Classic Values, Innovative Advice

Montana Highway Patrol Officers' Retirement System of the State of Montana

Actuarial Valuation as of June 30, 2015

Produced by Cheiron

September 2015

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Appendices

September 29, 2015

Public Employees' Retirement Board
100 North Park, Suite 200
Helena, Montana 59620

Dear Members of the Board:

At your request, we have conducted the annual actuarial valuation of the Montana Highway Patrol Officers' Retirement System as of June 30, 2015. The results of the valuation are contained in this report. The purpose of the valuation is discussed in the Foreword.

This report contains information on the System's assets, as well as analyses which combine asset and liability performance and projections. The report also provides information regarding employer contribution levels and certain required disclosures for financial statements. The purpose of this report is to present the annual actuarial valuation of the Montana Highway Patrol Officers' Retirement System. This report is for the use of the Public Employees' Retirement Board and its auditors in preparing financial reports in accordance with applicable law and accounting requirements.

Your attention is called to the Foreword in which we refer to the general approach employed in the preparation of this report. We also comment on the sources and reliability of both the data and the actuarial assumptions on which our findings are based. The results of this report are only applicable for Fiscal Year ending 2015 and rely on future system experience conforming to the underlying assumptions. To the extent that actual system experience deviates from the underlying assumptions, the results would vary accordingly.

We hereby certify that, to the best of our knowledge, this report and its contents have been prepared in accordance with generally recognized and accepted actuarial principles and practices which are consistent with the Code of Professional Conduct and applicable Actuarial Standards of Practice set out by the Actuarial Standards Board. Furthermore, as credentialed actuaries, we meet the Qualification Standards of the American Academy of Actuaries to render the opinion contained in this report. This report does not address any contractual or legal issues. We are not attorneys, and our firm does not provide any legal services or advice.

This actuarial report was prepared exclusively for the Montana Highway Patrol Officers' Retirement System for the purpose described herein. Other users of this valuation report are not intended users as defined in the Actuarial Standards of Practice, and Cheiron assumes no duty or liability to any other user.

Sincerely,
Cheiron

Stephen T. McElhaney, FSA, FCA	Margaret Tempkin, FSA
Principal Consulting Actuary	Principal Consulting Actuary

FOREWORD

Cheiron has performed the Actuarial Valuation of the Montana Highway Patrol Officers' Retirement System as of June 30, 2015. The purpose of this report is to:

1) **Measure and disclose**, as of the valuation date, the financial condition of the System;

2) **Indicate trends** in the financial progress of the System;

3) **Determine the sufficiency of the statutory contribution rate** paid by the employers for Fiscal Year 2015 to meet the requirements of an actuarial rate calculated as the normal cost, administrative expense, and a level percent of pay 30-year open amortization of the unfunded actuarial liability; and

4) **Provide information** and documentation as may be required for financial statements.

An actuarial valuation establishes and analyzes system assets and liabilities on a consistent basis, and traces the progress of both from one year to the next. It includes measurement of the System's investment performance as well as an analysis of actuarial liability gains and losses.

Section I presents a summary containing our findings and disclosing important trends experienced by the System in recent years.

Section II contains details on various asset measures, together with pertinent performance measurements.

Section III shows similar information on system liabilities, measured for actuarial, accounting, and government reporting purposes.

Section IV develops the employer contribution rate determined using actuarial techniques.

Section V includes certain required disclosures for financial statements.

The appendices to this report contain a summary of the System's membership at the valuation date, a summary of the major provisions of the System, and the actuarial methods and assumptions used in the valuation.

In preparing our report, we relied on information (some oral and some written) supplied by the staff of the Public Employee Retirement Administration. This information includes, but is not limited to, plan provisions, employee data, and financial information. We performed an informal examination of the obvious characteristics of the data for reasonableness and consistency in accordance with Actuarial Standard of Practice No. 23.

Future results may differ significantly from the current results presented in this valuation report due to such factors as the following: plan experience differing from that anticipated by the assumptions; changes in assumptions; and changes in plan provisions or applicable law.

SECTION I
BOARD SUMMARY

General Comments

The period to amortize unfunded actuarial liability decreased from 30.3 years at the June 30, 2014 valuation to 28.5 years as of June 30, 2015. During the year ended June 30, 2015, the System's assets gained 4.60% on a market value basis. However, due to the System's asset-smoothing technique which recognizes only a portion of the gains and losses, the return on the actuarial asset value was 9.61%. This return was above the assumed rate of return of 7.75% and resulted in an actuarial gain on investments of $2.1 million.

The actuarial liability was increased due to the passage of Senate Bill 238 (SB 238). SB 238, which was enacted during the 2015 legislative session, establishes a Deferred Retirement Option Plan (DROP) to eligible members of the Highway Patrol Officers' Retirement System. This benefit change added $1.7 million to the actuarial liability.

The System also experienced an actuarial loss on system liabilities resulting from salary increases different than assumed and members retiring, terminating, becoming disabled, and dying at rates different from the actuarial assumptions. The loss added $0.1 million to the expected actuarial liability. Experience gains and losses are normal in the course of the System's experience. The System will experience actuarial gains and losses over time because we cannot predict exactly how people will behave. When a system experiences alternating gains and losses that are small compared to the total actuarial liability, then the system's actuarial assumptions are reasonable.

As of the June 30, 2015 Actuarial Valuation, the System's unfunded actuarial liability was $67.3 million. This is an increase from last year's unfunded actuarial liability of $66.2 million. The funded ratio increased from 64% at the prior valuation to 65% at June 30, 2015.

Montana Code Annotated (MCA) 19-2-407 requires an analysis of how market performance is affecting the actuarial funding of the Retirement System. It is our understanding of the Code to report certain key results on a market value of assets basis. The market value at June 30, 2015 was $3.4 million greater than actuarial value. If market value were used rather than actuarial value, the funded ratio on the valuation date would be 67%, and the amortization period for the unfunded actuarial liability would be 26.1 years.

GASB Statement No. 67 became effective for the plan year ending June 30, 2014. GASB Statement No. 68 became effective for the employer's Fiscal Year ending June 30, 2015. Actuarial information related to required disclosures under GASB 67 and GASB 68 will be provided in a separate report.

SECTION I
BOARD SUMMARY

The following table compares the results at June 30, 2015, both before and after Senate Bill 238, and the June 30, 2014 valuation results.

Table I-1
Montana Highway Patrol Officers' Retirement System
Summary of Plan Changes

Valuation as of:	June 30, 2014	Before Senate Bill 238 June 30, 2015	After Senate Bill 238 June 30, 2015
Assets and Liabilities			
Actuarial Liability (AL)	$ 183,400,481	$ 191,291,104	$ 192,982,843
Actuarial Value of Assets (AVA)	117,226,278	125,675,791	125,675,791
Unfunded AL (AL – AVA)	$ 66,174,203	$ 65,615,313	67,307,052
Funded Ratio (AVA/AL)	63.9%	65.7%	65.1%
Contributions as a Percentage of Payroll			
Statutory Funding Rate	49.38%	50.38%	50.38%
Normal Cost Rate	24.46%	24.54%	25.26%
Administrative Expense	0.23%	0.23%	0.23%
Available for Amortization of UAL	24.69%	25.61%	24.89%
Period to Amortize	30.3 years	26.0 years	28.5 years
Projected 30-year Level Funding Rate	49.52%	48.33%	49.66%
Projected Shortfall (Surplus)	0.14%	(2.05%)	(0.72%)

SECTION I
BOARD SUMMARY

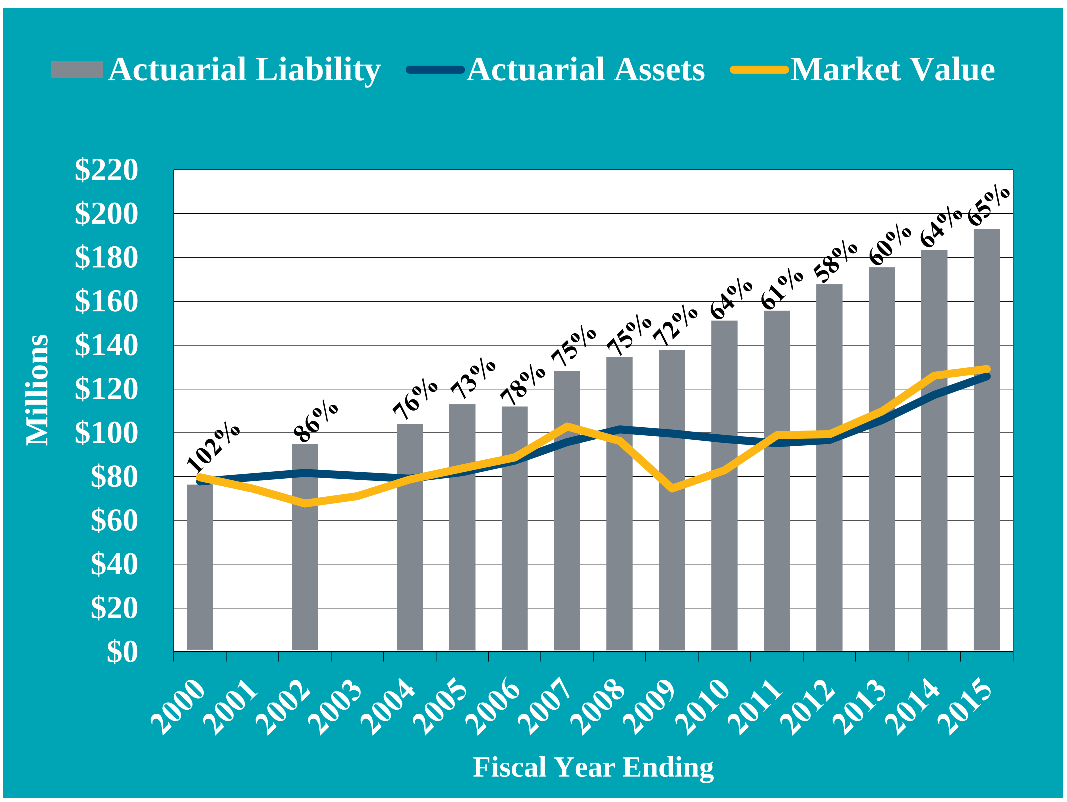
Trends

Assets and Liabilities

The market value of assets (MVA) increased over last year, returning 4.60% from the value at the prior valuation. The determination of the System's actuarial value of assets reflects only a portion of the amount by which the return differs from the assumed rate of 7.75%.

Over the period July 1, 2010 to June 30, 2015, the System's assets returned approximately 7.5% per year measured at actuarial value, compared to a current valuation assumption of 7.75% per year.

For funding purposes, the target amount or actuarial liability is represented by the top of the gray bar. We compare the actuarial value of assets to this measure of liability in developing the funded percent. These are the percentages shown in the graph labels.

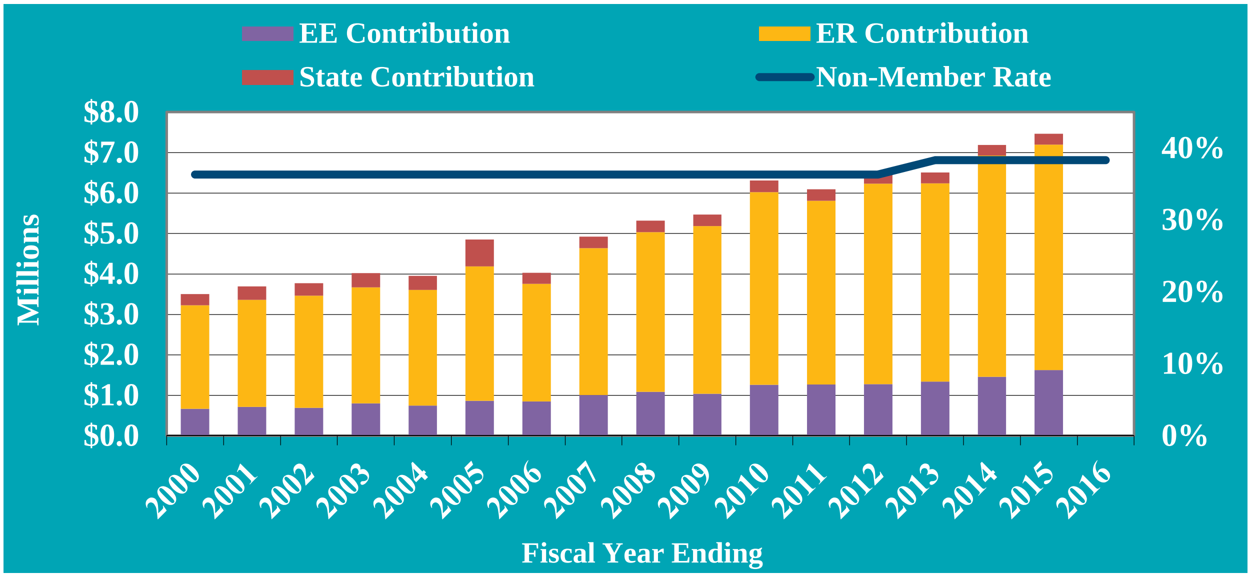


SECTION I
BOARD SUMMARY

Contribution Rates

The stacked bars in this graph show the contributions made by members, the employer, and the State (left-hand scale). The navy line shows the employer contribution rate as a percent of payroll (right-hand scale).

The employer, State, and member contribution rates are set by State law. The actuarial valuation determines the extent to which the statutory contributions will meet the requirements of funding the System.

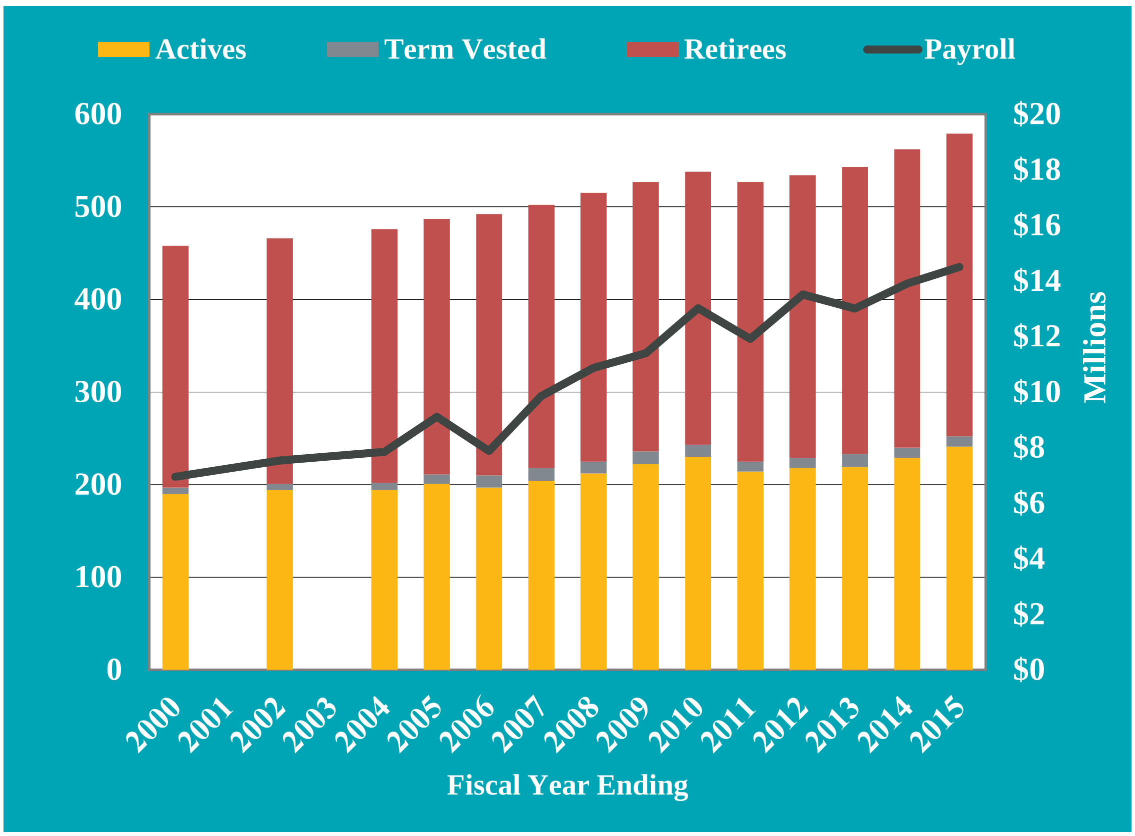


SECTION I
BOARD SUMMARY

Participant Trends

The bars show the number of participants in each category and should be read using the left-hand scale. The active-to-inactive ratio has remained relatively constant with 0.7 actives for each inactive in 2000 and also 0.7 actives for each inactive today.

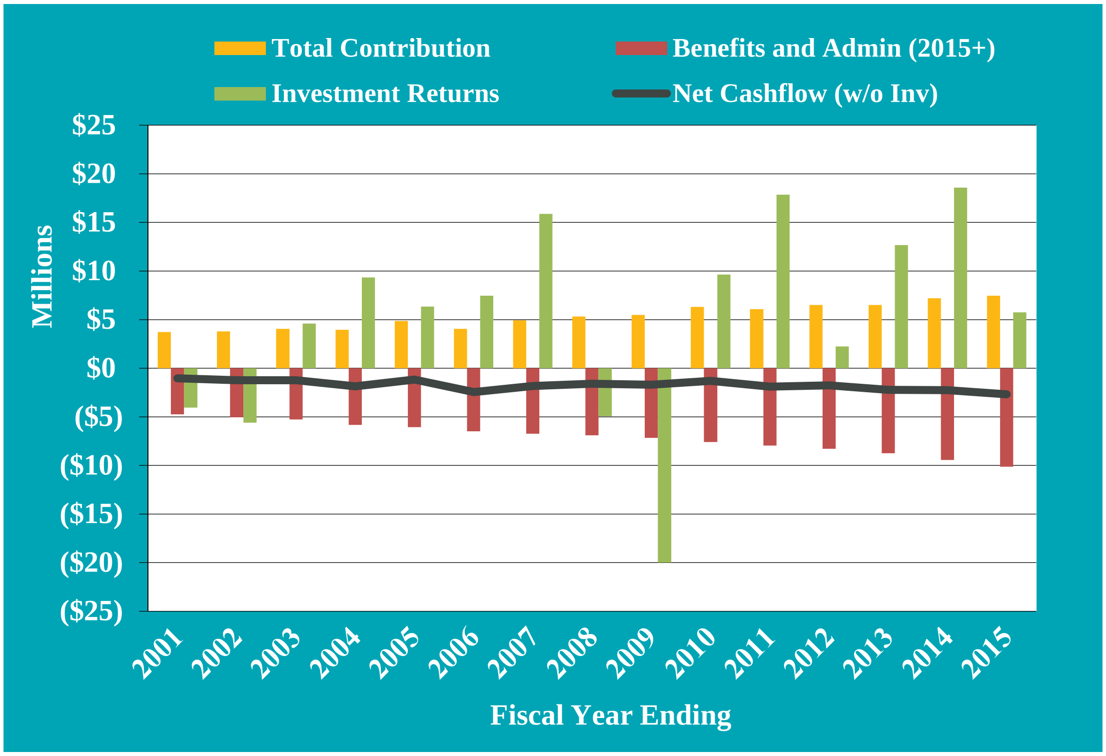
The black line shows the covered payroll in the System and is read using the right-hand scale.



SECTION I
BOARD SUMMARY

Net Cash Flow

This graph shows the historical contributions compared to benefit payments and, for 2015 and later, administrative expenses. The difference between these two measures is shown in the solid black line, and is the net cash flow (excluding investment returns).



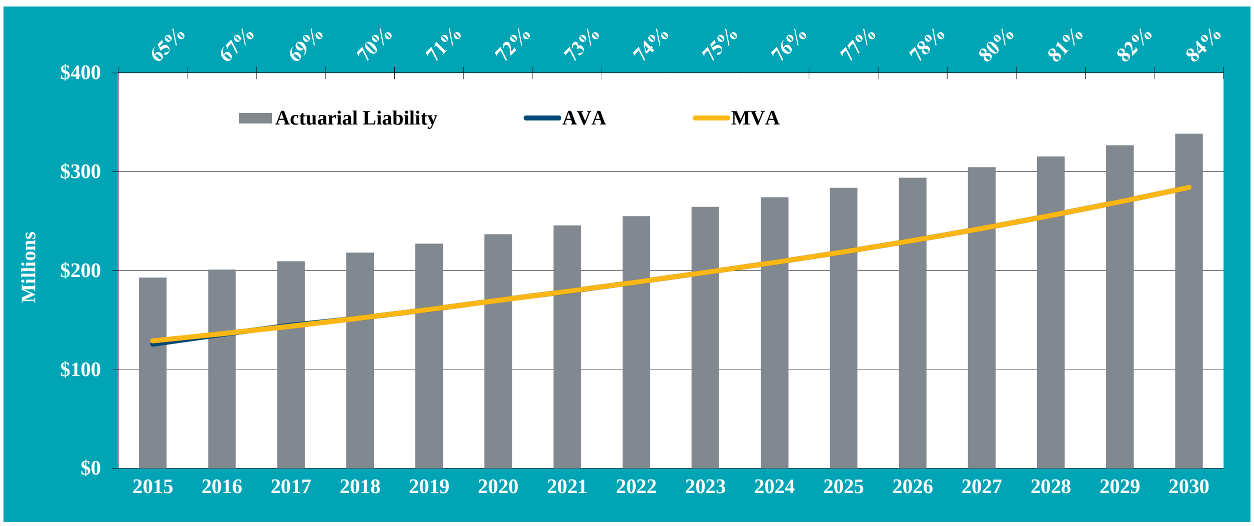
SECTION I
BOARD SUMMARY

Future Outlook

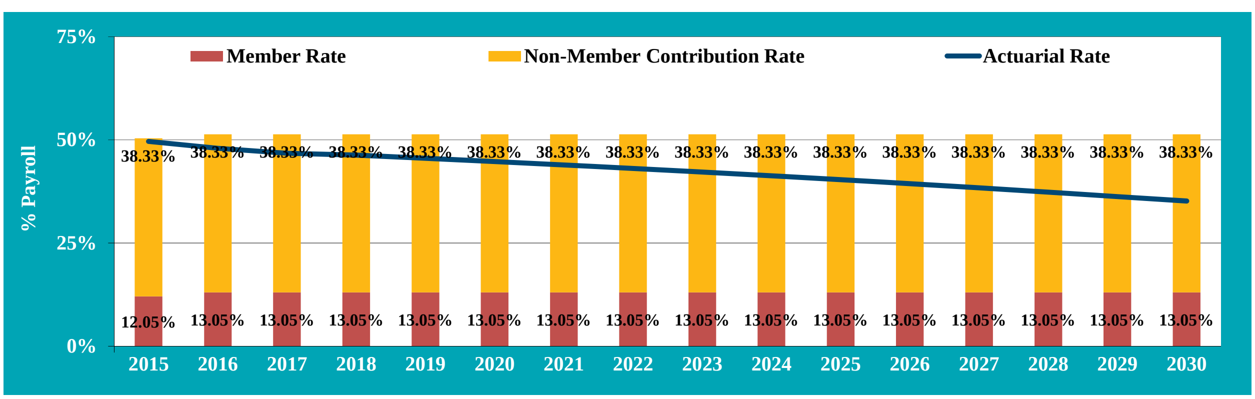
<u>Baseline Projections</u>

These graphs show the expected progress of the System over the next 15 years assuming the System's assets earn 7.75% on its *market value*, and that contributions continue to be made at the current statutory rates.

The values on top of the chart show that the funded status of the System is expected to increase gradually from the current ratio of 65% to 84% by the end of the 15-year period.



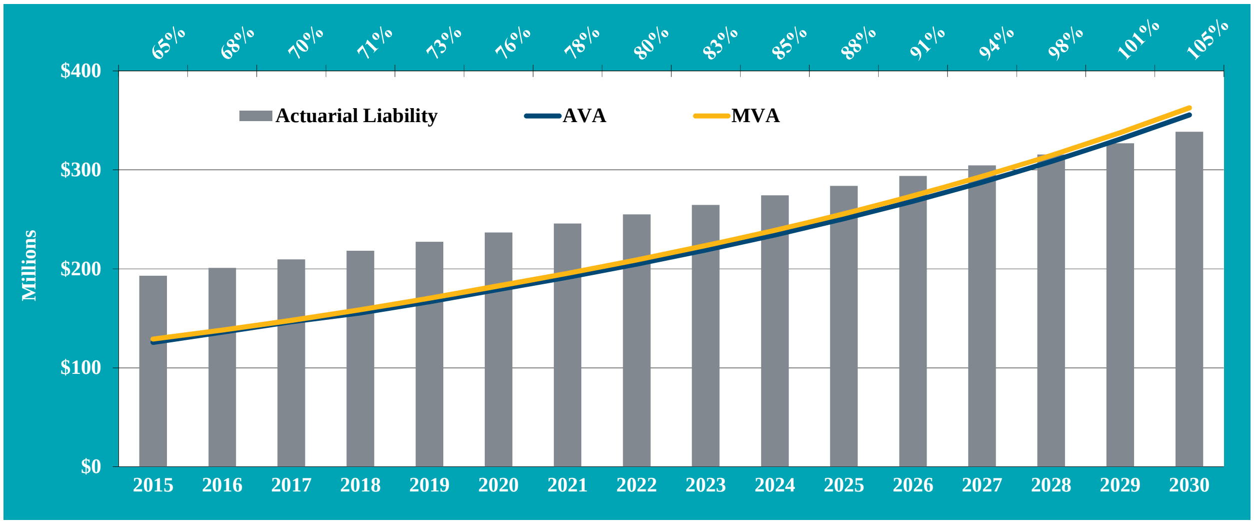
The chart below shows that the employer portion of the Actuarial Rate will decline steadily throughout the 15-year period. The Actuarial Rate is calculated as the normal cost, administrative expense, and a level percent of pay 30-year open amortization of the unfunded actuarial liability.



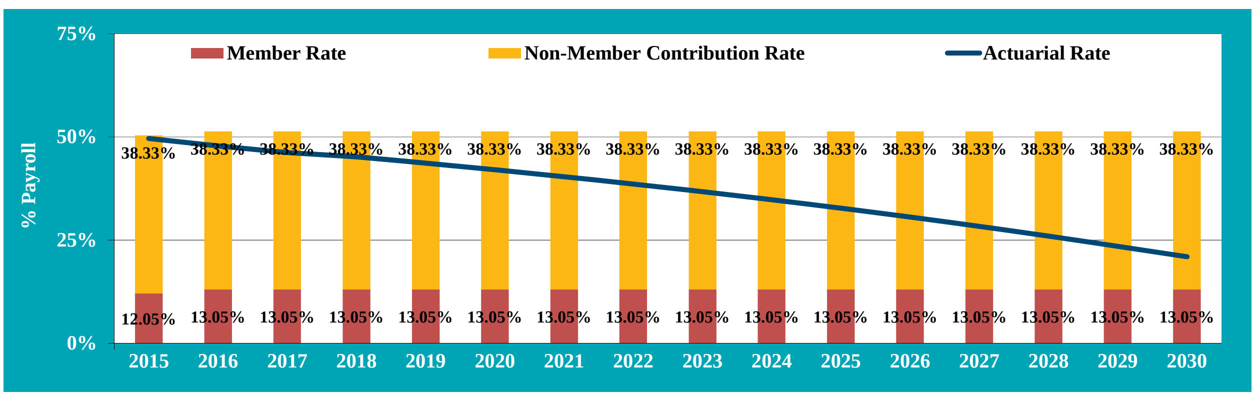
SECTION I
BOARD SUMMARY

Projections with Asset Returns of 9.25%

The future funding status of this System will be largely driven by the investment earnings. Changes in the rate of return on market value can have significant effects on the System's status. These two charts below show what the next 15 years would look like with a 9.25% annual return in each year (i.e., 1.5% greater than the assumed rate of return).



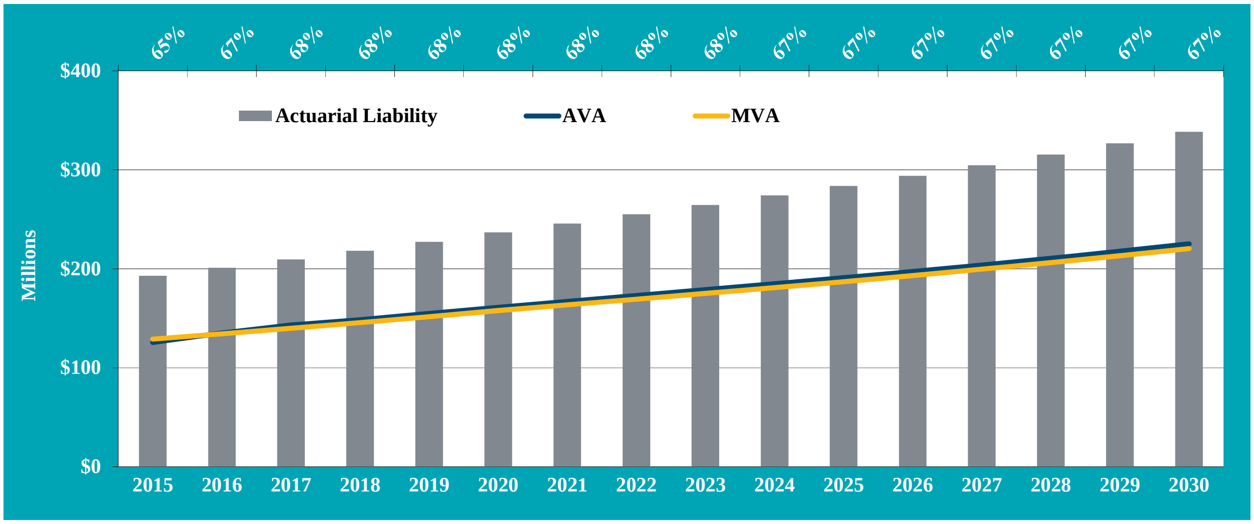
Compared to the baseline projections, the funded status begins to improve more quickly reaching 100% by the year 2029, and the employer portion of the Actuarial Rate declines even faster toward zero throughout this 15-year period.



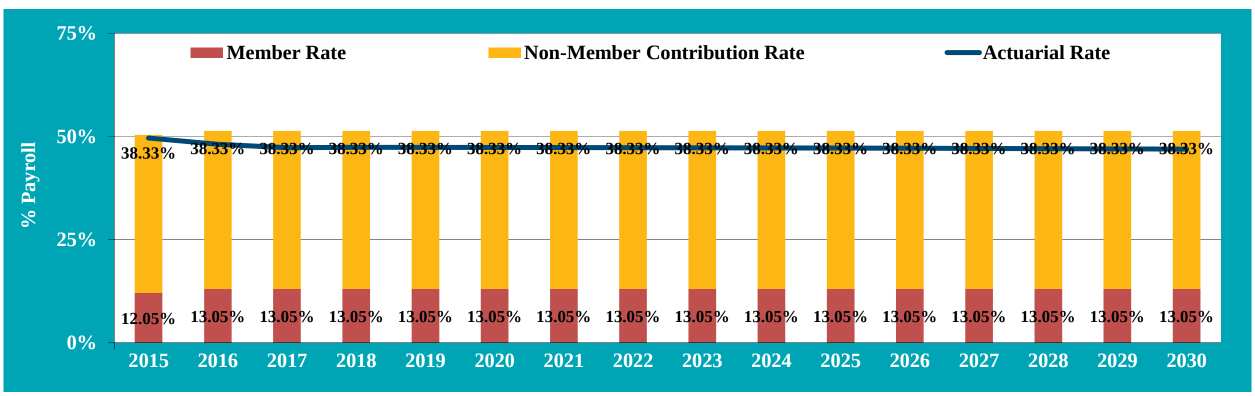
SECTION I
BOARD SUMMARY

<u>Projections with Asset Returns of 6.25%</u>

To further demonstrate how the future funding of this System will be driven by investment earnings, we show the anticipated system funding projections if the invested assets earn 6.25% per year over the entire 15-year period (i.e., 1.5% less than the assumed rate of return).



Under this scenario, the funded status increases the first couple of years, and stays mostly constant for the rest of the 15-year period. The employer portion of the Actuarial Rate declines slightly over the projection period under this scenario.



SECTION I
BOARD SUMMARY

Table I-2
Montana Highway Patrol Officers' Retirement System
Summary of Principal System Results

Valuation as of:	June 30, 2014	June 30, 2015	% Change
Participant Counts			
Active Members	229	241	5.2%
Disabled Members*	8	7	(12.5%)
Retirees and Beneficiaries*	314	320	1.9%
Terminated Vested Members	11	11	0.0%
Terminated Non-Vested Members	14	13	(7.1%)
Total**	576	592	2.8%
Annual Salaries of Active Members*	$ 13,901,207	$ 14,502,510	4.3%
Average Annual Salary	$ 60,704	$ 60,176	(0.9%)
Annual Retirement Allowances for Retired Members and Beneficiaries	$ 9,336,474	$ 9,891,640	5.9%
Assets and Liabilities			
Actuarial Liability (AL)	$ 183,400,481	$ 192,982,843	5.2%
Actuarial Value of Assets (AVA)	117,226,278	125,675,791	7.2%
Unfunded AL	$ 66,174,203	$ 67,307,052	1.7%
Funded Ratio (AVA/AL)	63.9%	65.1%	
Present Value of Accrued Benefits (PVAB)	$ 165,422,227	$ 177,928,585	7.6%
Market Value of Assets	126,010,392	129,067,319	2.4%
Unfunded PVAB	$ 39,411,835	$ 48,861,266	24.0%
Accrued Benefit Funding Ratio	76.2%	72.5%	
Ratio of Actuarial Value to Market Value	93.0%	97.4%	
Contributions as a Percentage of Payroll			
Statutory Funding Rate	49.38%	50.38%	
Normal Cost Rate	24.46%	25.26%	
Administrative Expense	0.23%	0.23%	
Available for Amortization of UAL	24.69%	24.89%	
Period to Amortize	30.3 years	28.5 years	
Projected 30-year Level Funding Rate	49.52%	49.66%	
Projected Shortfall (Surplus)	0.14%	(0.72%)	

* Based on PERB categorization for the annual report. For actuarial valuation purposes, 24 members in 2014 and 25 members in 2015 were valued as disabled members with offsetting reductions to the number of retired members.

** A reconciliation of participant counts appears at the beginning of Appendix A.

SECTION II
ASSETS

Pension plan assets play a key role in the financial operation of the System and in the decisions the Trustees may make with respect to future deployment of those assets. The level of assets, the allocation of assets among asset classes, and the methodology used to measure assets will likely have an impact upon benefit levels, contributions, and the ultimate security of participants' benefits.

In this section, we present detailed information on the System's assets including:

- **Disclosure** of System assets at June 30, 2014 and June 30, 2015;
- Statement of the **changes** in market values during the year;
- Development of the **Actuarial Value of Assets**;
- An assessment of **investment performance**; and
- A projection of the System's expected **cash flows** for the next 10 years.

Disclosure

The market value of assets represents "snap-shot" or "cash-out" values which provide the principal basis for measuring financial performance from one year to the next. Market values, however, can fluctuate widely with corresponding swings in the marketplace.

The actuarial values are market values which have been smoothed and are used for evaluating the System's ongoing liability to meet its obligations.

The actuarial value of assets is the current market value, adjusted by a four-year smoothing of gains and losses on a market value basis. Each year's gain or loss is determined as the difference between the actual market return and the expected market return using the assumed rate of investment return.

SECTION II
ASSETS

Table II-1 Changes in Market Values		
Value of Assets – June 30, 2014		**$ 126,010,392**
Additions		
Member Contributions	$ 1,624,327	
Employer Contributions	5,839,336	
Non-Employer Contributions	0	
Investment Return	5,738,373	
Other	0	
Total Additions	**$ 13,202,036**	
Deductions		
Benefit Payments	$ 10,000,856	
Administrative Expenses	144,253	
Total Deductions	**$ 10,145,109**	
Value of Assets – June 30, 2015		**$ 129,067,319**

SECTION II
ASSETS

Actuarial Value of Assets (AVA)

The actuarial value of assets represents a "smoothed" value developed by the actuary to reduce, or eliminate, volatile results which could develop from short-term fluctuations in the market value of assets. For this System, the actuarial value has been calculated by taking the market value of assets less 75% of the investment gain (loss) during the preceding year, less 50% of the investment gain (loss) during the second preceding year, and less 25% of the investment gain (loss) during the third preceding year. The tables below illustrate the calculation of actuarial value of assets for the June 30, 2015 valuation.

Table II-2
Market Value Gain/(Loss)

Value of Assets – June 30, 2014	$ 126,010,392
Total Contributions	7,463,663
Benefit Payments	(10,000,856)
Administrative Expense	(144,253)
Expected Return at 7.75%	9,663,838
Expected Value at June 30, 2015	$ 132,992,784
Actual Value at June 30, 2015	$ 129,067,319
Investment Gain/(Loss)	$ (3,925,465)

Table II-3
Develop Excluded Gain/(Loss)

	Total Gain/(Loss)	Excluded Portion
Exclude 75% of 2015 Gain/(Loss)	$ (3,925,465)	$ (2,944,099)
Exclude 50% of 2014 Gain/(Loss)	$ 10,153,654	$ 5,076,827
Exclude 25% of 2013 Gain/(Loss)	$ 5,035,198	$ 1,258,800
Total Excluded Gain/(Loss) for AVA Calculation		$ 3,391,528

Table II-4
Actuarial Value of Assets

Market Value of Assets – June 30, 2015	$ 129,067,319
Total Gain/(Loss) excluded	3,391,528
Actuarial Value of Assets – June 30, 2015	$ 125,675,791

SECTION II
ASSETS

Investment Performance

The market value of assets (MVA) returned 4.60% during Fiscal Year ended 2015, which is less than the assumed 7.75% return. A return of 9.61% on the actuarial value of assets (AVA) is primarily the result of the asset smoothing method being utilized for the calculation of the actuarial value of assets. Since only 25% of the gain or loss from the performance of the System is recognized in a given year, in periods of very good performance, the AVA can lag significantly behind the MVA. In a period of negative returns, the AVA does not decline as rapidly as the MVA.

Table II-5
Annual Rates of Return

Year Ending June 30,	Market Value	Actuarial Value
2005	8.14%	5.27%
2006	9.03%	9.39%
2007	18.07%	12.07%
2008	(4.83%)	7.73%
2009	(20.98%)	(0.15%)
2010	13.04%	(1.16%)
2011	21.79%	(0.04%)
2012	2.24%	3.32%
2013	12.88%	11.86%
2014	17.10%	13.13%
2015	4.60%	9.61%

SECTION II
ASSETS

Table II-6
Projection of System's Benefit Payments and Contributions
(in thousands)

Year Beginning July 1,	Expected Benefits	Expected Admin Expense	Expected Contributions*	Net Cash Flow (excluding Investment Return)	Expected Investment Return**	Net Cash Flow (including Investment Return)
2015	$ 10,499	$ 35	$ 7,745	$ (2,789)	$ 9,897	$ 7,108
2016	10,924	37	8,214	(2,747)	10,449	7,702
2017	11,368	38	8,543	(2,863)	11,042	8,179
2018	11,814	40	8,884	(2,970)	11,671	8,701
2019	12,278	41	9,240	(3,079)	12,342	9,263
2020	13,692	43	9,609	(4,126)	13,020	8,894
2021	14,216	45	9,994	(4,267)	13,703	9,436
2022	14,909	47	10,394	(4,562)	14,424	9,862
2023	15,771	48	10,809	(5,010)	15,171	10,161
2024	16,404	50	11,242	(5,212)	15,951	10,739

* Expected contributions include Employer Contributions, State Contributions and Member Contributions. For illustration purposes, we have assumed that all contribution rates will increase as stated in the Summary of Plan Provisions (Appendix C) and that payroll will increase at the actuarially assumed rate of 4.00% per year.

** Expected investment return is based upon an assumed return of 7.75% per annum.

Expected benefit payments are projected for the closed group valued at June 30, 2015. Projecting any farther than 10 years using a closed-group would not yield reliable predictions due to the omission of new hires.

SECTION III
LIABILITIES

In this section, we present detailed information on the System's liabilities including:

- **Disclosure** of System liabilities at June 30, 2014 and June 30, 2015;
- Statement of **changes** in these liabilities during the year;
- Details on the source of actuarial gains and losses between this valuation and the last; and
- Development of actuarial unfunded liability on a market value basis as required under MCA 19-2-407.

Disclosure

Several types of liabilities are calculated and presented in this report. Each type is distinguished by the people ultimately using the figures and the purpose for which they are using them.

- **Present Value of Benefits:** Used for analyzing the financial outlook of the System, this represents the amount of money needed today to fully pay off all future benefits and expenses of the System for the current participants, assuming participants continue to accrue benefits and all of the assumptions are met.

- **Actuarial Liability:** Used for funding calculations, this liability is calculated taking the Present Value of Benefits and subtracting the present value of future Member Contributions and future Employer Normal Costs under an acceptable actuarial funding method. This method is referred to as the **Entry Age Normal** (EAN) funding method.

- **Present Value of Accrued Benefits:** Used for communicating the current level of liabilities, this liability represents the total amount of money needed today to fully pay off the current accrued obligations of the System, assuming no future accruals of benefits. These liabilities are used to assess whether the System can meet its current benefit commitments.

The following table discloses each of these liabilities for the current and prior valuations. With respect to each disclosure, a subtraction of the appropriate value of System assets yields, for each respective liability type, a **net surplus** or an **unfunded liability**.

SECTION III
LIABILITIES

Table III-1 Liabilities/Net (Surplus)/Unfunded	June 30, 2014	June 30, 2015
<u>**Present Value of Benefits**</u>		
Active Participant Benefits	$ 84,099,889	$ 86,104,081
Retiree and Inactive Benefits	127,766,357	134,998,449
Present Value of Benefits (PVB)	**$ 211,866,246**	**$ 221,102,530**
Market Value of Assets (MVA)	$ 126,010,392	$ 129,067,319
Future Member Contributions	15,087,961	14,562,459
Future Employer Contributions	45,358,553	43,139,643
Funding Shortfall/(Surplus)	25,409,340	34,333,109
Total Resources	**$ 211,866,246**	**$ 221,102,530**
<u>**Actuarial Liability**</u>		
Present Value of Benefits (PVB)	$ 211,866,246	$ 221,102,530
Present Value of Future Normal Costs (PVFNC)	28,465,765	28,119,687
Actuarial Liability (AL=PVB–PVFNC)	**183,400,481**	**192,982,843**
Actuarial Value of Assets (AVA)	117,226,278	125,675,791
Net (Surplus)/Unfunded (AL – AVA)	**$ 66,174,203**	**$ 67,307,052**
<u>**Present Value of Accrued Benefits**</u>		
Present Value of Benefits (PVB)	$ 211,866,246	$ 221,102,530
Present Value of Future Benefit Accruals (PVFBA)	46,444,019	43,173,945
Present Value of Accrued Benefits (PVAB=PVB–PVFBA)	**$ 165,422,227**	**$ 177,928,585**
Market Value of Assets (MVA)	126,010,392	129,067,319
Net Unfunded (PVAB – MVA)	**$ 39,411,835**	**$ 48,861,266**

SECTION III
LIABILITIES

Changes in Liabilities

Each of the Liabilities disclosed in the prior table are expected to change at each valuation. The components of that change, depending upon which liability is analyzed, can include:

- New hires since the last valuation
- Benefits accrued since the last valuation
- System amendments changing benefits
- Passage of time which adds interest to the prior liability
- Benefits paid to retirees since the last valuation
- Participants retiring, terminating, or dying at rates different than expected
- A change in actuarial or investment assumptions
- A change in the actuarial funding method

Unfunded liabilities will change because of all of the above, and also due to changes in the System's assets resulting from:

- Employer contributions different than expected
- Investment earnings different than expected
- A change in the method used to measure System assets

In each valuation, we report on those elements of change which are of particular significance, potentially affecting the long-term financial outlook of the System. Below, we present key changes in liabilities since the last valuation. On the next page, we provide more detail on the sources of the actuarial (gain)/loss as measured on the basis of actuarial liability.

Table III-2
Changes in Liabilities

	Present Value of Benefits	Actuarial Liability	Present Value of Accrued Liability
Liabilities June 30, 2014	$ 211,866,246	$ 183,400,481	$ 165,422,227
Liabilities June 30, 2015	221,102,530	192,982,843	177,928,585
Liability Increase (Decrease)	9,236,284	9,582,362	12,506,358
Change Due to:			
Actuarial (Gain)/Loss	NC*	180,899	NC*
Plan Changes	(445,859)	1,691,739	3,963,806
Benefits Accumulated and Other Sources	9,682,143	7,709,724	8,542,552

* NC = not calculated.

SECTION III
LIABILITIES

Table III-3
Summary of Actuarial Gains and Losses as of June 30, 2015

Actuarial Liabilities as of June 30, 2014	$ 183,400,481
Normal Cost	3,598,464
Actual Benefit Payments	(10,000,856)
Interest	14,112,116
Expected Actuarial Liability as of June 30, 2015	191,110,205
Actuarial Liability as of June 30, 2015 (Before SB0238)	$ 191,291,104
Liability (Gain)/Loss	$ 180,899
Sources of Liability (Gain)/Loss	
Salary (Gain)/Loss	$ (1,666,872)
New Participant (Gain)/Loss	169,019
Active Retirements (Gain)/Loss	(925,274)
Active Terminations (Gain)/Loss	551,278
Active Deaths (Gain)/Loss	(33,572)
Active Disability (Gain)/Loss	150,957
Inactive Mortality (Gain)/Loss	328,789
Other (Gain)/Loss	1,606,574
Actuarial Liability as of June 30, 2015 (After SB0238)	$ 192,982,843
Liability (Gain)/Loss due to SB0238	$ 1,691,739
Actuarial Value of Assets as of June 30, 2014	$ 117,226,278
Net Cash Flow	(2,681,446)
Expected Earnings	8,983,069
Expected Actuarial Value of Assets as of June 30, 2015	123,527,901
Actuarial Value of Assets as of June 30, 2015	$ 125,675,791
Investment (Gain)/Loss	$ (2,147,890)
Total Liability (Gain)/Loss	1,872,638
Total Actuarial (Gain)/Loss	$ (275,252)

SECTION III
LIABILITIES

Table III-4 shows the actuarial liabilities as of the prior and current valuation dates. The unfunded actuarial liability is the difference between the actuarial liability and the actuarial value of assets. The funded ratio is the ratio of the actuarial value of assets to the actuarial liability.

Table III-4
Actuarial Liabilities for Funding

	June 30, 2014	June 30, 2015
1. Actuarial Liabilities		
Retiree and Inactive Benefits	$ 127,766,357	$ 134,998,449
Active Member Benefits	55,634,124	57,984,394
Total Actuarial Liability	**$ 183,400,481**	**$ 192,982,843**
2. Actuarial Value of Assets	$ 117,226,278	$ 125,675,791
3. Unfunded Actuarial Liability	$ 66,174,203	$ 67,307,052
4. Funded Ratio	63.9%	65.1%

Montana Code Annotated (MCA) 19-2-407 requires an analysis of how market performance is affecting the actuarial funding of the System. Table III-5 presented below shows the same information as in Table III-4 above, but using market value of assets rather than actuarial value of assets.

Table III-5
Actuarial Liabilities on Market Value Basis (MCA 19-2-407)

	June 30, 2014	June 30, 2015
1. Actuarial Liabilities		
Retiree and Inactive Benefits	$ 127,766,357	$ 134,998,449
Active Member Benefits	55,634,124	57,984,394
Total Actuarial Liability	**$ 183,400,481**	**$ 192,982,843**
2. Market Value of Assets	$ 126,010,392	$ 129,067,319
3. Unfunded Actuarial Liability	$ 57,390,089	$ 63,915,524
4. Funded Ratio	68.7%	66.9%

SECTION IV
CONTRIBUTIONS

In the process of evaluating the financial condition of any pension plan, the actuary analyzes the assets and liabilities to determine what level (if any) of contributions is needed to properly maintain the funding status of the System. Typically, the actuarial process will use a funding technique that will result in a pattern of contributions that are both stable and predictable.

For this System, the funding method employed is the **Entry Age Normal Actuarial Cost Method**. Under this method, there are three components to the total contribution: the **normal cost rate**, the **unfunded actuarial liability rate** (UAL rate), and the **administrative expense rate**. The normal cost rate is determined by taking the value, as of entry age into the System, of each member's projected future benefits. This value is then divided by the value, also at entry age, of each member's expected future salary. The normal cost rate is multiplied by current salary to determine each member's normal cost rate. Finally, the total normal cost rate is reduced by the member contribution rate to produce the employer normal cost rate. The difference between the EAN actuarial liability and the actuarial value of assets is the unfunded actuarial liability.

For purposes of determining the adequacy of the statutory funding rate, the UAL rate is calculated by subtracting the normal cost rate from the statutory rate. A calculation is then made to determine the period over which the UAL rate will amortize the unfunded actuarial liability. A second UAL rate is calculated based upon a 30-year amortization of the UAL, in accordance with Board funding policy. However, this rate should not necessarily be construed as a recommended contribution level and this policy will not fully amortize the unfunded liability. All UAL payments are determined as a level percentage of pay, assuming that total pay increases by the annual inflation rate of 4.00%.

The assumed administrative expense rate is 0.23% of payroll. This rate, when applied to payroll, is intended to provide an allowance above the cost of funding the benefits to pay for the expense of operating this System.

SECTION IV
CONTRIBUTIONS

The tables below present and compare the contribution rates for the System for this valuation and the prior one.

Table IV-1
Statutory Basis

	June 30, 2014	June 30, 2015
Statutory Funding Rates		
Members	11.05%	12.05%
Employers	28.15%	28.15%
State	10.18%	10.18%
Total	49.38%	50.38%
Normal Cost Rate*	24.46%	25.26%
Administrative Expense	0.23%	0.23%
Funding Rate Available for Amortization	24.69%	24.89%
Unfunded Actuarial Liability (Surplus)	$66,174,203	$67,307,052
Years to Amortize**	30.3 years	28.5 years

* The normal cost rate is projected to be 23.80% for members eligible after July 1, 2013. It is expected that the average normal cost rate will decrease over the next generation of active plan members.

** On a market value basis, the Years to Amortize the Unfunded Actuarial Liability was 23.9 years at June 30, 2014 and 26.1 years at June 30, 2015.

SECTION IV
CONTRIBUTIONS

Table IV-2
Calculated Actuarial Contribution Basis

	June 30, 2014	June 30, 2015
Normal Cost Rate	24.46%	25.26%
Amortization Payment (30-years)	24.83%	24.17%
Administrative Expense	0.23%	0.23%
Total Calculated Contribution Rate	49.52%	49.66%
Less Statutory Rate	49.38%	50.38%
Shortfall (Surplus) in Statutory Rate	0.14%	(0.72%)

Table IV-3
Calculated Actuarial Contribution on Market Value (MCA 19-2-407)

	June 30, 2014	June 30, 2015
Normal Cost Rate	24.46%	25.26%
Amortization Payment (30-years)	21.53%	22.95%
Administrative Expense	0.23%	0.23%
Total Calculated Contribution Rate	46.22%	48.44%
Less Statutory Rate	49.38%	50.38%
Shortfall (Surplus) in Statutory Rate	(3.16%)	(1.94%)

The following table projects the contribution rates for the next five valuations (assuming all assumptions are met, including 7.75% return).

Table IV-4
Projected Actuarial Contribution Rates

Valuation Year	Rate
2016	47.98%
2017	46.74%
2018	46.32%
2019	45.55%
2020	44.76%

SECTION V
FINANCIAL STATEMENT INFORMATION

The Government Finance Officers Association (GFOA) maintains a checklist of items to be included in a public retirement system's Comprehensive Annual Financial Report (CAFR) in order to receive recognition for excellence in financial reporting. Therefore, we have included certain schedules in this section for possible inclusion within the System's audited financial statements.

Tables V-1 through V-4 are exhibits which could be used with the CAFR report. Table V-1 is the Note to Required Supplementary Information, Table V-2 is a history of Financial Experience, Table V-3 is the Schedule of Funding Progress and Table V-4 is the Solvency Test which shows the portion of actuarial liability covered by assets.

SECTION V
FINANCIAL STATEMENT INFORMATION

Table V-1
Note To Required Supplementary Information

The information presented in the required supplementary schedules was determined as part of the actuarial valuation at the date indicated. Additional information as of the latest actuarial valuation follows.

Valuation date	June 30, 2015
Actuarial cost method	Entry Age Normal
Amortization method	Open
Remaining amortization period for Actuarial Contribution	30 years
Asset valuation method	Four-Year smoothed market
Actuarial assumptions:	
Investment rate of return*	7.75%
General wage growth*	4.00%
Merit salary increases	0.0% - 7.3%
*Includes inflation at	3.00%

The actuarial assumptions used have been recommended based on the most recent review of the System's experience (completed in 2010) and adopted by the Retirement Board.

The rate of employer contributions to the System is composed of the normal cost, amortization of the unfunded actuarial liability, and an allowance for administrative expenses. The normal cost is a level percent of payroll cost which will pay for projected benefits at retirement for each participant. The actuarial liability is that portion of the present value of projected benefits that will not be paid by future normal costs. The difference between this liability and the funds accumulated as of the same date is the unfunded actuarial liability. The allowance for administrative expenses is based upon the System's recent history of administrative expenses.

SECTION V
FINANCIAL STATEMENT INFORMATION

Table V-2
Analysis of Financial Experience

Gain and Loss in Accrued Liability During Years Ended June 30
Resulting from Differences Between Assumed Experience and Actual Experience

Type of Activity	*Gain (or Loss) for Year ending June 30, (expressed in thousands)* 2010	2011	2012	2013	2014	2015
Investment Income on Actuarial Assets	$ (9,065)	$ (7,496)	$ (4,179)	$ 3,921	$ 5,631	$ 2,148
Combined Liability Experience	(4,848)	2,128	(5,603)	1,648	(267)	(181)
(Loss)/Gain During Year from Financial Experience	$ (13,913)	$ (5,368)	$ (9,782)	$ 5,569	$ 5,364	$ 1,967
Non-Recurring Items	(2,700)	0	0	(2,179)	0	(1,692)
Composite Gain (or Loss) During Year	$ (16,613)	$ (5,368)	$ (9,782)	$ 3,390	$ 5,364	$ 275

Table V-3
Schedule of Funding Progress
(expressed in thousands)

Valuation Date June 30,	Actuarial Value of Assets	Actuarial Accrued Liability (AAL)	Funded Ratio	Unfunded AAL (UAAL)	Covered Payroll	UAAL as a Percentage of Covered Payroll
2015	$ 125,676	$ 192,983	65 %	$ 67,307	$ 14,549	463 %
2014	117,226	183,400	64 %	66,174	14,149	468 %
2013	105,736	175,594	60 %	69,858	13,484	518 %
2012	96,655	167,824	58 %	71,169	13,618	523 %
2011	95,274	155,742	61 %	60,468	12,472	485 %
2010	97,204	151,177	64 %	53,973	13,036	414 %

SECTION V
FINANCIAL STATEMENT INFORMATION

Table V-4
Solvency Test
Aggregate Accrued Liabilities for
(expressed in thousands)

Valuation Date June 30,	Active Member Contributions (1)	Retirees & Beneficiaries (2)	Active Member Employer Financed Contributions (3)	Actuarial Value of Reported Assets	Portion of Accrued Liabilities Covered by Reported Assets (1)	(2)	(3)
2015	$ 12,102	$ 133,628	$ 47,252	$ 125,676	100 %	85 %	0 %
2014	11,507	126,478	45,416	117,226	100 %	84 %	0 %
2013	11,339	117,914	46,341	105,736	100 %	80 %	0 %
2012	11,455	110,876	45,493	96,655	100 %	77 %	0 %
2011	10,795	107,035	37,911	95,274	100 %	79 %	0 %
2010	10,369	102,450	38,359	97,204	100 %	85 %	0 %

APPENDIX A
MEMBERSHIP INFORMATION

Reconciliation of Participant Counts	Active	Disabled	Retirees and Beneficiaries	Terminated Vested Members	Terminated Non-Vested Members	Total
Participant counts used for valuation	241	25	302	11	13	592
Disabled members having attained normal retirement age		(18)	18			0
Beneficiaries of Disabled Members						0
Beneficiaries with less than one year of certain payments remaining			0			0
Other Adjustments						0
Participant counts shown in Annual Financial Report	241	7	320	11	13	592

This chart is presented for informational purposes only. The counts shown in the valuation line were used for preparation of the liabilities disclosed within this report. The counts disclosed for the Annual Financial Report and the Board Summary (page 10) match the CAFR reports at the request of the Board. The differences between the counts, if any, have no material effect upon the liability calculation.

APPENDIX A
MEMBERSHIP INFORMATION

The following table shows a reconciliation of the participants used in the previous valuation to this valuation.

Status Reconciliation	Active	Retired	Vested	Non Vested	Disabled	Survivor	Total
Members on July 1, 2014	229	221	11	14	24	77	576
New Hires	24	0	0	0	0	0	24
Rehires	0	0	0	0	0	0	0
Retired	(9)	9	0	0	0	0	0
Terminated Vested	0	0	0	0	0	0	0
Terminated Non Vested	(1)	0	0	1	0	0	0
Active Deaths	0	0	0	0	0	0	0
Became Disabled	(1)	0	0	0	1	0	0
In Pay Deaths	0	(8)	0	0	0	(2)	(10)
Survivors	0	0	0	0	0	5	5
Cash Out	(1)	0	0	(2)	0	0	(3)
Members on July 1, 2015	241	222	11	13	25	80	592

The salaries used in the tables and charts which follow are different than the salaries used for the Board Summary on page 10. For this Appendix A, the valuation projected salaries are to be paid for the following fiscal year, whereas for the Board Summary, salaries are applicable in the year ending on the valuation date.

The benefits for retirees and beneficiaries used for the tables and charts which follow are different than the benefits used for the Board Summary on page 10. For this Appendix A, the valuation projected benefits to be paid for the following fiscal year (including Guaranteed Annual Benefit Adjustment (GABA) where applicable), whereas for the Board Summary, annual benefits are as of the valuation date.

APPENDIX A
MEMBERSHIP INFORMATION

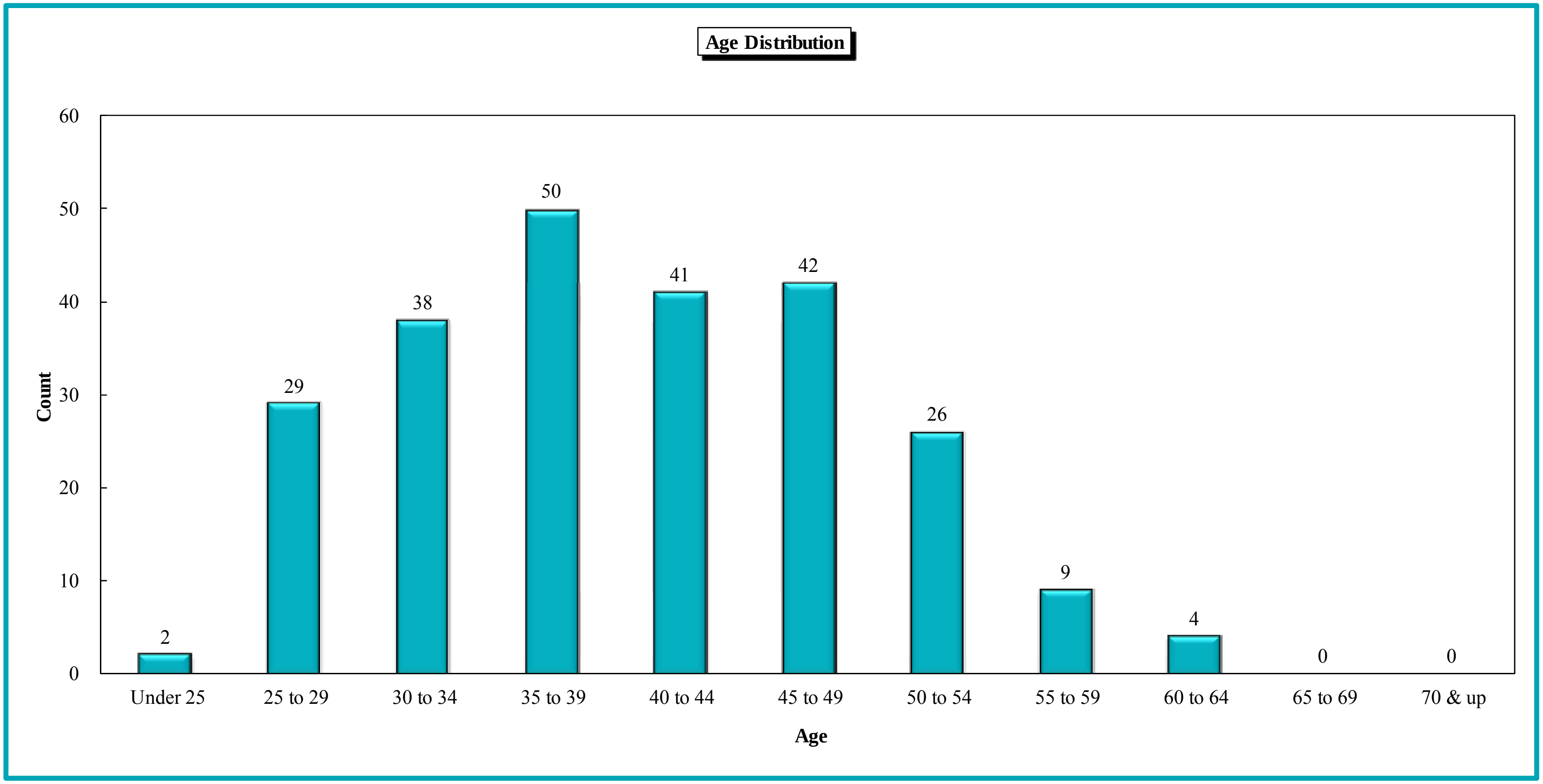
Montana Highway Patrol Officers' Retirement System Distribution of Active Members by Age and Service as of June 30, 2015

COUNTS BY AGE/SERVICE

	Service										
Age	Under 1	1 to 4	5 to 9	10 to 14	15 to 19	20 to 24	25 to 29	30 to 34	35 to 39	40 & up	Total
Under 25	0	2	0	0	0	0	0	0	0	0	2
25 to 29	9	19	1	0	0	0	0	0	0	0	29
30 to 34	3	17	16	2	0	0	0	0	0	0	38
35 to 39	10	7	12	17	4	0	0	0	0	0	50
40 to 44	0	3	10	15	12	1	0	0	0	0	41
45 to 49	1	2	8	10	11	10	0	0	0	0	42
50 to 54	0	0	6	5	7	4	4	0	0	0	26
55 to 59	0	0	2	2	4	0	1	0	0	0	9
60 to 64	0	0	1	0	0	1	1	1	0	0	4
65 to 69	0	0	0	0	0	0	0	0	0	0	0
70 & up	0	0	0	0	0	0	0	0	0	0	0
Total	23	50	56	51	38	16	6	1	0	0	241

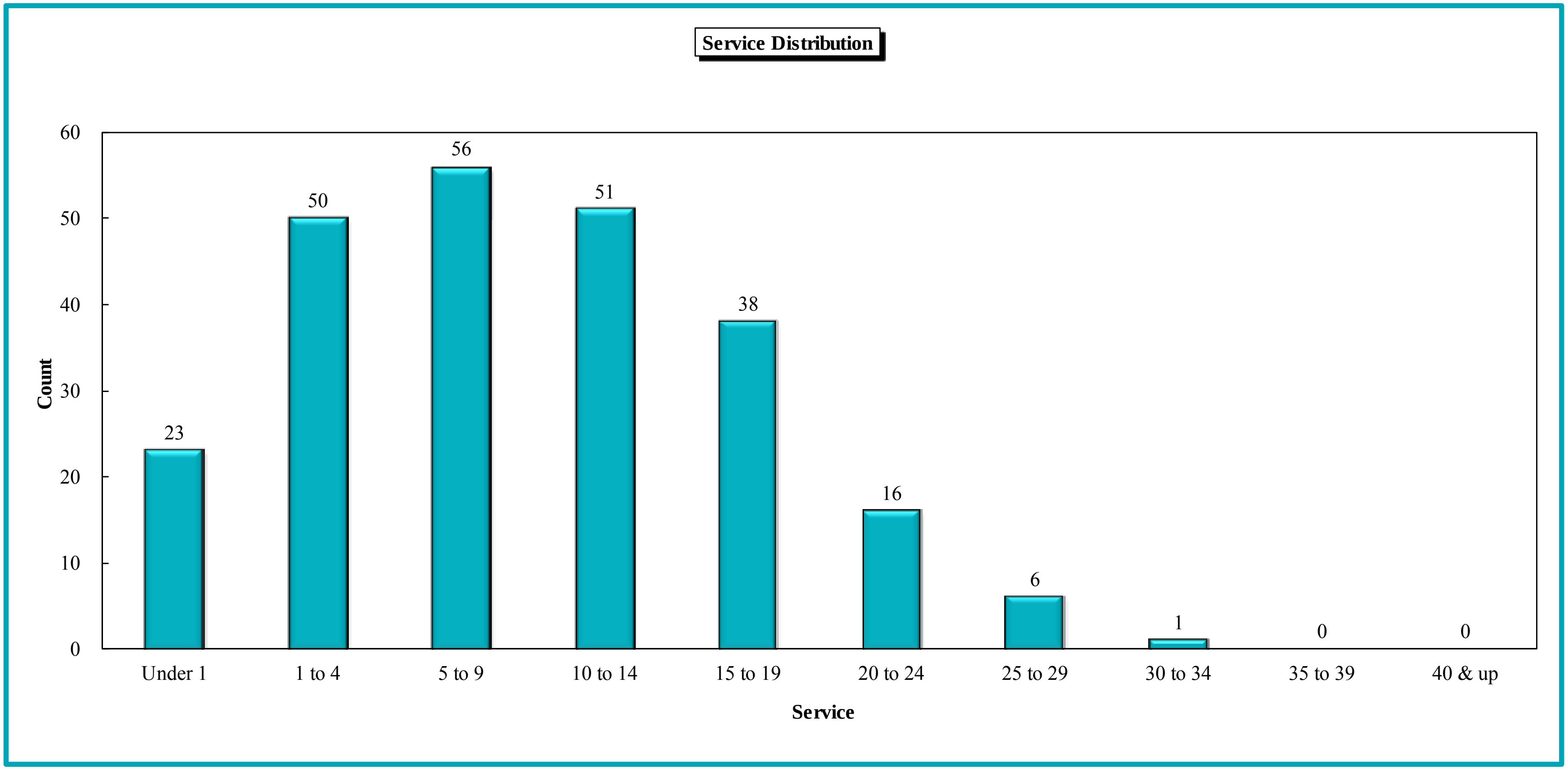
APPENDIX A
MEMBERSHIP INFORMATION

Montana Highway Patrol Officers' Retirement System Distribution of Active Members by Age as of June 30, 2015



APPENDIX A
MEMBERSHIP INFORMATION

Montana Highway Patrol Officers' Retirement System Distribution of Active Members by Service as of June 30, 2015



APPENDIX A
MEMBERSHIP INFORMATION

Montana Highway Patrol Officers' Retirement System Distribution of Active Members by Age and Service as of June 30, 2015

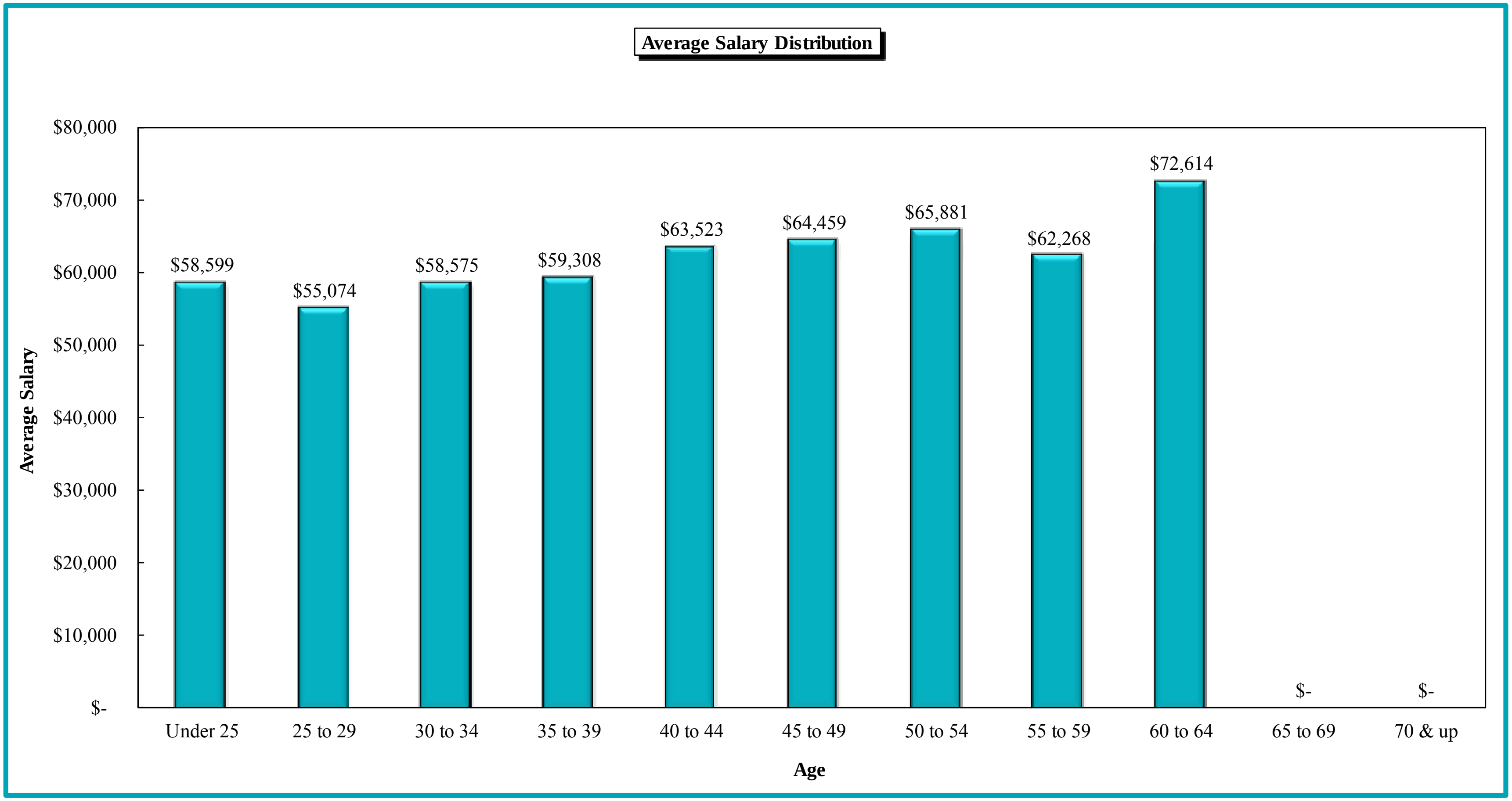
AVERAGE SALARY BY AGE/SERVICE

	Service										
Age	Under 1	1 to 4	5 to 9	10 to 14	15 to 19	20 to 24	25 to 29	30 to 34	35 to 39	40 & up	Total
Under 25	$ -	$ 58,599	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 58,599
25 to 29	$ 53,555	$ 55,375	$ 63,032	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 55,074
30 to 34	$ 52,125	$ 55,516	$ 60,577	$ 78,228	$ -	$ -	$ -	$ -	$ -	$ -	$ 58,575
35 to 39	$ 53,231	$ 56,171	$ 60,317	$ 61,609	$ 67,184	$ -	$ -	$ -	$ -	$ -	$ 59,308
40 to 44	$ -	$ 59,009	$ 60,737	$ 59,963	$ 70,204	$ 78,154	$ -	$ -	$ -	$ -	$ 63,523
45 to 49	$ 52,497	$ 54,617	$ 60,117	$ 62,867	$ 67,243	$ 69,625	$ -	$ -	$ -	$ -	$ 64,459
50 to 54	$ -	$ -	$ 63,346	$ 62,144	$ 64,251	$ 71,534	$ 71,554	$ -	$ -	$ -	$ 65,881
55 to 59	$ -	$ -	$ 58,340	$ 65,588	$ 61,460	$ -	$ 66,714	$ -	$ -	$ -	$ 62,268
60 to 64	$ -	$ -	$ 65,185	$ -	$ -	$ 68,362	$ 79,156	$ 77,754	$ -	$ -	$ 72,614
65 to 69	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
70 & up	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total	$ 53,181	$ 55,851	$ 60,827	$ 62,232	$ 67,012	$ 70,556	$ 72,014	$ 77,754	$ -	$ -	$ 61,332

The salary shown in the above chart was used for valuation purposes and assumes pay increases for the year.

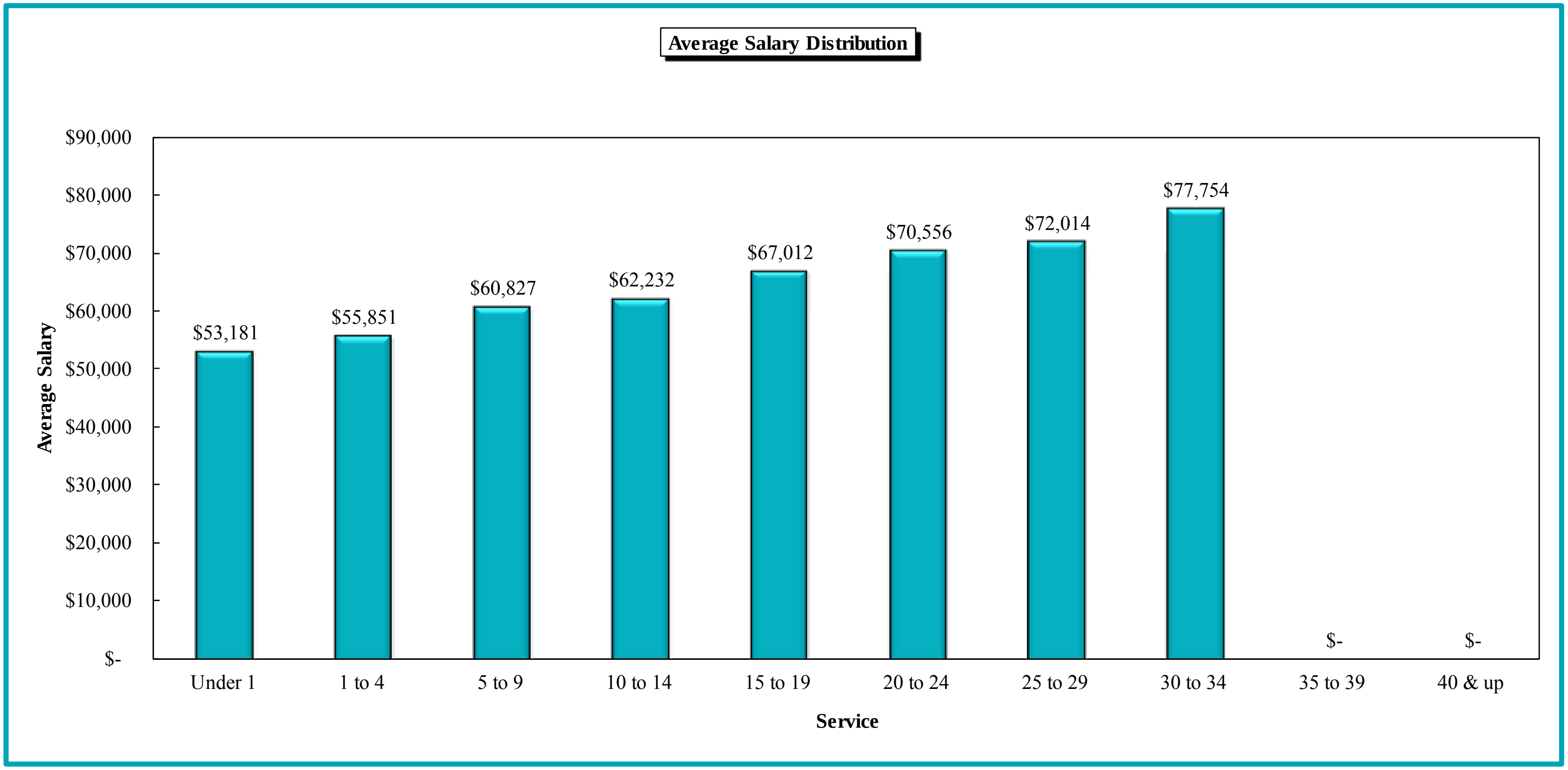
APPENDIX A
MEMBERSHIP INFORMATION

Montana Highway Patrol Officers' Retirement System Distribution of Active Members by Age as of June 30, 2015



APPENDIX A
MEMBERSHIP INFORMATION

Montana Highway Patrol Officers' Retirement System Distribution of Active Members by Service as of June 30, 2015



APPENDIX A
MEMBERSHIP INFORMATION

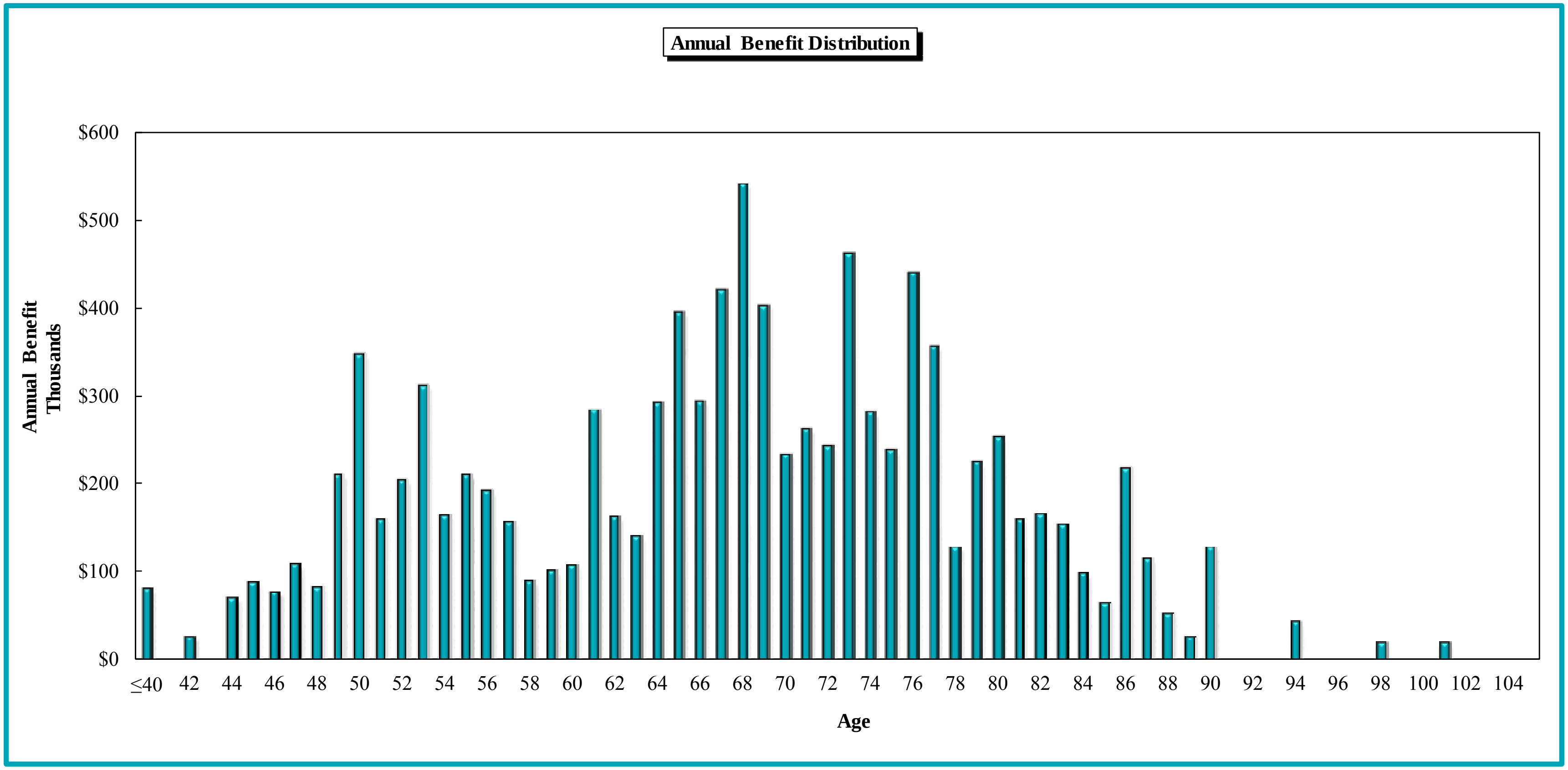
Montana Highway Patrol Officers' Retirement System Distribution of Retired Members, Survivors, and Disabled Members as of June 30, 2015

Age	Count	Annual Benefit	Age	Count	Annual Benefit
<25	3	$2,722	73	14	$461,738
25	0	$0	74	9	$279,499
26	0	$0	75	8	$237,225
27	0	$0	76	13	$439,611
28	0	$0	77	12	$355,222
29	0	$0	78	4	$126,471
30	0	$0	79	8	$222,898
31	0	$0	80	11	$252,134
32	0	$0	81	7	$158,604
33	0	$0	82	7	$164,574
34	0	$0	83	7	$152,798
35	0	$0	84	4	$96,521
36	1	$25,845	85	3	$61,719
37	1	$24,676	86	7	$216,636
38	0	$0	87	3	$112,930
39	0	$0	88	2	$51,431
40	1	$25,893	89	1	$24,250
41	0	$0	90	5	$126,801
42	1	$24,559	91	0	$0
43	0	$0	92	0	$0
44	3	$68,554	93	0	$0
45	3	$87,389	94	2	$42,450
46	2	$75,277	95	0	$0
47	3	$107,081	96	0	$0
48	2	$80,508	97	0	$0
49	6	$208,767	98	1	$16,883
50	10	$346,667	99	0	$0
51	6	$158,746	100	0	$0
52	7	$202,925	101	1	$16,888
53	9	$310,490	102	0	$0
54	4	$161,823	103	0	$0
55	9	$208,664	104	0	$0
56	6	$191,000	105	0	$0
57	5	$155,762	106	0	$0
58	2	$88,079	107	0	$0
59	3	$99,608	108	0	$0
60	3	$106,555	109	0	$0
61	8	$283,383	110	0	$0
62	6	$160,993	111	0	$0
63	5	$139,422	112	0	$0
64	8	$292,168	113	0	$0
65	11	$394,947	114	0	$0
66	9	$293,771	115	0	$0
67	11	$420,041	116	0	$0
68	18	$541,137	117	0	$0
69	10	$402,391	118	0	$0
70	5	$232,595	119	0	$0
71	9	$261,329	120	0	$0
72	8	$242,424			
			Totals	327	$10,043,475

The chart above reflects the counts and benefits used for valuation purposes as a result of data processing. The benefit amounts shown have been projected using a half year COLA assumption.

APPENDIX A
MEMBERSHIP INFORMATION

Montana Highway Patrol Officers' Retirement System Distribution of Retired Members, Survivors, and Disabled Members as of June 30, 2015



APPENDIX A
MEMBERSHIP INFORMATION

Montana Highway Patrol Officers' Retirement System Distribution of Terminated Vested Members as of June 30, 2015

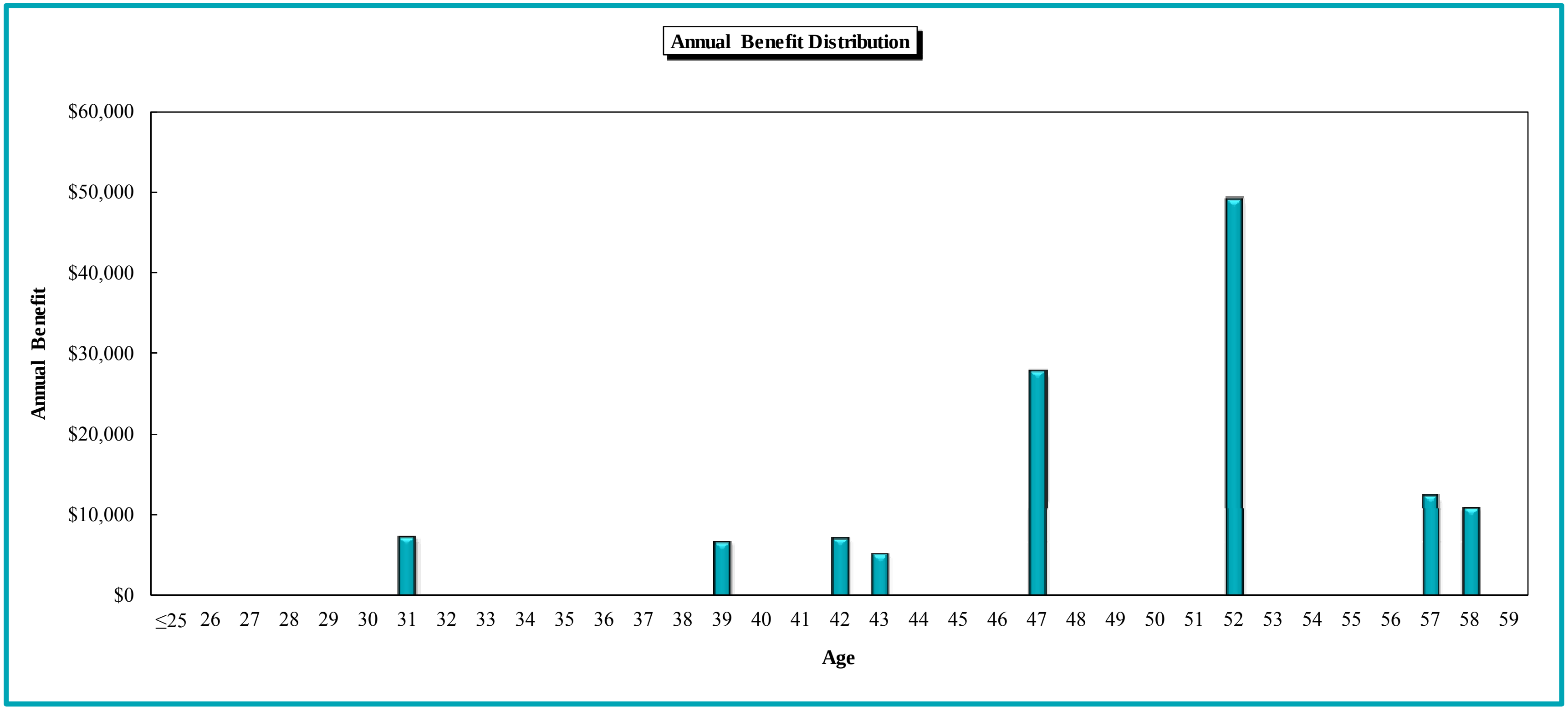
Age	Count	Annual Benefit*	Account Balance*	Age	Count	Annual Benefit*	Account Balance*
<25	0	$0	$0	73	0	$0	$0
25	0	$0	$0	74	0	$0	$0
26	0	$0	$0	75	0	$0	$0
27	0	$0	$0	76	0	$0	$0
28	0	$0	$0	77	0	$0	$0
29	0	$0	$0	78	0	$0	$0
30	0	$0	$0	79	0	$0	$0
31	1	$7,374	$0	80	0	$0	$0
32	0	$0	$0	81	0	$0	$0
33	0	$0	$0	82	0	$0	$0
34	0	$0	$0	83	0	$0	$0
35	0	$0	$0	84	0	$0	$0
36	0	$0	$0	85	0	$0	$0
37	0	$0	$0	86	0	$0	$0
38	0	$0	$0	87	0	$0	$0
39	1	$6,864	$0	88	0	$0	$0
40	0	$0	$0	89	0	$0	$0
41	0	$0	$0	90	0	$0	$0
42	1	$7,296	$0	91	0	$0	$0
43	1	$5,161	$0	92	0	$0	$0
44	0	$0	$0	93	0	$0	$0
45	0	$0	$0	94	0	$0	$0
46	0	$0	$0	95	0	$0	$0
47	2	$27,691	$11,748	96	0	$0	$0
48	0	$0	$0	97	0	$0	$0
49	0	$0	$0	98	0	$0	$0
50	0	$0	$0	99	0	$0	$0
51	0	$0	$0	100	0	$0	$0
52	2	$49,133	$0	101	0	$0	$0
53	0	$0	$0	102	0	$0	$0
54	0	$0	$0	103	0	$0	$0
55	1	$0	$9,969	104	0	$0	$0
56	0	$0	$0	105	0	$0	$0
57	1	$12,301	$0	106	0	$0	$0
58	1	$10,961	$0	107	0	$0	$0
59	0	$0	$0	108	0	$0	$0
60	0	$0	$0	109	0	$0	$0
61	0	$0	$0	110	0	$0	$0
62	0	$0	$0	111	0	$0	$0
63	0	$0	$0	112	0	$0	$0
64	0	$0	$0	113	0	$0	$0
65	0	$0	$0	114	0	$0	$0
66	0	$0	$0	115	0	$0	$0
67	0	$0	$0	116	0	$0	$0
68	0	$0	$0	117	0	$0	$0
69	0	$0	$0	118	0	$0	$0
70	0	$0	$0	119	0	$0	$0
71	0	$0	$0	120	0	$0	$0
72	0	$0	$0				
				Totals	11	$126,781	$21,717

** payable at the greater of age 60 or current age (use current age if member has 20 years of service)*

The chart above reflects the counts and benefits used for valuation purposes as a result of data processing.

APPENDIX A
MEMBERSHIP INFORMATION

Montana Highway Patrol Officers' Retirement System Distribution of Terminated Vested Members as of June 30, 2015



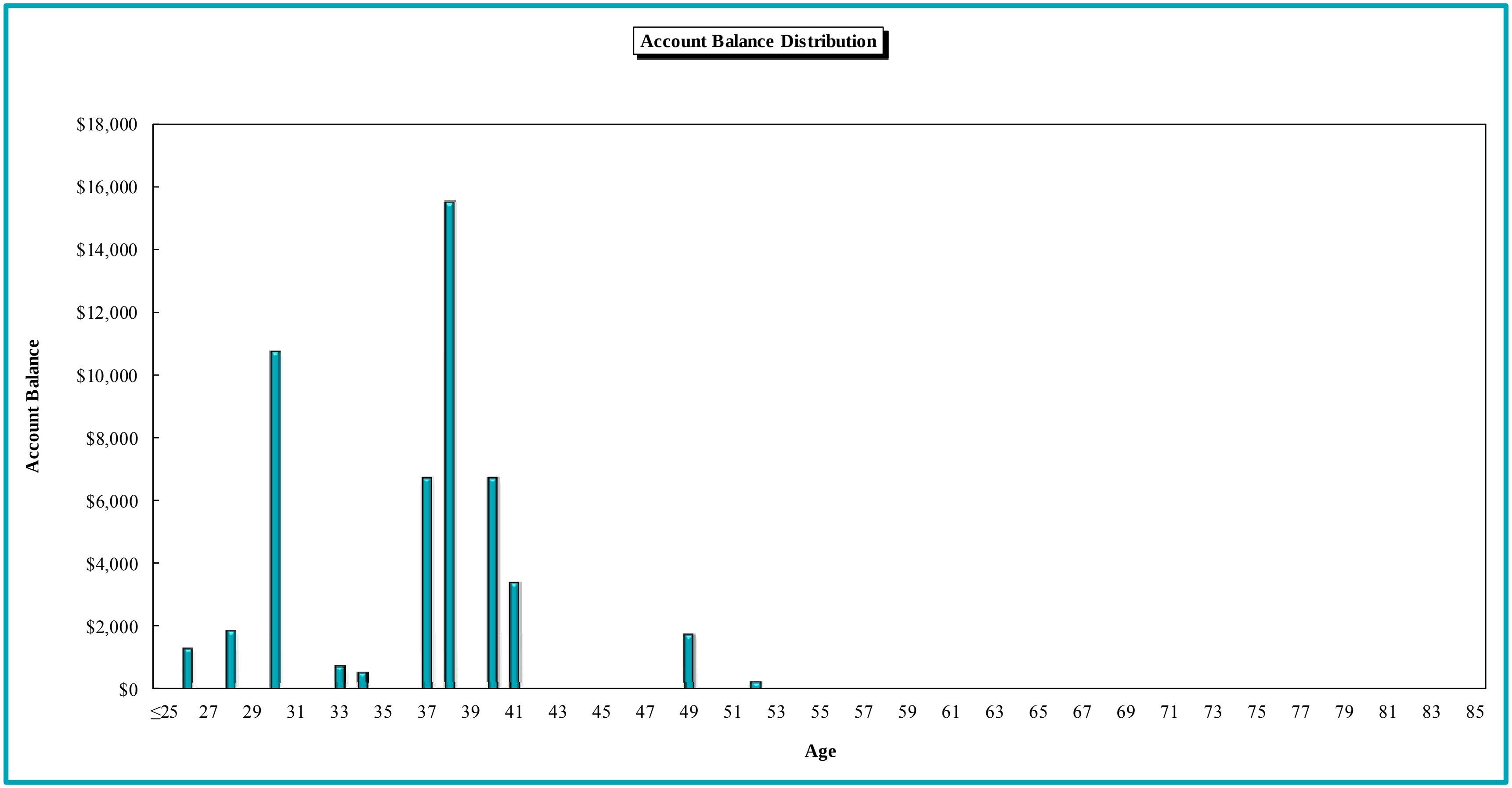
APPENDIX A
MEMBERSHIP INFORMATION

Montana Highway Patrol Officers' Retirement System Distribution of Terminated Non-Vested Members as of June 30, 2015

Age	Count	Account Balance	Age	Count	Account Balance
<25	0	$0	73	0	$0
25	0	$0	74	0	$0
26	1	$1,276	75	0	$0
27	0	$0	76	0	$0
28	1	$1,828	77	0	$0
29	0	$0	78	0	$0
30	2	$10,725	79	0	$0
31	0	$0	80	0	$0
32	0	$0	81	0	$0
33	1	$665	82	0	$0
34	1	$474	83	0	$0
35	0	$0	84	0	$0
36	0	$0	85	0	$0
37	1	$6,710	86	0	$0
38	1	$15,506	87	0	$0
39	0	$0	88	0	$0
40	2	$6,703	89	0	$0
41	1	$3,346	90	0	$0
42	0	$0	91	0	$0
43	0	$0	92	0	$0
44	0	$0	93	0	$0
45	0	$0	94	0	$0
46	0	$0	95	0	$0
47	0	$0	96	0	$0
48	0	$0	97	0	$0
49	1	$1,708	98	0	$0
50	0	$0	99	0	$0
51	0	$0	100	0	$0
52	1	$267	101	0	$0
53	0	$0	102	0	$0
54	0	$0	103	0	$0
55	0	$0	104	0	$0
56	0	$0	105	0	$0
57	0	$0	106	0	$0
58	0	$0	107	0	$0
59	0	$0	108	0	$0
60	0	$0	109	0	$0
61	0	$0	110	0	$0
62	0	$0	111	0	$0
63	0	$0	112	0	$0
64	0	$0	113	0	$0
65	0	$0	114	0	$0
66	0	$0	115	0	$0
67	0	$0	116	0	$0
68	0	$0	117	0	$0
69	0	$0	118	0	$0
70	0	$0	119	0	$0
71	0	$0	120	0	$0
72	0	$0			
			Totals	13	$49,207

APPENDIX A
MEMBERSHIP INFORMATION

Montana Highway Patrol Officers' Retirement System Distribution of Terminated Non-Vested Members as of June 30, 2015



APPENDIX B
ACTUARIAL ASSUMPTIONS AND METHODS

A. Long-Term Assumptions Used to Determine Plan Costs and Liabilities

1. Demographic Assumptions

a. Healthy Retirees, Beneficiaries and Non-Retired Members

Male and Female RP-2000 Combined Employee and Annuitant Mortality Tables. To reflect mortality improvements since the date of the table and to project future mortality improvements, the tables are projected to 2015 using scale AA.

Sample Rates of Healthy Mortality		
Age	Male	Female
50	0.163%	0.130%
55	0.272%	0.241%
60	0.530%	0.469%
65	1.031%	0.900%
70	1.770%	1.553%
75	3.062%	2.492%
80	5.536%	4.129%
85	9.968%	7.076%
90	17.271%	12.588%

70% of deaths from active service are assumed to be duty related.

b. Disabled Inactive Mortality

Male and Female RP-2000 Combined Employee and Annuitant Mortality Tables with no projections. No future mortality improvement is assumed.

Sample Rates of Disabled Inactive Mortality		
Age	Male	Female
50	0.214%	0.168%
55	0.362%	0.272%
60	0.675%	0.506%
65	1.274%	0.971%
70	2.221%	1.674%
75	3.783%	2.811%
80	6.437%	4.588%
85	11.076%	7.745%
90	18.341%	13.168%

APPENDIX B
ACTUARIAL ASSUMPTIONS AND METHODS

c. Rates of Active Disability

Sample Rates of Active Disability	
Age	Rate
22	0.00%
27	0.10%
32	0.10%
37	0.10%
42	0.40%
47	0.40%
52	0.40%
57	0.40%
62	0.00%

75% of all disabilities are assumed to be duty related, and all disabilities are assumed to be permanent and without recovery.

d. Termination of Employment (Prior to Normal Retirement Eligibility)

Service	Rate
0	12.0%
1 – 4	7.5%
5 – 9	5.0%
10 – 14	3.0%
15 & over	1.0%

e. Probability of Electing a Refund of Member Contributions upon Termination

Probability of Electing Refund		
Age at Term.	Non-Vested	Vested
Under 35	100%	40%
35-39	100%	40%
40-44	100%	40%
45-49	100%	30%
50 & Over	100%	0%

APPENDIX B
ACTUARIAL ASSUMPTIONS AND METHODS

f. Retirement

Annual Retirement Rates	
Age	20 years or more
<50	12.00%
50 – 54	16.00%
55 – 59	20.00%
60 & over	100.00%

Vested terminations are assumed to retire at their earliest unreduced eligibility.

g. DROP Retirement

DROP accounts are assumed to earn the actuarial rate of return. 15% of active members are assumed to elect to enter the DROP for each of the first six years following DROP eligibility. These members are assumed to elect to participate in the DROP for five years (or until age 60 if earlier).

h. Merit/Seniority Salary Increase (in addition to across-the-board increase)

Service based table plus an annual inflation rate of 4.00% (rates shown below exclude amount for inflation). Salaries for members participating in DROP are assumed to increase annually by 4%.

Service	Annual Increase
1	7.3%
2	5.6%
3	4.4%
4	3.5%
5	2.8%
6	2.2%
7	1.7%
8	1.3%
9	1.0%
10	0.7%
11-15	0.4%
16-20	0.2%
21 & over	0.0%

i. Family Composition

Female spouses are assumed to be three years younger than males.

APPENDIX B
ACTUARIAL ASSUMPTIONS AND METHODS

100% of non-retired employees are assumed married for both male and female employees.

Actual marital characteristics are used for pensioners.

j. Vested Benefits for Terminated Members

Vested benefits for members who terminated during the years ending June 30, 2009 and later were estimated based upon compensation and service information in the census data. For members who terminated prior to June 30, 2008, vested benefits valued were the same as had been calculated by the prior actuary for the June 30, 2008 actuarial valuation.

2. Economic Assumptions

a. Rate of Investment Return:	7.75% (net of investment expenses)
b. Rate of Wage Inflation:	4.00% (3.00% inflation plus 1.00% real wage growth)
c. Interest on Member Contributions:	3.50%
d. Interest on DROP accounts:	7.75%
e. Rate of Increase in Total Payroll	4.00% (for amortization and non-GABA post retirement increases)
f. Administrative Expenses as a Percentage of Payroll	0.23%

3. Changes since Last Valuation

Assumptions in relation to the new DROP benefit were added, including:

- DROP accounts are assumed to earn the actuarial rate of return.
- 15% of active members are assumed to elect to enter the DROP for each of the first six years following DROP eligibility. These members are assumed to elect to participate in the DROP for five years (or until age 60 if earlier).

4. Rationale for Demographic and Economic Actuarial Assumptions

The actuarial assumptions (other than the administrative expense rate) were adopted by the Board based upon the results of an actuarial experience study covering the period July 1, 2003 through June 30, 2009. The administrative expense rate is based upon actual recurring administrative expenses during the period July 1, 2008 through June 30, 2013.

APPENDIX B
ACTUARIAL ASSUMPTIONS AND METHODS

B. Actuarial Methods

1. Funding Method

The Entry Age Normal Actuarial Cost method is used to determine costs. Under this funding method, a normal cost is determined as a level percent of pay individually for each active employee.

The actuarial liability is that portion of the present value of projected benefits that will not be paid by future normal costs. The difference between this liability and funds accumulated as of the same date is referred to as the unfunded actuarial liability.

The portion of the actuarial liability in excess of Plan assets is amortized to develop an additional cost or savings which is added to each year's employer normal cost. Under this cost method, actuarial gains and losses are directly reflected in the size of the unfunded actuarial liability.

2. Actuarial Value of Assets

For purposes of determining the unfunded actuarial liability, we use an actuarial value of assets. The asset adjustment method dampens the volatility in asset values that could occur because of fluctuations in market conditions. Use of an asset smoothing method is consistent with the long-term nature of the actuarial valuation process.

The actuarial value of assets is the current market value, adjusted by a four-year smoothing of gains and losses on a market value basis. Each year's gain or loss is determined as the difference between the actual market return and the expected market return using the assumed rate of investment return.

3. Amortization Method

The unfunded actuarial liability is amortized as a level percentage of future payroll. The valuation determines the period over which the statutory contributions will fully amortize the unfunded actuarial liability.

4. Changes since Last Valuation

None.

APPENDIX C
SUMMARY OF PLAN PROVISIONS

1. Membership

The plan is a single employer defined benefit plan that covers all members of the Montana Highway Patrol including supervisors and assistant supervisors.

2. Contributions

The members' contribution rates vary according to the following schedule. Interest is credited at rates determined by the Board.

For members not covered by a Guaranteed Annual Benefit Adjustment (GABA), members contribute 11% of their compensation, an increase of 1% from 10% prior to July 1, 2015. Members covered by GABA contribute 11.05% of their compensation, an increase of 1% from 10.05% prior to July 1, 2015. Member contributions increase 1% annually through the fiscal year ending 2016. Interest is credited at rates determined by the Board. A schedule of member contribution rates is shown below.

Effective Dates	Members Not Covered Under GABA - Contribution Rate	Members Covered Under GABA - Contribution Rate
Up to June 30, 2013	9.00%	9.05%
July 1, 2013 to June 30, 2014	10.00%	10.05%
July 1, 2014 to June 30, 2015	11.00%	11.05%
July 1, 2015 to June 30, 2016	12.00%	12.05%
Beginning July 1, 2016	13.00%	13.05%

Member contributions are made through an "employer pick-up" arrangement which results in deferral of taxes on the contributions.

The employer contributes 28.15% of each member's compensation, an increase of 2% from 26.15% prior to July 1, 2013.

The State of Montana contributes 10.18% of each member's compensation, paid from the General Fund.

3. Service Credit

Service used to determine the amount of retirement benefit. One month of service credit is earned for each month where the member is paid for 160 hours. This includes certain transferred and purchased service.

APPENDIX C
SUMMARY OF PLAN PROVISIONS

4. Membership Service

Service used to determine eligibility for vesting, retirement, or other HPORS benefits. One month of membership service is earned for any month member contributions are made to HPORS regardless of hours worked.

5. Highest Average Compensation (HAC)

Highest Average Compensation (HAC) is the average of the highest 36 consecutive months (or shorter period of total service) of compensation paid to the member. Compensation is specifically defined in law.

For members hired on or after July 1, 2013: Highest Average Compensation calculations initially exclude amounts over 110% of the compensation included for each previous year with this excess compensation, if any, divided by the member's total months of service credit and added to the compensation for each month considered part of the member's HAC.

Bonuses paid on or after July 1, 2013 to any member will not be treated as compensation for retirement purposes. No member or employer contributions will be paid on bonuses.

6. Service Retirement

Eligibility: 20 years of membership service.

Benefit: 2.6% of highest average compensation times years of service credit.

7. Early Retirement

Eligibility: Age 50 with five years of membership service; if discontinued from service other than for cause.

Benefit: Normal retirement benefit calculated using highest average compensation and service credit at early retirement, and reduced to the actuarial equivalent based on a retirement age of 60.

APPENDIX C
SUMMARY OF PLAN PROVISIONS

8. Disability Benefit

Eligibility: Any active member.

Benefit: (i) For duty-related disability:
(a) If less than 20 years of membership service: 50% of highest average compensation
(b) If 20 years or more of membership service: 2.6% of highest average compensation multiplied by years of service credit.

(ii) For regular disability, the actuarial equivalent of the normal retirement benefit based on retirement age of 60.

9. Survivor's Benefit

Eligibility: Active or retired member.

Benefit: For duty-related deaths, a monthly survivor benefit to the surviving spouse or dependent child equal to 50% of highest average compensation of the member.

For non-duty-related deaths, the member's spouse will receive (or, if there is no surviving spouse or after the surviving spouse dies, each dependent child for as long as they remain dependent children will equally receive) a benefit that is the actuarial equivalent of the early retirement benefit.

A beneficiary may elect to receive the present value of a monthly benefit as a single lump sum.

For retired members without a surviving spouse or dependent child, the member's designated beneficiary will receive a payment equal to the retired member's accumulated contributions reduced by any retirement benefits already paid.

10. Vesting

Eligibility: For members hired prior to July 1, 2013: Five years of membership service.

For members hired on or after July 1, 2013: 10 years of membership service.

Benefit: Accrued normal retirement benefit, payable at normal or early retirement date. In lieu of a pension, a member may receive a refund of accumulated contributions. Upon receipt of a refund of contributions, a member's vested right to a monthly benefit shall be forfeited.

APPENDIX C
SUMMARY OF PLAN PROVISIONS

11. Withdrawal of Employee Contributions

Eligibility: Terminates service and is not eligible for other benefits.

Benefit: Accumulated member contributions. Upon receipt of a refund of contributions, a member's vested right to a monthly annuity is forfeited.

12. Retirement Benefits - Form of Payment

The retirement benefit is paid for the retired member's life. Upon the death of the retired member, the benefit is paid to the surviving spouse. If there is no surviving spouse, or after the death of a surviving spouse, benefits are paid to the dependent children, if any, for as long as they remain dependent children.

13. Post Retirement Benefit Increases

For retired members who became active members on or after July 1, 1997 and those who elected to be covered under this provision, and who have been retired at least 12 months, a GABA will be paid each year in January equal to 3%.

For retired members who were hired prior to July 1, 1997 and who did not elect GABA, the minimum monthly benefit is provided equal to 2% times service credit multiplied by the current base compensation of a probationary highway patrol officer. Such benefit may not exceed 60% of the current base compensation of a probationary highway patrol office, and the annual increase may not exceed 5% of the current benefit.

For non-GABA members who retired prior to July 1, 1991 and meet eligibility requirements, a supplemental lump sum payment will be made each year based on the increase in the Consumer Price Index.

For retired members who became active members on or after July 1, 2013, and who have been retired at least 36 months, a GABA will be paid each year in January equal to 1.5%.

14. Changes since Last Valuation

HPORS Deferred Retirement Option Program (DROP) - Senate Bill 238, effective October 1, 2015 and subject to Internal Revenue Service (IRS) approval.

- Eligible members of the Highway Patrol Officers' Retirement System (HPORS) will have the opportunity to participate in the DROP. The DROP allows active HPORS members to begin accumulating their retirement benefit, without terminating employment, for up to 60 months. If member chose to join the DROP, their monthly retirement benefit and their employee contributions will go into their individual DROP account.
- Eligibility - Active member of HPORS with at least 20 years of membership service.

APPENDIX C
SUMMARY OF PLAN PROVISIONS

- DROP Terms -
  - DROP Period - the number of months member chose to participate in the DROP. It may be from one month up to a maximum of 60 months (five years). The DROP Period will begin on the first day of a month and end on the last day of a month. The member will choose the beginning and ending date of their DROP Period on their DROP application.
  - DROP Accrual - the monthly benefit and the member's employee contributions. This amount is credited to the member's DROP account.
  - The member's DROP Account will grow on a tax-deferred basis, based on the member's DROP Accruals while the member continues to work and receive their regular pay.
  - The member's DROP Benefit is the lump sum benefit the member will receive from their DROP Account upon termination of employment.

While a member is working, the member's employer and the state will pay the regular contributions to HPORS. Member contributions will go into the DROP participants DROP account. The member will not earn additional membership service or service credit.

When the member terminates employment at the end of their DROP Period they will begin receiving their HPORS monthly retirement benefit. At this time, the member will receive their DROP Benefit as a lump sum payment or a direct rollover to another eligible retirement plan (as allowed by the IRS). If the member does not designate a distribution method within 60 days after termination of employment, their DROP benefit will be paid in a taxable lump sum.

If the member becomes disabled during the DROP Period, they will not be eligible for HPORS disability benefits. If the member terminates their service, their service retirement benefit will be paid to the member rather than to their monthly DROP Account. They will also be eligible to receive their DROP benefit.

If a member dies before the end of their DROP Period, the members' surviving spouse or dependent children are entitled to the members' DROP Benefit and a survivorship benefit. If the member does not have a surviving spouse or dependent children, the member's designated beneficiary receives the balance of their retirement account and a lump-sum payment of the DROP Benefit.

If a members' HPORS-covered employment is terminated during the DROP Period, their DROP benefit will be distributed to them and payment of their monthly service retirement benefit will begin.

A member may continue to work after the DROP Period ends and remain vested in HPORS. The member will not receive their service retirement benefit or their DROP Benefit during the time they continue working. The balance of their DROP Account will continue to earn interest. Upon termination of employment, the member will receive their initial HPORS

APPENDIX C
SUMMARY OF PLAN PROVISIONS

monthly retirement benefit; an additional benefit based on their service credit and highest average compensation earned after DROP participation; and their DROP Benefit.

A members' DROP account will earn an interest rate equal to the actuarial assumed rate of return. Currently the rate of return is 7.75%.

Members do not receive Guaranteed Annual Benefit Adjustment (GABA) on the accrued DROP retirement benefit. GABA starts January 1 immediately following retirement for initial and subsequent benefits.

APPENDIX D
GLOSSARY

1. **Actuarial Assumptions**

   Assumptions as to the occurrence of future events affecting pension costs, such as: mortality, withdrawal, disability, and retirement; changes in compensation; inflation; rates of investment earnings, and asset appreciation or depreciation; and other relevant items.

2. **Actuarial Cost Method**

   A procedure for determining the Actuarial Present Value of pension plan benefits and expenses and for developing an allocation of such value to each year of service, usually in the form of a Normal Cost and an Actuarial Liability.

3. **Actuarial 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, as determined in accordance with a particular Actuarial Cost Method.

4. **Actuarial Liability**

   The portion of the Actuarial Present Value of Projected Benefits which will not be paid by future Normal Costs. It represents the value of the past Normal Costs with interest to the valuation date.

5. **Actuarial Present Value (Present Value)**

   The value as of a given date of a future amount or series of payments. The Actuarial Present Value discounts the payments to the given date at the assumed investment return and includes the probability of the payment being made. As a simple example: assume you owe $100 to a friend one year from now. Also, assume there is a 1% probability of your friend dying over the next year, in which case you won't be obligated to pay him. If the assumed investment return is 10%, the actuarial present value is as follows:

Amount		Probability of Payment		1/(1+Investment Return)		
$100	x	(1 - .01)	x	1/(1+.1)	=	$90

6. **Actuarial Valuation**

   The determination, as of a specified date, of the Normal Cost, Actuarial Liability, Actuarial Value of Assets, and related Actuarial Present Values for a pension plan.

APPENDIX D
GLOSSARY

7. Actuarial Value of Assets

The value of cash, investments and other property belonging to a pension plan as used by the actuary for the purpose of an Actuarial Valuation. The purpose of an Actuarial Value of Assets is to smooth out fluctuations in market values. This way, long-term costs are not distorted by short-term fluctuations in the market.

8. Actuarially Equivalent

Of equal Actuarial Present Value, determined as of a given date with each value based on the same set of Actuarial Assumptions.

9. Amortization Payment

The portion of the pension plan contribution which is designed to pay interest and principal on the Unfunded Actuarial Liability in order to pay for that liability in a given number of years.

10. Entry Age Normal Actuarial Cost Method

A method under which the Actuarial Present Value of the Projected Benefits of each individual included in an Actuarial Valuation is allocated on a level basis over the earnings of the individual between entry age and assumed exit ages.

11. Funded Percentage

The ratio of the Actuarial Value of Assets to the Actuarial Liabilities.

12. Inflation (CPI)

The assumed increase in dollar related values in the future due to the general increase in the cost-of-living. The usual measure for inflation is the Consumer Price Index (CPI).

13. Investment Return Assumption

The assumed interest rate used for projecting dollar related values in the future.

14. Mortality Table

A set of percentages which estimate the probability of death at a particular point in time. Typically, the rates are annual and based on age and gender.

APPENDIX D
GLOSSARY

15. Normal Cost

That portion of the Actuarial Present Value of pension plan benefits and expenses which is allocated to a valuation year by the Actuarial Cost Method.

16. Projected Benefits

Those pension plan benefit amounts which are expected to be paid in the future under a particular set of Actuarial Assumptions, taking into account such items as the effect of advancement in age and increases in future compensation and service credits.

17. Unfunded Actuarial Liability

The excess of the Actuarial Liability over the Actuarial Value of Assets.