. The Board may wish to establish a "corridor" around the market value of assets such as 80% to 120%, so that the funding value of assets does not deviate from the market value of assets by an unreasonably large amount. This is currently not a problem, which may make this an opportune time for the Board to consider taking actions.

**COMMENT E**: The retiree liability is only 67.6% funded. In addition, the amortization period (currently 25 years) exceeds the average expected future lifetime of the current retired members (which is approximately 20 years). We recommend that the Board consider lowering the amortization period for at least the portion of the unfunded liability attributable to retiree liability. For comparison, the table below provides the computed contribution rates if the unfunded retiree liabilities were to be amortized over a shorter time period.

| Amortization Period | | |
|---|---|---|
| Unfunded Retiree Liability | Unfunded Remaining Liability | Contribution Rate |
| 10  years | 25  years | 78.73% |
| 15 | 25 | 68.05% |
| 20 | 25 | 62.78% |
| 25 | 25 | 59.68% |

**COMMENT F**: This valuation does not include funding requirements for retiree health care benefits (this is submitted in a separate report).

**COMMENT G**: The Michigan State Treasurer has established uniform actuarial assumptions as required by Public Act 202 (PA 202) of 2017 for use with the annual Form 5572 (Retirement System Annual Report). The use of the uniform assumptions for reporting is required starting with the 2019 fiscal year.

The current valuation assumptions and/or methods used by the Plan match or fall in the range of uniform assumptions established by the Treasurer for PA 202 reporting purposes, with the exception of the Amortization of the Unfunded Actuarial Accrued Liability. In particular, the maximum amortization period for the 2020 fiscal year under PA 202 is 19 years. Therefore, the results related to actuarially determined contributions in this valuation would most likely not be suitable for the reporting requirements of PA 202. We can either:

- Perform calculations based on a different amortization period consistent with the Treasurer's established uniform assumptions for PA 202 reporting purposes. These additional calculations could be included with the GASB Statement Nos. 67 and 68 report that we provide.

- Discuss with the Board the suitability of using the Treasurer's established amortization period for funding purposes if policymakers wish to consider that change.

Additionally, PA 202 requires submitting a funding improvement plan to the State Treasurer if the Plan's funded status is less than 60% and the actuarially determined contribution (ADC) for all of the defined benefit retirement systems of the local government is greater than 10% of the local government's annual governmental fund revenues. Under current assumptions the plan is 48% funded.

Fees associated with these reporting requirements would be based on the complexity of the assignment.

**CONCLUSION**:  The City's contributions (member contributions are additional) to the City of Madison Heights Police and Fire Retirement System, for the fiscal year beginning July 1, 2020, have been computed to be 59.68% of active member payroll for pensions with an additional 5.93% for administrative and investment expenses.

It is the actuary's opinion that the required contribution rates determined by this actuarial valuation are sufficient to meet the Retirement System's funding objective, presuming the ongoing financial viability of the plan sponsor.

**We are concerned about potential cash flow problems for the Retirement System.  This is complicated by the Annuity Withdrawal provisions causing large disbursements over short periods of time. The assets in the plan are not sufficient to cover current retiree liabilities and the ratio of assets (Market Value) to retiree benefit payroll is 7.75. This means that approximately seven years of retiree benefit payments can be paid from current assets; the ability to make such payments beyond that period is heavily dependent upon future contributions and future investment return. Please take the time to read pages B-8, B-9, and B-10 which cover in more detail the risks the System is exposed to and the limits of what is within our control.**

# 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 all actuarial assumptions are met (including the assumption of the plan earning 6.75% on the actuarial value of assets), it is expected that:

1) The unfunded actuarial accrued liabilities will be fully amortized after 25 years;
2) The funded status of the plan will increase gradually towards a 100% funded ratio; and
3) The unfunded accrued liability will increase for an extended period before beginning to decline. This is particularly true when the plan sponsor is contributing on a percent-of-payroll basis and there is no payroll growth.

## 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 an 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. 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.

## Limitations of Project Scope

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.

## Risks to Future Employer Contribution Requirements

There are ongoing risks to future employer contribution requirements to which the Retirement System is exposed, such as:

- Actual and Assumed Investment Rate of Return
- Actual and Assumed Mortality Rates
- Amortization Policy

# Risk Measures Summary

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
|---|---|---|---|---|---|---|---|---|---|
| | | | Market Value | | Market Value | | | | |
| | Accrued | Market | Value | | Funded | Retiree | RetLiab / | AAL / | Assets / |
| Valuation | Liabilities | Value of | Unfunded | Valuation | Ratio | Liabilities | AAL | Payroll | Payroll |
| Date (6/30) | (AAL) | Assets | AAL | Payroll | (2)/(1) | (RetLiab) | (6)/(1) | (1)/(4) | (2)/(4) |
| 2012 | $ 67,930 | $ 45,299 | $ 22,631 | $ 5,677 | 66.7% | $ 41,542 | 61.2% | 1196.6% | 797.9% |
| 2013 | 67,745 | 45,451 | 22,294 | 5,867 | 67.1% | 41,556 | 61.3% | 1154.7% | 774.7% |
| 2014 | 70,493 | 49,685 | 20,808 | 5,562 | 70.5% | 43,345 | 61.5% | 1267.4% | 893.3% |
| 2015 | 78,427 | 45,922 | 32,505 | 5,282 | 58.6% | 51,644 | 65.8% | 1484.8% | 869.4% |
| 2016 | 77,751 | 41,606 | 36,145 | 5,492 | 53.5% | 54,304 | 69.8% | 1415.7% | 757.6% |
| 2017 | 81,946 | 42,365 | 39,581 | 5,533 | 51.7% | 58,239 | 71.1% | 1481.0% | 765.7% |
| 2018 | 83,976 | 42,665 | 41,311 | 5,352 | 50.8% | 61,722 | 73.5% | 1569.1% | 797.2% |
| 2019 | 90,143 | 43,441 | 46,702 | 5,744 | 48.2% | 64,092 | 71.1% | 1569.3% | 756.3% |

**(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.

# Risk Measures Summary

| Valuation Date (6/30) | (10) Portfolio Standard Deviation* | (11) Standard Deviation as % of Pay | (12) Unfunded AAL/Payroll | (13) Non-Investment Cash Flow (NICF) | (14) NICF / Assets (13)/(2) | (15) Market Rate of Return | (16) 5-Year Trailing Geometric Average |
|---|---|---|---|---|---|---|---|
| 2012 | | | 398.6% | $ (2,227) | -4.9% | 5.4% | -0.8% |
| 2013 | | | 374.1% | (2,227) | -4.5% | 5.4% | 1.1% |
| 2014 | | | 615.4% | (2,266) | -4.9% | 14.7% | 8.2% |
| 2015 | 14.7% | 111.4% | 658.1% | (3,757) | -9.0% | 0.0% | 6.4% |
| 2016 | 12.6% | 96.5% | 715.4% | (3,853) | -9.1% | -1.1% | 3.0% |
| 2017 | 14.1% | 112.4% | 771.9% | (3,221) | -7.5% | 10.0% | 5.6% |
| 2018 | 13.8% | 110.0% | 771.9% | (3,243) | -7.6% | 8.7% | 6.3% |
| 2019 | 13.2% | 99.8% | 813.1% | (1,849) | -4.3% | 6.3% | 4.7% |

*Standard deviation of expected 1-year return based on the System's asset allocation and capital market assumptions shared with us by various investment consultants.*

**(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. This ratio is likely to increase as the plan approaches full funding.

**(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 both give an indication of the reasonableness of the system's assumed return. Of course, past performance is not a guarantee of future results. Market rate shown is based on actuarial estimation method and may differ from figures provided by the System's investment consultant.

# SECTION C

## SUMMARY OF BENEFIT PROVISIONS AND VALUATION DATA

# Brief Summary of Act 345 Benefit Provisions
## (June 30, 2019)

| Eligibility | Amount |
|---|---|

## Service Retirement

**Members hired after 7/1/2009 (excluding Dept. Heads)**
Age 55 with 25 or more years of service or age 60 with 10 years of service.

Straight life pension equals 2.0% (2.5% if member has at least 25 years of service) of 3-year Average Final Compensation (AFC) times the first 25 years of service plus 1.0% of AFC times years of service in excess of 25 years.

**Dept. Heads and Members hired before 7/1/2009**
25 or more years of service regardless of age or age 60 with 10 years of service.

Straight life pension equals 2.0% (2.8% if member has at least 25 years of service) of 3-year AFC times first 25 years of service plus 1.0% of AFC times years of service in excess of 25 years.

## Deferred Retirement

10 or more years of service.

Computed as service retirement but based upon service, AFC and benefits in effect at termination. Benefit begins at the date retirement would have occurred had the member remained in employment.

## Death after Retirement Survivor's Pension

Payable to a surviving spouse, if any, upon the death of a retired member who was receiving a straight life pension which was effective July 1, 1975 or later.

Spouse's pension equals 60% of the straight life pension the deceased retiree was receiving.

## Non-Duty Death-in-Service Survivor's Pension

Payable to a surviving spouse, if any, upon the death of a member with 20 or more years of service.

Accrued straight life pension actuarially reduced in accordance with an Option I election.

## Duty Death-in-Service Survivor's Pension

Payable upon the expiration of Workers' Compensation to the survivors of a member who died in the line of duty.

Same amount that was paid by Workers' Compensation.

## Non-Duty Disability

Payable upon the total and permanent disability of a member with 5 or more years of service.

**To earliest projected service retirement eligibility:**
1.5% of AFC times years of service.
**At earliest projected service retirement eligibility:**
Same as Service Retirement Pension.

## Duty Disability

Payable upon the total and permanent disability of a member in the line of duty.

**To earliest projected service retirement eligibility:**
50% of AFC.
**At earliest projected service retirement eligibility:**
Same as Service Retirement Pension with service credit from the date of disability to projected age of retirement eligibility.

## Member Contributions

8.90% of pay for Firefighters
8.90% of pay for Fire Command
8.90% for Police
8.90% for Police Command
8.90% for Department Heads

Annuity withdrawal based on Merrill Lynch Bond Index available at retirement with 25 years of service.

Interest earned on Member Contributions is 3.5% annually effective July 1, 2011.

# Retirees and Beneficiaries Added to and Removed from Rolls
## Comparative Statement

| Year Ended June 30 | Added to Rolls No. | Added to Rolls Annual Pensions | Removed from Rolls No. | Removed from Rolls Annual Pensions | Rolls End of Year No. | Active Per Retired | Rolls End of Year Annual Pensions Dollars | Rolls End of Year Annual Pensions % of Pay | % Incr. in Annual Pensions | Average Pension | Present Value of Pensions |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2000 | 13 | $ 515,306 | 3 | $ 59,400 | 97 | 1.0 | $ 2,634,124 | 47.1 % | 20.9 % | $ 27,156 | $ 29,462,600 |
| 2001 | 5 | 233,147 | 1 | 34,484 | 101 | 0.9 | 2,832,787 | 48.8 | 7.5 | 28,047 | 31,482,029 |
| 2002 | 2 | 38,323 | 2 | 63,872 | 101 | 1.0 | 2,807,238 | 43.6 | (0.9) | 27,794 | 30,706,301 |
| 2003 | 3 | 122,791 | 2 | 15,098 | 102 | 1.0 | 2,914,931 | 46.2 | 3.8 | 28,578 | 31,583,764 |
| 2004 | 4 | 99,475 | 3 | 76,875 | 103 | 1.0 | 2,937,531 | 42.0 | 0.8 | 28,520 | 31,928,907 |
| 2005 | 1 | 23,232 | 3 | 79,834 | 101 | 1.0 | 2,880,929 | 40.5 | (1.9) | 28,524 | 30,919,712 |
| 2006 | 3 | 170,036 | 1 | 3,880 | 103 | 0.9 | 3,047,085 | 43.2 | 5.8 | 29,583 | 32,399,560 |
| 2007 | 2 | 93,031 | 4 | 83,266 | 101 | 0.9 | 3,056,850 | 42.3 | 0.3 | 30,266 | 32,176,238 |
| 2008 | 5 | 78,960 | 4 | 114,827 | 102 | 0.9 | 3,020,983 | 39.8 | (1.2) | 29,617 | 30,142,812 |
| 2009 | 3 | 82,044 | 1 | 25,502 | 104 | 0.9 | 3,077,525 | 41.0 | 1.9 | 29,592 | 30,340,870 |
| 2010 | 5 | 142,333 | 4 | 104,122 | 105 | 0.8 | 3,115,736 | 45.5 | 1.2 | 29,674 | 30,412,190 |
| 2011 | 12 | 634,045 | 2 | 32,757 | 115 | 0.7 | 3,717,024 | 61.9 | 19.3 | 32,322 | 37,300,027 |
| 2012 | 7 | 440,833 | 2 | 27,202 | 120 | 0.6 | 4,130,655 | 72.8 | 11.1 | 34,422 | 41,541,931 |
| 2013 | 4 | 195,238 | 4 | 148,883 | 120 | 0.6 | 4,177,010 | 71.2 | 1.1 | 34,808 | 41,555,510 |
| 2014 | 4 | 223,638 | 0 | 0 | 124 | 0.5 | 4,400,648 | 79.1 | 5.4 | 35,489 | 43,344,843 |
| 2015 | 11 | 483,755 | 4 | 73,399 | 131 | 0.5 | 4,811,004 | 91.1 | 9.3 | 36,725 | 51,643,558 |
| 2016 | 8 | 401,007 | 4 | 108,444 | 135 | 0.5 | 5,103,567 | 92.9 | 6.1 | 37,804 | 54,304,406 |
| 2017 | 6 | 300,680 | 0 | 0 | 141 | 0.5 | 5,404,247 | 97.7 | 5.9 | 38,328 | 58,238,711 |
| 2018 | 8 | 361,468 | 3 | 101,965 | 146 | 0.5 | 5,663,750 | 105.8 | 4.8 | 38,793 | 61,722,141 |
| **2019** | **1** | **14,104** | **1** | **23,507** | **146** | **0.5** | **5,654,347** | **98.4** | **(0.2)** | **38,728** | **64,091,619** |

GRS

# Retirees and Beneficiaries as of June 30, 2019
## Tabulated by Type of Pensions Being Paid

| Type of Pensions Being Paid | Number | Annual Pensions |
|---|---|---|
| **Age and Service Pensions** | | |
| Regular pensions - benefit terminating at death of retiree | 17 | $ 616,539 |
| Regular pensions - automatic 60% to spouse | 81 | 4,056,543 |
| Regular pension - survivor | 31 | 559,620 |
| Option 1 pension | 1 | 55,531 |
| Option 2 pension - modified joint and survivor benefit | 0 | 0 |
| Total age and service pensions | 130 | $ 5,288,233 |
| | | |
| **Casualty Pensions** | | |
| Duty disability pensions | 7 | $ 196,134 |
| Non-duty disability pensions | 3 | 89,570 |
| Duty disability pension - survivor | 2 | 16,218 |
| Non-duty disability pension - survivor | 0 | 0 |
| Duty death pension - survivor | 1 | 14,484 |
| Non-duty death pensions - survivor | 3 | 49,708 |
| Total casualty pensions | 16 | $ 366,114 |
| | | |
| **Total Pensions Being Paid** | **146** | **$ 5,654,347** |

# Retirees and Beneficiaries as of June 30, 2019
## Tabulated by Attained Ages

| Attained Ages | No. | Annual Pensions |
|---|---|---|
| 38 | 1 | $ 14,484 |
| 45 | 1 | 35,858 |
| 49 | 1 | 42,050 |
| 50 | 1 | 60,261 |
| 51 | 2 | 96,118 |
| 53 | 6 | 372,867 |
| 54 | 6 | 350,718 |
| 55 | 4 | 148,770 |
| 56 | 7 | 344,952 |
| 57 | 5 | 281,834 |
| 58 | 4 | 228,663 |
| 59 | 2 | 138,958 |
| 60 | 4 | 171,206 |
| 61 | 5 | 252,079 |
| 62 | 2 | 81,336 |
| 63 | 4 | 208,823 |
| 64 | 7 | 310,924 |
| 65 | 10 | 432,511 |
| 66 | 1 | 46,462 |
| 67 | 2 | 80,491 |
| 68 | 1 | 44,864 |
| 69 | 3 | 130,693 |
| 70 | 7 | 242,128 |
| 71 | 2 | 106,335 |
| 72 | 2 | 60,041 |
| 73 | 4 | 172,939 |
| 74 | 3 | 79,520 |
| 76 | 6 | 143,694 |
| 77 | 9 | 240,323 |
| 78 | 3 | 103,183 |
| 79 | 5 | 93,156 |
| 80 | 1 | 33,474 |
| 81 | 5 | 155,600 |
| 82 | 6 | 158,370 |
| 84 | 2 | 42,659 |
| 85 | 2 | 20,567 |
| 86 | 1 | 10,819 |
| 87 | 2 | 33,045 |
| 88 | 2 | 25,764 |
| 89 | 2 | 37,053 |
| 90 | 1 | 8,783 |
| 95 | 1 | 9,458 |
| 96 | 1 | 2,514 |
| **Totals** | **146** | **$ 5,654,347** |

# Vested Terminated Members as of June 30, 2019*
## Tabulated by Attained Ages

|  |  | Estimated |
| :---: | :---: | :---: |
| Attained | | Annual |
| Ages | No. | Pensions |
| 37 | 1 | $ 30,664 |
| 40 | 1 | 23,125 |
| 44 | 1 | 23,998 |
| 47 | 1 | 23,876 |
| 50 | 1 | 36,997 |
| 54 | 1 | 36,724 |
| **Totals** | **6** | **$ 175,384** |

*Includes members currently on leave of absence from service.*

## Active Members Included in Valuation by Division

| Division | | No. | Valuation Payroll | Average Pay |
|---|---|---|---|---|
| Police | - Command | 13 | $1,289,548 | $ 99,196 |
| | - Other | 34 | 2,316,148 | 68,122 |
| Fire | - Command | 7 | 713,497 | 101,928 |
| | - Other | 17 | 1,073,193 | 63,129 |
| Department Heads | | 3 | 351,784 | 117,261 |
| **Totals** | | **74** | **$5,744,170** | **$ 77,624** |

## Active Members Added to and Removed from Rolls

| Year Ended June 30 | Number Added During Year A | E | Terminations Normal Retirement A | E | Disabled A | E | Died-in-Service A | E | Withdrawal Vested A | Other A | Total A | E | Active Members End of Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2000 | 8 | 11 | 11 | 1.0 | 0 | 0.2 | 0 | 0.1 | 0 | 0 | 0 | 1.0 | 94 |
| 2001 | 4 | 5 | 4 | 0.7 | 0 | 0.2 | 0 | 0.1 | 0 | 1 | 1 | 0.9 | 93 |
| 2002 | 6 | 0 | 0 | 0.2 | 0 | 0.2 | 0 | 0.1 | 0 | 0 | 0 | 1.0 | 99 |
| 2003 | 1 | 2 | 2 | 0.6 | 0 | 0.2 | 0 | 0.1 | 0 | 0 | 0 | 1.1 | 98 |
| 2004 | 1 | 1 | 1 | 1.0 | 0 | 0.2 | 0 | 0.1 | 0 | 0 | 0 | 1.1 | 98 |
| 2005 | 0 | 2 | 0 | 0.5 | 0 | 0.2 | 0 | 0.1 | 0 | 2 | 2 | 1.9 | 96 |
| 2006 | 1 | 3 | 3 | 0.4 | 0 | 0.3 | 0 | 0.1 | 0 | 0 | 0 | 1.6 | 94 |
| 2007 | 1 | 3 | 1 | 0.5 | 0 | 0.3 | 0 | 0.1 | 0 | 2 | 2 | 1.4 | 92 |
| 2008 | 0 | 0 | 0 | 0.4 | 0 | 0.3 | 0 | 0.1 | 0 | 0 | 0 | 1.3 | 92 |
| 2009 | 0 | 2 | 1 | 0.6 | 0 | 0.3 | 1 | 0.1 | 0 | 0 | 0 | 1.1 | 90 |
| 2010 | 0 | 8 | 1 | 0.6 | 1 | 0.4 | 0 | 0.2 | 0 | 6 | 6 | 1.0 | 82 |
| 2011 | 3 | 10 | 10 | 2.1 | 0 | 0.3 | 0 | 0.2 | 0 | 0 | 0 | 0.8 | 75 |
| 2012 | 4 | 9 | 7 | 1.5 | 0 | 0.3 | 0 | 0.2 | 2 | 0 | 2 | 0.7 | 70 |
| 2013 | 5 | 3 | 2 | 1.0 | 0 | 0.3 | 0 | 0.2 | 1 | 0 | 1 | 0.8 | 72 |
| 2014 | 2 | 6 | 4 | 3.0 | 0 | 0.3 | 0 | 0.1 | 0 | 2 | 2 | 1.3 | 68 |
| 2015 | 7 | 9 | 6 | 3.6 | 2 | 0.2 | 0 | 0.1 | 1 | 0 | 1 | 1.0 | 66 |
| 2016 | 13 | 7 | 6 | 2.8 | 0 | 0.1 | 0 | 0.0 | 0 | 1 | 1 | 1.4 | 72 |
| 2017 | 8 | 9 | 5 | 3.0 | 0 | 0.2 | 0 | 0.1 | 1 | 3 | 4 | 2.1 | 70 |
| 2018 | 8 | 8 | 5 | 2.3 | 0 | 0.2 | 0 | 0.1 | 0 | 3 | 3 | 2.1 | 70 |
| 2019 | 6 | 2 | 0 | 0.2 | 0 | 0.1 | 0 | 0.0 | 0 | 2 | 2 | 2.2 | 74 |
| 5-Yr. Totals | 42 | 35 | 22 | 11.9 | 2 | 0.8 | 0 | 0.3 | 2 | 9 | 11 | 8.8 | |
| Expected for 2020 | | | | 0.2 | | 0.2 | | 0.1 | | | | 2.2 | |

A = actual
E = expected

# Active Members in Valuation
## Comparative Schedule

| Valuation Date June 30 | No. | Valuation Payroll | Average Pay | % Incr. | Age | Service |
|---|---|---|---|---|---|---|
| 2000 | 94 | $ 5,593,871 | $ 59,509 | (0.5) % | 36.9 yrs. | 9.9 yrs. |
| 2001 | 93 | 5,799,631 | 62,362 | 4.8 | 37.1 | 9.8 |
| 2002 | 99 | 6,435,274 | 65,003 | 4.2 | 37.5 | 10.2 |
| 2003 | 98 | 6,307,652 | 64,364 | (1.0) | 38.1 | 10.8 |
| 2004 | 98 | 6,991,955 | 71,346 | 10.8 | 38.8 | 11.6 |
| 2005 | 96 | 7,115,713 | 74,122 | 3.9 | 39.9 | 12.6 |
| 2006 | 94 | 7,060,160 | 75,108 | 1.3 | 40.2 | 13.0 |
| 2007 | 92 | 7,220,564 | 78,484 | 4.5 | 41.0 | 13.8 |
| 2008 | 92 | 7,597,087 | 82,577 | 5.2 | 42.0 | 14.8 |
| 2009 | 90 | 7,499,803 | 83,331 | 0.9 | 43.1 | 15.8 |
| 2010 | 82 | 6,844,767 | 83,473 | 0.2 | 44.1 | 16.8 |
| 2011 | 75 | 6,009,688 | 80,129 | (4.0) | 44.0 | 16.6 |
| 2012 | 70 | 5,676,851 | 81,098 | 1.2 | 43.8 | 16.2 |
| 2013 | 72 | 5,867,119 | 81,488 | 0.5 | 43.8 | 15.8 |
| 2014 | 68 | 5,561,732 | 81,790 | 0.4 | 44.2 | 16.3 |
| 2015 | 66 | 5,282,238 | 80,034 | (2.1) | 43.0 | 14.7 |
| 2016 | 72 | 5,491,632 | 76,273 | (4.7) | 41.1 | 12.4 |
| 2017 | 70 | 5,533,353 | 79,048 | 3.6 | 40.3 | 11.6 |
| 2018 | 70 | 5,352,132 | 76,459 | (3.3) | 39.3 | 10.8 |
| 2019 | 74 | 5,744,170 | 77,624 | 1.5 | 39.6 | 11.1 |

# Active Members as of June 30, 2019
# By Near Age and Years of Service

| Near Age | Years of Service to Valuation Date | | | | | | | Totals | |
|---|---|---|---|---|---|---|---|---|---|
| | 0-4 | 5-9 | 10-14 | 15-19 | 20-24 | 25-29 | 30 Plus | No. | Valuation Payroll |
| 20-24 | 2 | | | | | | | 2 | $   102,446 |
| 25-29 | 14 | | | | | | | 14 | 773,529 |
| 30-34 | 8 | 3 | | | | | | 11 | 668,286 |
| 35-39 | 5 | 2 | 1 | 1 | | | | 9 | 649,528 |
| 40-44 | 2 | | | 2 | 3 | | | 7 | 618,716 |
| 45-49 | 2 | 2 | | 5 | 12 | | | 21 | 1,908,557 |
| 50-54 | | | | 3 | 3 | 1 | | 7 | 719,570 |
| 55-59 | | | | 1 | 2 | | | 3 | 303,538 |
| **Totals** | **33** | **7** | **1** | **12** | **20** | **1** | | **74** | **$   5,744,170** |

While not used in the financial computations, the following group averages are computed and shown because of their general interest.

| | | |
|---|---|---|
| Age: | 39.6 | years |
| Service: | 11.1 | years |
| Annual Pay: | $77,624 | |

# Summary of
# Current Asset Information
# Furnished for Valuation

## Balance Sheet

| Current Assets (Market Value) | | Reserve for | |
|---|---:|---|---:|
| Cash | $ 1,354,151 | Employees Contributions | $ 6,820,538 |
| Accrued Interest & Dividends | 107,831 | Employer Contributions | 7,551,466 |
| Stocks | 28,719,505 | Retired Benefit Payments | 28,292,542 |
| Stock Mutual Funds | 2,775,814 | Undistributed Investment Income | 776,198 |
| U.S. Government Bonds | 3,703,279 | | |
| Corporate Bonds | 3,920,762 | | |
| Mortgages | 1,242,358 | | |
| Agency Bonds | 754,106 | | |
| Asset Backed Securities | 0 | | |
| Receivables | 862,934 | | |
| Accounts Payable | 0 | | |
| Total Current Assets | $ 43,440,740 | Total Reserves * | $ 43,440,744 |

*  As reported.

## Receipts and Disbursements

| | 2018-19 | 2017-18 |
|---|---:|---:|
| Balance - July 1, | $ 42,664,542 | $ 42,364,918 |
| **Receipts:** | | |
| Employees contributions | 509,736 | 500,066 |
| - for EE service purchase | 0 | 0 |
| Employer contributions | 3,262,858 | 2,698,592 |
| - for retiree health insurance | 0 | 0 |
| - for admin. & inv. expenses | 349,433 | 375,854 |
| Investment income | 2,616,691 | 3,542,427 |
| **Disbursements:** | | |
| Benefit payments | 5,608,206 | 5,456,962 |
| Refund of member contributions | 13,497 | 984,499 |
| Retiree health insurance | 0 | 0 |
| Administrative expenses | 170,409 | 168,621 |
| Investment expenses | 170,408 | 207,233 |
| Audit Adjustment | 0 | 0 |
| Balance June 30, | $ 43,440,740 | $ 42,664,542 |

# Development of Funding Value of Retirement System Assets

| Year Ended June 30: | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|
| (A) Funding Value Beginning of Year | $45,546,957 | $44,678,218 | $42,974,487 | | | |
| (B) Market Value End of Year | 42,364,918 | 42,664,542 | 43,440,744 | | | |
| (C) Market Value Beginning of Year | 41,606,219 | 42,364,918 | 42,664,542 | | | |
| (D) Non Investment Net Cash Flow | (3,221,261) | (3,242,803) | (1,849,109) | | | |
|    (EE + ER cont.) - (Ret. Ben. + Refunds) | | | | | | |
| (E) Investment Income: | | | | | | |
|   (E1) Market Total: B-C-D | 3,979,960 | 3,542,428 | 2,625,311 | | | |
|   (E2) Assumed Rate | 7.50% | 7.25% | 7.00% | 6.75% | 6.75% | 6.75% |
|   (E3) Amount for Immediate Recognition | | | | | | |
|       E2 * (A + D/2) | 3,295,224 | 3,121,619 | 2,943,495 | | | |
|   (E4) Amount for Phased-In Recognition: E1-E3 | 684,736 | 420,809 | (318,184) | | | |
| (F) Phased-In Recognition Investment Income: | | | | | | |
|   (F1) From Current Year = .25 x (E3) | 171,184 | 105,202 | (79,546) | | | |
|   (F2) First Year Prior | (967,920) | 171,184 | 105,202 | $ (79,546) | | |
|   (F3) Second Year Prior | (891,014) | (967,920) | 171,184 | 105,202 | $ (79,546) | |
|   (F4) Third Year Prior | 745,048 | (891,013) | (967,920) | 171,184 | 105,203 | $ (79,546) |
|   (F5) Total Recognized Investment Gain | (942,702) | (1,582,547) | (771,080) | 196,840 | 25,657 | (79,546) |
| **(G) Funding Value End of Year** | | | | | | |
|   = (A) + (D) + (E3) + (F5) | $44,678,218 | $42,974,487 | $43,297,793 | | | |
| (H) Difference between Market & Funding Value | (2,313,300) | (309,944) | 142,951 | | | |
| (I) Recognized Rate of Return | 5.4% | 3.6% | 5.2% | | | |
| (J) Ratio of Funding Value of Assets to Market Value | 105.5% | 100.7% | 99.7% | | | |
| (K) Market Rate of Return | 10.0% | 8.7% | 6.3% | | | |

The Funding Value of Assets recognizes assumed investment income (line E3) fully each year. Differences between actual and assumed investment income (line E4) are phased-in over a closed four-year period. During periods when investment performance exceeds the assumed rate, Funding Value of Assets will tend to be less than Market Value. During periods when investment performance is less than the assumed rate, Funding Value of Assets will tend to be greater than Market Value. The Funding Value of Assets is *unbiased* with respect to Market Value. At any time, it may be either greater or less than Market Value. If actual and assumed rates of investment income are exactly equal for three consecutive years, the Funding Value will become equal to Market Value.

# SECTION D

## SUMMARY OF ACTUARIAL COST METHOD AND ASSUMPTIONS

# Actuarial Cost Method

Normal cost and the allocation of benefit values between service rendered before and after the valuation date was determined using an individual **_entry-age normal cost_** method having the following characteristics:

    (i)    The annual normal costs for each individual active member, payable from the date of employment to the date of retirement, are sufficient to accumulate the value of the member's benefit at the time of retirement; and

    (ii)    Each annual normal cost is a constant percentage of the member's year-by-year projected covered pay.

**Financing of Unfunded Actuarial Accrued Liabilities**.  Unfunded actuarial accrued liabilities (the portion of total liabilities not covered by present assets or expected future normal cost contributions) were amortized by level (principal or interest combined) percent-of-payroll contributions over a closed period of 25 years for the contribution rate beginning July 1, 2020.

# Actuarial Assumptions Used for the Valuations

The actuary calculates the contribution requirements and benefit values of the Retirement System by applying actuarial assumptions to the benefit provisions and people information furnished, using the actuarial cost method described on the previous page.  All actuarial assumptions used in this report are estimates of future experience, not market measures.

The principal areas of financial risk which require assumptions about future experiences are:

    (i)     Long-term rates of investment return to be generated by the assets of the Retirement System.
    (ii)    Patterns of pay increases to members.
    (iii)   Rates of mortality among members, retirees and beneficiaries.
    (iv)   Rates of withdrawal of active members (without entitlement to a retirement benefit).
    (v)    Rates of disability among members.
    (vi)   The age patterns of actual retirement.

In making a valuation, the actuary calculates the monetary effect of each assumption for as long as a present covered person survives - - a period of time which can be as long as a century.

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Actual experience of the Retirement System will not coincide exactly with assumed experience, regardless of the wisdom of the assumptions, or the skill of the actuary and the precision of the many calculations made.  Each valuation provides a complete recalculation of assumed future experience and takes into account all past differences between assumed and actual experience.  The result is a continual series of adjustments (usually small) to the computed contribution rate.

From time-to-time it becomes appropriate to modify one or more of the assumptions, to reflect experience trends (but not random year-to-year fluctuations).

# Valuation Assumptions

**The rate of investment return** was 6.75% a year, compounded annually (gross of investment and administrative expenses). This assumption is used to make money payable at one point in time equal in value to a different amount of money payable at another point in time. This assumption was first used for the June 30, 2019 valuation.

Experience over the last five years has been as illustrated below:

|  | Year Ending June 30, | | | | | 5-Year |
| --- | --- | --- | --- | --- | --- | --- |
|  | **2019** | **2018** | **2017** | **2016** | **2015** | **Average** |
| 1) Recognized rate* | 5.2 % | 3.6 % | 5.4 % | 4.4 % | 3.8 % | 4.5 % |
| 2) Increase in CPI | 1.6 | 2.9 | 1.6 | 1.0 | 0.1 | 1.4 |
| 3) Average salary increase | 3.5 | 1.9 | 8.3 | 2.7 | 3.6 | 4.0 |
| 4) Real return |  |  |  |  |  |  |
|    - investment purposes | 3.6 | 0.7 | 3.8 | 3.4 | 3.7 | 3.0 |
|    - funding purposes | 1.7 | 1.7 | (2.9) | 1.7 | 0.2 | 0.5 |

> \* The recognized rate of return was computed using the approximate formula: $i = I$ divided by $1/2 (A+B-I)$, where $I$ is realized investment income, $A$ is the beginning of year asset value and $B$ is the end of year asset value.

**The rates of salary increase** used for individual members are in accordance with the following table. This assumption is used to project a member's current salary to the salaries upon which benefit amounts will be based.

### Salary Increase Assumptions
### for an Individual Member

| Sample Ages | Merit & Seniority | Base (Economic) | Increase Next Year |
| --- | --- | --- | --- |
| 20 | 3.00 % | 3.25 % | 6.25 % |
| 25 | 3.00 | 3.25 | 6.25 |
| 30 | 2.60 | 3.25 | 5.85 |
| 35 | 1.10 | 3.25 | 4.35 |
| 40 | 0.20 | 3.25 | 3.45 |
| 45 | 0.20 | 3.25 | 3.45 |
| 50 | 0.20 | 3.25 | 3.45 |
| 55 | 0.10 | 3.25 | 3.35 |
| 60 | 0.00 | 3.25 | 3.25 |

If the number of active members remains constant, then the total active member payroll will increase 3.25% annually, the base portion of the individual salary increase assumptions. This increasing payroll was recognized in amortizing unfunded actuarial accrued liabilities. The wage inflation assumption was first used for the June 30, 2019 valuation.

**Price inflation** is not directly used in the valuation. For purposes of assessing the reasonableness of the assumed rate of return, we assumed price inflation of 2.50% per year. This assumption was first used for the June 30, 2019 valuation.

**The mortality table** used to measure post-retirement mortality is the Pub-2010, Amount Weighted, Safety, Healthy Retiree tables for males and females. The corresponding Disabled and Employee tables were used to measure Disabled mortality and Pre-Retirement mortality, respectively. A base year of 2010 with future mortality improvements using scale MP-2018 was used. Additional margin for future mortality improvements are included in the projection scale. This assumption was first used for the June 30, 2019 valuation. Sample post retirement rates follow:

| Sample Ages in 2019 | Single Life Retirement Values | | | | |
|---|---|---|---|---|---|
| | Present Value of $1 Monthly for Life | | Future Life Expectancy (Years) | | |
| | Males | Females | | Males | Females |
| 45 | $165.68 | $167.59 | | 40.82 | 42.88 |
| 50 | 159.40 | 161.78 | | 35.64 | 37.64 |
| 55 | 151.13 | 154.24 | | 30.55 | 32.52 |
| 60 | 140.71 | 144.97 | | 25.66 | 27.62 |
| 65 | 128.17 | 133.66 | | 21.05 | 22.97 |
| 70 | 113.3 | 119.81 | | 16.77 | 18.56 |
| 75 | 96.13 | 103.52 | | 12.85 | 14.48 |
| 80 | 77.61 | 85.76 | | 9.42 | 10.88 |

For purposes of the pre-retirement death benefit, it was assumed that 100% of members were married at the time of death. 25% of pre-retirement deaths were assumed to be duty related.

**Probabilities of retirement** for members eligible to retire were:

| | Hired Before July 1, 2009 | | | Hired On or After July 1, 2009 | | |
|---|---|---|---|---|---|---|
| | Percent of Active Members Retiring within Next Year | | | Percent of Active Members Retiring within Next Year | | |
| Retirement Ages | Police | Fire & Dept. Heads | Retirement Ages | Police | Fire & Dept. Heads |
| 45 | 40 % | 20 % | 55 | 62.5 % | 50 % |
| 46 | 40 | 20 | 56 | 47.5 | 30 |
| 47 | 40 | 20 | 57 | 47.5 | 30 |
| 48 | 40 | 20 | 58 | 47.5 | 30 |
| 49 | 40 | 20 | 59 | 47.5 | 30 |
| 50 | 40 | 20 | 60 | 100.0 | 100 |
| 51 | 35 | 15 | | | |
| 52 | 20 | 10 | | | |
| 53 | 15 | 10 | | | |
| 54 | 15 | 10 | | | |
| 55 | 15 | 10 | | | |
| 56 | 15 | 10 | | | |
| 57 | 15 | 10 | | | |
| 58 | 15 | 10 | | | |
| 59 | 25 | 20 | | | |
| 60 | 100 | 100 | | | |

# Sample Rates of Separation from Active Employment before Retirement, Other than Death or Disability

| Sample Ages | Years of Service | % of Active Members Separating within Next Year | |
|---|---|---|---|
| | | Police | Fire & Dept. Heads |
| ALL | 0 | 12.00 % | 10.00 % |
| | 1 | 9.00 | 7.00 |
| | 2 | 7.00 | 5.00 |
| | 3 | 5.00 | 4.00 |
| | 4 | 4.50 | 3.50 |
| 25 | 5 & Over | 4.50 | 3.50 |
| 30 | | 3.90 | 2.90 |
| 35 | | 2.30 | 1.50 |
| 40 | | 0.90 | 0.60 |
| 45 | | 0.50 | 0.50 |
| 50 | | 0.50 | 0.50 |
| 55 | | 0.50 | 0.50 |
| 60 | | 0.50 | 0.50 |

# Sample Rates of Disability

| Sample Ages | Probabilities of Becoming Disabled During Next Year | |
|---|---|---|
| | Males | Females |
| 20 | 0.07 % | 0.03 % |
| 25 | 0.09 | 0.05 |
| 30 | 0.10 | 0.07 |
| 35 | 0.14 | 0.13 |
| 40 | 0.21 | 0.19 |
| 45 | 0.32 | 0.28 |
| 50 | 0.52 | 0.45 |
| 55 | 0.92 | 0.76 |
| 60 | 1.53 | 1.10 |

50% of disabilities were assumed to be duty related.

# Summary of Assumptions Used
## June 30, 2019

**Pensions in an Inflationary Environment**

**Value of $1,000/month Retirement Benefit**
**To an Individual Who Retires at Age 50**
**In an Environment of 3.25% Wage Inflation**

| Age | Value |
|-----|-------|
| 50 | $  1,000 |
| 51 | 969 |
| 52 | 938 |
| 53 | 909 |
| 54 | 880 |
| 55 | 852 |
| 60 | 726 |
| 65 | 619 |
| 70 | 527 |
| 75 | 450 |
| 80 | 383 |
| 85 | 326 |

# Miscellaneous and Technical Assumptions

**Marriage Assumption**
100% of members are assumed to be married for purposes of death-in-service benefits. 90% of members are assumed to be married at time of retirement for purposes of death after retirement benefits.

**Pay Increase Timing**
Beginning of (fiscal) year. This is equivalent to assuming that reported pays represent amounts paid to members during the year ended on the valuation date.

**Decrement Timing**
Decrements of all types are assumed to occur at the middle of the year.

**Eligibility Testing**
Eligibility for benefits is determined based upon the age nearest birthday and service nearest whole year on the date the decrement is assumed to occur.

**Benefit Service**
Exact fractional service is used to determine the amount of benefit payable.

**Decrement Relativity**
Decrement rates are used directly from tabular rates, without adjustment for multiple decrement table effects.

**Decrement Operation**
Disability and mortality decrements do not operate during the first five years of service. Disability and separation do not operate during retirement eligibility.

**Normal Form of Benefit**
The assumed normal form of benefit is straight life for single members and joint and 60% survivor for married members.

**Loads**
Normal Retirement Present Values were loaded by 5% of age and service actuarial liabilities for Police and Fire hired before July 1, 2009 and 20% of age and service actuarial liabilities for Department Heads hired before July 1, 2009 for lump sums payable at retirement.

**Incidence of Contributions**
Contributions are assumed to be received continuously throughout the year based upon the computed percent-of-payroll shown in this report, and the actual payroll payable at the time contributions are made. New entrant normal cost contributions are applied to the funding of new entrant benefits.

**Annuity Withdrawal**
It was assumed that 80% of all future retirees will elect to withdraw their employee contributions at retirement resulting in a corresponding reduction to the monthly annuity. A 3.25% interest rate assumption was used to determine the annuity equivalent of the member contribution balance at retirement. This assumption was first used for the June 30, 2019 valuation

**Data Adjustments**
Prior year salary was used for one member on medical leave and two members on workers compensation.

# Glossary

**Actuarial Accrued Liability**   The difference between (i) the actuarial present value of future plan benefits, and (ii) the actuarial present value of future normal cost. Sometimes referred to as "accrued liability" or "past service liability."

**Accrued Service**   The service credited under the plan which was rendered before the date of the actuarial valuation.

**Actuarial Assumptions**   Estimates of future plan experience with respect to rates of mortality, disability, turnover, retirement, rate or rates of investment income and salary increases. Decrement assumptions (rates of mortality, disability, turnover and retirement) are generally based on past experience, often modified for projected changes in conditions. Economic assumptions (salary increases and investment income) consist of an underlying rate in an inflation-free environment plus a provision for a long-term average rate of inflation.

**Actuarial Cost Method**   A mathematical budgeting procedure for allocating the dollar amount of the "actuarial present value of future plan benefits" between the actuarial present value of future normal cost and the actuarial accrued liability. Sometimes referred to as the "actuarial funding method."

**Actuarial Equivalent**   A single amount or series of amounts of equal value to another single amount or series of amounts, computed on the basis of the rate(s) of interest and mortality tables used by the plan.

**Actuarial Present Value**   The amount of funds presently required to provide a payment or series of payments in the future. It is determined by discounting the future payments at a predetermined rate of interest, taking into account the probability of payment.

**Amortization**   Paying off an interest-bearing liability by means of periodic payments of interest and principal, as opposed to paying it off with a lump sum payment.

**Experience Gain (Loss)**   A measure of the difference between actual experience and that expected based upon a set of actuarial assumptions during the period between two actuarial valuation dates, in accordance with the actuarial cost method being used.

**Funding Value of Assets**   Also referred to as actuarial value of assets, smoothed market value of assets, or valuation assets. Valuation assets recognize assumed investment return fully each year. Differences between actual and assumed investment return are phased-in over a closed four-year period. During periods when investment performance exceeds the assumed rate, valuation assets will tend to be less than market value. During periods when investment performance is less than the assumed rate, valuation assets will tend to be greater than market value. If assumed rates are exactly realized for three consecutive years, valuation assets will become equal to market value.

**Normal Cost**                     The annual cost assigned, under the actuarial funding method, to current and subsequent plan years. Sometimes referred to as "current service cost." Any payment toward the unfunded actuarial accrued liability is not part of the normal cost.

**Plan Termination Liability**  The actuarial present value of future plan benefits based on the assumption that there will be no further accruals for the future service and salary. The termination liability will generally be less than the liabilities computed on a "going concern" basis and is not normally determined in a routine actuarial valuation.

**Reserve Account**           An account used to indicate that funds have been set aside for a specific purpose and are not generally available for other uses.

**UAAL**                        (Unfunded Actuarial Accrued Liability) The difference between the actuarial accrued liability and the funding value of assets. Sometimes referred to as "unfunded accrued liability."

Most retirement systems have unfunded actuarial accrued liability. An amount arises each time new benefits are added and each time an experience loss occurs.

The existence of unfunded actuarial accrued liability is not in itself bad, any more than a mortgage on a house is bad. Unfunded actuarial accrued liability does not represent a debt that is payable today. What is important is the ability to control the amount of unfunded actuarial accrued liability and the trend in the amount (after due allowance for devaluation of the dollar).

February 5, 2020

Retirement Board
City of Madison Heights Police
 and Fire Retirement System
300 West Thirteen Mile Road
Madison Heights, Michigan  48071

Attention:  Ms. Linda A. Kunath, Finance Director/Treasurer

Dear Board Members:

Enclosed are seven copies of the report of the June 30, 2019 Actuarial Valuation of liabilities for the City of Madison Heights Police and Fire Retirement System.

I would be pleased to meet with you and the Board to discuss the report.

Sincerely,

Brad Lee Armstrong, ASA, EA, FCA, MAAA

BLA:bd
Enclosures