

June 29, 2017 - DRAFT

Ms. Kerrie Vanden Bosch
Director, Office of Retirement Services
530 W. Allegan
Lansing, Michigan 48909

**Re: Separate Actuarial Valuation as of September 30, 2016 for
University Members of MPSERS (Pension Benefits Only)**

Dear Ms. Vanden Bosch:

We have completed a separate actuarial valuation for current and former employees of the seven Michigan Universities that have withdrawn from the Michigan Public School Employees Retirement System (for their employees hired on or after January 1, 1996) due to the enactment of Act No. 272 of the Public Acts of 1995. This actuarial valuation was prepared as of September 30, 2016, and utilized the same actuarial assumptions and methods used for the 2016 valuation of MPSERS, except that the unfunded actuarial accrued liability for University members is expected to be completely amortized by September 30, 2036.

The purpose of the valuation is to provide the required contribution rates for the fiscal year beginning October 1, 2018 and to evaluate the liabilities and funded status of the System for the affected members in total. This report should not be relied upon for any other purpose.

Select valuation results are presented in the following tables:

Table 1 - Demographic Characteristics - Comparison of University and Non-University MPSERS Members as of September 30, 2016 and September 30, 2015

Table 2 - Contribution Rates for the Indicated Fiscal Years Expressed as a Percentage of Payroll

Table 3 - University Contribution Rates as of September 30, 2016 for the Fiscal Year Beginning October 1, 2018 – Expressed as a Percentage of Payroll and Estimated Dollars

Table 4 - Actuarial Valuation Results as of September 30, 2016

Table 5 - Active University MPSERS Members as of September 30, 2016 by Age and Years of Service

Table 6 - Active University MPSERS Member Statistics by Plan Type

Table 7 - University MPSERS Pensions in Force on September 30, 2016 by Type of Pension, Selected Option, and Pension Amount

Table 8 - Summary of MPSERS Liability Transfers Between Non-University and University from October 1, 2015 through September 30, 2016

Table 9 - Allocation of September 30, 2016 MPSERS Assets Between University and Non-University Members

Table 10 - Unfunded Actuarial Accrued Liability and Actuarial Gain (Loss)

Section 41a of Act 300 of the Public Acts of 1980, as amended, provides for "... the payment schedule for universities being based on and applied to the combined payrolls of the universities' employees who are members and who were hired before January 1, 1996 and the universities' employees who would have been members on or after January 1, 1996, but for the enactment of 1995 PA 272." The total additional payroll for University employees hired since January 1, 1996 was reported to be \$97.9 million for the year ending September 30, 2016. Table 3 converts the employer percentage of payroll contribution rate that is based on payroll *only* for University MPSERS members with future benefit accruals in the defined benefit plan (97.40% for the fiscal year beginning October 1, 2018) into a contribution rate (30.49% for the fiscal year beginning October 1, 2018) based on that payroll plus a percentage (25.20% for the fiscal year beginning October 1, 2018) based on the combined payroll of University employees hired since January 1, 1996 who are not members of MPSERS and of University MPSERS members who elected not to continue future benefit accruals in the defined benefit plan. Therefore, the 2018/2019 employer contribution should be the sum of:

- a) 30.49% of University MPSERS member payroll for those continuing in the defined benefit plan, plus
- b) 25.20% of University non-MPSERS member payroll and University MPSERS member payroll for those who elected the defined contribution plan.

Please note, the amortization component of the employer contribution as a percentage of payroll has been calculated consistently with previously issued University reports. The payroll floor associated with the enactment of Act No. 136 of the Public Acts of 2016 is not reflected in the exhibits of this valuation report. The payroll floor for the fiscal year beginning October 1, 2018 is \$226.9 million. If the payroll floor is used as the basis for determining the amortization component of the employer contribution as a percentage of payroll, the amortization payment as a percentage of payroll for the fiscal year beginning October 1, 2018 would be 20.69%, rather than 25.20%.

The valuation was based upon information furnished by the Office of Retirement Services, concerning Retirement System benefits, financial transactions, and active members, terminated members, retirees and beneficiaries. Data was checked for internal and year-to-year consistency, but was not audited by us. This report may be provided to parties other than the Office of Retirement Services only in its entirety and only with the permission of the Office of Retirement Services. GRS is not responsible for unauthorized use of this report.

The valuation summarized in this report involves actuarial calculations that require making assumptions about future events. The assumptions and methods are disclosed fully in the September 30, 2016 actuarial valuation of MPSERS. We believe that the assumptions and methods used in this report are reasonable and appropriate. However, other assumptions and methods could also be reasonable and could result in materially different results. Some of the numbers in this report are rounded. There may be cases where schedules do not add, or where they do not exactly balance to other related schedules due to rounding. The use of rounded numbers for plan liabilities should not imply a lack of precision. 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 we deem to be immaterial.

As noted in the September 30, 2016 actuarial valuation report of MPSERS, we continue to include two service purchase loads in the accrued liability due to questions from the auditor as to how purchased service is reported. We included a load of \$116,000 in the accrued liability for purchased service that has been paid for but not reported. We included a load of \$86,200 in the accrued liability for amounts included in the plan's reported assets for purchased service that has not yet been paid for by the members.

In accordance with directions provided by the Office of Retirement Services, the Non-Hybrid plan investment return assumption was lowered from 8.00% to 7.50% effective with this valuation. This assumption change increased the normal cost as a percentage of payroll by 1.00% of payroll, the accrued liabilities by \$45.5 million, and the projected fiscal year 2019 employer contribution by \$2.4 million.

To the best of our knowledge, this report is complete and accurate and the valuation was conducted in accordance with standards of practice prescribed by the Actuarial Standards Board and in compliance with the applicable State statutes. Mita D. Drazilov is a Member of the American Academy of Actuaries (MAAA), is independent of the plan sponsor, and meets the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein. It is our opinion that the actuarial assumptions used for the valuation produce results which are reasonable.

Sincerely,



Mita D. Drazilov, ASA, FCA, MAAA

MDD:rmn

TABLE 1
DEMOGRAPHIC CHARACTERISTICS
COMPARISON OF UNIVERSITY AND NON-UNIVERSITY MPERS MEMBERS
AS OF SEPTEMBER 30, 2016 AND SEPTEMBER 30, 2015

2016	Total	University MPERS Members	Non-University MPERS Members
<u>Active Members</u>			
Number	189,761	1,398	188,363
Average age	46.2	56.8	46.1
Average service	13.0	26.1	12.9
Reported payroll	\$ 7,912,564,735	\$ 68,941,459	\$ 7,843,623,276
Average annual payroll	\$ 41,698	\$ 49,314	\$ 41,641
<u>Inactive Vested Members</u>			
Number	22,508	411	22,097
<u>Retirees & Beneficiaries</u>			
Number	211,007	4,994	206,013
Annual pension	\$ 4,709,668,096	\$ 81,665,593	\$ 4,628,002,503
Average annual pension	\$ 22,320	\$ 16,353	\$ 22,465
2015	Total	University MPERS Members	Non-University MPERS Members
<u>Active Members</u>			
Number	194,957	1,515	193,442
Average age	46.1	56.1	46.0
Average service	12.8	25.5	12.7
Reported payroll	\$ 8,005,009,024	\$ 73,014,050	\$ 7,931,994,974
Average annual payroll	\$ 41,060	\$ 48,194	\$ 41,005
<u>Inactive Vested Members</u>			
Number	22,717	439	22,278
<u>Retirees & Beneficiaries</u>			
Number	207,651	5,017	202,634
Annual pension	\$ 4,568,852,488	\$ 80,248,165	\$ 4,488,604,323
Average annual pension	\$ 22,003	\$ 15,995	\$ 22,151

The above statistics include only those members entitled to some type of defined benefit from the Retirement System. Active members hired after PA 300 of 2012 who elected the pure defined contribution plan are excluded from the statistics above.

The September 30, 2015 inactive counts include 5,272 people (including 41 University people) who elected not to continue future accruals (after the transition date of February 1, 2013) in the defined benefit plan as a result of PA 300.

The September 30, 2016 inactive counts include 4,640 people (including 36 University people) who elected not to continue future accruals (after the transition date of February 1, 2013) in the defined benefit plan as a result of PA 300.

TABLE 2
CONTRIBUTION RATES FOR THE INDICATED FISCAL YEARS
EXPRESSED AS A PERCENTAGE OF PAYROLL

Total - All MPERS Members			
Valuation Date	September 30, 2016	September 30, 2015	September 30, 2014
Fiscal Year Beginning	October 1, 2018	October 1, 2017	October 1, 2016
Total Normal Cost	9.19 %	8.29 %	8.28 %
Member Contributions	<u>4.73</u>	<u>4.69</u>	<u>4.63</u>
Employer Normal Cost	4.46 %	3.60 %	3.65 %
Amortization Payment	<u>24.01</u>	<u>22.18</u>	<u>22.30</u>
Total Employer Contribution	N/A	N/A	N/A
Projected Active Member Payroll			
For Fiscal Year (in millions)			
Normal Cost \$	\$8,761.3	\$8,864.0	\$8,797.9
Amortization \$	\$9,072.4	\$9,136.4	\$9,028.8
University MPERS Members			
Valuation Date	September 30, 2016	September 30, 2015	September 30, 2014
Fiscal Year Beginning	October 1, 2018	October 1, 2017	October 1, 2016
Total Normal Cost	8.42 %	7.41 %	7.40 %
Member Contributions	<u>3.13</u>	<u>3.14</u>	<u>3.10</u>
Employer Normal Cost	5.29 %	4.27 %	4.30 %
Amortization Payment	<u>92.11</u>	<u>80.88</u>	<u>74.57</u>
Total Employer Contribution	97.40 %	85.15 %	78.87 %
Projected Active Member Payroll ⁽¹⁾			
For Fiscal Year (in millions)			
Normal Cost \$	\$51.0	\$55.4	\$59.0
Amortization \$	\$51.0	\$55.4	\$59.0
Non-University MPERS Members			
Valuation Date	September 30, 2016	September 30, 2015	September 30, 2014
Fiscal Year Beginning	October 1, 2018	October 1, 2017	October 1, 2016
Total Normal Cost	9.19 %	8.30 %	8.29 %
Member Contributions	<u>4.74</u>	<u>4.70</u>	<u>4.64</u>
Employer Normal Cost	4.45 %	3.60 %	3.65 %
Amortization Payment	<u>23.63</u>	<u>21.82</u>	<u>21.96</u>
Total Employer Contribution	N/A	N/A	N/A
Projected Active Member Payroll ⁽²⁾			
For Fiscal Year (in millions)			
Normal Cost \$	\$8,710.3	\$8,808.6	\$8,738.9
Amortization \$	\$9,021.4	\$9,081.0	\$8,969.8

⁽¹⁾ Payroll for University members of MPERS with future defined benefit accruals.

⁽²⁾ Payroll for Non-University members of MPERS and University members of MPERS with future defined contribution accruals.

TABLE 3
UNIVERSITY CONTRIBUTION RATES AS OF SEPTEMBER 30, 2016
FOR THE FISCAL YEAR BEGINNING OCTOBER 1, 2018
EXPRESSED AS A PERCENTAGE OF PAYROLL AND ESTIMATED DOLLARS

	Using Only Payroll of University Members of MPSERS with Future Defined Benefit Accruals		Also Using Payroll of University Non-Members Hired Since January 1, 1996 and University Members of MPSERS with Future Defined Contribution Accruals For Amortization Payment	
	Percentage of Pay	Dollar Amount (In Millions)	Percentage of Pay	Dollar Amount (In Millions)
Normal Cost	8.42 %	\$ 4.291	8.42 %	\$ 4.291
Member Contributions	<u>3.13</u>	<u>1.595</u>	<u>3.13</u>	<u>1.595</u>
Employer Normal Cost	5.29 %	\$ 2.696	5.29 %	\$ 2.696
Amortization Payment	<u>92.11</u>	<u>46.942</u>	<u>25.20</u>	<u>46.942</u>
Total Employer Contribution	97.40 %	\$ 49.638	30.49 %	\$ 49.638
Projected Payroll				
For Normal Cost		\$ 50.963		\$ 50.963
For Amortization Payment		\$ 50.963		\$ 186.254

This exhibit does not reflect the payroll floor associated with Act No. 136 of the Public Acts of 2016 (see page 2).

TABLE 4
ACTUARIAL VALUATION RESULTS
AS OF SEPTEMBER 30, 2016

	Total All MPSERS Members	University MPSERS Members	Non-University MPSERS Members
(1) Fiscal Year Ending September 30,	2019	2019	2019
(2) Total Normal Cost of Benefits (as a % of member pay)	9.19%	8.42%	9.19%
(3) Member Contribution % (weighted average)	<u>4.73%</u>	<u>3.13%</u>	<u>4.74%</u>
(4) Employer Normal Cost % = (2) - (3)	4.46%	5.29%	4.45%
(5) Projected Active Member Payroll for Fiscal Year - Normal Cost \$	\$8,761,318,013	\$50,962,517	\$8,710,355,496
(6) Employer Normal Cost \$ = (4) x (5) ¹	390,317,866	2,695,917	387,621,949
(7) Actuarial Accrued Liability - Total	72,310,445,826	1,092,812,604	71,217,633,222
Active employees	20,986,215,105	280,291,707	20,705,923,398
Inactive vested members ²	1,922,350,458	23,438,624	1,898,911,834
Other inactive members ³	102,443,221	2,370,580	100,072,641
Retirees and surviving beneficiaries	49,299,437,042	786,711,693	48,512,725,349
(8) Funding Value of Assets	43,203,593,340	487,577,728	42,716,015,612
(9) Unfunded Actuarial Accrued Liabilities (UAAL) = (7) - (8)	29,106,852,486	605,234,876	28,501,617,610
(10) Amortization Period (years)	Multiple Periods	18	Multiple Periods
(11) Amortization Factor (level percent of payroll payments)	N/A	12.82494824	N/A
(12) Amortization Payment %	24.01%	92.11%	23.63%
(13) Projected Active Member Payroll for Fiscal Year - Amortization \$	\$9,072,406,207	\$50,962,517	\$9,021,443,690
(14) Amortization Payment \$ = (12) x (13)	2,178,284,730	46,941,574	2,131,343,156
(15) Total Computed Employer Contribution % = (4) + (12)	N/A	97.40%	N/A
(16) Total Computed Employer Contribution \$ = (6) + (14)	\$ 2,568,602,596	\$ 49,637,491	\$ 2,518,965,105

¹ The formula in line (6) only applies to the University column. This is because of the effect of the Pension Plus provisions and the multiple amortization periods on the Total and Non-University columns.

² Includes pending refunds of employee contributions for former employees who terminated without a vested benefit.

³ Includes liabilities for employees who transferred to the DC pension plan in connection with PA 300.

TABLE 5
ACTIVE UNIVERSITY MPERS MEMBERS AS OF SEPTEMBER 30, 2016
BY AGE AND YEARS OF SERVICE

Age	Years of Service							Total Count	Total Pay	Average Pay
	0 - 4	5 - 9	10 - 14	15 - 19	20 - 24	25 - 29	30 & up			
35 - 39		1		1	1			3	\$ 128,519	\$ 42,840
40 - 44		6	4	15	18	1		44	2,173,923	49,407
45 - 49	8	18	20	17	43	51	4	161	7,278,606	45,209
50 - 54	8	10	11	18	68	113	73	301	14,688,603	48,799
55 - 59	10	11	13	25	52	119	179	409	19,007,857	46,474
60 - 64	8	14	5	13	40	84	168	332	17,299,904	52,108
65 - 69	7	7	3	4	13	23	41	98	5,533,488	56,464
70 & Over	8	3	4	2	5	7	21	50	2,830,559	56,611
Total	49	70	60	95	240	398	486	1,398	\$ 68,941,459	\$ 49,314

The September 30, 2016 active statistics exclude 36 University people who elected not to continue future accruals (after the transition date of February 1, 2013) in the defined benefit plan as a result of PA 300.

As of September 30, 2016, the total University payroll (MPERS members and Non-MPERS members) was reported to be \$168.0 million.

TABLE 6
ACTIVE UNIVERSITY MPSERS MEMBER STATISTICS
BY PLAN TYPE

	September 30, 2015	September 30, 2016
Basic Members		
Number	680	620
Average Age	56.9 years	57.6 years
Average Service	28.9 years	29.4 years
Reported Payroll	\$ 34,411,171	\$ 32,204,469
Average Annual Pay	\$ 50,605	\$ 51,943
MIP Members		
Number	835	778
Average Age	55.4 years	56.1 years
Average Service	22.7 years	23.5 years
Reported Payroll	\$ 38,602,879	\$ 36,736,990
Average Annual Pay	\$ 46,231	\$ 47,220
Total		
Number	1,515	1,398
Average Age	56.1 years	56.8 years
Average Service	25.5 years	26.1 years
Reported Payroll	\$ 73,014,050	\$ 68,941,459
Average Annual Pay	\$ 48,194	\$ 49,314

The September 30, 2015 total active count excludes 41 University people who elected not to continue future accruals (after the transition date of February 1, 2013) in the defined benefit plan as a result of PA 300.

The September 30, 2016 total active count excludes 36 University people who elected not to continue future accruals (after the transition date of February 1, 2013) in the defined benefit plan as a result of PA 300.

As of September 30, 2016, the total University payroll (MPSERS members and Non-MPSERS members) was reported to be \$168.0 million.

TABLE 7

**UNIVERSITY MPERS PENSIONS IN FORCE ON SEPTEMBER 30, 2016
BY TYPE OF PENSION, SELECTED OPTION, AND PENSION AMOUNT**

Amount of Monthly Benefit	Number of Retirees	Type of Retirement*						Selected Option**				
		1	2	3	4	5	6	Opt. 1	Opt. 2	Opt. 3	Opt. 4	Opt 1E 2E,3E,4E
\$ 1 - 200	357	294	59	0	2	0	2	160	112	54	7	24
201 - 400	551	430	76	5	32	0	8	270	150	81	10	40
401 - 600	563	432	71	4	40	0	16	268	152	78	13	52
601 - 800	499	394	47	5	37	0	16	234	116	82	20	47
801 - 1,000	478	405	34	4	28	0	7	234	95	78	22	49
1,001 - 1,200	399	333	37	2	20	0	7	172	85	79	29	34
1,201 - 1,400	342	296	30	1	9	0	6	131	93	70	27	21
1,401 - 1,600	305	268	27	0	3	0	7	120	72	55	26	32
1,601 - 1,800	242	218	18	0	4	0	2	99	53	46	22	22
1,801 - 2,000	205	177	22	0	3	0	3	79	50	42	18	16
Over 2,000	1,053	940	98	0	4	0	11	388	311	215	85	54
Totals	4,994	4,187	519	21	182	0	85	2,155	1,289	880	279	391

* Type of Retirement

- 1 – Normal retirement for age & service
- 2 – Survivor payment – normal retirement
- 3 – Duty disability retirement (including survivors)
- 4 – Non-duty disability retirement (including survivors)
- 5 – Survivor payment – duty death in service
- 6 – Survivor payment – non-duty death in service

** Selected Option

- Opt. 1 – Straight life allowance
- Opt. 2 – 100% survivor option
- Opt. 3 – 50% survivor option
- Opt. 4 – 75% survivor option
- Opt. 1E, 2E, 3E, 4E – Equated retirement options

TABLE 8
SUMMARY OF MPSERS LIABILITY TRANSFERS BETWEEN NON-UNIVERSITY &
UNIVERSITY
FROM OCTOBER 1, 2015 THROUGH SEPTEMBER 30, 2016

Transfers between segments	
Transfers to University	
a) 8 Non-University actives as of 10/1/2015 who transferred to University actives by 10/1/2016	\$ 1,192,266
b) 0 Non-University terminated vested as of 10/1/2015 who transferred to University actives by 10/1/2016	0
c) 0 Non-University pensioners as of 10/1/2015 who transferred to University actives by 10/1/2016	0
d) 0 Non-University actives as of 10/1/2015 who transferred to University terminated vesteds by 10/1/2016	0
e) 1 Non-University terminated vesteds as of 10/1/2015 who transferred to University terminated vesteds by 10/1/2016	74,448
f) 0 Non-University pensioners as of 10/1/2015 who transferred to University terminated vesteds by 10/1/2016	0
g) 0 Non-University actives as of 10/1/2015 who transferred to University pensioners by 10/1/2016	0
h) 6 Non-University terminated vested as of 10/1/2015 who transferred to University pensioners by 10/1/2016	424,722
i) 1 Non-University pensioners as of 10/1/2015 who transferred to University pensioners by 10/1/2016	11,288
j) Total Transfers into University	\$ 1,702,724
Transfers from University	
k) 7 University actives as of 10/1/2015 who transferred to Non-University actives by 10/1/2016	\$ 1,222,387
l) 0 University terminated vesteds as of 10/1/2015 who transferred to Non-University actives by 10/1/2016	0
m) 0 University pensioners as of 10/1/2015 who transferred to Non-University actives by 10/1/2016	0
n) 1 University actives as of 10/1/2015 who transferred to Non-University terminated vesteds by 10/1/2016	63,924
o) 3 University terminated vested as of 10/1/2015 who transferred to Non-University terminated vesteds by 10/1/2016	400,026
p) 0 University pensioners as of 10/1/2015 who transferred to Non-University terminated vesteds by 10/1/2016	0
q) 0 University actives as of 10/1/2015 who transferred to Non-University pensioners by 10/1/2016	0
r) 0 University terminated vested as of 10/1/2015 who transferred to Non-University pensioners by 10/1/2016	0
s) 0 University pensioners as of 10/1/2015 who transferred to Non-University pensioners by 10/1/2016	0
t) Total Transfers from University	\$ 1,686,337
u) Total Net Transfers (j - t)	\$ 16,387

TABLE 9

ALLOCATION OF SEPTEMBER 30, 2016 MPSERS ASSETS BETWEEN UNIVERSITY AND NON-UNIVERSITY MEMBERS

	Total MPSERS Assets	MPSERS University Assets	MPSERS Non-University Assets
1. Beginning of Year Assets			
a) Market Value	\$ 42,382,360,872	\$ 495,345,725	\$ 41,887,015,147
b) Valuation Assets	41,006,352,969	474,583,901	40,531,769,068
2. End of Year Assets at Market Value	43,460,578,748	492,315,440	42,968,263,308
3. Net Additions to Market Value			
a) Member Contributions	398,893,138	2,443,880 ⁴	396,449,258
b) Employer Contributions	2,308,657,030	43,460,297 ⁵	2,265,196,733
c) Investment Income ¹	3,095,177,500	35,610,802	3,059,566,698
d) Benefit Payments	(4,671,299,698)	(81,781,466)	(4,589,518,232)
e) Contribution Refunds / Transfers	(24,518,373)	0	(24,518,373)
f) Administrative Expenses ¹	(26,213,125)	(301,589)	(25,911,536)
g) Transfers from (to) stabilization subaccount	0	0	0
h) University Employer Contribution Refund ³	(2,478,596)	(2,478,596)	0
i) Transfers in (out)	0	16,387	(16,387)
j) Audit Adjustment ¹	0	0	0
k) Total Additions to Market Value	1,078,217,876	(3,030,285)	1,081,248,161
4. Average Market Value of Assets = (1a) + .5 x [(5a) + (5c) + (5d)] + (5f)	41,386,987,623	476,167,783	40,910,819,840
5. Summary of Net Additions to Market Value			
a) Net Contributions = (3a) + (3b) + (3e) + (3g)	2,683,031,795	45,904,177	2,637,127,618
b) Net Investment Income = (3c) + (3f)	3,068,964,375	35,309,213	3,033,655,162
c) Benefit Payments = (3d)	(4,671,299,698)	(81,781,466)	(4,589,518,232)
d) University Employer Contribution Refund = (3h) ³	(2,478,596)	(2,478,596)	0
e) Transfers in (out) = (3i)	0	16,387	(16,387)
f) Audit Adjustment = (3j)	0	0	0
g) Total Additions to Market Value	1,078,217,876	(3,030,285)	1,081,248,161
6. Average Valuation Assets = (1b) + .5 x [(5a) + (5c) + (5d)] + (5f)	40,010,979,720	455,405,958	39,555,573,762
7. Imputed Income at Valuation Rate = Discount Rate ² x (6)	3,198,778,275	36,432,477	3,162,345,798
8. Gain (Loss) from Investments = (5b) – (7)	(129,813,900)	(1,123,264)	(128,690,636)
9. Portion of Gains (Losses) recognized from prior years			
a) From this year = .2 x (8)	(25,962,780)	(224,653)	(25,738,127)
b) From one year ago	(433,451,498)	(6,257,797)	(427,193,701)
c) From two years ago	644,579,078	9,405,612	635,173,466
d) From three years ago	372,032,865	5,598,491	366,434,374
e) From four years ago	432,010,930	6,379,195	425,631,735
f) Total	989,208,595	14,900,848	974,307,747
10. Change in Valuation Assets = (5a) + (5c) + (5d) + (5e) + (5f) + (7) + (9f)	2,197,240,371	12,993,827	2,184,246,544
11. End of Year Assets			
a) Market Value = (2)	43,460,578,748	492,315,440	42,968,263,308
b) Valuation Assets = (1b) + (10)	43,203,593,340	487,577,728	42,716,015,612
12a. Actuarial Rate of Return	10.47%	11.27%	10.46%
12b. Market Rate of Return	7.42%	7.42%	7.42%

¹ Allocated in proportion to average market value (i.e., item 4).

² Discount rate was 8% for the Non-Hybrid groups and 7% for the Hybrid group for the September 30, 2015 valuation.

³ The University Employer Contribution Refund assumed to occur in the middle of the fiscal year.

⁴ Excludes 3% member health contributions.

⁵ Includes non-member employer contributions.

TABLE 10

UNFUNDED ACTUARIAL ACCRUED LIABILITY AND ACTUARIAL GAIN (LOSS)

	Unfunded Actuarial Accrued Liability as of September 30, 2016		
	All MPSERS Members	University MPSERS Members	Non-University MPSERS Members
1. Actuarial accrued liability	\$72,310,445,826	\$1,092,812,604	\$71,217,633,222
2. Valuation assets	<u>43,203,593,340</u>	<u>487,577,728</u>	<u>42,716,015,612</u>
3. Unfunded (overfunded) actuarial accrued liability = (1) - (2)	29,106,852,486	605,234,876	28,501,617,610
	Derivation of Actuarial Gain (Loss)		
	All MPSERS Members	University MPSERS Members	Non-University MPSERS Members
4. Unfunded Actuarial Accrued Liability (UAAL) - Previous Valuation	\$ 26,721,224,610	\$ 573,573,980	\$ 26,147,650,630
5. Total Normal Cost (employer plus member) for Year Ending 9/30/2016	691,998,863	5,108,562	686,890,301
6. Total Contributions (employer plus member) for Year Ending 9/30/2016	2,707,550,168	45,904,177	2,661,645,991
7. Interest on:			
a. UAAL: Discount Rate ¹ x (4)	2,137,698,198	45,885,918	2,091,812,280
b. Normal Cost and Contributions: Discount Rate* / 2 x [(5) - (6)]	<u>(80,607,700)</u>	<u>(1,631,825)</u>	<u>(78,975,875)</u>
c. Net Total: (a) + (b)	2,057,090,498	44,254,093	2,012,836,405
8. Change in UAAL due to Benefit Changes	0	0	0
9. Change in UAAL due to Assumption Changes	3,452,363,091	45,516,740	3,406,846,351
10. Expected UAAL Current Year: (4) + (5) - (6) + (7c) + (8) + (9)	30,215,126,894	622,549,198	29,592,577,696
11. Actual UAAL Current Year	29,106,852,486	605,234,876	28,501,617,610
12. Experience Gain/(Loss): (10) - (11)	1,108,274,408 ²	17,314,322 ²	1,090,960,086
13. Actuarial accrued liability at start of year	67,727,577,579	1,048,157,881	66,679,419,698
14. Gain (loss) as percent of pension actuarial accrued liabilities at start of year	1.64%	1.65%	1.64%
15. Portion of gain (loss) due to investment performance	989,208,595	14,900,848	974,307,747

¹ Discount rate was 8% for the Non-Hybrid groups and 7% for the Hybrid group for the September 30, 2015 valuation.

² Please note that row 12 above includes the refund of University employer contributions totaling \$2,478,596.