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PERS
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**Report on Thirty Year
Projections of the Mississippi
Retirement Systems**

Prepared as of June 30, 2019





Cavanaugh Macdonald

CONSULTING, LLC

The experience and dedication you deserve

December 3, 2019

Board of Trustees
Public Employees' Retirement System of Mississippi
429 Mississippi Street
Jackson, MS 39201-1005

Ladies and Gentlemen:

Presented in this report are the results of 30 year projections of the Public Employees' Retirement System (PERS) of Mississippi, the Highway Safety Patrol Retirement System (HSPRS) and the Supplemental Legislative Retirement Plan (SLRP). The purpose of the projection study is to develop a forecast of the Systems' funding progress over time, to review the funding goals and benchmarks outlined in the funding policies that were adopted by the Board of Trustees and provide the status of the metrics/targets in the funding policies that determines whether or not a contribution rate increase should be recommended.

The projections are based on the June 30, 2019 valuations of PERS, HSPRS and SLRP. Membership was projected over a 30-year period from that date and actuarial valuations were performed annually for each of the 30 years to measure the Systems' funding progress.

The Executive Summary provides a summary of the main projection results. We certify that we are members of the American Academy of Actuaries and that we meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained in this report.

Respectfully submitted,

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Chief Executive Officer

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EJK/JTC:mjn



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Section I - Executive Summary

Since 1985, the benefit structure of the Public Employees Retirement System (PERS) of Mississippi has undergone significant changes as noted in the table below (the entire HSPRS history of benefit modifications is listed in Appendix C).

Fiscal Year Beginning	Benefit Modifications
July 1, 1985	<ul style="list-style-type: none"> Final average compensation calculated using the highest four consecutive years (reduced from highest five consecutive years) Liberalized survivor benefit provision to reduce the marriage requirement from 5 years to 1 year and to allow a member to designate a child as beneficiary Minimum benefit increased from \$5.00 to \$7.50 per month for each year of creditable service for current and future retirees Eligibility for service retirement reduced from 10 years to 4 years at age 60 Established “discretionary” COLA provision in addition to the base COLA provision to be paid to eligible retirees based on sufficient actuarial gains 3% ad hoc increase for all retirees
July 1, 1986	<ul style="list-style-type: none"> Eligibility for non-duty related disability retirement reduced from 10 years to 4 years Permanent exemption from 3% penalty for those required to retire at age 60 Retirement incentive granted – one additional year of credit to any member with 30 years of service credit or age 60
July 1, 1987	<ul style="list-style-type: none"> Established service retirement eligibility based on 25 & out with reduced benefits Benefit accrual increased from 1-5/8% to 1-3/4% for the first 20 years Minimum benefit increased from \$7.50 to \$10.00 per month for each year of service for current and future retirees 5% ad hoc increase for all retirees Provided elected official leave credit
July 1, 1989	<ul style="list-style-type: none"> Unreduced retirement at age 55 with 25 years of service Benefit accrual increased from 1-3/4% to 1-7/8% for the first 30 years of service Unreduced retirement lowered from age 65 to age 60 5% ad hoc increase for all retirees
July 1, 1990	<ul style="list-style-type: none"> Provided that base COLA percentage granted shall be cumulative from year to year
July 1, 1991	<ul style="list-style-type: none"> Unreduced retirement at any age with 25 years of service Benefit accrual increased to 2% for all years of service over 25



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Fiscal Year Beginning	Benefit Modifications
July 1, 1992	<ul style="list-style-type: none"> • Ad hoc increase for those retired prior to July 1, 1991, with more than 25 years of service • Tiered disability benefit • Expanded survivor benefits to include automatic spousal and dependent child benefits • Liberalized definition of average compensation to provide that the highest four years did not have to be consecutive years • Expanded military service credit to include all active duty military • Removed reference to “Governor’s Salary” and established maximum compensation cap at \$125,000
July 1, 1994	<ul style="list-style-type: none"> • Benefits for all retirees under Options 2(5) and 4A(5) were recalculated to remove the reduction imposed for the right to revert to the Maximum
July 1, 1999	<ul style="list-style-type: none"> • Benefit accrual increased from 2% to 2-1/4% for all years of service over 25 for current and future retirees • Base COLA increased to 3% simple up to age 55 and 3% compounded after age 55 • Reemployed retiree COLA will be based on all fiscal years in retirement, not just the fiscal years in retirement since the last retirement. • Provided that the COLA will be prorated and paid to the beneficiary of a retiree or beneficiary who is receiving the COLA in a lump sum and who dies between July 1 and December 1
July 1, 2000	<ul style="list-style-type: none"> • Benefit accrual increased from 1-7/8% to 2% for all years of service over 10 and less than 25 for current and future retirees
July 1, 2001	<ul style="list-style-type: none"> • Benefit accrual increased from 1-7/8% to 2% for all years of service over 5 and less than 25 for current and future retirees
July 1, 2002	<ul style="list-style-type: none"> • Benefit accrual increased from 1-7/8% to 2% for all years of service up to and including 25 and from 2-1/4% to 2-1/2% for all years of service over 25 for current and future retirees • Increased maximum compensation cap to \$150,000 • Provided for free active duty military service for pre-1972 service in the Commissioned Corps of the U.S. Public Health Service for those retiring on or after July 1, 2002 • Reemployed retiree who has previously been retired for at least one full fiscal year no longer has to wait another full fiscal year for his or her COLA to resume • A local county or municipal elected official who is receiving retirement benefits may receive a salary for the elected position that does not exceed 25% of the retiree’s average compensation



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Fiscal Year Beginning	Benefit Modifications
July 1, 2004	<ul style="list-style-type: none"> Removed remarriage penalty on certain spouse / survivor benefits and provided upon application for the reinstatement of spouse survivor benefits previously terminated due to remarriage
July 1, 2008	<ul style="list-style-type: none"> Maximum reportable earned compensation was increased from \$150,000 to \$230,000 to coincide with the compensation limit set pursuant to Section 401(a)(17) of the Internal Revenue Code Vesting requirement for those employees hired on or after July 1, 2007 was increased from 4 to 8 years of service.
July 1, 2010	<ul style="list-style-type: none"> Members who retire on or after July 1, 2010 receive additional credit toward retirement for one-half day of leave for each full fiscal year of membership service accrued after June 30, 2010 Option 4, a 75% joint and survivor annuity, made available to members who retire on or after January 1, 2011
July 1, 2011	<ul style="list-style-type: none"> For members hired on or after July 1, 2011, 30 years of creditable service will be required for retirement regardless of age. For members hired on or after July 1, 2011, 33 years of creditable service will be required to select a partial lump sum option at retirement. For members hired on or after July 1, 2011, the retirement formula will be 2% of average compensation for the first 30 years of creditable service plus 2.5% of average compensation for each year beyond 30 years of creditable service. For members hired on or after July 1, 2011, the actuarial reduction for early retirement will be the lesser of the number of years below 30 years of creditable service or the number of years in age a member is below age 65. For members hired on or after July 1, 2011, the COLA will be a simple 3% of the annual retirement allowance at retirement up to the fiscal year in which the retired member reaches age 60. Thereafter, the COLA will be a compounded 3% for all future years.
July 1, 2016	<ul style="list-style-type: none"> The interest rate on employee contributions shall be calculated based on the money market rate as published by the Wall Street Journal on December 31 of each preceding year with a minimum rate of one percent and a maximum rate of five percent.

Between 1985 and 2005, there was only one increase in the employer contribution rate from 8.75% to 9.75% effective January 1, 1990. However since that time, the employer contribution rate has increased from 9.75% to 17.40%. In addition, the employee contribution rate was increased from 6.00% to 6.50% effective July 1, 1989, to 7.25% effective July 1, 1991 and to 9.00% effective July 1, 2010.



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Since 1986, PERS' assets have experienced better than assumed investment returns overall. However, the negative returns for the 2008 and 2009 fiscal years have caused the employer contribution rates to increase and the funded ratio to decrease. Now that the 2008 and 2009 negative returns are past the ten year mark, the 10-year return for 2019 is well above the current assumption of 7.75%. The historical ten year rolling returns have been:

Ten Year Period Ending June 30	Ten Year Annualized Rate of Return
1986	9.7%
1987	9.3
1988	9.6
1989	10.3
1990	11.5
1991	13.6
1992	14.2
1993	12.4
1994	12.2
1995	11.3
1996	10.7
1997	11.6
1998	13.2
1999	12.9
2000	12.7
2001	10.8
2002	8.6
2003	7.8
2004	9.1
2005	8.4
2006	8.0
2007	7.9
2008	5.1
2009	1.7
2010	2.3
2011	5.4
2012	6.1
2013	7.1
2014	7.5
2015	6.9
2016	5.9
2017	5.5
2018	7.4
2019	10.5



Section I - Executive Summary

The following report is being provided to the Board of Trustees of the Public Employees' Retirement System of Mississippi to develop a forecast of the Systems' funding progress over time, to review the funding goals and benchmarks outlined in the funding policies that were adopted by the Board of Trustees and provide the status of the metrics/targets in the funding policies that determines whether or not a contribution rate increase should be recommended. The objective of the current funding policies is to accumulate sufficient assets during a member's employment to fully finance the benefit the member receives throughout retirement. In order to reach that objective, some goals and benchmarks were established as follows:

- Preservation of the defined benefit structure for providing lifetime benefits to the membership,
- Maintain an increasing trend in the funded ratio over the projection period with an ultimate goal of being 100% funded,
- Ensure benefit improvements are funded through increases in contribution requirements in accordance with Article 14, S 272A, of the Mississippi Constitution.

The PERS funding policy includes two additional benchmarks that were included in the new policy that was adopted by the Board of Trustees on June 26, 2018:

- Contribution rate stability as a percentage of payroll (Fixed Contribution Rate – FCR),
- Require clear reporting and risk analysis of the metrics by the actuary as outlined in Section II of this policy using a “Signal Light” approach to assist the Board in determining whether increases or decreases are needed in the employer contribution rate, and

For PERS, if any one of the following metrics are in the Red Signal Light status in conjunction with the annual valuation report and the projection report, the actuary will determine and recommend to the Board an employer contribution rate increase to consider that is sufficient enough to get all three metrics back into the Green Signal Light status.

- Funded Ratio – defined as the actuarial value of assets divided by the actuarial accrued liability. One of the funding goals is to have an increasing funded ratio over the projection period with an ultimate goal of having a 100% funded ratio. The Board sets the Signal Light definition as follows:

Status	Definition
Green	Funded Ratio above 80% in 2047
Yellow	Funded Ratio between 65% and 80% in 2047
Red	Funded Ratio below 65% in 2047



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- Cash flow as a percentage of assets – defined as the difference between total contributions coming into the trust and the benefit payments made to retirees and beneficiaries going out of the trust as a percentage of beginning year market value of assets. Over the projection period, this percentage will fluctuate from year to year so for Signal Light testing, the net cash flow percentage over the entire projection period will be tested. The Board sets the Signal Light definition as follows:

Status	Definition
Green	Net Cash Flow Percentage above negative 6.00% (-6.00%) during the projection period
Yellow	Net Cash Flow Percentage between negative 6.00% (-6.00%) and negative 7.75% (-7.75%) during the projection period
Red	Net Cash Flow Percentage below negative 7.75% (-7.75%) during the projection period

- Actuarially Determined Contribution (ADC) – defined as the contribution requirement determined by the actuary using a contribution allocation procedure based on the principal elements disclosed in Section III of the funding policy:
 1. Actuarial Cost Method
 2. Asset Smoothing Method
 3. Amortization Method

The calculation of the ADC will be determined during the actuarial valuation and not during the projection report. The ratio of the ADC to the fixed contribution rate (ADC/FCR) as set by the Funding Policy will be tested. The Board sets the Signal Light definition as follows:

Status	Definition
Green	ADC ratio at or below 100% of fixed contribution rate at valuation date
Yellow	ADC ratio between 100% and 110% of fixed contribution rate at valuation date
Red	ADC ratio above 110% of fixed contribution rate at valuation date



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For SLRP, if the projected funded ratio is less than 60% in 2042 or less than 75% following two consecutive projection reports, a contribution rate increase will be determined that is sufficient to generate a funded ratio of 85% in 2042. If a funded ratio of 100% or more is attained and is projected to remain above 100% for the ensuing 30 years following two consecutive annual projection reports, a reduced contribution pattern will be established provided the funded ratio remains at or above 100% in every future year.

For HSPRS, the employer contribution rate as a percentage of annual compensation was increased from 37.00% to 49.08% as of July 1, 2018. The funding policy still reads that if the projected funded ratio is less than 60% in 2042 or less than 70% following three consecutive projection reports, a contribution rate increase will be determined that is sufficient to generate a funded ratio of 90% in 2042. If a funded ratio of 100% or more is attained and is projected to remain above 100% for the ensuing 30 years following three consecutive annual projection reports, a reduced contribution pattern will be established provided the funded ratio remains at or above 100% in every future year. Please note that the projections for HSPRS include additional contributions estimated at \$3.7 million to be made in perpetuity due to Senate Bill No. 2659 (enacted in 2004) and House Bill No. 1015 (enacted in 2013).



Section I - Executive Summary

The results of the 30 year projections for each of the PERS, HSPRS and SLRP plans are shown in the next 3 sections of the report. This projection report reflects the following assumption changes that were adopted by the PERS Board of Trustees on August 27, 2019:

PERS Plan

- The wage inflation assumption was reduced from 3.25% to 3.00%.
- The price inflation assumption was reduced from 3.00% to 2.75%.
- The administrative expense load was increased from 0.23% to 0.25%.
- The rates of retirement were slightly increased for retirements under 25 years of service (below age 73 for males and age 70 for females) and also slightly increased for retirement at younger ages once a member reaches 25 years of service.
- The withdrawal rates were increased at younger ages and during the select period (below 2 years of service).
- The percentage of active member disabilities assumed to be in the line of duty was increased from 7% to 9%.
- Changes were made to the Mortality Table for both healthy and disabled lives.

HSPRS Plan

- The wage inflation assumption was reduced from 3.25% to 3.00%.
- The price inflation assumption was reduced from 3.00% to 2.75%.
- The administrative expense load was increased from 0.23% to 0.25%.
- Changes were made to the Mortality Table for both healthy and disabled lives.

SLRP Plan

- The wage inflation assumption was reduced from 3.25% to 3.00%.
- The price inflation assumption was reduced from 3.00% to 2.75%.
- The administrative expense load was increased from 0.23% to 0.25%.
- Changes were made to the Mortality Table for both healthy and disabled lives.

Regular actuarial valuations measure the Systems present financial position and contribution adequacy by calculating and financing the liabilities created by the present benefit program. This process involves discounting to present values the future benefit payments on behalf of present active and retired members and their survivors. However, valuations do not produce information regarding future changes in the makeup of the covered group or the amounts of benefits to be paid or investment income to be received – actuarial projections do provide this information.

Whereas valuations provide a snapshot of the System as of a given date, projections provide a moving forecast. Projected active and retired groups are developed from year to year by the application of assumptions regarding pre-retirement withdrawal from service, retirements, deaths, disabilities, and the addition of new members. Projected information regarding the retired life group leads to assumed future benefit payouts. Performing actuarial valuations every year during the projection period generates expected contribution rates and unfunded accrued liability (UAL) amortization periods. Combining future benefit payments with assumed contributions based on periodic valuations of the projected membership and expected investment earnings produces the net cash flow of the System each year, and thus end of year asset levels. Finally, the valuation results permit the development of the funded ratio trend line for the entire projection period.



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Projections are used for many purposes. Among them are (i) developing cash flow patterns for investment policy and asset mix consideration, (ii) exploring the effect of alternative assumptions about future experience, and (iii) analyzing the impact on plan funding progress of changes in the workforce.

Projection results are useful in demonstrating changing relationships among key elements affecting plan financial activity (e.g., how benefits payable and plan assets will grow in future decades). Projections are not predictions of specific future events and do not provide numeric precision in absolute terms. For instance, cash flow projected to occur 10 years in the future will not be exact (except by coincidence), but understanding the changed relationship between future benefit payout and future investment income can be very useful.

The projection of System finances over 30 years requires an assumption regarding future new entrants to the Systems as well as the regular valuation assumptions used to estimate the timing of future events for current members. As members are assumed to terminate service for any reason, they are replaced with a sufficient number of new entrants to keep the active population constant in number. Valuations are then performed on the projected active and retired membership for each of the thirty years of the study.



Section I - Executive Summary

The main results from the study (details can be found in the following sections of this report) are noted on the following pages.

For PERS:

- With a fixed contribution rate as a percentage of annual compensation of 17.40% beginning July 1, 2019, the projection results for this study show that the Plan will have a funded ratio of 83.2% in 2047. Last year's projection results had a projected funded ratio in 2047 of 95.8%. The main reason for this decrease in the projected funded ratio were as follows:
 - The experience investigation for the 4-year period ending June 30, 2018 resulted in a change in the mortality table that extended life expectancy and a lower wage inflation assumption that lowered expected payroll and therefore contributions in the future, and
 - PERS had unfavorable investment experience in the 2019 fiscal year, a return of 6.64% net of investment expenses.

The assumption changes and unfavorable experience shown above were offset somewhat by the aggregate salary increases for the fiscal year ending 2019. As contributions are based on annual salaries, when salaries increase more than expected, there is usually favorable experience in the projection of future contributions. Although there was a decrease in the projected funded ratio in 2047, there was no drop in status for the metric. This still results in a "Green" status for the funded ratio metric of the funding policy as the projected ratio remains above 80% in 2047.

- The second metric in the funding policy is the cash flow as a percentage of assets – defined as the difference between total contributions coming into the trust and the benefit payments made to retirees and beneficiaries going out of the trust as a percentage of beginning year market value of assets. For the length of the projection period, the lowest cash flow rate is negative 5.59% in fiscal year 2032. Because this result is larger than negative 6.00%, there is a "Green" status for this metric of the funding policy.
- The third and final metric in the funding policy is the ratio of the Actuarially Determined Contribution (ADC) to the Fixed Contribution Rate (FCR) that is tested during the June 30, 2019 actuarial valuation. The ADC is determined by the actuary using a contribution allocation procedure based on the principal elements disclosed in Section III of the funding policy:
 1. Actuarial Cost Method
 2. Asset Smoothing Method
 3. Amortization Method

During the June 30, 2019 valuation, this ratio was calculated as 109.02%, which results in a "Yellow" status (between 100% and 110%) for this metric of the funding policy. As can be seen this is very close to the "Red" status as of June 30, 2019. If PERS was to experience some negative investment and/or demographic experience for the 2020 fiscal year, this metric may be in "Red" status as of June 30, 2020.



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- **However, since none of the three metrics are in the “Red” status as of the 2019 valuation and projection study, this result meets the funding goals and benchmarks set by the Board in the current funding policy and no change in the employer contribution rate from 17.40% is necessary at this time.**

For HSPRS:

- Utilizing the funding policy for HSPRS, with a fixed contribution rate of 49.08% of payroll for the length of the projection period, the projection results for this study show that the Plan will have a funded ratio of 102.6% in 2042. During last year’s study, the funded ratio in 2042 was 103.5%. The main reason for the decrease was due to the unfavorable investment experience in the 2019 fiscal year and the change in the assumptions offset by favorable demographic experience for the 2019 valuation. We have assumed that the fund will earn 7.75% for each of the projection years and that the actuarial assumptions in the back of this report are experienced.
- **This result meets the funding goals and benchmarks set by the Board in the current funding policy and no change in the employer contribution rate from 49.08% is necessary at this time.**

For SLRP:

- Utilizing the funding policy for SLRP, with a fixed contribution rate of 7.40% of payroll for the length of the projection period, the projection results for 2019 show that the Plan will have a funded ratio of 103.3% in 2042. During last year’s study, the funded ratio in 2042 was 97.5%. The main reason for the increase was due to the favorable demographic experience in the 2019 fiscal year offset by the investment experience and assumptions changes. We have assumed that the fund will earn 7.75% for each of the projection years and that the actuarial assumptions in the back of this report are experienced.
- **This result meets the funding goals and benchmarks set by the Board in the current funding policy and no change in the employer contribution rate is necessary at this time.**

It must be kept in mind that projections do not purport to show exact numerical results over the entire period under study. They do however provide a good basis for drawing conclusions about the likely position of the Systems and the relative impact changes over the years will have on System finances. Below are tables showing the summary of the metrics in each of the three funding policies utilized for each plan.



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PERS Plan

Metric	2019 Baseline Projection (7.75%)	2019 Status	2018 Baseline Projection (7.75%)	2018 Status
Funding Ratio in 2047	83.2%	Green	95.8%	Green
Cash Flow as a Percentage of Assets	-5.59%	Green	-5.54%	Green
ADC/FCR Ratio from Valuation	109.0%	Yellow	101.3%	Yellow

2019 Summary of Funded Ratios in 2042

System	7.75% Assumption	7.50% Assumption	7.25% Assumption	7.00% Assumption
HSPRS	102.6%	91.7%	81.7%	72.7%
SLRP	103.3%	91.8%	81.1%	71.5%



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Reconciliation of Projected Funded Ratio in 2047/2042 from 2018 to 2019

Below is a reconciliation of the projected funded ratio for all three plans. Please note that for PERS, the projected funded ratio is as of the 2047 valuation and for HSPRS and SLRP, the projected funded ratio is as of 2042.

	PERS 2047	HSPRS 2042	SLRP 2042
2018 Projected Funded Ratio in 2047/2042	95.8%	103.5%	97.5%
Change in Employer Contribution Rate	0.0%	0.0%	0.0%
Assumption Changes	(10.9)%	(8.1)%	(7.8)%
Investment Experience	(3.8)%	(2.6)%	(3.3)%
Method Change	0.0%	0.0%	0.0%
Demographic Experience*	2.1%	9.8%	16.9%
2019 Projected Funded Ratio in 2047/2042	83.2%	102.6%	103.3%

* The demographic experience includes the change in the new entrant profile which included salary increases for new entrant members for all three plans.



Section II – PERS Projection Results

SPECIAL ASSUMPTIONS

In addition to the regular valuation assumptions used in performing the annual actuarial valuations of PERS (all assumptions utilized in the projection study are outlined in Appendix A), additional assumptions must be made that are unique to projections. The first of these is what, if any, change in the overall active membership will be anticipated. For this projection study it was assumed that the number of active members would remain static over the 30 year projection period.

But since we assume active members will leave the system through termination, death, disability or retirement, we need to make some assumptions as to the composition of new hires that will replace departing members in order to maintain the membership at a constant number. The new entrant profile we developed was based on the new hires over the 3 year period prior to the projection start date of June 30, 2019. That profile is summarized in the table on the following page.

Age	Average Pay	Percent Male	Weight
19	27,300	58%	1.0%
23	29,700	41	19.3
27	33,000	38	21.3
32	33,000	34	13.2
37	33,400	34	10.8
42	32,700	34	8.9
47	32,700	36	7.9
52	32,900	38	6.6
57	32,900	42	5.7
62	33,000	45	3.2
69	29,000	55	2.1

For the projection results presented in this section of the report, it was further assumed that the benefit structure as it exists on June 30, 2019 would remain in place for the following 30 years.

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Section II – PERS Projection Results

FUTURE MEMBERSHIP

The following chart and graph show the headcounts of active participants and retired members over the projection period. The actives are broken down into those existing as of June 30, 2019 and those who are hired after June 30, 2019. Although the membership at PERS has been trending downward over the past few years, active membership was relatively flat for the 2019 valuation. Therefore, we have assumed the active membership will continue at its current population of 150,651 active members over the projected period. After a reduction in active membership since 2008, many statewide public sector systems are beginning to experience a turnaround and active membership is starting to level off and even increase.

By the end of the projection period we estimate that about 98.7% of those active employees will have been hired after June 30, 2019 and be included in the Tier 4 benefit structure. After about 13 years, the retiree headcount begins to drop as retiree deaths outnumber new retirees.

Member	2019	2024	2029	2039	2049
Active – Existing Employees	150,651	84,495	47,159	12,231	1,929
Active – New Entrants	0	66,156	103,492	138,420	148,722
Retired	107,844	115,947	118,244	109,884	91,858
Total	258,495	266,598	268,895	260,535	242,509

PROJECTION RESULTS

The baseline projection results shown below use the same actuarial assumptions as used in the June 30, 2019 actuarial valuation. In addition, the projection results using different long-term investment return assumptions for future valuations (7.50%, 7.25% and 7.00%) are included.

Baseline Projection Results (7.75%) (\$000's)

	2019	2024	2029	2039	2049
Total Payroll	\$6,144,916	\$6,984,887	\$7,939,476	\$10,531,289	\$14,184,380
UAL	\$17,982,248	\$19,113,188	\$19,955,525	\$18,791,992	\$8,349,634
Normal Cost Rate	1.47%	1.39%	1.38%	1.42%	1.50%
UAL Rate	15.93%	16.01%	16.02%	15.98%	15.90%
Total Rate	17.40%	17.40%	17.40%	17.40%	17.40%
Funding Ratio	60.9%	63.0%	64.6%	70.4%	88.4%
Amortization Period	36 years	33 years	28 years	16 years	5 years
Cash Flow Percentage	-4.3%	-5.1%	-5.5%	-5.0%	-2.7%



Section II – PERS Projection Results

Projection Results Assuming 7.50% Long-Term Investment Return (\$000's)

	2019	2024	2029	2039	2049
Total Payroll	\$6,144,916	\$6,984,887	\$7,939,476	\$10,531,289	\$14,184,380
UAL	\$17,982,248	\$20,785,613	\$22,350,799	\$24,040,387	\$19,529,275
Normal Cost Rate	1.47%	1.87%	1.86%	1.90%	2.00%
UAL Rate	15.93%	15.53%	15.54%	15.50%	15.40%
Total Rate	17.40%	17.40%	17.40%	17.40%	17.40%
Funding Ratio	60.9%	60.8%	61.3%	63.0%	73.5%
Amortization Period	36 years	40 years	35 years	23 years	12 years
Cash Flow %	-4.3%	-5.1%	-5.7%	-5.5%	-3.1%

Projection Results Assuming 7.25% Long-Term Investment Return (\$000's)

	2019	2024	2029	2039	2049
Total Payroll	\$6,144,916	\$6,984,887	\$7,939,476	\$10,531,289	\$14,184,380
UAL	\$17,982,248	\$22,559,578	\$24,836,704	\$29,226,841	\$30,110,289
Normal Cost Rate	1.47%	2.42%	2.40%	2.45%	2.56%
UAL Rate	15.93%	14.98%	15.00%	14.95%	14.84%
Total Rate	17.40%	17.40%	17.40%	17.40%	17.40%
Funding Ratio	60.9%	58.6%	58.2%	56.2%	60.3%
Amortization Period	36 years	51 years	45 years	34 years	22 years
Cash Flow %	-4.3%	-5.2%	-5.9%	-6.0%	-3.7%

Projection Results Assuming 7.00% Long-Term Investment Return (\$000's)

	2019	2024	2029	2039	2049
Total Payroll	\$6,144,916	\$6,984,887	\$7,939,476	\$10,531,289	\$14,184,380
UAL	\$17,982,248	\$24,331,763	\$27,306,053	\$34,237,497	\$39,992,537
Normal Cost Rate	1.47%	2.96%	2.93%	2.98%	3.11%
UAL Rate	15.93%	14.44%	14.47%	14.42%	14.29%
Total Rate	17.40%	17.40%	17.40%	17.40%	17.40%
Funding Ratio	60.9%	56.6%	55.2%	50.1%	48.7%
Amortization Period	36 years	65 years	60 years	50 years	36 years
Cash Flow %	-4.3%	-5.3%	-6.0%	-6.6%	-4.5%



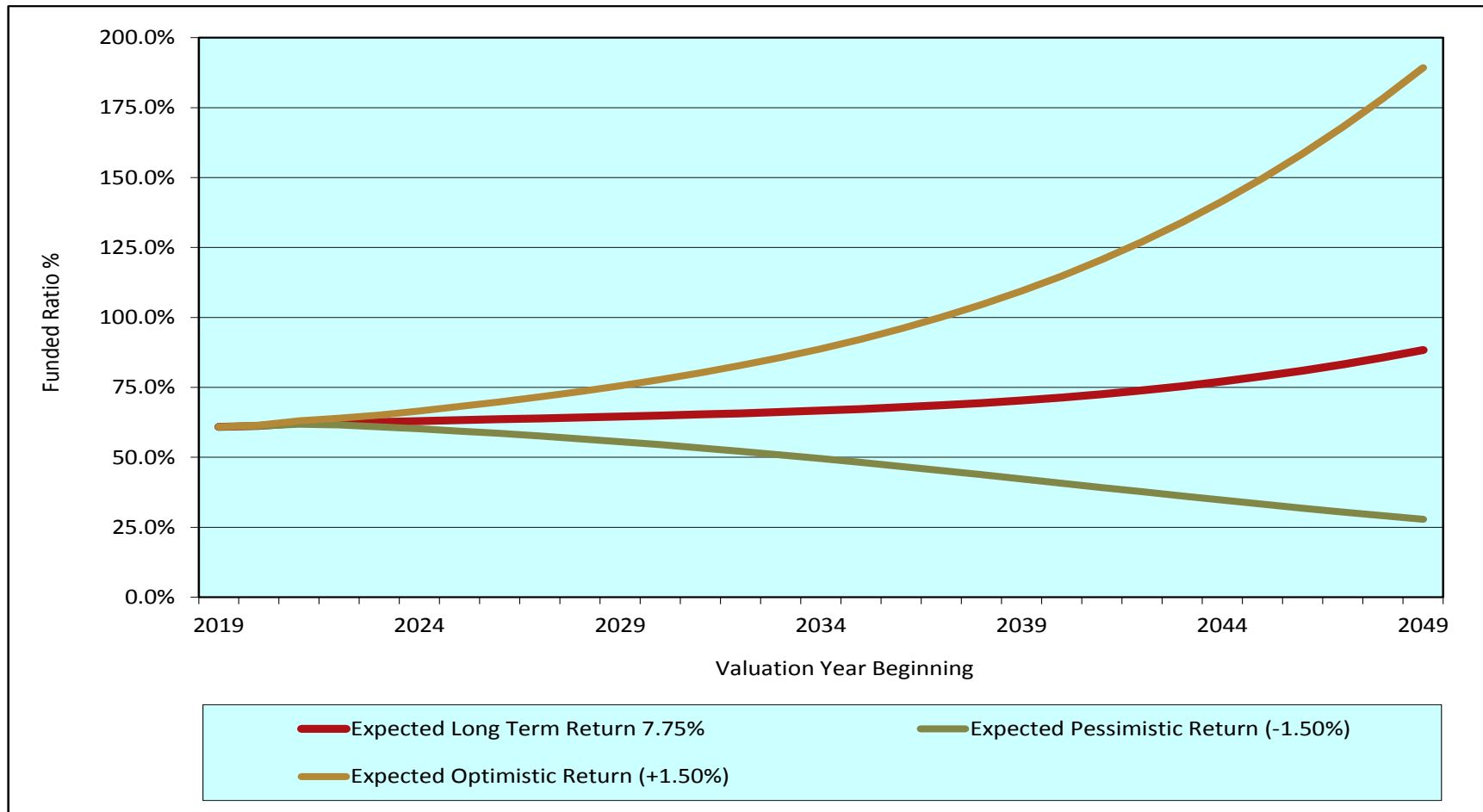
Section II – PERS Projection Results

The following graphs show a comparison of the projected funded ratios and amortization periods for the baseline valuation (assuming 7.75%) and two alternative investment return scenarios to show an optimistic view if the fund earns 1.50% above the assumed rate each year of the projection study and a pessimistic view if the fund earns 1.50% less than the assumed rate each year of the projection study. As can be seen from the graphs, even under a pessimistic view of investment returns, the Plan remains solvent over the length of the projection period.



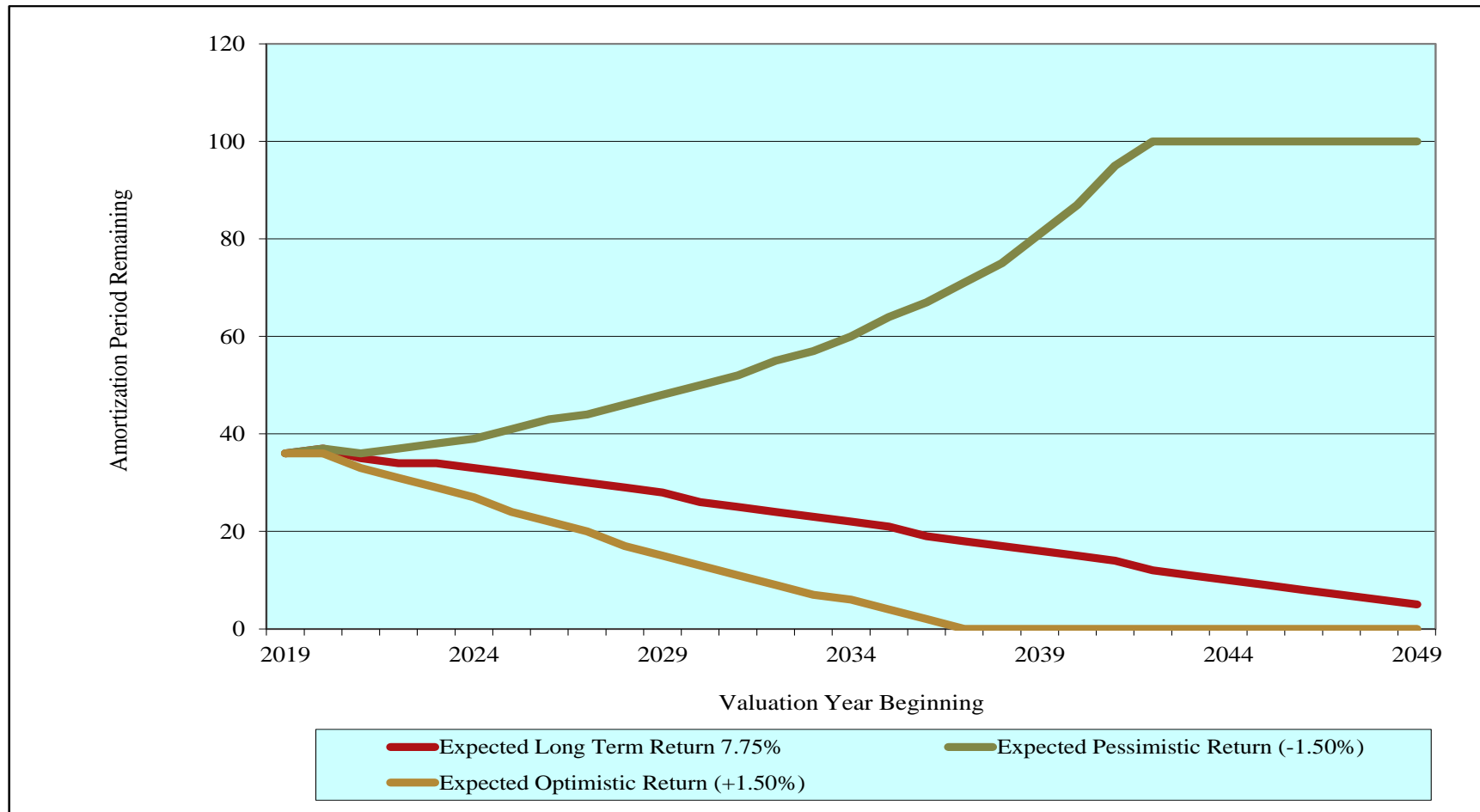
Section II – PERS Projection Results

Mississippi PERS – PERS Plan 30 Year Projection of Funded Ratio on Actuarial Asset Value Based on June 30, 2019 Valuation Results



Section II – PERS Projection Results

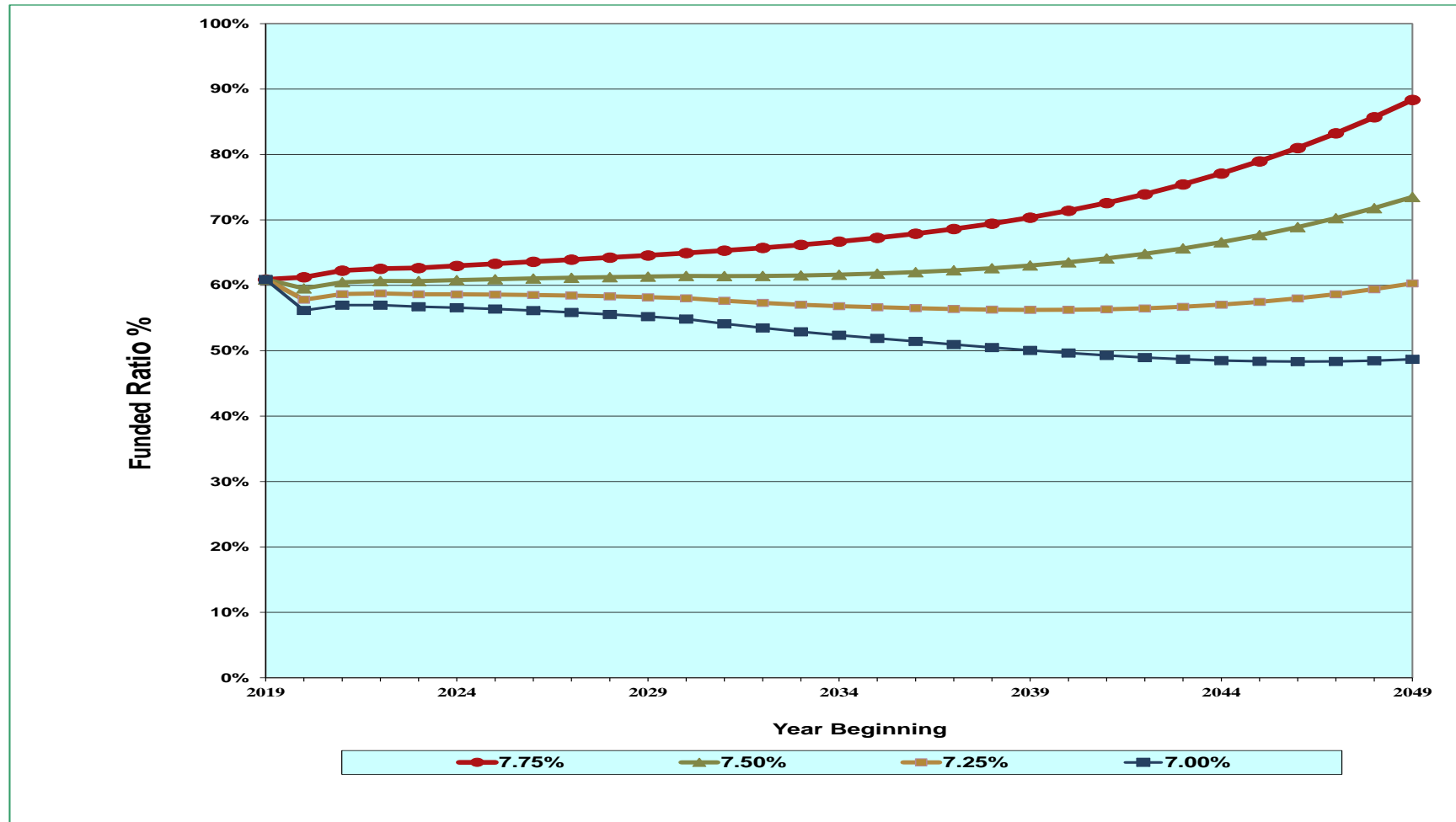
Mississippi PERS – PERS Plan 30 Year Projection Amortization Period Based on June 30, 2019 Valuation Results





Section II – PERS Projection Results

Mississippi PERS – PERS Plan 30-Year Projection of Funded Ratio on Actuarial Asset Value Based on June 30, 2019 Valuation Results





Section II – PERS Projection Results

CASH FLOW PROJECTIONS

The funded ratio is the primary measure of funded status of a pension plan and, thereby, the most common measurement used for drawing conclusions on funding progress. The funded ratio is the ratio of the actuarial value of assets to the actuarial or accrued liability of the system as calculated by the funding method used in developing system contribution levels. When using the funded ratio in assessing trends over several valuations, we recommend that the basis for determining both the assets and liabilities in the ratio are taken into consideration and reasonable efforts are made to adjust the ratio to reflect these differences when they are known. On a consistent basis, an increasing funded ratio would typically indicate progress in meeting the obligations of the system. In most cases, other measures should also be considered in a trend assessment. These may include the trend in the length of the amortization period, the required contribution rate, percentage of required contributions funded, and the unfunded actuarial liability as a percentage of payroll. Focusing solely on any one measure as the indication of funding progress is an oversimplification of a complex and dynamic system.

Another of those additional metrics is an outlook on the cash flow as a percentage of assets for the System. Most retirement systems are funded with an advance-funding mechanism, meaning contributions and investment earnings are earned during a member's active lifetime in order to pay for the benefit payments during his retirement years. Many mature retirement systems, like PERS, have negative cash flow, where benefit payments paid out of the trust are more than the contributions being collected by employers and employees.

For the fiscal year ending June 30, 2020, we are projecting PERS to have a negative cash flow of approximately \$1.21 Billion (benefit payments of \$2.97 Billion and contributions of \$1.76 Billion). With market value of assets of \$28.2 Billion as of June 30, 2019, the cash flow as a percentage of assets is estimated to be negative 4.29% for the 2020 fiscal year. While market value of assets is assumed to earn 7.75% each year, the difference between the investment return assumption and the negative cash flow percentage is positive, meaning assets are projected to grow for the 2020 fiscal year. When assets do not earn a positive return enough to cover this negative cash flow percentage, assets are expected to decline for the year. As long as the negative cash flow percentage does not grow more than the assumed investment return assumption, the System's assets will continue to increase and sustainability of the plan may be achieved.

The tables on the following three pages demonstrate the open group projection of cash flow on the baseline assumption and then a sensitivity analysis, using a one-year return of negative 7.00% in 2020. This demonstrates the projection of this metric if PERS experiences one significant bad investment year in one of the next five years without a correction in the market. As can be seen from the table on page 22, the cash flow as a percentage of market value of assets does not get more than negative 5.59% on the baseline assumption, meaning that PERS' assets should continue to increase as long as all baseline actuarial assumptions are met. However, if there is a significant negative investment experience in one of the next five years (as seen on the table on page 23), the negative cash flow could be more than the investment experience of the Plan and PERS' assets may decrease at some point during the projection period. The good news is that under either of the pessimistic scenarios, the Plan would not reach insolvency and ultimately, the Plan's assets would begin to increase later in the projection period.

This metric will continue to be monitored as part of the funding policy under the baseline assumptions to ensure the continued growth of PERS' assets during the projection period.



Section II – PERS Projection Results

Mississippi PERS 30-year Open Group Projection of Cash Flow PERS Plan Based on June 30, 2019 Valuation Results

Projection of Cash Flow

Contribution Methodology:
Investment Return Methodology:

Employee and Employer Contributions
As Programmed

Valuation Year Beginning July 1	Expected Short-term Investment Return	Valuation Annual Payroll	Market Value of Assets July 1	Total Contributions	Projected Benefit Payments	Ratio of Cash Flow to MVA	Expected Investment Return	Net Cash Flow	Market Value of Assets June 30	Valuation Year Ending June 30
2019	7.75%	6,468,855,947	28,206,602,000	1,759,011,309	(2,968,885,837)	-4.29%	2,140,003,787	930,129,259	29,136,731,259	2020
2020	7.75%	6,555,940,219	29,136,731,259	1,782,691,264	(3,108,345,622)	-4.55%	2,207,686,048	882,031,690	30,018,762,950	2021
2021	7.75%	6,686,461,905	30,018,762,950	1,818,182,721	(3,243,714,987)	-4.75%	2,272,245,449	846,713,183	30,865,476,133	2022
2022	7.75%	6,827,700,130	30,865,476,133	1,856,588,219	(3,375,305,119)	-4.92%	2,334,322,191	815,605,292	31,681,081,424	2023
2023	7.75%	6,984,886,916	31,681,081,424	1,899,330,450	(3,467,178,342)	-4.95%	2,395,663,298	827,815,406	32,508,896,831	2024
2024	7.75%	7,155,407,231	32,508,896,831	1,945,698,334	(3,592,735,612)	-5.07%	2,456,807,660	809,770,382	33,318,667,212	2025
2025	7.75%	7,336,779,160	33,318,667,212	1,995,016,989	(3,720,719,851)	-5.18%	2,516,573,450	790,870,588	34,109,537,800	2026
2026	7.75%	7,528,607,800	34,109,537,800	2,047,179,033	(3,847,407,072)	-5.28%	2,575,031,954	774,803,915	34,884,341,715	2027
2027	7.75%	7,728,523,805	34,884,341,715	2,101,540,193	(3,978,696,748)	-5.38%	2,632,153,898	754,997,343	35,639,339,058	2028
2028	7.75%	7,939,476,060	35,639,339,058	2,158,902,330	(4,101,606,276)	-5.45%	2,688,173,623	745,469,677	36,384,808,735	2029
2029	7.75%	8,157,525,698	36,384,808,735	2,218,194,388	(4,222,697,305)	-5.51%	2,743,597,495	739,094,578	37,123,903,313	2030
2030	7.75%	8,384,194,318	37,123,903,313	2,279,830,119	(4,340,885,586)	-5.55%	2,798,726,803	737,671,336	37,861,574,649	2031
2031	7.75%	8,619,301,325	37,861,574,649	2,343,760,416	(4,455,673,943)	-5.58%	2,853,962,353	742,048,827	38,603,623,476	2032
2032	7.75%	8,863,405,333	38,603,623,476	2,410,137,178	(4,568,230,308)	-5.59%	2,909,715,067	751,621,937	39,355,245,413	2033
2033	7.75%	9,116,345,306	39,355,245,413	2,478,916,616	(4,676,960,742)	-5.59%	2,966,446,551	768,402,424	40,123,647,837	2034
2034	7.75%	9,377,303,906	40,123,647,837	2,549,876,478	(4,781,248,603)	-5.56%	3,024,730,376	793,358,251	40,917,006,088	2035
2035	7.75%	9,649,178,087	40,917,006,088	2,623,804,505	(4,879,744,995)	-5.51%	3,085,281,380	829,340,891	41,746,346,979	2036
2036	7.75%	9,931,115,689	41,746,346,979	2,700,468,978	(4,971,918,632)	-5.44%	3,148,965,533	877,515,879	42,623,862,858	2037
2037	7.75%	10,225,100,529	42,623,862,858	2,780,409,336	(5,055,938,300)	-5.34%	3,216,817,889	941,288,925	43,565,151,783	2038
2038	7.75%	10,531,289,223	43,565,151,783	2,863,668,166	(5,128,855,332)	-5.20%	3,290,161,048	1,024,973,882	44,590,125,665	2039
2039	7.75%	10,848,115,055	44,590,125,665	2,949,819,446	(5,193,961,590)	-5.03%	3,370,396,803	1,126,254,658	45,716,380,323	2040
2040	7.75%	11,176,103,652	45,716,380,323	3,039,006,105	(5,253,875,695)	-4.84%	3,458,794,685	1,243,925,095	46,960,305,418	2041
2041	7.75%	11,514,941,465	46,960,305,418	3,131,142,883	(5,305,883,425)	-4.63%	3,556,724,867	1,381,984,325	48,342,289,743	2042
2042	7.75%	11,863,621,821	48,342,289,743	3,225,956,046	(5,355,173,114)	-4.40%	3,665,559,772	1,536,342,704	49,878,632,447	2043
2043	7.75%	12,222,499,481	49,878,632,447	3,323,542,059	(5,400,619,451)	-4.16%	3,786,609,045	1,709,531,653	51,588,164,100	2044
2044	7.75%	12,591,346,207	51,588,164,100	3,423,838,861	(5,444,809,082)	-3.92%	3,921,231,334	1,900,261,113	53,488,425,213	2045
2045	7.75%	12,971,618,639	53,488,425,213	3,527,242,540	(5,491,388,179)	-3.67%	4,070,662,438	2,106,516,799	55,594,942,012	2046
2046	7.75%	13,363,306,280	55,594,942,012	3,633,750,244	(5,536,186,399)	-3.42%	4,236,264,115	2,333,827,960	57,928,769,971	2047
2047	7.75%	13,767,315,236	57,928,769,971	3,743,608,359	(5,578,497,026)	-3.17%	4,419,704,408	2,584,815,741	60,513,585,712	2048
2048	7.75%	14,184,379,720	60,513,585,712	3,857,016,533	(5,619,240,683)	-2.91%	4,622,790,840	2,860,566,691	63,374,152,403	2049
2049	7.75%	14,613,125,125	63,374,152,403	3,973,600,984	(5,662,018,977)	-2.66%	4,847,291,383	3,158,873,390	66,533,025,793	2050



Section II – PERS Projection Results

Mississippi PERS 30-year Open Group Projection of Cash Flow PERS Plan Based on June 30, 2019 Valuation Results

Projection of Cash Flow

Contribution Methodology:
Investment Return Methodology:

Employee and Employer Contributions
As Programmed

Valuation Year Beginning July 1	Expected Short-term Investment Return	Valuation Annual Payroll	Market Value of Assets July 1	Total Contributions	Projected Benefit Payments	Ratio of Cash Flow to MVA	Expected Investment Return	Net Cash Flow	Market Value of Assets June 30	Valuation Year Ending June 30
2019	-7.00%	6,468,855,947	28,206,602,000	1,759,011,309	(2,968,885,837)	-4.29%	(1,931,348,353)	(3,141,222,881)	25,065,379,119	2020
2020	7.75%	6,555,940,219	25,065,379,119	1,782,691,264	(3,108,345,622)	-5.29%	1,892,156,257	566,501,899	25,631,881,019	2021
2021	7.75%	6,686,461,905	25,631,881,019	1,818,182,721	(3,243,714,987)	-5.56%	1,932,262,100	506,729,834	26,138,610,853	2022
2022	7.75%	6,827,700,130	26,138,610,853	1,856,588,219	(3,375,305,119)	-5.81%	1,967,990,132	449,273,233	26,587,884,085	2023
2023	7.75%	6,984,886,916	26,587,884,085	1,899,330,450	(3,467,178,342)	-5.90%	2,000,940,505	433,092,613	27,020,976,699	2024
2024	7.75%	7,155,407,231	27,020,976,699	1,945,698,334	(3,592,735,612)	-6.10%	2,031,493,849	384,456,571	27,405,433,269	2025
2025	7.75%	7,336,779,160	27,405,433,269	1,995,016,989	(3,720,719,851)	-6.30%	2,058,297,819	332,594,957	27,738,028,226	2026
2026	7.75%	7,528,607,800	27,738,028,226	2,047,179,033	(3,847,407,072)	-6.49%	2,081,239,962	281,011,923	28,019,040,149	2027
2027	7.75%	7,728,523,805	28,019,040,149	2,101,540,193	(3,978,696,748)	-6.70%	2,100,093,027	222,936,472	28,241,976,621	2028
2028	7.75%	7,939,476,060	28,241,976,621	2,158,902,330	(4,101,606,276)	-6.88%	2,114,878,035	172,174,089	28,414,150,710	2029
2029	7.75%	8,157,525,698	28,414,150,710	2,218,194,388	(4,222,697,305)	-7.05%	2,125,871,499	121,368,582	28,535,519,292	2030
2030	7.75%	8,384,194,318	28,535,519,292	2,279,830,119	(4,340,885,586)	-7.22%	2,133,127,041	72,071,574	28,607,590,866	2031
2031	7.75%	8,619,301,325	28,607,590,866	2,343,760,416	(4,455,673,943)	-7.38%	2,136,778,610	24,865,084	28,632,455,950	2032
2032	7.75%	8,863,405,333	28,632,455,950	2,410,137,178	(4,568,230,308)	-7.54%	2,136,949,583	(21,143,547)	28,611,312,403	2033
2033	7.75%	9,116,345,306	28,611,312,403	2,478,916,616	(4,676,960,742)	-7.68%	2,133,791,743	(64,252,384)	28,547,060,019	2034
2034	7.75%	9,377,303,906	28,547,060,019	2,549,856,478	(4,781,248,603)	-7.82%	2,127,544,820	(103,827,305)	28,443,232,714	2035
2035	7.75%	9,649,178,087	28,443,232,714	2,623,804,505	(4,879,744,995)	-7.93%	2,118,563,944	(137,376,545)	28,305,856,169	2036
2036	7.75%	9,931,115,689	28,305,856,169	2,700,468,978	(4,971,918,632)	-8.02%	2,107,327,495	(164,122,159)	28,141,734,010	2037
2037	7.75%	10,225,100,529	28,141,734,010	2,780,409,336	(5,055,938,300)	-8.09%	2,094,452,904	(181,076,060)	27,960,657,950	2038
2038	7.75%	10,531,289,223	27,960,657,950	2,863,668,166	(5,128,855,332)	-8.10%	2,080,812,776	(184,374,390)	27,776,283,560	2039
2039	7.75%	10,848,115,055	27,776,283,560	2,949,819,446	(5,193,961,590)	-8.08%	2,067,324,040	(176,818,105)	27,599,465,455	2040
2040	7.75%	11,176,103,652	27,599,465,455	3,039,006,105	(5,253,875,695)	-8.03%	2,054,733,783	(160,135,807)	27,439,329,648	2041
2041	7.75%	11,514,941,465	27,439,329,648	3,131,142,883	(5,305,883,425)	-7.93%	2,043,849,244	(130,891,298)	27,308,438,350	2042
2042	7.75%	11,863,621,821	27,308,438,350	3,225,956,046	(5,355,173,114)	-7.80%	2,035,436,289	(93,780,779)	27,214,657,571	2043
2043	7.75%	12,222,499,481	27,214,657,571	3,323,542,059	(5,400,619,451)	-7.63%	2,030,150,993	(46,926,399)	27,167,731,172	2044
2044	7.75%	12,591,346,207	27,167,731,172	3,423,838,861	(5,444,809,082)	-7.44%	2,028,647,783	7,677,562	27,175,408,734	2045
2045	7.75%	12,971,618,639	27,175,408,734	3,527,242,540	(5,491,388,179)	-7.23%	2,031,403,661	67,258,022	27,242,666,756	2046
2046	7.75%	13,363,306,280	27,242,666,756	3,633,750,244	(5,536,186,399)	-6.98%	2,038,962,782	136,526,627	27,379,193,382	2047
2047	7.75%	13,767,315,236	27,379,193,382	3,743,608,359	(5,578,497,026)	-6.70%	2,052,112,222	217,223,555	27,596,416,937	2048
2048	7.75%	14,184,379,720	27,596,416,937	3,857,016,533	(5,619,240,683)	-6.39%	2,071,710,260	309,486,111	27,905,903,048	2049
2049	7.75%	14,613,125,125	27,905,903,048	3,973,600,984	(5,662,018,977)	-6.05%	2,098,502,058	410,084,065	28,315,987,113	2050



Section II – PERS Projection Results

SOLVENCY TESTING

While not a metric that is part of the new PERS' funding policy, another metric that is often reviewed during the valuation process is the Solvency Testing. The Solvency Test is a test of current assets to different categories of actuarial accrued liability.

1. Accumulated Employee Contributions with Interest
2. Retirees and Beneficiaries currently receiving benefits
3. Employer financed portion of Active and Inactive member benefits

In the test, we calculate the portion of accrued liabilities from the categories above that are covered by the Actuarial Value of Assets. As can be seen from the table below (from the 2019 valuation report), assets cover 100% of category #1 but only 76.9% of category #2 as of June 30, 2019. The purpose of this metric is to monitor this Solvency Test and see if progress is made during the projection period for funding of category #2 and eventually category #3.

Actuarial Accrued Liabilities for							
Valuation Date	(1) Accumulated Employee Contributions Including Allocated Investment Earnings	(2) Retirees and Beneficiaries Currently Receiving Benefits	(3) Active and Inactive Members Employer Financed Portion	Net Assets Available for Benefits	Portions of Accrued Liabilities Covered by Assets		
					(1)	(2)	(3)
6/30/10	\$4,266,621	\$16,763,455	\$10,369,912	\$20,143,426	100.0%	94.7%	0.0%
6/30/11	4,356,556	18,001,718	10,296,191	20,315,165	100.0	88.7	0.0
6/30/12	4,463,252	19,547,367	10,482,254	19,992,797	100.0	79.4	0.0
6/30/13	5,053,888	20,789,551	9,699,409	20,490,555	100.0	74.3	0.0
6/30/14	5,277,944	22,033,588	9,703,756	22,569,940	100.0	78.5	0.0
6/30/15	5,379,226	24,012,624	10,972,734	24,387,161	100.0	79.2	0.0
6/30/16	5,468,859	25,390,774	11,137,880	25,185,078	100.0	77.7	0.0
6/30/17	5,534,403	26,686,958	10,945,130	26,364,446	100.0	78.1	0.0
6/30/18	5,570,524	27,874,365	10,951,272	27,455,702	100.0	78.5	0.0
6/30/19	5,626,602	29,109,623	11,270,634	28,024,611	100.0	76.9	0.0

During the baseline projection, we anticipate that the percentage in category #2 will actually decrease over the first 10 years of the projection period but once the baby boomer generation of retirees begin to die, then the Solvency Test will begin to improve. Below is the baseline projection of the Solvency Test:



Section II – PERS Projection Results

Mississippi PERS 30-year Open Group Projection of Solvency Test PERS Plan Based on June 30, 2019 Valuation Results

(\$ in Thousands)

Valuation Date	(1) Accumulated Employee Confs with Interest	(2) Retiree and Beneficiary Liability	(3) Active Employer Financed	(4) Total Accrued Liability	(5) Ratio of Retiree Liability to Total Liability	Actuarial Value of Assets	Solvency Testing		
	Portion of Accrued Liabilities by Assets								
							(1)	(2)	(3)
2019	5,626,602	29,109,623	11,270,634	46,006,859	63.3%	28,024,611	100.0%	76.9%	0.0%
2020	5,739,134	30,884,060	10,596,272	47,219,466	65.4%	28,913,621	100.0%	75.0%	0.0%
2021	5,853,917	32,080,339	10,426,481	48,360,736	66.3%	30,107,509	100.0%	75.6%	0.0%
2022	5,970,995	33,254,429	10,258,287	49,483,711	67.2%	30,946,749	100.0%	75.1%	0.0%
2023	6,090,415	34,411,300	10,069,080	50,570,795	68.0%	31,681,079	100.0%	74.4%	0.0%
2024	6,212,223	35,534,144	9,875,716	51,622,082	68.8%	32,508,894	100.0%	74.0%	0.0%
2025	6,336,467	36,636,974	9,667,286	52,640,727	69.6%	33,318,665	100.0%	73.6%	0.0%
2026	6,463,196	37,711,903	9,448,168	53,623,267	70.3%	34,109,535	100.0%	73.3%	0.0%
2027	6,592,460	38,748,210	9,228,619	54,569,289	71.0%	34,884,339	100.0%	73.0%	0.0%
2028	6,724,309	39,717,126	9,031,554	55,472,989	71.6%	35,639,336	100.0%	72.8%	0.0%
2029	6,858,795	40,646,372	8,835,164	56,340,332	72.1%	36,384,806	100.0%	72.6%	0.0%
2030	6,995,971	41,530,073	8,645,662	57,171,707	72.6%	37,123,901	100.0%	72.5%	0.0%
2031	7,135,890	42,362,666	8,469,604	57,968,160	73.1%	37,861,572	100.0%	72.5%	0.0%
2032	7,278,608	43,151,862	8,301,195	58,731,665	73.5%	38,603,621	100.0%	72.6%	0.0%
2033	7,424,180	43,896,866	8,141,930	59,462,976	73.8%	39,355,243	100.0%	72.7%	0.0%
2034	7,572,664	44,604,502	7,986,686	60,163,852	74.1%	40,123,645	100.0%	73.0%	0.0%
2035	7,724,117	45,237,894	7,875,578	60,837,589	74.4%	40,917,003	100.0%	73.4%	0.0%
2036	7,878,599	45,800,824	7,809,758	61,489,181	74.5%	41,746,344	100.0%	73.9%	0.0%
2037	8,036,171	46,253,839	7,834,304	62,124,314	74.5%	42,623,860	100.0%	74.8%	0.0%
2038	8,196,894	46,585,870	7,968,558	62,751,322	74.2%	43,565,149	100.0%	75.9%	0.0%
2039	8,360,832	46,831,909	8,189,374	63,382,115	73.9%	44,590,123	100.0%	77.4%	0.0%
2040	8,528,049	47,000,457	8,497,861	64,026,367	73.4%	45,716,378	100.0%	79.1%	0.0%
2041	8,698,610	47,108,533	8,884,573	64,691,716	72.8%	46,960,303	100.0%	81.2%	0.0%
2042	8,872,582	47,211,346	9,305,388	65,389,316	72.2%	48,342,287	100.0%	83.6%	0.0%
2043	9,050,034	47,334,838	9,740,813	66,125,685	71.6%	49,878,630	100.0%	86.3%	0.0%
2044	9,231,035	47,498,422	10,179,308	66,908,764	71.0%	51,588,162	100.0%	89.2%	0.0%
2045	9,415,656	47,695,208	10,633,751	67,744,615	70.4%	53,488,423	100.0%	92.4%	0.0%
2046	9,603,969	47,927,123	11,105,014	68,636,106	69.8%	55,594,939	100.0%	96.0%	0.0%
2047	9,796,048	48,187,065	11,607,506	69,590,620	69.2%	57,928,767	100.0%	99.9%	0.0%
2048	9,991,969	48,473,762	12,151,239	70,616,970	68.6%	60,513,583	100.0%	100.0%	16.9%
2049	10,191,808	48,830,326	12,701,651	71,723,784	68.1%	63,374,150	100.0%	100.0%	34.3%



Section III – HSPRS Projection Results

SPECIAL ASSUMPTIONS

In addition to the regular valuation assumptions used in performing the annual actuarial valuations of HSPRS (all assumptions utilized in the projection study are outlined in Appendix B), additional assumptions must be made that are unique to projections. The first of these is what, if any, change in the overall active membership will be anticipated. For this projection study it was assumed that the number of active members would remain static over the 30 year projection period.

But since we assume active members will leave the system through termination, death, disability or retirement, we need to make some assumptions as to the composition of new hires that will replace departing members in order to maintain the membership at a constant number. The new entrant profile we developed was based on the new hires in the last two years (2018 and 2019) with a significant group of entering trainees through the projection start date of June 30, 2019. That profile is summarized in the table below.

Age	Average Pay	Percent Male	Weight
23	\$41,500	92%	12.0%
25	41,500	98	25.0
29	41,500	94	25.0
32	42,000	93	21.0
38	43,000	93	7.0
41	43,000	92	6.0
48	45,000	99	4.0

For the projection results presented in this section of the report, it was further assumed that the benefit structure as it exists on June 30, 2019 would remain in place for the following 30 years.



Section III – HSPRS Projection Results

FUTURE MEMBERSHIP

The following chart and graph show the headcounts of active participants and retired members over the projection period. The actives are broken down into those existing as of June 30, 2019 and those who are hired after June 30, 2019. We have assumed the active membership will continue at the current population of 522 active members over the projected period.

Member	2019	2024	2029	2042	2049
Active – Existing Employees	522	382	269	60	8
Active – New Entrants	0	140	253	462	514
Retired	734	870	976	1,157	1,232
Total	1,256	1,392	1,498	1,679	1,754

PROJECTION RESULTS

The baseline projection results shown below use the same actuarial assumptions as used the June 30, 2019 actuarial valuation report. Please note that contributions from SB 2659 and HB 1015 are assumed to continue to provide an additional \$3,700,000 annually throughout the projection period under all scenarios. These dollars are in addition to the employer contributions as a percent of payroll shown below. In addition, the projection results using different long-term investment return assumptions for future valuations (7.50%, 7.25% and 7.00%) are included.

Baseline Projection Results (7.75%) (\$000's)

	2019	2024	2029	2042	2049
Total Payroll	\$31,811	\$34,464	\$37,093	\$49,602	\$60,730
UAL	\$179,334	\$165,129	\$142,290	(\$22,659)	(\$247,462)
Normal Cost Rate	15.71%	15.89%	15.95%	16.03%	16.17%
UAL Rate	33.37%	33.19%	33.13%	33.05%	32.91%
Total Rate	49.08%	49.08%	49.08%	49.08%	49.08%
Funding Ratio	66.9%	73.2%	79.3%	102.6%	124.9%
Amortization Period	18 years	14 years	10 years	0 years	0 years
Cash Flow %	-3.3%	-3.6%	-3.9%	-3.2%	-2.3%



Section III – HSPRS Projection Results

Projection Results Assuming 7.50% (Long-Term Investment Return) (\$000's)

	2019	2024	2029	2042	2049
Total Payroll	\$31,811	\$34,464	\$37,093	\$49,602	\$60,730
UAL	\$179,334	\$186,062	\$173,863	\$73,557	(\$77,715)
Normal Cost Rate	15.71%	17.40%	17.46%	17.58%	17.73%
UAL Rate	33.37%	31.68%	31.62%	31.50%	31.35%
Total Rate	49.08%	49.08%	49.08%	49.08%	49.08%
Funding Ratio	66.9%	70.7%	75.4%	91.7%	107.6%
Amortization Period	18 years	19 years	15 years	2 years	0 years
Cash Flow %	-3.3%	-3.6%	-4.0%	-3.4%	-2.6%

Projection Results Assuming 7.25% (Long-Term Investment Return) (\$000's)

	2019	2024	2029	2042	2049
Total Payroll	\$31,811	\$34,464	\$37,093	\$49,602	\$60,730
UAL	\$179,334	\$208,277	\$206,630	\$167,440	\$83,212
Normal Cost Rate	15.71%	19.12%	19.19%	19.34%	19.52%
UAL Rate	33.37%	29.96%	29.89%	29.74%	29.56%
Total Rate	49.08%	49.08%	49.08%	49.08%	49.08%
Funding Ratio	66.9%	68.1%	71.6%	81.7%	92.1%
Amortization Period	18 years	24 years	21 years	10 years	2 years
Cash Flow %	-3.3%	-3.7%	-4.1%	-3.8%	-3.0%

Projection Results Assuming 7.00% (Long-Term Investment Return) (\$000's)

	2019	2024	2029	2042	2049
Total Payroll	\$31,811	\$34,464	\$37,093	\$49,602	\$60,730
UAL	\$179,334	\$230,471	\$239,182	\$257,403	\$233,958
Normal Cost Rate	15.71%	20.78%	20.86%	21.05%	21.25%
UAL Rate	33.37%	28.30%	28.22%	28.03%	27.83%
Total Rate	49.08%	49.08%	49.08%	49.08%	49.08%
Funding Ratio	66.9%	65.7%	68.1%	72.7%	78.3%
Amortization Period	18 years	32 years	30 years	22 years	14 years
Cash Flow %	-3.3%	-3.7%	-4.3%	-4.1%	-3.4%



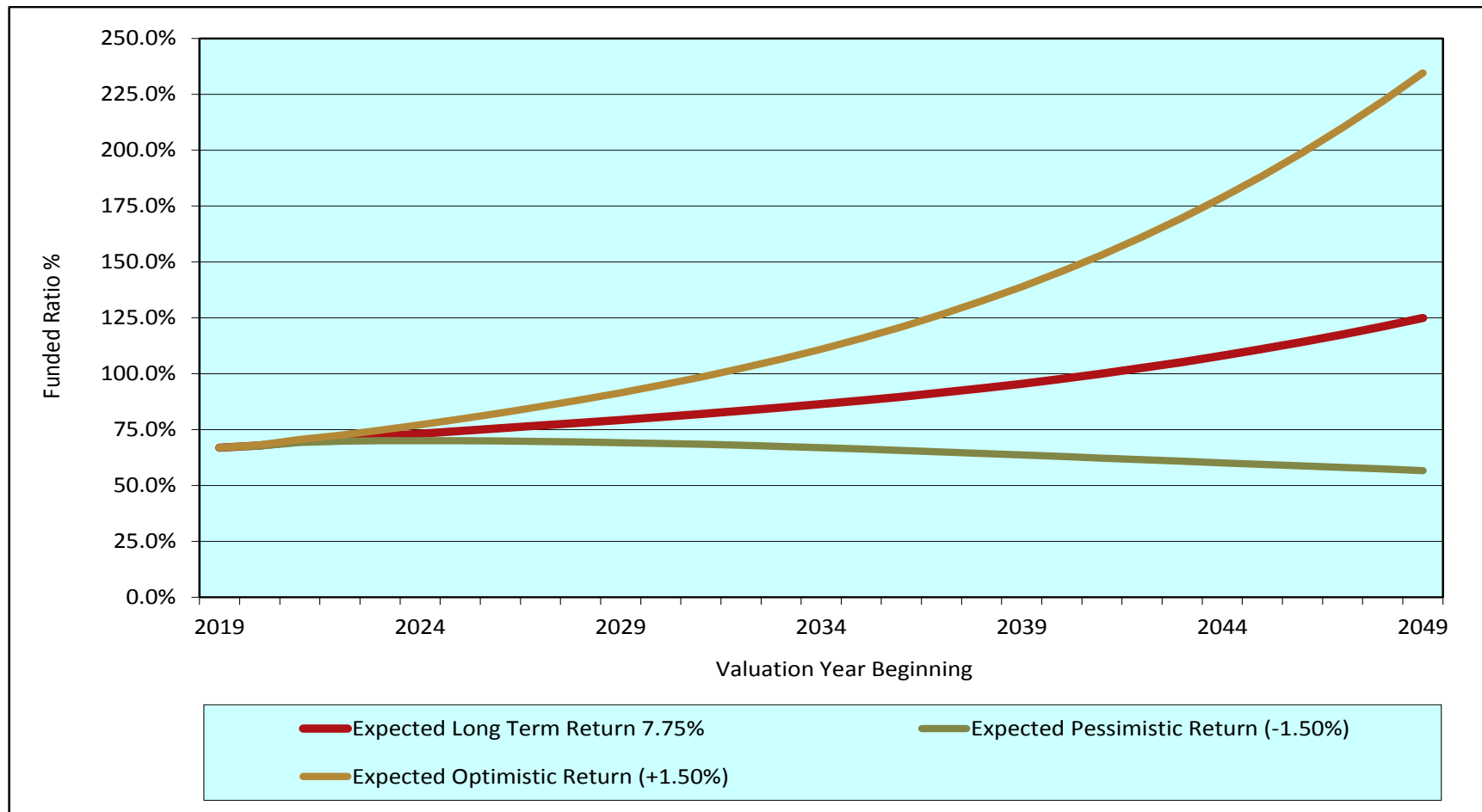
Section III – HSPRS Projection Results

The following graphs show a comparison of the projected funded ratios and amortization periods for the baseline valuation (assuming 7.75%) and two alternative investment return scenarios to show an optimistic view if the fund earns 1.50% above the assumed rate each year of the projection study and a pessimistic view if the fund earns 1.50% less than the assumed rate each year of the projection study. As can be seen from the graphs, under a pessimistic view of investment returns, the Plan remains solvent over the length of the projection period.



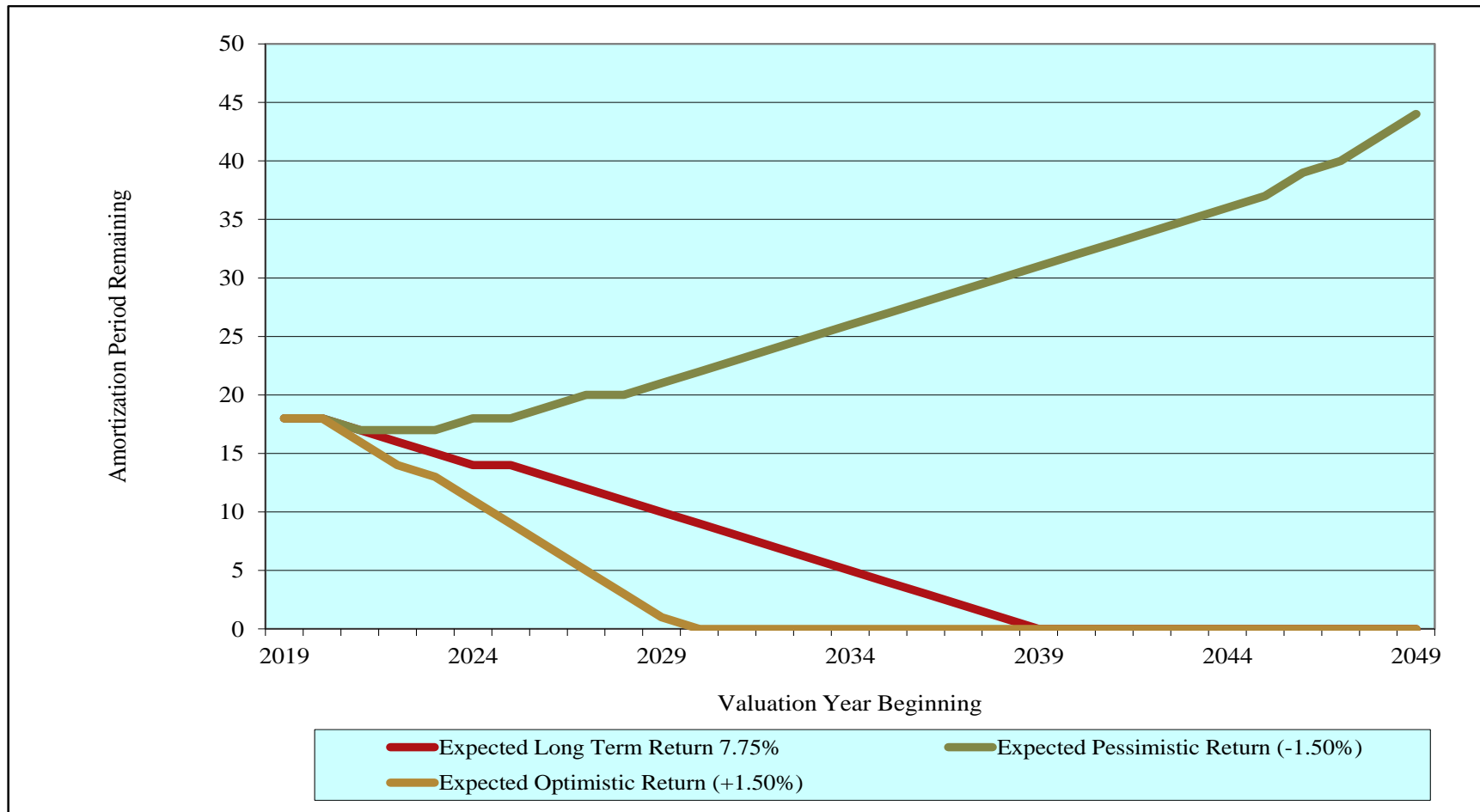
Section III – HSPRS Projection Results

Mississippi PERS – HSPRS Plan 30 Year Projection of Funded Ratio on Actuarial Asset Value Based on June 30, 2019 Valuation Results



Section III – HSPRS Projection Results

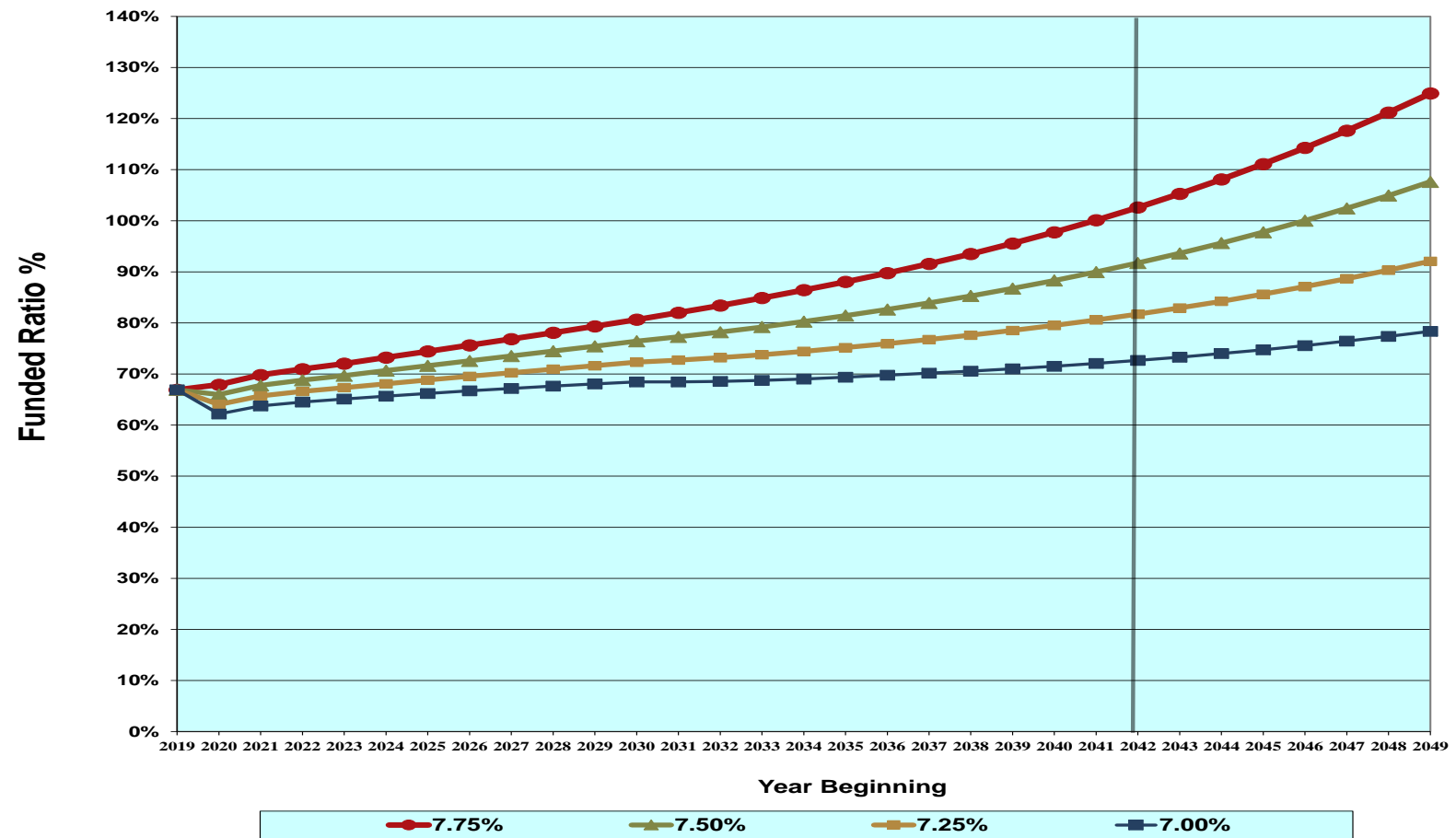
Mississippi PERS – HSPRS Plan 30 Year Projection Amortization Period Based on June 30, 2019 Valuation Results





Section III – HSPRS Projection Results

Mississippi PERS – HSPRS Plan
30-Year Projection of Funded Ratio on Actuarial Asset Value
Based on June 30, 2019 Valuation Results





Section IV – SLRP Projection Results

SPECIAL ASSUMPTIONS

In addition to the regular valuation assumptions used in performing the annual actuarial valuations of SLRP (all assumptions utilized in the projection study are outlined in Appendix D), additional assumptions must be made that are unique to projections. The first of these is what, if any, change in the overall active membership will be anticipated. For this projection study it was assumed that the number of active members would remain static over the 30-year projection period.

Since we assume active members will leave the system through termination, death, disability or retirement, we need to make some assumptions as to the composition of new hires that will replace departing members in order to maintain the membership at a constant number. The new entrant profile we developed was based on the new hires over the 4-year period prior to the projection start date of June 30, 2019.

It is important to note that an eligibility service load of 2.50 years was included in the new entrant profile as the census data shows more and more active members in SLRP are entering the Plan with service from the PERS plan. That profile is summarized in the table below.

Age	Average Pay	Percent Male	Weight
31	\$39,000	89.0%	18%
39	39,000	90.0	19%
45	39,000	91.0	22%
51	39,000	75.0	23%
56	39,000	95.0	10%
64	39,000	75.0	8%

For the projection results presented in this section of the report, it was further assumed that the benefit structure as it exists on June 30, 2019 would remain in place for the following 30 years.



Section IV – SLRP Projection Results

FUTURE MEMBERSHIP

The following chart and graph show the headcounts of active participants and retired members over the projection period. The actives are broken down into those existing as of June 30, 2019 and those who are hired after June 30, 2019. Although the 2019 active headcounts were at 170 actives, we have assumed the active membership will continue at the current maximum population of 174 active members over the projected period. As can be seen from the chart below, the retiree headcount begins to drop as retiree deaths outnumber new retirees.

Member	2019	2024	2029	2042	2049
Active – Existing Employees	170	87	58	14	5
Active – New Entrants	0	87	116	160	169
Retired	215	230	211	148	126
Total	385	404	385	322	300

PROJECTION RESULTS

The baseline projection results shown below use the same actuarial assumption as used in the June 30, 2019 actuarial valuation report. In addition, the projection results using different long-term investment return assumptions for future valuations (7.50%, 7.25% and 7.00%) are included.

Baseline Projection Results (7.75%)

(\$000's)

	2019	2024	2029	2042	2049
Total Payroll	\$6,937	\$8,021	\$9,058	\$13,057	\$16,005
UAL	\$4,506	\$4,198	\$3,667	(\$1,138)	(\$8,133)
Normal Cost Rate	2.88%	3.11%	3.20%	3.23%	3.12%
UAL Rate	4.52%	4.29%	4.20%	4.17%	4.28%
Total Rate	7.40%	7.40%	7.40%	7.40%	7.40%
Funding Ratio	80.4%	83.4%	86.7%	103.3%	120.2%
Amortization Period	23 years	18 years	13 years	0 years	0 years
Cash Flow %	-5.0%	-5.0%	-4.9%	-3.2%	-2.5%



Section IV – SLRP Projection Results

Projection Results Assuming 7.50% Long-Term Investment Return (\$000's)

	2019	2024	2029	2042	2049
Total Payroll	\$6,937	\$8,021	\$9,058	\$13,057	\$16,005
UAL	\$4,506	\$4,969	\$4,903	\$2,907	(\$933)
Normal Cost Rate	2.88%	3.41%	3.50%	3.53%	3.42%
UAL Rate	4.52%	3.99%	3.90%	3.87%	3.98%
Total Rate	7.40%	7.40%	7.40%	7.40%	7.40%
Funding Ratio	80.4%	80.8%	82.7%	91.8%	102.3%
Amortization Period	23 years	26 years	21 years	7 years	0 years
Cash Flow %	-5.0%	-5.1%	-5.0%	-3.5%	-2.9%

Projection Results Assuming 7.25% Long-Term Investment Return (\$000's)

	2019	2024	2029	2042	2049
Total Payroll	\$6,937	\$8,021	\$9,058	\$13,057	\$16,005
UAL	\$4,506	\$5,775	\$6,168	\$6,814	\$5,833
Normal Cost Rate	2.88%	3.74%	3.84%	3.87%	3.76%
UAL Rate	4.52%	3.66%	3.56%	3.53%	3.64%
Total Rate	7.40%	7.40%	7.40%	7.40%	7.40%
Funding Ratio	80.4%	78.3%	78.7%	81.1%	86.2%
Amortization Period	23 years	40 years	36 years	23 years	13 years
Cash Flow %	-5.0%	-5.2%	-5.2%	-3.9%	-3.3%

Projection Results Assuming 7.00% Long-Term Investment Return (\$000's)

	2019	2024	2029	2042	2049
Total Payroll	\$6,937	\$8,021	\$9,058	\$13,057	\$16,005
UAL	\$4,506	\$6,581	\$7,422	\$10,539	\$12,137
Normal Cost Rate	2.88%	4.06%	4.17%	4.20%	4.09%
UAL Rate	4.52%	3.34%	3.23%	3.20%	3.31%
Total Rate	7.40%	7.40%	7.40%	7.40%	7.40%
Funding Ratio	80.4%	75.8%	74.9%	71.5%	72.0%
Amortization Period	23 years	74 years	83 years	80 years	53 years
Cash Flow %	-5.0%	-5.2%	-5.3%	-4.3%	-3.9%

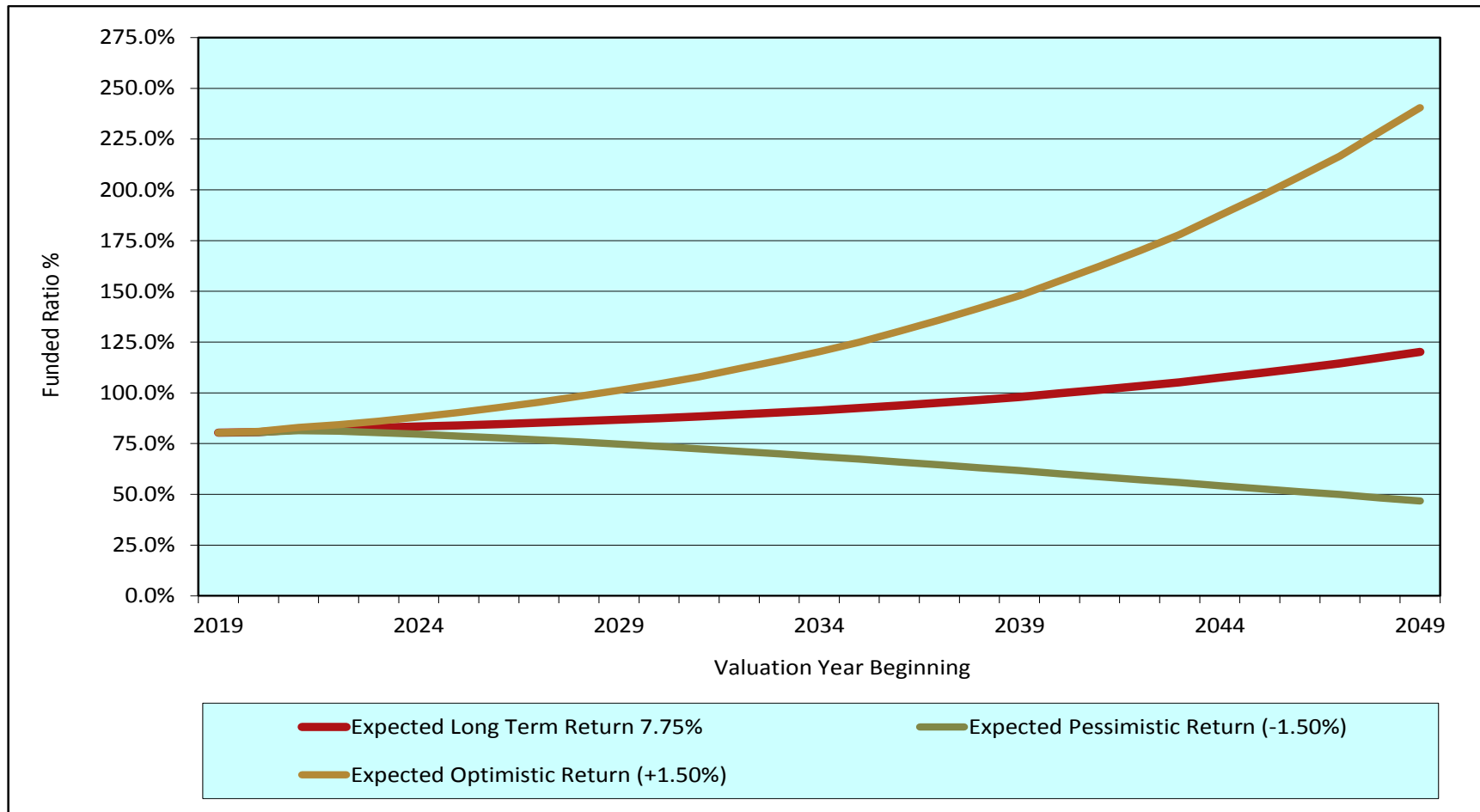


Section IV – SLRP Projection Results

The following graphs show a comparison of the projected funded ratios and amortization periods for the baseline valuation (assuming 7.75%) and two alternative investment return scenarios to show an optimistic view if the fund earns 1.50% above the assumed rate each year of the projection study and a pessimistic view if the fund earns 1.50% less than the assumed rate each year of the projection study. As can be seen from the graphs, even under a pessimistic view of investment returns, the Plan remains solvent over the length of the projection period.

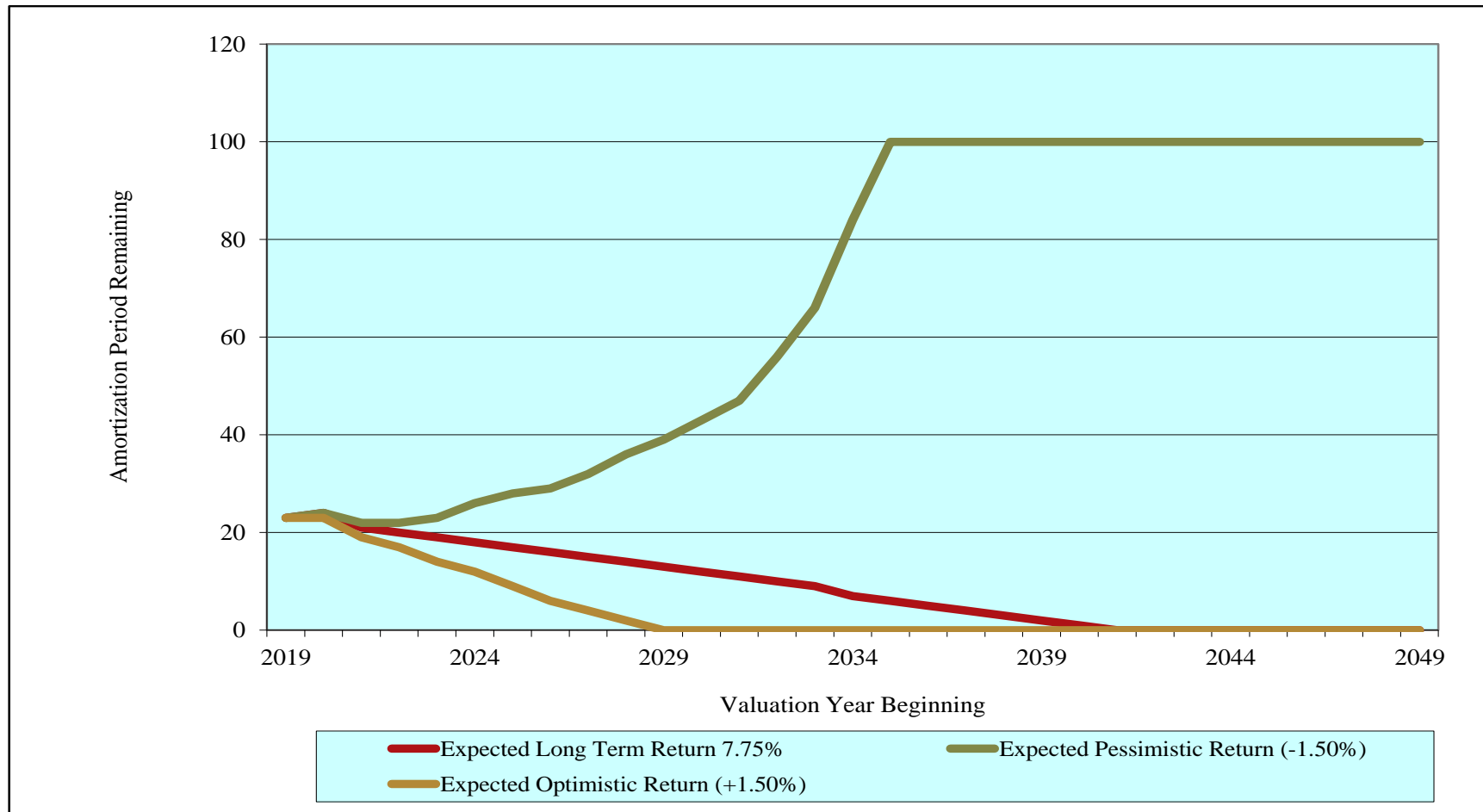
Section IV – SLRP Projection Results

Mississippi PERS – SLRP Plan 30 Year Projection of Funded Ratio on Actuarial Asset Value Based on June 30, 2019 Valuation Results



Section IV – SLRP Projection Results

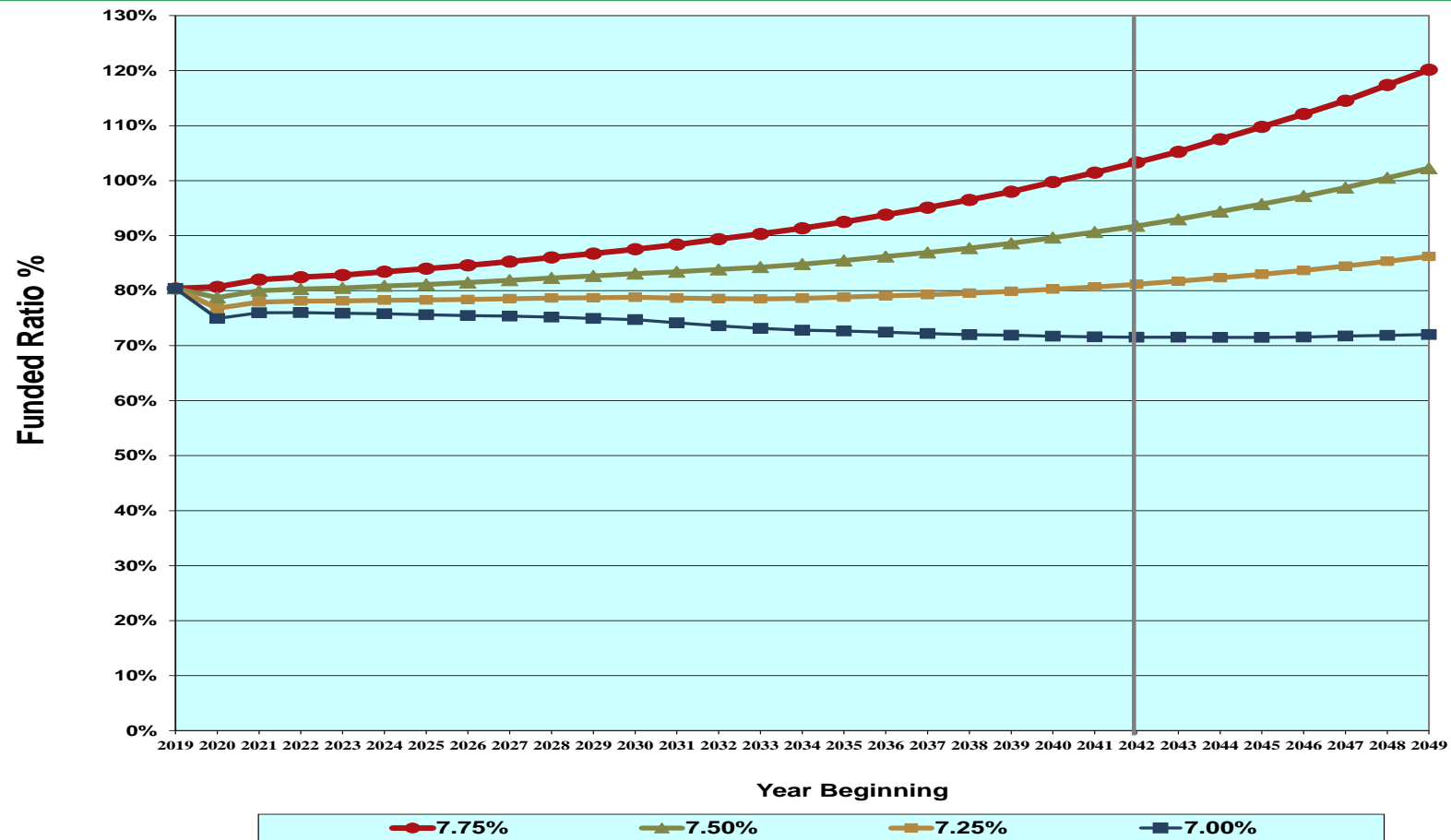
Mississippi PERS – SLRP Plan 30 Year Projection Amortization Period Based on June 30, 2019 Valuation Results





Section IV – SLRP Projection Results

Mississippi PERS – SLRP Plan 30-Year Projection of Funded Ratio on Actuarial Asset Value Based on June 30, 2019 Valuation Results





Section V – Sensitivity Analysis

As mentioned earlier in the report, the intended purpose of the Projection Report is to help assess the Plan's funding progress and to provide information to decision makers to help ensure that the applicable pension liabilities and funding mechanisms are managed in a manner that promotes sustainability. The Projection Report process should be viewed as an enhancement to the actuarial valuation control cycle by providing additional evaluation metrics to assess the need for further, in-depth analysis of the risks to the Plan's sustainability. The actuarial valuation control cycle is a key component of managing a long-term liability whose ultimate value is based upon uncertain future events. As the ultimate value of future cash flows cannot be predicted with certainty, pension liabilities are managed in the short-term through the continuous monitoring of economic and demographic assumptions, with a keen eye on the identification, measurement, and management of risks.

The Projection Report process, like other actuarial modeling, is not intended to provide absolute results. The intended purpose of the Projection Report process is to identify anticipated trends and to compare various outcomes, under a given methodology, rather than predicting certain future events. The results produced by the Projection Report process do not predict the financial condition of the Plan or the Plan's ability to pay benefits in the future and do not provide any guarantee of future financial soundness of the Plan. Because actual experience will not unfold exactly as expected, actual results can be expected to differ from the results presented herein. To the extent actual experience deviates significantly from the assumptions, results could be significantly better or significantly worse than the expected outcome indicated in this report.

Measuring pension obligations and actuarially determined contributions requires the use of assumptions regarding future economic and demographic experience. Whenever assumptions are made about future events, there is risk that actual experience will differ from expected. Actuarial valuations include the risk that actual future measurements will deviate from expected future measurements due to actual experience that is different than the actuarial assumptions. The primary areas of risk in this actuarial valuation are.

- Investment Risk – the potential that actual investment returns will be different than expected.
- Longevity and Other Demographic Risks – the potential that mortality or other demographic experience will be different than expected.
- Interest Rate Risk – To the extent market rates of interest affect the expected return on assets, there is a risk of change to the discount rate which determines the present value of liabilities and actuarial valuation results.
- Contribution Risk – The potential that actual contributions are different than the fixed contribution rates.

Annual actuarial valuations are performed for PERS which re-measure the assets and liabilities and the adequacy of the contribution rate. Actuarial projections are also performed every year with sensitivity testing of several factors. PERS also has experience studies performed every two years to analyze the discrepancies between actuarial assumptions and actual experience and determine if the actuarial assumptions need to be changed. Annual actuarial valuations and projections and periodic experience studies are practical ways to monitor and reassess risk.



Section V – Sensitivity Analysis

Investment Risk

In this section of the report, we will demonstrate the variability in achieving funding goals based on sensitivity around the three key variables listed above. Earlier in this section, we reviewed the projections if the long-term investment return assumption was lowered to rates below 7.75%. In this section, we keep the long-term investment return assumption at 7.75% but review the sensitivity of short-term investment returns as a single year event (and then 7.75% for all years thereafter) and simulate the next 5- or 10-year periods of return (and then 7.75% for all years thereafter).

Projected Funded Ratios

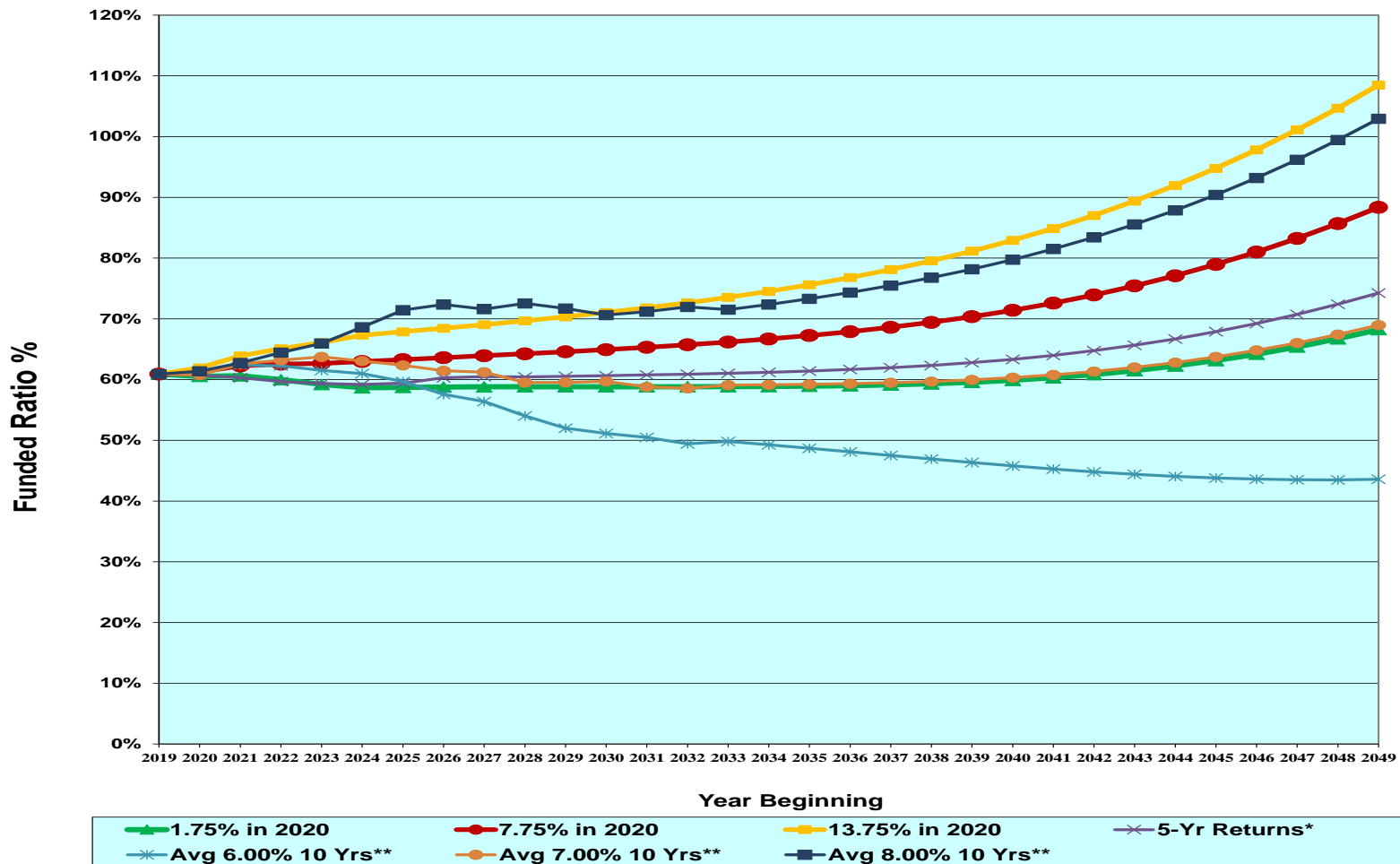
Projected to:	2047	2042	2042
Single Year Event	PERS	HSPRS	SLRP
• 1.75% in 2020	65.4%	89.7%	87.0%
• 3.75% in 2020	71.3%	94.0%	92.4%
• 5.75% in 2020	77.3%	98.3%	97.9%
• 7.75% in 2020 (Baseline)	83.2%	102.6%	103.3%
• 9.75% in 2020	89.2%	106.9%	108.7%
• 11.75% in 2020	95.2%	111.2%	114.2%
• 13.75% in 2020	101.1%	115.5%	119.6%
• Simulate 2008 loss using -15% in 2020	15.6%	53.8%	41.4%
Returns over next 5-Year Period			
• Next five years equal to last five years (3.46%, 0.89%, 14.96%, 9.59%, 6.46%)	70.7%	93.8%	91.8%
Average Returns over next 10-Year Period (Simulated returns using mean and standard deviations from PERS' Investment Consultant's Capital Market Assumptions)*			
• 6.00%	43.5%	72.2%	67.3%
• 7.00%	66.0%	89.2%	87.6%
• 8.00%	96.2%	111.0%	115.1%

* 6.00% Average Returns over the next 10-Year Period: 7.04%, 10.32%, 2.25%, 5.45%, 8.52%, 0.00%, 5.44%, 11.49%, -7.04%, 18.53%
 7.00% Average Returns over the next 10-Year Period: 3.61%, 20.67%, -0.02%, 11.58%, -4.84%, 8.13%, 18.10%, 2.04%, 0.83%, 12.67%
 8.00% Average Returns over the next 10 Year Period: 9.00%, 9.01%, 16.24%, 4.84%, 16.62%, 6.78%, -3.74%, 6.19%, 18.57%, -1.19%

To put this table of funded ratios in perspective, the graphs on the next three pages provide the projection results of several of these sensitivity scenarios on short-term investment returns. We believe it demonstrates the importance of these continued projection reports and the continued monitoring of this sensitivity analysis because short-term differences in investment returns can have a major impact on the projection of funded ratios.

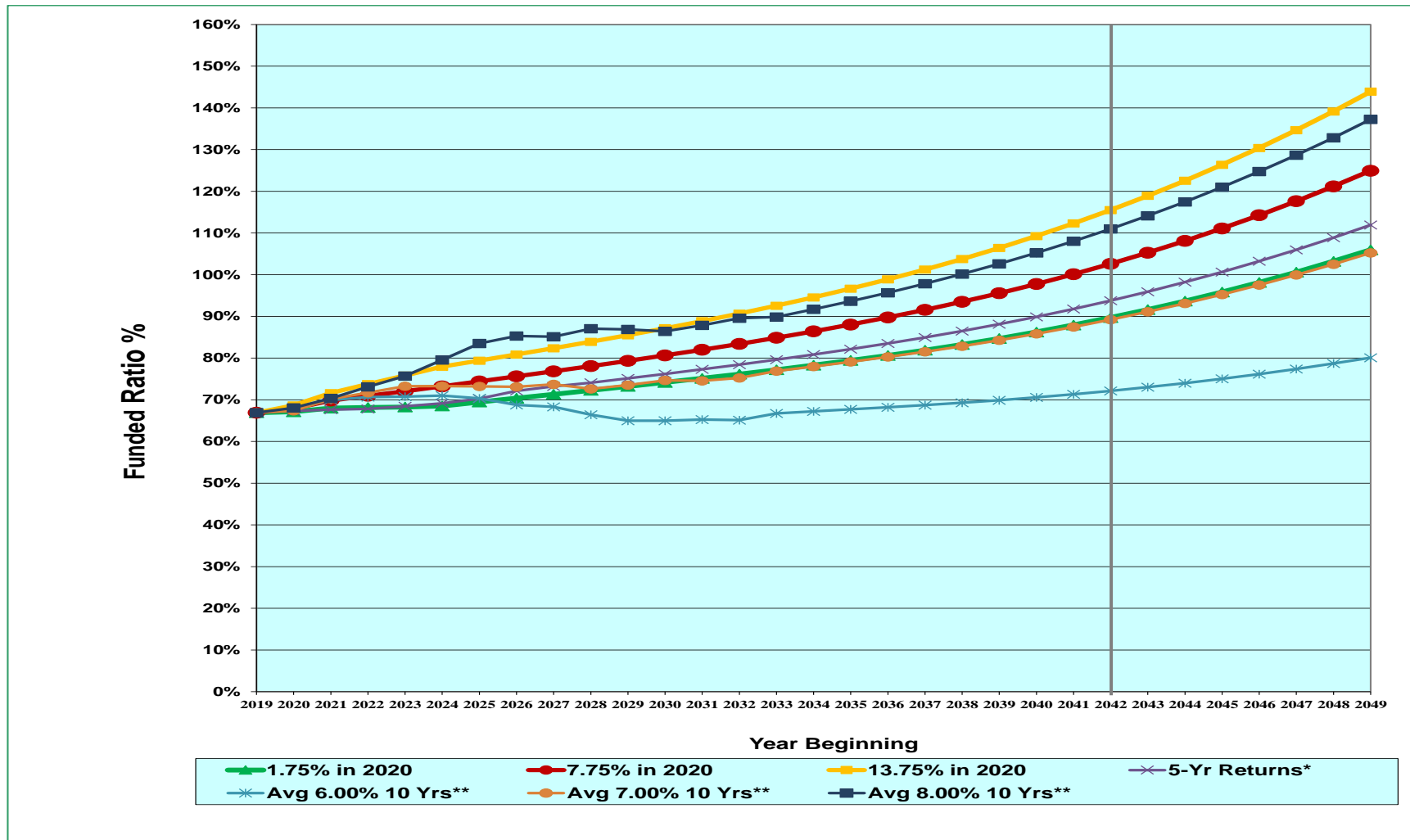
Section V – Sensitivity Analysis

**Mississippi PERS – PERS Plan
30-Year Projection of Funded Ratio on Actuarial Asset Value
Based on June 30, 2019 Valuation Results**



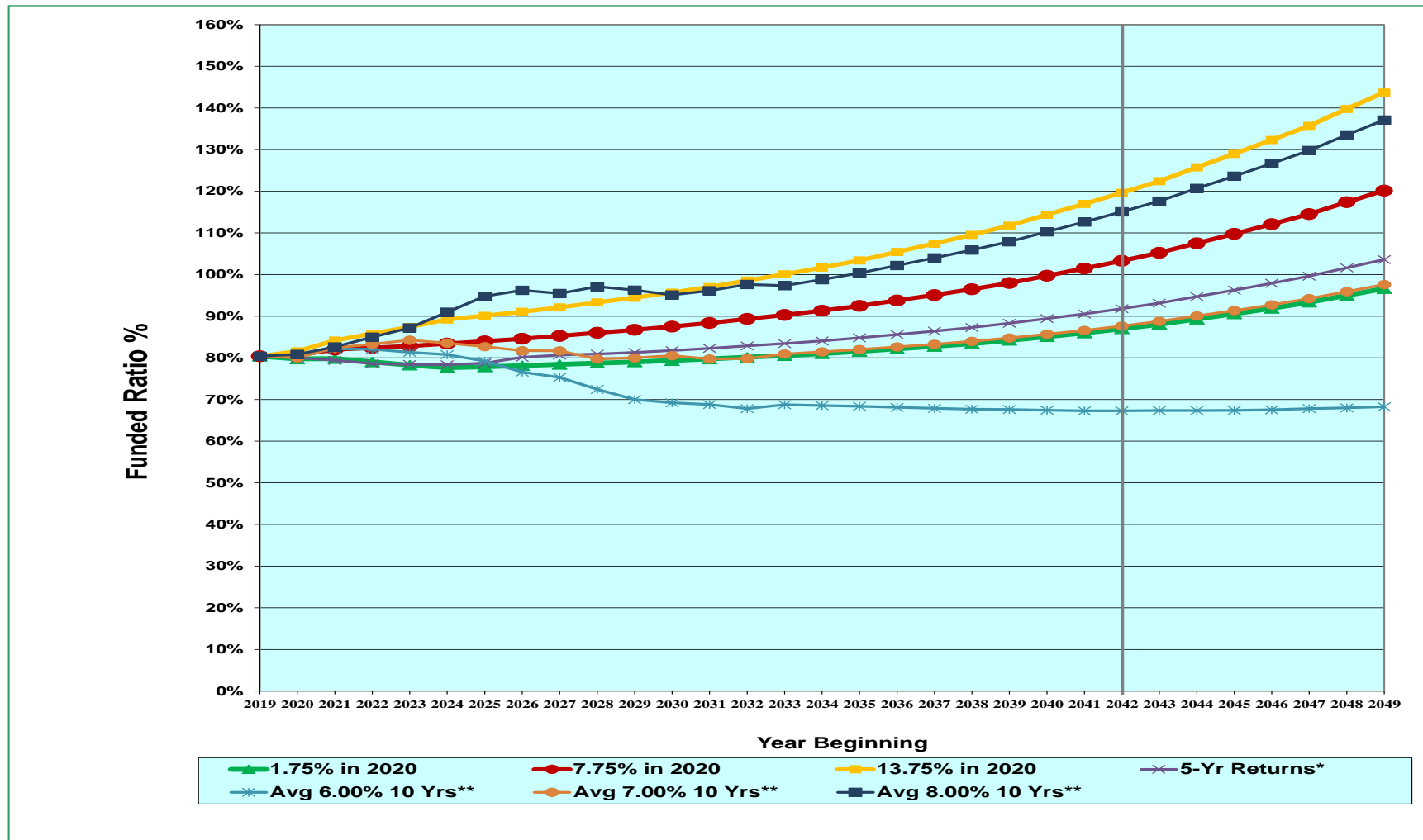
Section V – Sensitivity Analysis

Mississippi PERS – HSPRS Plan 30-Year Projection of Funded Ratio on Actuarial Asset Value Based on June 30, 2019 Valuation Results



Section V – Sensitivity Analysis

Mississippi PERS – SLRP Plan 30-Year Projection of Funded Ratio on Actuarial Asset Value Based on June 30, 2019 Valuation Results





Section V – Sensitivity Analysis

Demographic Risk

While actual investment returns compared to that assumed is the most critical driver of funding, many other assumptions are used in the actuarial projections to review sensitivity, such as population growth and wage inflation. Variances in these other assumptions over the long-term may also have an impact on the funding of the Plan.

For the PERS and HSPRS plans, there have been significant decreases in active membership since 2008. In the baseline projections we assume a static population, meaning the active membership will be the same in each of the projections than it is in 2019. For sensitivity analysis, we have performed the projections assuming both a 0.25% and 0.50% increase and decrease each year around this static assumption. For PERS, a 0.50% decrease in active population each year of the projection results in the active population dropping to 120,000 (it is currently 150,000). Since SLRP has a set number of active legislative members and should remain static over the projection period, we have not reviewed the sensitivity around this assumption. In the table below, we review these alternatives to the static active membership growth:

Projected Funded Ratios

Projected to:	2047	2042	2042
Active Membership Growth	PERS	HSPRS	SLRP
• Increase 0.50% each year	93.4%	106.0%	N/A
• Increase 0.25% each year	88.3%	104.3%	N/A
• Static Population (Baseline Assumption)	83.2%	102.6%	103.3%
• Decrease 0.25% each year	78.2%	101.0%	N/A
• Decrease 0.50% each year	73.2%	99.3%	N/A

Assumption Risk

We also performed a sensitivity analysis for the wage inflation assumption. As a result of the experience study presented in April, 2019, the Board adopted a reduction in the wage inflation assumption from 3.25% to 3.00%, which is 0.25% above the price inflation of 2.75%. Wage inflation is major component of the underlying salary increase assumptions, as well as the amortization of the Unfunded Accrued Liability which is based on the level percent of payroll amortization methodology.

In the table below, the second scenario lowers the discount rate to 7.50% but does not change the price inflation or wage inflation. The third scenario lowers the price and wage inflation by 0.25% and lowers the discount rate to 7.50%.

Projected Funded Ratios

Projected to:				2047	2042	2042
Scenario	Price Inflation	Discount Rate	Wage Inflation	PERS	HSPRS	SLRP
1 - Baseline	2.75%	7.75%	3.00%	83.2%	102.6%	103.3%
2	2.75%	7.50%	3.00%	70.3%	91.7%	91.8%
3	2.50%	7.50%	2.75%	68.4%	90.1%	90.5%



Section V – Sensitivity Analysis

Contribution Risk

To demonstrate the contribution risk of making the Fixed Contribution Rates (FCR) for all three plans, we have calculated the projected funded ratios if the FCRs were 1% higher or 1% lower than the current rates for all future years beginning on July 1, 2021.

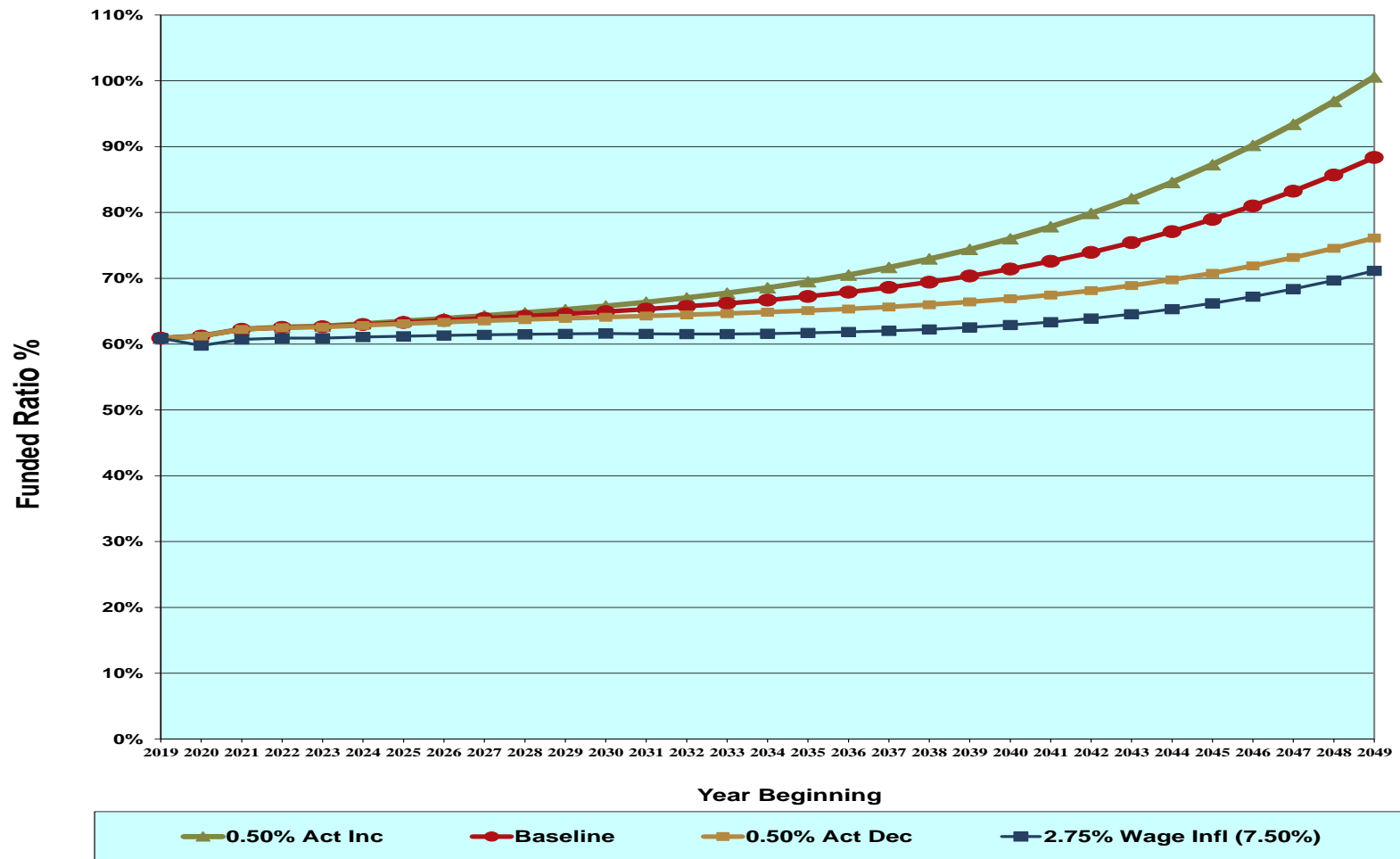
Projected to:	2047	2042	2042
Change in Fixed Contribution Rate (FCR)	PERS	HSPRS	SLRP
• Baseline	83.2%	102.6%	103.3%
• 1.00% increase in FCR	92.0%	104.7%	116.5%
• 1.00% decrease in FCR	74.5%	100.5%	90.1%

As can be seen in the table above, the contribution risk has a much bigger impact for PERS and SLRP plans than for HSPRS.

Over a long projection period, gains and losses due to population growth and wage inflation assumptions will be relatively concentrated around the expected value of these assumptions. So, the impact of the sensitivity around these baseline assumptions is small when compared to the investment return assumption. We have included graphs of these sensitivity projections on the next three pages.

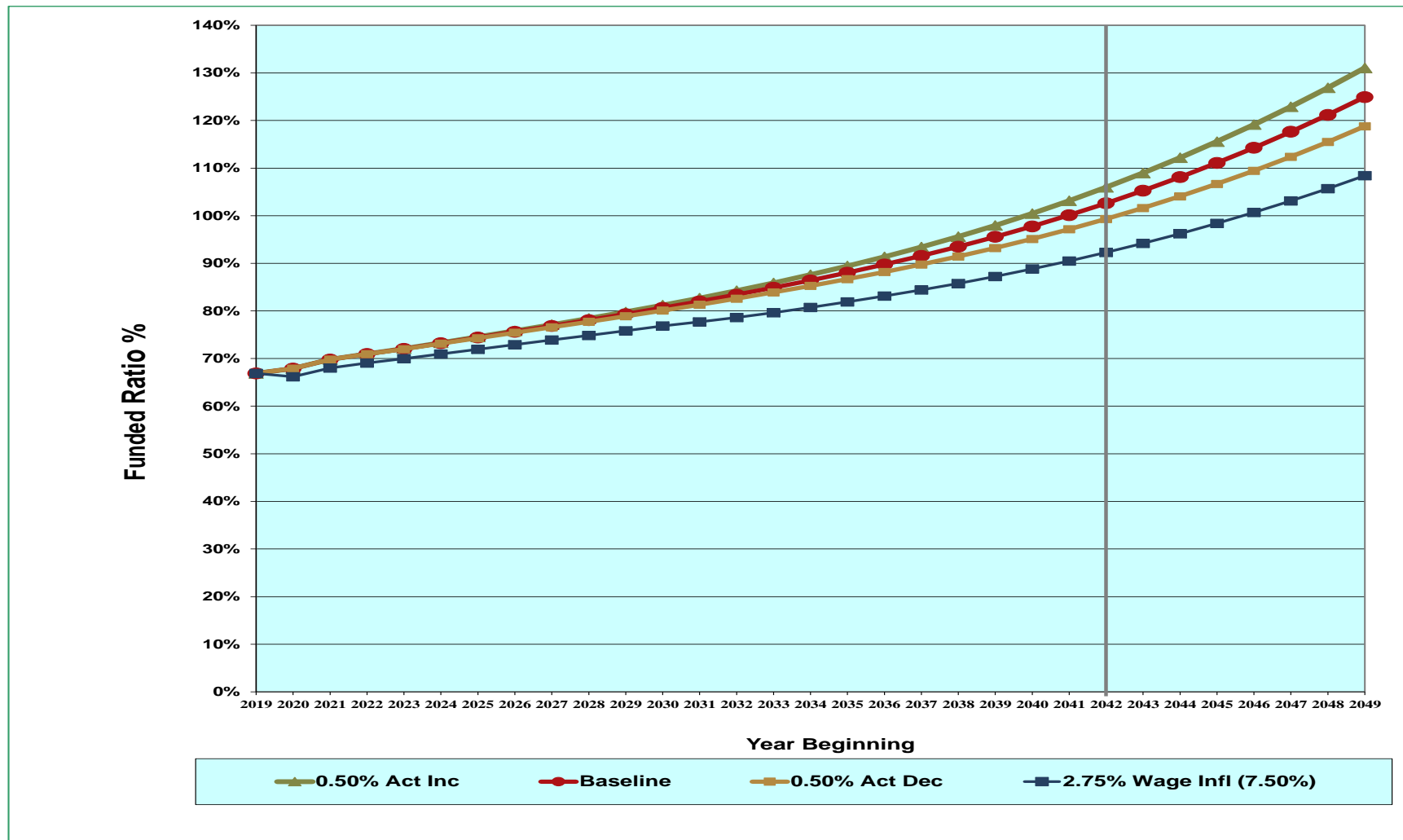
Section V – Sensitivity Analysis

Mississippi PERS – PERS Plan 30-Year Projection of Funded Ratio on Actuarial Asset Value Based on June 30, 2019 Valuation Results



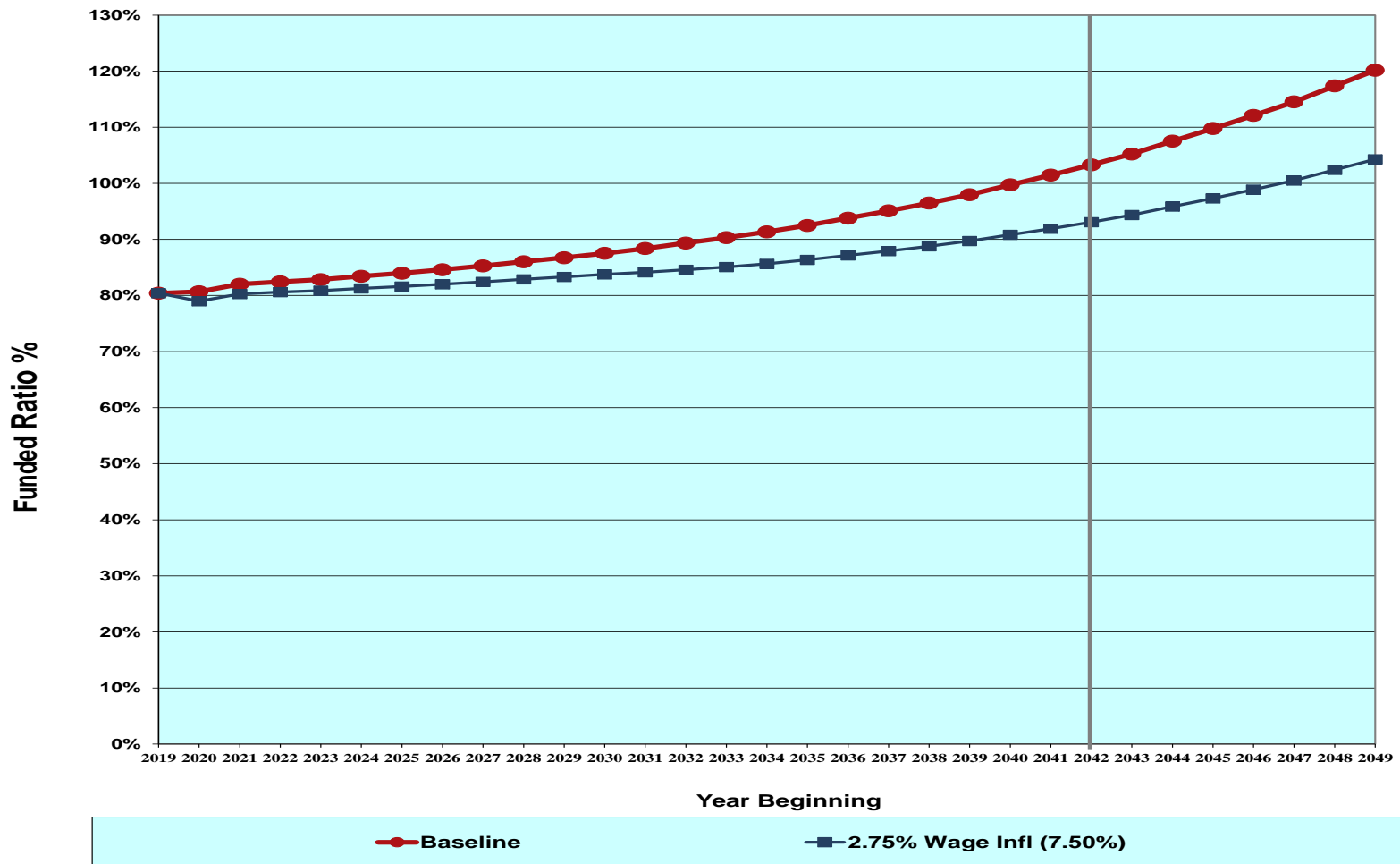
Section V – Sensitivity Analysis

Mississippi PERS – HSPRS Plan 30-Year Projection of Funded Ratio on Actuarial Asset Value Based on June 30, 2019 Valuation Results



Section V – Sensitivity Analysis

Mississippi PERS – SLRP Plan 30-Year Projection of Funded Ratio on Actuarial Asset Value Based on June 30, 2019 Valuation Results





Section VI – Conclusion

PERS

Utilizing the funding policy for PERS, with a fixed contribution rate as a percentage of annual compensation of 17.40% of payroll beginning July 1, 2019, the projection results for 2019 show that the Plan will have a “Green” light status for the funded ratio and cash flow metrics and have a “Yellow” status for the Actuarially Determined Contribution (ADC) metric. **This result meets the funding goals and benchmarks set by the Board in the current funding policy and no change in the PERS employer contribution rate is necessary at this time. However, if PERS was to experience some negative investment and/or demographic experience for the 2020 fiscal year, the ADC metric may be in “Red” status as of June 30, 2020.**

HSPRS

Utilizing the funding policy for HSPRS, with a fixed contribution rate of 49.08% of payroll for the length of the projection period, the projection results for 2019 show that the Plan will have a funded ratio of 102.6% in 2042. **This result meets the funding goals and benchmarks set by the Board in the current funding policy and no change in the HSPRS employer contribution rate is necessary at this time.**

SLRP

Utilizing the funding policy for SLRP, with a fixed contribution rate of 7.40% of payroll for the length of the projection period, the projection results for 2019 show that the Plan will have a funded ratio of 103.3% in 2042. **This result meets the funding goals and benchmarks set by the Board in the current funding policy and no change in the SLRP employer contribution rate is necessary at this time.**

Going forward, short-term variations, both positive and negative, are to be expected given the volatility inherent in the actual investment return from year to year and should not elicit extreme concern without further analysis. With the addition of several actuarial metrics and sensitivity to the projection results, the Board now has more information on the trend of funded ratios for each of the Systems when making decisions in the future.



Appendix A – PERS Actuarial Assumptions and Methods

INTEREST RATE: 7.75% per annum, compounded annually (net of investment expense only). The expected return on assets consists of 2.75% price inflation and 5.00% real rate of return.

SEPARATIONS FROM ACTIVE SERVICE: Representative values of the assumed rates of separation from active service are as follows:

Age	Annual Rates of					
	Withdrawal and Vesting*		Death**		Disability	
	Male	Female	Male	Female	Male	Female
20	26.50%	32.50%	0.0483%	0.0126%	0.010%	0.009%
25	18.50	18.50	0.0567	0.0189	0.012	0.011
30	11.75	12.00	0.0630	0.0259	0.017	0.014
35	8.50	8.75	0.0714	0.0350	0.036	0.017
40	6.75	7.00	0.0893	0.0483	0.110	0.070
45	6.25	6.00	0.1218	0.0665	0.230	0.140
50	6.25	6.00	0.1764	0.0917	0.290	0.220
55	6.25	6.00	0.2594	0.1274	0.500	0.380
60	6.25	6.00	0.3980	0.1757	0.530	0.410
65	6.25	6.00	0.6353	0.2429	0.200	0.150
70	6.25	6.00	1.1655	0.4739	0.200	0.150
74	6.25	6.00	1.8942	0.8092	0.200	0.150

Age	Annual Rates of Service Retirements			
	Male		Female	
	Under 25 Years of Service***	25 Years of Service and Over***	Under 25 Years of Service***	25 Years of Service and Over***
45		22.50%		18.00%
50		15.00		13.00
55		18.25		19.00
60	10.50%	19.50	13.25%	22.25
62	20.75	32.00	19.00	37.50
65	25.00	29.50	29.25	42.50
70	20.00	25.00	24.00	25.50
75	100.00	100.00	100.00	100.00

* For all ages, rates of 33.5% for 1st year of employment and 24.0% for 2nd year.

**Base Rates

*** For Tier 4 members, 30 years of service.



Appendix A – PERS Actuarial Assumptions and Methods

SALARY INCREASES: Representative values of the assumed annual rates of salary increases are as follows:

Service	Merit & Seniority	Annual Rates of Base (Economy)	Increase Next Year
0	15.25%	3.00%	18.25%
1	5.25	3.00	8.25
2	2.75	3.00	5.75
3	1.75	3.00	4.75
4	1.25	3.00	4.25
5-7	0.75	3.00	3.75
8-27	0.25	3.00	3.25
28 and Over	0.00	3.00	3.00

DEATH AFTER RETIREMENT: The mortality table, for post-retirement mortality, used in evaluating allowances to be paid is the PubS.H-2010(B) Retiree Table with the following adjustments:

- For males, 112% of male rates from ages 18 to 75 scaled down to 105% for ages 80 to 119.
- For females, 85% of the female rates from ages 18 to 65 scaled up to 102% for ages 75 to 119.
- Projection scale MP-2018 is used to project future improvements in life expectancy generationally.

The PubT.H-2010 Disabled Retiree Table is used for disabled retirees with the following adjustments - 137% of male rates at all ages and 115% of female rates at all ages. Projection scale MP-2018 is used to project future improvements in life expectancy generationally.

PAYROLL GROWTH: 3.00% per annum, compounded annually.

ADMINISTRATIVE EXPENSES: 0.25% of payroll.

TIMING OF DECREMENTS AND PAY INCREASES: Middle of Year.

ACTIVE MEMBER DISABILITY ASSUMPTION: 9% of active member disabilities are assumed to be in the line of duty and 91% of active member disabilities are assume to not be in the line of duty.

ACTIVE MEMBER DEATH ASSUMPTION: 6% of active deaths are assumed to be in the line of duty and 94% of active member deaths are assumed to not be in the line of duty.



Appendix A – PERS Actuarial Assumptions and Methods

ACTIVE MEMBER WITHDRAWAL ASSUMPTION: 60% of vested participants who terminate before retirement elect to receive a deferred benefit upon attaining the eligibility requirements for retirement. They are assumed to commence their benefit at age 60 for Tiers 1, 2 and 3 and age 62 for Tier 4. The remaining 40% elect to withdraw their contributions.

FINAL AVERAGE COMPENSATION: 0.25% load on the final average compensation produced by our valuation software.

MARRIAGE ASSUMPTION: 85% married with the husband three years older than his wife.

UNUSED SICK LEAVE: Assumed 0.50 years at retirement.

MILITARY SERVICE: Assumed that participants will have on average 0.25 years of military service at retirement.

MAXIMUM COVERED EARNINGS ASSUMPTION GROWTH: 3.00%.

AGE-LIMITED DISABILITY DECREMENTS: Assumed to turn off at age 60.

DEFERRED VESTEDS: Deferred vested benefits are assumed to commence at age 60 for Tiers 1, 2 and 3 and at age 65 for Tier 4.

ASSUMED INTEREST RATE ON EMPLOYEE CONTRIBUTIONS: 2.00%.

ASSET VALUATION METHOD: Actuarial value, as developed in Schedule A. The actuarial value of assets recognizes a portion of the difference between the market value of assets and the expected market value of assets, based on the assumed valuation rate of return. The amount recognized each year is 20% of the difference between market value and expected market value.



Appendix A – PERS Actuarial Assumptions and Methods

VALUATION METHOD: The valuation is prepared on the projected benefit basis, which is used to determine the present value of each member's expected benefit payable at retirement, disability or death. The calculations are based on the member's age, years of service, sex, compensation, expected future salary increases, and an assumed future interest earnings rate (currently 7.75%). The calculations consider the probability of a member's death or termination of employment prior to becoming eligible for a benefit and the probability of the member terminating with a service, disability, or survivor's benefit. The present value of the expected benefits payable to active members is added to the present value of the expected future payments to current benefit recipients to obtain the present value of all expected benefits payable to the present group of members and survivors.

The employer contributions required to support the benefits of PERS are determined following a level funding approach, and consist of a normal contribution and an accrued liability contribution.

The normal contribution is determined using the "entry age normal" method. Under this method, a calculation is made for pension benefits to determine the uniform and constant percentage rate of employer contribution which, if applied to the compensation of the average new member during the entire period of his anticipated covered service, would be required in addition to the contributions of the member to meet the cost of all benefits payable on his behalf.

The unfunded actuarial accrued liability is determined by subtracting the current assets and the present value of prospective employer normal contributions and member contributions from the present value of expected benefits to be paid from the PERS. The accrued liability contribution amortizes the balance of the unfunded actuarial accrued liability over a period of years from the valuation date.



Appendix B – HSPRS Actuarial Assumptions and Methods

INTEREST RATE: 7.75% per annum, compounded annually (net of investment expenses only). The expected return on assets consists of 2.75% price inflation and 5.00% real rate of return.

SEPARATIONS FROM ACTIVE SERVICE: Representative values of the assumed annual rates of separation from active service are as follows:

Age	Withdrawal and Vesting	Death*		Disability		Service Retirement**
		Males	Females	Non-Duty	Duty	
25	5.60%	0.06%	0.02%	0.07%	0.00%	5
30	4.00	0.06	0.03	0.09	0.01	10
35	3.00	0.07	0.04	0.12	0.04	15
40	2.00	0.09	0.05	0.15	0.05	20
45	1.00	0.12	0.07	0.22	0.05	25
50	1.00	0.18	0.09	0.38	0.04	30
55	0.00	0.26	0.13	0.68	0.01	35
60	0.00	0.40	0.18	1.16	0.00	40+

* Base Rates.

** The annual rate of service retirement is 100% at age 61.

It is assumed that a member will be granted 1¾ years of service credit for unused leave at termination of employment. In addition, it is assumed that, on average, ¼ year of service credit for peace-time military service will be granted to each member.



Appendix B – HSPRS Actuarial Assumptions and Methods

SALARY INCREASES: Representative values of the assumed annual rates of salary increases are as follows:

Age	Merit & Seniority	Annual Rates of	
		Base (Economy)	Increase Next Year
20	5.56%	3.00%	8.56%
25	2.31	3.00	5.31
30	1.49	3.00	4.49
35	1.49	3.00	4.49
40	1.49	3.00	4.49
45	1.00	3.00	4.00
50	0.50	3.00	3.50
55	0.50	3.00	3.50
60	0.00	3.00	3.00

DEATH AFTER RETIREMENT: The mortality table, for post-retirement mortality, used in evaluating allowances to be paid was the PubS.H-2010(B) Retiree Table with the following adjustments. For males, 112% of male rates from ages 18 to 75 scaled down to 105% for ages 80 to 119. For females, 85% of the female rates from ages 18 to 65 scaled up to 102% for ages 75 to 119. Projection scale MP-2018 is used to project future improvements in life expectancy generationally. The PubT.H-2010 Disabled Retiree Table for disabled retirees with the following adjustments – 137% of male rates at all ages and 115% of female rates at all ages was used for the period after disability retirement. Projection scale MP-2018 is used to project future improvements in life expectancy generationally. This assumption is used to measure the probabilities of each benefit payment being made after retirement.

PAYROLL GROWTH: 3.00% per annum, compounded annually.

ADMINISTRATIVE EXPENSES: 0.25% of payroll.

TIMING OF DECREMENT AND PAY INCREASES: Middle of Year.

ASSUMED INTEREST RATE ON EMPLOYEE CONTRIBUTIONS: 2.00%

MARRIAGE ASSUMPTION: 100% married with the husband three years older than his wife.

SURVIVING CHILD BENEFITS ASSUMPTION: A small load is applied for surviving children.



Appendix B – HSPRS Actuarial Assumptions and Methods

ASSET VALUATION METHOD: Actuarial value, as developed in Schedule A. The actuarial value of assets recognizes a portion of the difference between the market value of assets and the expected market value of assets, based on the assumed valuation rate of return. The amount recognized each year is 20% of the difference between market value and expected market value.

MAXIMUM COVERED EARNINGS ASSUMPTION GROWTH: 3.00%

MODIFIED CASH REFUND: Benefits were valued with a twelve year certain period for retirees and five year certain for active members to estimate the value of the modified cash refund feature.

VALUATION METHOD: The valuation is prepared on the projected benefit basis, which is used to determine the present value of each member's expected benefit payable at retirement, disability or death. The calculations are based on the member's age, years of service, sex, compensation, expected future salary increases, and an assumed future interest earnings rate (currently 7.75%). The calculations consider the probability of a member's death or termination of employment prior to becoming eligible for a benefit and the probability of the member terminating with a service, disability, or survivor's benefit. The present value of the expected benefits payable to active members is added to the present value of the expected future payments to current benefit recipients to obtain the present value of all expected benefits payable to the present group of members and survivors.

The employer contributions required to support the benefits of HSPRS are determined following a level funding approach, and consist of a normal contribution and an accrued liability contribution.

The normal contribution is determined using the "entry age normal" method. Under this method, a calculation is made for pension benefits to determine the uniform and constant percentage rate of employer contribution which, if applied to the compensation of the average new member during the entire period of his anticipated covered service, would be required in addition to the contributions of the member to meet the cost of all benefits payable on his behalf.

The unfunded actuarial accrued liability is determined by subtracting the current assets and the present value of prospective employer normal contributions and member contributions from the present value of expected benefits to be paid from the HSPRS. The accrued liability contribution amortizes the balance of the unfunded actuarial accrued liability over a period of years from the valuation date.



Appendix C – HSPRS History of Benefit Improvements

MISSISSIPPI HIGHWAY SAFETY PATROL RETIREMENT SYSTEM History of Benefit Modifications

Fiscal Year Beginning	Benefit Modifications
July 1, 1958	<ul style="list-style-type: none"> Mississippi Highway Safety Patrol Retirement System created.
July 1, 1966	<ul style="list-style-type: none"> Removed limit of \$200 per month for disability retirement payments. Eliminated reduction in retirement benefits resulting from Social Security payments. Provided same survivor benefits to disability retirant's beneficiaries as those provided for service retirant's beneficiaries.
July 1, 1974	<ul style="list-style-type: none"> Authorized military service credit (not to exceed 4 years maximum unless proof furnished member was retained by causes beyond his control).
July 1, 1975	<ul style="list-style-type: none"> Provided additional benefit payments (13th Checks) to retired patrolmen. Authorized payment of benefits to spouses and families of patrolmen who die after serving minimum period or who are killed in line of duty.
July 1, 1976	<ul style="list-style-type: none"> Provided benefits to widows of highway patrolmen who were killed in line of duty prior to enactment of highway patrol retirement system.
July 1, 1977	<ul style="list-style-type: none"> Provided that a highway patrolman who reenters service with the highway safety patrol may receive retirement credit for prior years upon repayment of amount refunded and interest from date of refund to repayment.
July 1, 1979	<ul style="list-style-type: none"> Provided guaranty of benefits and maximum retirement allowance in the highway safety patrol retirement system.
July 1, 1980	<ul style="list-style-type: none"> Provided a minimum service and disability retirement benefit for members of MHSPRS. Provided any member who served in maritime service during periods of hostility in WWII shall be allowed credit for maritime service. Provided all members who served in armed forces during war or military conflict or in maritime service during periods of hostility in WWII shall be allowed credit regardless of when they retired.
July 1, 1982	<ul style="list-style-type: none"> Provided employer pickup of member contributions. Increases additional payment (13th check) to 1/2 of annual percentage change of CPI not to exceed 2 1/2%.
July 1, 1984	<ul style="list-style-type: none"> Provided that unused leave shall be treated as creditable service under MHSPRS.
July 1, 1985	<ul style="list-style-type: none"> Increased 13th check to an amount equal to 2 1/2% of annual percentage change in CPI for years thru 6-30-85; and for subsequent years 100% of annual percentage change in CPI not to exceed 2 1/2%; provided an additional amount could be paid in increments of 1/4 of 1% to a maximum of 1 1/2% provided there were sufficient gains in excess of accrued liability.
July 1, 1986	<ul style="list-style-type: none"> Reduced to 5 years the required years to qualify to retire at age 55. Provided full retirement with 30 years creditable service regardless of age. Reduced the number of years which determine average compensation to 4 highest consecutive years.



Appendix C – HSPRS History of Benefit Improvements

Fiscal Year Beginning	Benefit Modifications
	<ul style="list-style-type: none"> • 3% reduction in retirement allowance shall apply to the lesser of: each year of age below age 55 or each year less 30 years of creditable service. • Provided retirement allowance shall not exceed 85% of average compensation. • Provided mandatory retirement and termination of membership at age 60. • Provided no monthly benefit payment may be made for a period of time in excess of that allowed by federal law. • Provided an ad hoc increase of 3% to retirees who retired prior to July 1, 1986, and average compensation was based on 5 consecutive years of earned compensation instead of 4. • Provided that a retiree may elect by an irrevocable agreement to receive additional payment (13th check) in equal installments not to exceed 6 months. • Amended section 25-13-13 on death benefits to conform to section 25-13-11 allowing 5 year vesting by deleting 10 year requirement. • Provided a one-time early retirement for any member who had at least 20 years of creditable service; exempted early service retirement allowance from the 3% reduction if member is below age 55; allowance was based on current fiscal year's salary.
July 1, 1989	<ul style="list-style-type: none"> • Provided survivor benefits from day one of employment to a spouse and/or dependent children of a member who is either killed in the line of performance of duty or dies as a direct result.
July 1, 1990	<ul style="list-style-type: none"> • Amended section 25-13-11 to reduce from 30 to 25 numbers of years required for full retirement regardless of age. • Provided a 10% ad hoc increase in annual retirement allowance to retired members and beneficiaries with minimum benefits of \$500.00 if retired with 15 or more years of service credit; \$300.00 per month if retired with 10 or more but less than 15 years credit; \$250.00 per month to anyone with less than 10 years credit; beneficiaries to receive a minimum of \$250.00 per month. • Established options for service and disability retirees retiring 7-1-90 or later. • Provided an active member qualified for retirement may pre-select an option. • Provided option selection will take precedence over automatic survivor benefits.
July 1, 1991	<ul style="list-style-type: none"> • Allowed sworn agents of MS Bureau of Narcotics, who were employed by such bureau prior to December 1, 1990, regardless of age, may be employed as enforcement officers, if they meet all other qualifications. Those employed retain all compensatory, personal and sick leave accrued; • Provided cost-of-living payment (13th check) shall be cumulative to conform to PERS law. • Provided regular interest shall be credited annually to member's employee contribution account.
July 1, 1992	<ul style="list-style-type: none"> • Provided benefits to dependent children to age 23 if they remain in school.
July 1, 1997	<ul style="list-style-type: none"> • Allowed retired Highway Patrolmen to irrevocably elect to have COLA (13th check) paid in twelve (12) equal installments.



Appendix C – HSPRS History of Benefit Improvements

Fiscal Year Beginning	Benefit Modifications
July 1, 1999	<ul style="list-style-type: none"> • Provide that if the member and beneficiary die before having received in benefits an amount equal to the total of the contributions and accrued interest of the member at the time of death, that the balance will be refunded to the designated beneficiary or by statutory succession. • Provided that payment of death benefits shall be in accordance with the statutory provisions set forth as of the date of death of the member. • Authorized a retiree who retired before or after July 1, 1999, to be eligible for the same “pop-up” and “pop-down” provisions of PERS; and recalculates the benefits of those retirees who selected Option 5 “pop-up” protection. • Authorized an ad hoc benefit adjustment to each member of the Mississippi Highway Safety Patrol Retirement System (MHSPRS) retired on or before July 1, 1999, in the amount of \$3.50 per month for each full fiscal year of retirement through June 30, 1999, plus \$1.00 per month for each year of service credit used in the calculation of benefits. • Removed from consideration in the base COLA the requirement that the Consumer Price Index (CPI) have increased by at least 2 ½%. • Provided that a prorated portion of the annual adjustment will be paid to the beneficiary or estate of any member or beneficiary who is receiving the annual adjustment in a lump sum, but who dies between July 1 and December 1 in those cases where no more monthly benefits will be paid after the member’s or beneficiary’s death. This prorated portion will be equal to the amount that such recipient would have received had he or she elected to receive the annual adjustment for the year on a monthly basis.
July 1, 2000	<ul style="list-style-type: none"> • Deleted the maximum option where no additional benefits are payable after death. The statute retains Option 9, which provides a maximum option with a 50% survivor benefit with no reduction in the member's retirement allowance. • Provided for a new retirement option that would allow a member who is eligible for an <u>unreduced retirement benefit</u> to select a partial lump-sum option at retirement. • Allowed the Cost of Living Adjustment to be calculated on <u>all</u> full fiscal years in retirement, not just the years since the retirant's last retirement. • Provided for the same service credit for active duty, as is allowed in PERS and is no longer limited to active duty service during times of conflict. This amendment applies to all persons who have retired from the Highway Patrol and who qualify for such credit, whether they retired before or after July 1, 2000. This provision, however, did not require any back payments. • Changed the maximum limitation on the retirement benefit from 85% of the average compensation regardless of the years of service to 100% of the average compensation.
July 1, 2002	<ul style="list-style-type: none"> • Provided that Option 4-C, Social Security Leveling Option, will no longer be available to members retiring on or after July 1, 2004. • Provided that any member who has five years of service (reduced from 10 years) may apply for a regular non-duty related disability retirement allowance.



Appendix C – HSPRS History of Benefit Improvements

Fiscal Year Beginning	Benefit Modifications
	<ul style="list-style-type: none"> • Provided for a compounded COLA, based on 3% of the retirement allowance for each full fiscal year in retirement with the 3% compounding beginning at age 60; to further provide that the age at which the compounding begins will be reduced gradually to age 55 as such can be accomplished without causing the unfunded accrued liability amortization period to exceed 20 years; to further provide that a pro-rated share of the lump-sum COLA will be paid if a benefit terminates before December 1 of the fiscal year. Also, allows the Board to grant a change in the manner the COLA is paid if a hardship is shown.
July 1, 2004	<ul style="list-style-type: none"> • Conformed the MHSPRS COLA section (except for the age of compounding) to the provisions in PERS. • Eliminated the re-marriage penalty which terminates a spouse's benefit, currently provided in subsections (1) and (3), upon his/her remarriage. This amendment also allows those spouses whose benefits have been previously terminated to apply to have the benefits reinstated prospectively.
July 1, 2008	<ul style="list-style-type: none"> • Allowed a retroactive effective date (up to 3 months) for retirees who revert from Option 2 or Option 4A to the maximum option following the death of the named beneficiary.
July 1, 2011	<ul style="list-style-type: none"> • Option 4, a 75% joint and survivor annuity, made available to members who retire on or after July 1, 2011 • For members hired on or after July 1, 2011, the mandatory retirement age was increased from age 60 to age 63.
July 1, 2016	<ul style="list-style-type: none"> • The interest rate on employee contributions shall be calculated based on the money market rate as published by the Wall Street Journal on December 31 of each preceding year with a minimum rate of one percent and a maximum rate of five percent. • The early retirement formula shall be reduced by an actuarially determined percentage or factor (rather than a fixed 3%) for each year of age below 55 or for each year of service below 25, whichever is less.



Appendix D – SLRP Actuarial Assumptions and Methods

INTEREST RATE: 7.75% per annum, compounded annually (net of investment expenses only). The expected return on assets consists of 2.75% price inflation and 5.00% real rate of return.

SEPARATIONS FROM ACTIVE SERVICE: Representative values of the assumed rates of separation from active service are as follows:

Age	Annual Rate of		
	Male	Female	Disability**
20	0.05%	0.01%	0.04%
25	0.06	0.02	0.05
30	0.06	0.03	0.07
35	0.07	0.04	0.11
40	0.09	0.05	0.17
45	0.12	0.07	0.23
50	0.18	0.09	0.30
55	0.26	0.13	0.35
60	0.40	0.18	0.40
65	0.64	0.24	0.00
70	1.17	0.47	0.00
75	2.14	0.92	0.00

* Base rates.

** 93% are presumed to be non-duty related, and 7% are assumed to be duty related.

WITHDRAWAL AND VESTING: 20% in an election year, none in a non-election year.

SERVICE RETIREMENT: 30% in an election year, none in a non-election year. All members are assumed to retire no later than age 80.

It is assumed that a member will be granted 2.5 years of service credit for unused leave at termination of employment.

SALARY INCREASES: 3.00% per annum, for all ages.



Appendix D – SLRP Actuarial Assumptions and Methods

DEATH AFTER RETIREMENT: The mortality table, for post-retirement mortality, used in evaluating allowances to be paid was the PubS.H-2010(B) Retiree Table with the following adjustments. For males, 112% of male rates from ages 18 to 75 scaled down to 105% for ages 80 to 119. For females, 85% of the female rates from ages 18 to 65 scaled up to 102% for ages 75 to 119. Projection scale MP-2018 is used to project future improvements in life expectancy generationally. The PubT.H-2010 Disabled Retiree Table for disabled retirees with the following adjustments – 137% of male rates at all ages and 115% of female rates at all ages was used for the period after disability retirement. Projection scale MP-2018 is used to project future improvements in life expectancy generationally. This assumption is used to measure the probabilities of each benefit payment being made after retirement.

PAYROLL GROWTH: 3.00% per annum, compounded annually.

ADMINISTRATIVE EXPENSES: 0.25% of payroll.

TIMING OF DECREMENTS AND PAY INCREASES: Middle of Year.

ASSUMED INTEREST RATE ON EMPLOYEE CONTRIBUTIONS: 2.00%

MARRIAGE ASSUMPTION: 85% married with the husband three years older than his wife.

ASSET VALUATION METHOD: Actuarial value, as developed in Schedule A. The actuarial value of assets recognizes a portion of the difference between the market value of assets and the expected market value of assets, based on the assumed valuation rate of return. The amount recognized each year is 20% of the difference between market value and expected market value.

MAXIMUM COVERED EARNINGS ASSUMPTION GROWTH: 3.00%

MODIFIED CASH REFUND: Benefits were valued with a six year certain period for retirees and a five year certain period for active members to estimate the value of the modified cash refund feature.



Appendix D – SLRP Actuarial Assumptions and Methods

VALUATION METHOD: The valuation is prepared on the projected benefit basis, which is used to determine the present value of each member's expected benefit payable at retirement, disability or death. The calculations are based on the member's age, years of service, sex, compensation, expected future salary increases, and an assumed future interest earnings rate (currently 7.75%). The calculations consider the probability of a member's death or termination of employment prior to becoming eligible for a benefit and the probability of the member terminating with a service, disability, or survivor's benefit. The present value of the expected benefits payable to active members is added to the present value of the expected future payments to current benefit recipients to obtain the present value of all expected benefits payable to the present group of members and survivors.

The employer contributions required to support the benefits of SLRP are determined following a level funding approach, and consist of a normal contribution and an accrued liability contribution.

The normal contribution is determined using the "entry age normal" method. Under this method, a calculation is made for pension benefits to determine the uniform and constant percentage rate of employer contribution which, if applied to the compensation of the average new member during the entire period of his anticipated covered service, would be required in addition to the contributions of the member to meet the cost of all benefits payable on his behalf.

The unfunded actuarial accrued liability is determined by subtracting the current assets and the present value of prospective employer normal contributions and member contributions from the present value of expected benefits to be paid from the SLRP. The accrued liability contribution amortizes the balance of the unfunded actuarial accrued liability over a period of years from the valuation date.



Appendix E – Board Funding Policies

Funding Policy for PERS

The purpose of the funding policy is to state the overall funding goals and objectives for the Public Employees' Retirement System of Mississippi (PERS), and to document both the metrics that will be used to measure progress toward achieving those goals, and the methods and assumptions employed to develop the metrics.

The employer contribution rate for PERS will be set based on the metrics, assumptions and methods outlined in Section II and III of this policy.

I. Funding Goals and Objectives

The objective in requiring employer and member contributions to PERS is to accumulate sufficient assets during a member's employment to fully finance the benefits the member will receive in retirement. In meeting this objective, PERS will strive to meet the following goals:

- Preservation of the defined benefit structure for providing lifetime benefits to the PERS membership,
- Contribution rate stability as a percentage of payroll (Fixed Contribution Rate – FCR),
- Maintain an increasing trend in the funded ratio over the projection period with an ultimate goal of being 100% funded,
- Require clear reporting and risk analysis of the metrics by the actuary as outlined in Section II of this policy using a “Signal Light” approach to assist the Board in determining whether increases or decreases are needed in the employer contribution rate, and
- Ensure benefit improvements are funded through increases in contribution requirements in accordance with Article 14, S 272A, of the Mississippi Constitution.

II. Metrics

To track progress in achieving the outlined funding goals and objectives and to assist the Board in making a determination whether an increase or decrease in the employer contribution rate for PERS should be considered, certain metrics will be measured annually in conjunction with information provided in the actuarial valuation and projection report. As part of the annual valuation and projection reports, each metric will be calculated and assigned a “Signal Light” with the following definitions:

Status	Definition
Green	Plan passes metric and PERS' funding goals and objectives are achieved
Yellow	Plan passes metric but a warning is issued that negative experience may lead to failing status
Red	Plan fails metric and PERS must consider contribution increases



Appendix E – Board Funding Policies

If any one of the metrics are in the Red Signal Light status in conjunction with the annual valuation report and the projection report-the actuary will determine and recommend to the Board an employer contribution rate increase to consider that is sufficient enough to get all three metrics back into the Green Signal Light status. The employer contribution rate increase would be effective for the July 1st, 18 months following the completion of the projection report (e.g. if the projection report in 2019 deems an increase to be considered, then it would be effective for July 1, 2021).

The following metrics will be measured:

- **Funded Ratio** – Funded Ratio is defined as the actuarial value of assets divided by the actuarial accrued liability. One of the funding goals is to have an increasing funded ratio over the projection period with an ultimate goal of having a 100 percent funded ratio. The Board sets the Signal Light definition as follows:

Status	Definition
Green	Funded Ratio above 80% in 2047
Yellow	Funded Ratio between 65% and 80% in 2047
Red	Funded Ratio below 65% in 2047

- **Cash flow as a percentage of assets** – Cash flow as a percentage of assets is defined as the difference between total contributions coming into the trust and the benefit payments made to retirees and beneficiaries going out of the trust as a percentage of beginning year market value of assets. Over the projection period, this percentage will fluctuate from year to year so for Signal Light testing, the net cash flow percentage over the entire projection period will be tested. The Board sets the Signal Light definition as follows:

Status	Definition
Green	Net Cash Flow Percentage above negative 6.00% (-6.00%) during the projection period
Yellow	Net Cash Flow Percentage between negative 6.00% (-6.00%) and negative 7.75% (-7.75%) during the projection period
Red	Net Cash Flow Percentage below negative 7.75% (-7.75%) during the projection period



Appendix E – Board Funding Policies

- **Actuarially Determined Contribution (ADC)** – ADC is defined as the contribution requirement determined by the actuary using a contribution allocation procedure based on the principal elements disclosed in Section III of this funding policy:
 1. Actuarial Cost Method
 2. Asset Smoothing Method
 3. Amortization Method

The calculation of the ADC will be determined during the actuarial valuation and not during the projection report. The ratio of the ADC to the fixed contribution rate (ADC/FCR) as set by this Funding Policy will be tested.

The Board sets the Signal Light definition as follows:

Status	Definition
Green	ADC ratio at or below 100% of fixed contribution rate at valuation date
Yellow	ADC ratio between 100% and 110% of fixed contribution rate at valuation date
Red	ADC ratio above 110% of fixed contribution rate at valuation date

III. Assumptions and Methods

Each year, the actuary will perform an actuarial valuation and projection report for funding purposes. During the process, the actuary shall calculate all the metrics listed in Section II of this funding policy and PERS' Signal Light status for each metric. The following three major components of a funding valuation will be used:

- **Actuarial Cost Method** – This component determines the attribution method upon which the cost/liability of the retirement benefits are allocated to a given period, defining the normal cost or annual accrual rate associated with projected benefits. The Entry Age Normal Cost Method (EAN) is to be used for determination of the normal cost rate and the actuarial accrued liability for purposes of calculating the Actuarial Determined Contribution (ADC).
- **Asset Valuation Method** – This component dictates the method by which the asset value, used in the determination of the Unfunded Actuarial Accrued Liability (UAAL) and Funded Ratio, is determined. The asset valuation method to be used shall be a five-year smoothed market value of assets. The difference between the actual market value investment returns and the expected market investment returns is recognized equally over a five-year period.
- **Amortization Method** – This component prescribes, in terms of duration and pattern, the systematic manner in which the difference between the accrued liability and the actuarial value of assets is reduced. For purposes of calculating the ADC metric, the following amortization method assumptions are used:
 - I. Once established for any component of the UAAL, the amortization period for that component will be closed and will decrease by one year annually.



Appendix E – Board Funding Policies

- II. The amortization payment will be determined on a level percentage of pay basis.
 - III. The length of the amortization periods will be as follows:
 - a. Existing UAAL on June 30, 2018 – 30 years.
 - b. Annual future actuarial experience gains and losses, assumption changes or benefit enhancements or reductions – 25 years from the date of the valuation.
 - IV. If any future annual actuarial valuation indicates that PERS has a negative UAAL, the ADC shall be set equal to the Normal Cost.
- **Actuarial Assumptions** – The actuarial assumptions are used to develop the annual and projected actuarial metrics, as well as the ADC rates. The actuarial assumptions are derived and proposed by the actuary and adopted by the PERS' Board in conformity with the *Actuarial Standards of Practice*. The actuarial assumptions for this funding policy were developed using the experience for the four-year period ending June 30, 2018 (State of Mississippi Retirement Systems Experience Investigation for the Four-Year Period Ending June 30, 2018). The long-term investment return assumption adopted by the PERS' Board in conjunction with the experience investigation is 7.75 percent and will be reduced until it reaches the rate recommended by the actuary in the most recent experience study using investment gains based on the following parameters:
 - 2% Excess return over assumed rate, lower assumption by 5 basis points,
 - 5% Excess return over assumed rate, lower assumption by 10 basis points,
 - 8% Excess return over assumed rate, lower assumption by 15 basis points,
 - 12% Excess return over assumed rate, lower assumption by 20 basis points.

IV. Governance Policy/Process

Below is a list of specific actuarial and funding related studies, the frequency at which they should be commissioned by the Board and additional responsibilities related to each:

- **Actuarial Valuation (performed annually)** – The Board is responsible for the review of PERS' annual actuarial valuation report, which provides the annual funded ratio and the calculation of the ADC.
- **Projection Report (performed annually)** – The Board is responsible for the review of PERS' 30-year projection report, which will include the actuarial metrics and Signal Light status for each metric over a 30-year period.
- **Experience Analysis (performed every two years on a rolling four-year)** – The Board is responsible for ensuring that an experience analysis is performed as prescribed, review of the results of the study, and approving the actuarial assumptions and methodologies to be used for all actuarial purposes relating to the defined benefit pension plan.
- **Actuarial Audit (performed at least every five years)** – The Board is responsible for the review of an audit report performed by a new actuarial firm to provide a critique of the reasonableness of the actuarial methods and assumptions in use and the resulting actuarially computed liabilities and contribution rates.
- **Funding Policy Review (performed at least annually)** – The Board is responsible for the periodic review of this policy, but at least annually following the Projection Report and biennially following the Experience Analysis.



Appendix E – Board Funding Policies

V. Glossary of Funding Policy Terms

- **Actuarial Accrued Liability (AAL):** The AAL is the value at a particular point in time of all past normal costs. This is the amount of assets the plan would have today if the current plan provisions, actuarial assumptions, and participant data had always been in effect, contributions equal to the normal cost had been made, and all actuarial assumptions had been met.
- **Actuarial Cost Method:** The actuarial cost method allocates a portion of the total cost (present value of benefits) to each year of service, both past service and future service.
- **Actuarial Determined Contribution (ADC):** The potential payment to the plan as determined by the actuary using a contribution allocation procedure that, if contributed consistently and combined with investment earnings, would be sufficient to pay promised benefits in full over the long term. The ADC may or may not be the amount actually paid by the plan sponsor or other contributing entity.
- **Asset Values:**
 - **Actuarial Value of Assets (AVA):** The AVA is the market value of assets less the deferred investment gains or losses not yet recognized by the asset smoothing method.
 - **Market Value of Assets (MVA):** The MVA is the fair value of assets of the plan as reported in the plan's audited financial statements.
- **Entry Age Normal Actuarial Cost Method (EAN):** The EAN actuarial cost method is a funding method that calculates the normal cost as a level percentage of pay or level dollar amount over the working lifetime of the plan's members.
- **Funded Ratio:** The funded ratio is the ratio of the plan assets to the plan's actuarial accrued liabilities.
 - **Actuarial Value Funded Ratio:** is the ratio of the AVA to the AAL.
- **Normal Cost:** The normal cost is the cost allocated under the actuarial cost method to each year of active member service.
- **Present Value of Benefits (PVB) or total cost:** The PVB is the value at a particular point in time of all projected future benefit payments for current plan members. The future benefit payments and the value of those payments are determined using actuarial assumptions regarding future events. Examples of these assumptions are estimates of retirement and termination patterns, salary increases, investment returns, etc.
- **Surplus:** A surplus refers to the positive difference, if any, between the AVA and the AAL.
- **Unfunded Actuarial Accrued Liability (UAAL):** The UAAL is the portion of the AAL that is not currently covered by the AVA. It is the positive difference between the AAL and the AVA.
- **Valuation Date:** The valuation date is the annual date upon which an actuarial valuation is performed; meaning that the trust assets and liabilities of the plan are valued as of that date. PERS' annual valuation date is June 30.



Appendix E – Board Funding Policies

Funding Policy for SLRP

The purpose of the funding policy is to state the overall funding goals for the Supplemental Legislative Retirement Plan (referred to as "System" in this policy), the benchmarks that will be used to measure progress in achieving those goals, and the methods and assumptions that will be employed to develop the benchmarks.

The policy refers to pension benefits and does not address retiree healthcare benefits that may be provided under statute in the future. In addition to periodic reviews of this policy, the Board will amend the policy if retiree healthcare benefits become payable.

I. Funding Goals

The objective in requiring employer and member contributions to the System is to accumulate sufficient assets during a member's employment to fully finance the benefits the member receives throughout retirement. In meeting this objective, the System will strive to meet the following funding goals:

- To maintain an increasing ratio of system assets to accrued liabilities and reach an 80 percent minimum funded ratio in 2042;
- To maintain adequate asset levels to finance the benefits promised to members;
- To develop a pattern of stable contribution rates when expressed as a percentage of member payroll as measured by valuations prepared in accordance with the principles of practice prescribed by the Actuarial Standards Board, with a minimum employer contribution equal to the normal cost determined under the Entry Age Normal funding method;
- To provide intergenerational equity for taxpayers with respect to System costs; and
- To fund benefit improvements through increases in contribution rates in accordance with Article 14, § 272A, of the Mississippi Constitution.

II. Benchmarks

To track progress in achieving the previously outlined funding goals, the following benchmarks will be measured annually as of the actuarial valuation date (with due recognition that a single year's results may not be indicative of long-term trends):

- **Funded ratio** - The funded ratio, defined as the actuarial value of System assets divided by the System's actuarial accrued liability, should be increasing over time, before adjustments for changes in benefits, actuarial methods, and/or actuarial assumptions, with a target of at least 80 percent in 2042. If the projected funded ratio is less than 60 percent in 2042 or if the projected funded ratio is projected



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to be less than 75 percent in 2042 following two consecutive annual projection reports, a contribution rate increase will be determined that is sufficient to generate a funded ratio of 85 percent in 2042. If a funded ratio of 100 percent or more is attained, and is projected to remain above 100 percent for the ensuing 30 years following two consecutive annual projection reports, a reduced contribution pattern will be established provided the projected funded ratio remains at or above 100 percent in every future year.

- **Contribution rate history** - Employer and member contribution rates should be level from year to year when expressed as a percent of active member payroll unless the projected funded ratio reaches a level that triggers a change in contribution rates. The initial employer contribution rates for the Supplemental Legislative Retirement Plan (SLRP) set under this policy, as revised October 23, 2012, will be 7.40 percent of active member payroll effective July 1, 2013.
- **Unfunded Actuarial Accrued Liability (UAAL) amortization period** - The amortization period for the System's UAAL should be declining over time.

III. Methods and Assumptions

The actuarial funding method used to develop the benchmarks will be entry age normal. The method used to develop the actuarial value of assets will recognize the underlying market value of the assets by spreading each year's unanticipated investment income (gains and losses) over a five-year smoothing period (20 percent per year) as adopted by the Board.

The actuarial assumptions used will be those last adopted by the Board based upon the advice and recommendation of the System's actuary. The actuary shall conduct an investigation into the system's experience at least every two years on a rolling four year basis, and utilize the results of the investigation to form the basis for those recommendations.

The Board will have an audit of the System's actuarial valuation results conducted by an independent actuary at least every six years. The purpose of such a review is to provide a critique of the reasonableness of the actuarial methods and assumptions in use and the resulting actuarially computed liabilities and contribution rates.



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IV. Funding Policy Review

The funding policy components and triggers will be reviewed annually following the annual actuarial valuation and in conjunction with the annual projection report and will be amended as necessary following each experience investigation conducted by the Board.



Appendix E – Board Funding Policies

Funding Policy for HSPRS

The purpose of the funding policy is to state the overall funding goals for the Mississippi Highway Safety Patrol Retirement System (System), the benchmarks that will be used to measure progress in achieving those goals, and the methods and assumptions that will be employed to develop the benchmarks.

I. Funding Goals

The objective in requiring employer and member contributions is to accumulate sufficient assets during a member's employment to fully finance the benefits the member receives throughout retirement. In meeting this objective, the System will strive to meet the following funding goals:

- To maintain an increasing ratio of System assets to accrued liabilities and reach an 80 percent minimum funded ratio in 2042;
- To maintain adequate asset levels to finance the benefits promised to members;
- To develop a pattern of stable contribution rates when expressed as a percentage of member payroll as measured by valuations prepared in accordance with the principles of practice prescribed by the Actuarial Standards Board, with a minimum employer contribution equal to the normal cost determined under the Entry Age Normal funding method;
- To provide intergenerational equity for taxpayers with respect to system costs; and
- To fund benefit improvements through increases in contribution rates in accordance with Article 14, § 272A, of the Mississippi Constitution.

II. Benchmarks

To track progress in achieving the previously outlined funding goals, the following benchmarks will be measured annually as of the actuarial valuation date (with due recognition that a single year's results may not be indicative of long-term trends):

- **Funded ratio** - The funded ratio, defined as the actuarial value of System assets divided by the System's actuarial accrued liability, should be increasing over time before adjustments for changes in benefits, actuarial methods, and/or actuarial assumptions, with a target of at least 80 percent in 2042. If the funded ratio is projected to be less than 60 percent in 2042 or if the funded ratio is projected to be less than 70 percent following three consecutive annual projection reports, a contribution rate increase will be determined that is sufficient to generate a funded ratio of 90 percent in 2042. If a funded ratio of 100 percent or more is attained, and is projected to remain above 100 percent for the ensuing 30 years following three consecutive annual projection reports, a reduced contribution pattern



Appendix E – Board Funding Policies

will be established provided the projected funded ratio remains at or above 100 percent in every future year.

- **Contribution rate history** - Employer and member contribution rates should be level from year to year when expressed as a percent of active member payroll unless the projected funded reaches a level that triggers a change in contribution rates. The initial employer contribution rate set under this policy as revised June 19, 2013 is 37.00 percent of active member payroll effective July 1, 2013. This contribution rate will increase to 49.08 percent of active member payroll effective July 1, 2018.
- **Unfunded Actuarial Accrued Liability (UAAL) amortization period** - The amortization period for the System's UAAL should be declining over time.

III. Methods and Assumptions

The actuarial funding method used to develop the benchmarks will be entry age normal. The method used to develop the actuarial value of assets will recognize the underlying market value of the assets by spreading each year's unanticipated investment income (gains and losses) over a five-year smoothing period (20 percent per year), as adopted by the Board of Trustees of the Public Employees' Retirement System of Mississippi (PERS).

The actuarial assumptions used will be those last adopted by the PERS Board based upon the advice and recommendation of the System's actuary. The actuary shall conduct an investigation into the System's experience at least every two years on a rolling four-year basis, and utilize the results of the investigation to form the basis for those recommendations.

The PERS Board will have an audit of the System's actuarial valuation results conducted by an independent actuary at least every six years. The purpose of such a review is to provide a critique of the reasonableness of the actuarial methods and assumptions in use and the resulting actuarially computed liabilities and contribution rates.

IV. Funding Policy Review

The funding policy components and triggers will be reviewed annually following the annual actuarial valuation and in conjunction with the annual projection report and will be amended as necessary following each experience investigation conducted by the Board.