



August 26, 2019

Ms. Bethany Rhodes, Director
Ohio Retirement Study Council
Rhodes State Office Tower
30 East Broad Street, 2nd Floor
Columbus, OH 43215

Dear Ms. Rhodes:

In accordance with Ohio Revised Code Section 5505.12(A), I am attaching the actuarial valuation of the Highway Patrol Retirement System at December 31, 2018.

If you have any questions, please contact me.

Sincerely,

Mark R. Atkeson
Executive Director
direct dial 614.430.3557
matkeson@ohprs.org

cc: The Honorable Mike DeWine, Governor
The Ohio Retirement Study Council
Director Kimberly Murnieks, Office of Budget and Management
The Honorable Larry Householder, Speaker of the House
The Honorable Larry Obhof, Senate President
The Honorable Kirk Schuring, Chair, Ohio Retirement Study Council
The Honorable Bill Reineke, Vice-Chair, House Aging & Long Term Care
The Honorable Joe Uecker, Chair, Senate Local Government, Public Safety & Veterans Affairs

Ohio State Highway Patrol Retirement System

Annual Actuarial Valuation Report
December 31, 2018



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August 16, 2019

Retirement Board
Ohio State Highway Patrol Retirement System
Columbus, Ohio

Ladies and Gentlemen:

The results of the regular annual **actuarial valuation as of December 31, 2018** of the Ohio State Highway Patrol Retirement System (HPRS), as established by Chapter 5505 of the Revised Code, are presented in this report.

The purposes of the valuation are as follows:

- Measure the financial position of HPRS;
- Assist the Board in establishing employer and employee contribution rates necessary to fund the benefits provided by HPRS;
- Determine the number of years required to amortize the pension unfunded actuarial accrued liabilities based upon established contribution rates; and
- Provide actuarial reporting and disclosure information for the System's financial report, and analyze the experience of the System over the past year.

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

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

Your Executive Director furnished the member statistical data required for the valuation, together with pertinent data on financial operations. We checked for internal and year-to-year consistency, but did not audit the data. We are not responsible for the accuracy or completeness of the data.

Your attention is directed particularly to the summary of results, comments and recommendations on pages 3 through 5.

The actuarial calculations were performed in accordance with accepted actuarial procedures. The calculations were based upon provisions of the Retirement System described in Section A.


The financial assumptions used in making the valuations are shown in Section F of this report. Assumptions concerning future experience are needed for computing employer contribution rates. As time passes and actual experience develops, assumed and actual experiences are compared. From time to time one or more of the assumptions about the future are changed by the Board after consulting with the actuary. The assumptions used in performing the 2018 valuation were adopted by the Board in conjunction with a five-year experience investigation for the period ending December 31, 2014 and updated in conjunction with an assumption review performed in between the December 31, 2017 and December 31, 2018 actuarial valuation.

The cooperation of the Executive Director and staff in furnishing materials requested for this valuation, and the complete and excellent condition of the records, is acknowledged with appreciation.

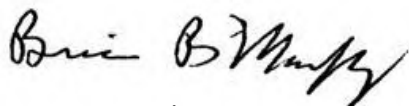
The signing actuaries are independent of the plan sponsor.

Mita D. Drazilov and Brian B. Murphy are Members of the American Academy of Actuaries (MAAA), and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein.

Respectfully submitted,



Mita D. Drazilov, ASA, FCA, MAAA



Brian B. Murphy, FSA, EA, FCA, MAAA, PhD

MDD/BBM:sc



December 31, 2018

Summary of Results, Comments and Recommendations

Ohio Revised Code Section 5505.15 provides in part as follows:

(B) The state shall annually pay into the employer accumulation fund, in monthly or less frequent installments as the state highway patrol retirement board requires, the employer contribution. The employer contribution shall be an amount equal to twenty-six and one-half percent of the total salaries paid to contributing members.

With the enactment of Senate Bill 345, the Board has the discretion to set the member contribution rate and the Cost of Living Allowance (COLA) percentage to comply with the amortization requirement of Section 5505.121 of the Revised Code. The results presented in this report are based upon the Board decision to adopt a member contribution rate of 14.0% and a COLA rate of 0.0% beginning in calendar year 2020 and thereafter (a member contribution rate of 12.5% and a COLA rate of 1.25% were assumed for calendar year 2019). The purpose of this report is to provide information on the results of the December 31, 2018 actuarial valuation based upon these decisions.

The **total employer contribution rate** is 26.50% of payroll, as established by Statute. The breakdown between employer, employee, pension and health used for this valuation is shown below:

	Contribution Rates Expressed as a % of Active Payroll		
	Retirement, Survivor & Disability Allowances	Post-Retirement Health Care	Totals
Employer	26.50%	0.00%	26.50%
Employee	14.00%	0.00%	14.00%
Totals	40.50%	0.00%	40.50%

December 31, 2018

Summary of Results, Comments and Recommendations (Continued)

Items of significant importance for the December 31, 2018 actuarial valuation include:

1. The December 31, 2018 actuarial valuation included a change in the assumed rate of investment return from 7.75% to 7.25%, and a change in the mortality projection scale from MP-2015 to MP-2018.
2. The December 31, 2018 actuarial valuation included a change in the member contribution rate from 12.5% to 14.0%, and a change in the COLA assumption from 1.25% to 0.00%.
3. The market value rate of return for calendar year 2018 was approximately (5.0)%. This is lower than the actuarial assumed investment return rate of 7.75% for that year. This figure will generally differ from other reported return figures due to restated audited asset figures, approximate formulas and treatment of System expenses. The investment loss based on the market value of assets (i.e., in comparison to the 7.75% assumption) roughly equals 100% of payroll. The funding value rate of return was below the assumed investment return rate. The funding value rate of return for calendar year 2018 was approximately 3.6%. The funding value of assets currently exceeds the market value of assets by approximately \$61 million.
4. Non-investment experience during calendar year 2018 in the retiree health plan was favorable (i.e., actual employer paid claims were less than expected). The retiree health plan is expected to remain solvent until 2030, compared with 2029 last year.

This valuation indicates that a total employer contribution rate allocation to the pension program of 26.50% and a member contribution rate of 14.0% of payroll produces a 23-year amortization period for the pension program.

December 31, 2018

Summary of Results, Comments and Recommendations (Concluded)

Comment on Post-Retirement Health Care: If all assumptions are met exactly and contribution rates and benefit provisions continue at their present levels, the retiree health program will run out of money and benefits will cease in 2030. At that time, the rate of benefit payout is projected to exceed 14.0% of payroll. This situation cannot continue indefinitely. **Further changes to the retiree health plan (i.e., in addition to those made recently) and/or further increases in employer contribution rates and/or member premiums will need to be a part of the future if the program is to continue. These changes/contribution increases are likely to be significant.**

Recommendation: The following reserve transfers are recommended as of December 31, 2018:

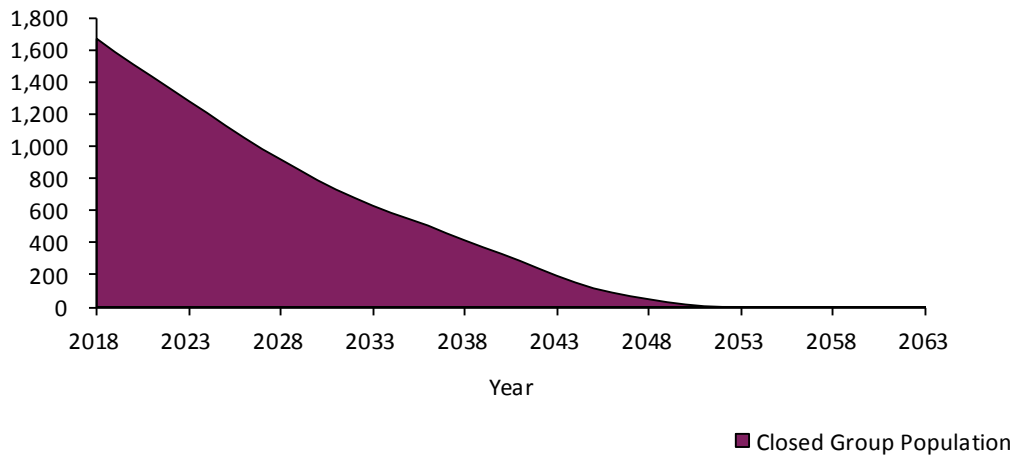
Transfer To (From)	Total Amount
Pension Reserve Fund:	\$39,741,052
Survivor Benefit Fund:	40,510,979
Total	\$80,252,031

The reserve funds from which the transfers are made are determined as follows: First, the accumulated contributions of members who retired or died with survivor benefits payable prior to January 1, 2019 should be transferred from the Employees' Savings Fund if this has not already been done. The remainder of the transfer should then be taken from the Income Fund or the Employer's Accumulation Fund, as the Board deems appropriate. The purpose of these transfers is to ensure that all pension benefits are fully funded by the appropriate reserve funds.

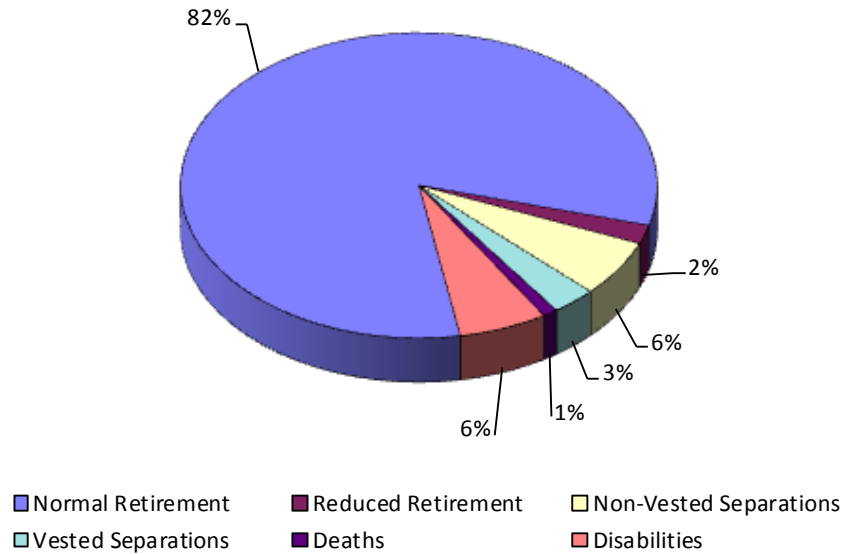
Conclusion: Based upon the results of the December 31, 2018 regular annual actuarial valuation, the unfunded actuarial accrued liabilities of the pension program are expected to be amortized over a 23-year period. With regard to the Retiree Health Plan, solvency to 2030 is an unfavorable result, since most people presently near retirement will live beyond that date. In addition, given the volatility of health care costs, the Plan may become insolvent sooner than 2030. A combination of contribution increases and continued cost containment measures including plan redesign will be important for the Retiree Health Plan. **These changes/contribution increases are likely to be significant.**

Expected Development of Present Population December 31, 2018

Closed Group Population Projection



**Expected Terminations from Active Employment for
Current Active Members**



The charts above show the expected future development of the present population in simplified terms. The Retirement System presently covers 1,668 active members. Eventually, 6% of the population is expected to terminate covered employment prior to retirement and forfeit eligibility for an employer provided benefit. 87% of the present population is expected to receive monthly retirement benefits either by retiring directly from active service, or by separating from service without withdrawing contributions. 7% of the present population is expected to become eligible for death-in-service or disability benefits. Within 12 years, over half of the covered membership is expected to consist of new hires.

Other Observations

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

Given the pension plan's contribution allocation procedure, if all actuarial assumptions are met (including the assumption of the plan earning 7.25% on the actuarial value of assets), it is expected that:

- (1) Employer normal cost contributions will decrease as a percentage of payroll as more active members become covered under the post January 1, 2020 benefit provisions,
- (2) The unfunded actuarial accrued liabilities will be fully amortized after 23 years, and
- (3) The funded status of the plan will increase gradually towards a 100% funded ratio.

When selecting a contribution allocation procedure, the following three items should be considered, including the balance amongst the three items:

- (1) Benefit security,
- (2) Intergenerational equity, and
- (3) Contribution stability and predictability

Generally, given the nature of public employee retirement systems (e.g., level contribution financing objective and perceived ongoing nature of the plan or plan sponsor), intergenerational equity and contribution stability and predictability have received more consideration than benefit security when contribution allocation procedures are selected. However, given the importance of benefit security to any retirement system, we suggest that contributions to the System in excess of those presented in this report be considered.

Limitations of Funded Status Measurements

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

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

SECTION A

RETIREMENT, SURVIVOR AND DISABILITY ALLOWANCES

Retirement, Survivor, and Disability Allowances

Benefits and Conditions Valued

December 31, 2018

Age & Service Pension: A member may retire at age 52 to age 60, provided the member has 20 or more years of service (or also at age 48 with 25 or more years of contributing service for members hired before January 1, 2020). The member's pension equals the sum of 2-1/2% of final average salary [average of salaries during highest 5 years (3 years prior to January 1, 2015)] times years of service not in excess of 20, 2-1/4% of final average salary times years of service in excess of 20 but not in excess of 25 and 2% of final average salary times years of service in excess of 25. The maximum pension payable is 79.25% of the member's final average salary. A member must retire upon attainment of age 60 or completion of 20 years of service, whichever occurs later.

Reduced Retirement: A member who has acquired at least 20 but less than 25 years of service and is between the ages of 48 and 52 is eligible to receive a Pension computed in the same manner as an Age & Service pension but reduced as follows:

Age	Percent of Age & Service Pension
48	75%
49	80
50	86
51	93
52	100

Deferred Pension: A member who has acquired 20 years of service and retires is eligible to receive a pension computed in the same manner as an Age & Service Pension at the attainment of age 52. A reduced benefit is payable if the retirant elects to receive a benefit after age 48 and prior to age 52. The reduction is waived for members with 25 or more years of service. A member, who has acquired 15 years of service and who voluntarily resigns or is discharged, is eligible to receive a pension equal to 1-1/2% of final average salary multiplied by total service. The pension shall begin the first month after attainment of age 55, provided the member does not withdraw his accumulated contributions from the employees' savings fund.

Disability Pension:

- A. **In-the-Line-of-Duty:** A member who is permanently disabled with a duty-related injury is eligible to receive a pension that is the larger of (i) 61.25% of average final salary, or (ii) the Age & Service Pension.
- B. **Off-Duty:** A member who is permanently disabled with a non-duty related injury or illness, provided he/she has 5 or more years of service, is eligible to receive a pension that is the larger of (i) 30% of average annual salary, or (ii) the Age & Service Pension.

Retirement, Survivor, and Disability Allowances Benefits and Conditions Valued December 31, 2018 (Continued)

Survivor's Benefits: The surviving spouse of a deceased retirant (other than a deferred retirant) who retired or entered the DROP before 5/11/2018 is eligible to receive a pension of \$900 a month, or 50% of the computed monthly pension the retirant was receiving, whichever is greater. The surviving spouse of an active member or of a deferred retirant who *was not* yet eligible for an immediate pension benefit is eligible to receive a pension of \$900 per month in 2018. The surviving spouse of a deceased retirant who retires on or after 5/11/2018 (does not include members who retired or entered the DROP before 5/11/2018) is eligible to receive a pension of \$911.25 a month in 2019, increasing annually as determined by the COLA percentage set by the Board. The cost of living adjustments began in 2019, and all affected survivors will receive the same rate regardless of when they became survivors. The benefit terminates upon death. Each surviving child of a deceased member or retirant is eligible for a pension of \$150 a month until attainment of age 18, marriage, or death. The benefit may be continued to age 23 if the child is a full-time student. Each surviving child regardless of age, who was totally dependent upon the deceased member or retirant at his death because of physical or mental disability is eligible to receive a pension of \$150 per month until his death or recovery from the disability. If there is no spouse or surviving children, each dependent parent is eligible to receive a pension of \$150 a month. Additionally, a \$5,000 lump sum benefit is payable upon the death of the retirant.

The surviving spouse of a deceased active member who is eligible to retire and who has not entered the DROP will receive a 50% joint and survivor benefit payable immediately. The benefit is calculated as if the deceased member retired the day after death.

The spouse of a member who retired or entered the DROP before 5/11/2018 and who becomes married after retirement is eligible for survivor benefits. For members who retire on or after 5/11/2018, a survivor is only eligible for a survivor benefit if the survivor was married to the member when the member was active.

Minimum Benefit: All members who retired with an Age & Service Pension or Disability Benefit are eligible to receive a minimum benefit of \$1,050 per month.

Members' Contributions to the Fund: Members contribute a certain percentage of the member's annual salary. The percentage shall not be less than 10.0% of salary but not more than 14.0%. The State Highway Patrol Retirement System shall establish and may adjust the rate as it considers necessary to meet the amortization period requirement. For the December 31, 2018 valuation, the assumed member contribution rate is **14.0%** (a member contribution rate of 12.5% was assumed for calendar year 2019).

State Contributions: The State contributes the remaining amount necessary to finance the Retirement System on an actuarial basis. By statute, the State's contribution rate can be neither less than the member contribution rate, nor more than three times the member rate. The employer contribution shall be an amount equal to 26.50 percent of the total salaries paid to contributing members.

Retirement, Survivor, and Disability Allowances

Benefits and Conditions Valued

December 31, 2018

(Concluded)

Post-Retirement Increases: The basic benefit for all retirants is increased by 0.00 percent each year starting at age 60 (age 53 for members retired or entered the DROP prior to 1/7/2013). A COLA rate of 1.25% was assumed for calendar year 2019. The retirant must have also been receiving monthly benefits for at least twelve months. Benefit recipients receiving survivor benefits prior to 1/7/2013 are eligible for the increase after receiving benefits for twelve months. Disability members retired prior to 1/7/2013 are eligible for the increase after receiving benefits for sixty months or age 53 whichever occurs first. The Board may adjust the cost of living adjustment annually. The Board's determination shall be based on the annual actuarial valuation. If the Board determines that an increase may be made, the increase shall not exceed 3 percent of the eligible member's basic benefit.

PLUS: A qualified member may elect a partial lump sum benefit of not less than 6 times the monthly amount payable to the member as a single lifetime pension and not more than 60 times that amount.

Deferred Retirement Option Program (DROP): Members are eligible for a one-time election to "DROP in" upon attainment of unreduced retirement eligibility. The primary features of the DROP include:

- a) During participation in the DROP, members continue to make contributions based upon the member contribution rate. While participating in the DROP, 100% of members' contributions, up to 10% of payroll, are deposited to their DROP account.
- b) 100% of the member's computed benefit (based upon service and salary at time of DROP), including any scheduled post-retirement increases is credited to the member's DROP account.
- c) The DROP account is credited with interest annually based upon a rate of return earned on a selected group of fixed income type investments.
- d) A member who "DROPS in" must stay in the DROP for a minimum period of time based on age at time of "DROPPing in". A minimum participation period of 3 years for members who "DROP in" prior to age 52 and 2 years for members who "DROP in" on or after age 52. After a maximum of 8 years in the DROP program or attaining age 60, the member who entered the DROP program must retire.
- e) If the member "DROPS in", the member's annual benefit when the member "DROPS out" (i.e., retires) is based upon the benefit calculations at time of the "DROP in", including any post-retirement increases that may have accrued during the DROP participation period.
- f) If, during participation in the DROP, a member becomes disabled due to a duty related injury/illness, the member can choose to 1) have a disability pension benefit calculated based on the assumption that participation in the DROP did not occur, or 2) the member can elect to accept the age/service pension benefit achieved through DROP participation plus the accumulation in the DROP account. Duty disability benefit recipients will not suffer the loss of accumulated interest for early departure from the DROP.
- g) Once a member elects to participate in the DROP, their contributions are committed for the minimum period (2 or 3 years). If the member voluntarily discontinues DROP participation prior to the minimum participation period, the member will not receive any interest accumulated in the DROP account but will receive all accumulated pension benefits and pension contributions deposited into the DROP account at the end of the minimum participation period.

Sample Benefit Computation for Members

Assumed data in connection with this sample retirement is shown below:

	Data	Description
A.	\$60,000	Final Average Compensation
B.	27	Years of Credited Service
C.	50	Age of Retirant
D.	50%	Percentage to continue to spouse after retirant's death (this is automatic)

Sample Computation Steps

E. Benefit Formula:	$0.0250 \times 20 \times \$60,000 =$	\$30,000
	$0.0225 \times 5 \times \$60,000 =$	\$ 6,750
	$0.0200 \times 2 \times \$60,000 =$	\$ 2,400
		\$39,150

Benefit Payable to:

F. Retirant while spouse is alive (E)	\$39,150
G. Spouse after retirant's death (D x E)	\$19,575
H. Retirant after spouse's death (E)	\$39,150

Retirement Survivor & Disability Allowances Computed Employer Contributions to Support Benefits

Contributions for	Contributions Expressed as Percents of Payroll	
	2018	2017
Valuation Date - December 31		
Normal Cost:		
Age & Service Benefits	14.84%	14.09%
Disability Benefits	2.03%	1.97%
Survivor Benefits	0.11%	0.08%
Separation Benefits	1.11%	1.01%
Administrative Expenses	1.20%	1.20%
Purchase of Military Service	0.75%	0.75%
Total Normal Cost	20.04%	19.10%
Less Member Contributions	14.00%	12.50%
 Employer Normal Cost	 6.04%	 6.60%
 Unfunded Actuarial Accrued Liabilities	 20.46%	 19.90%
Amortization Period	23	27
 PENSION EMPLOYER CONTRIBUTION RATE	 26.50%	 26.50%

The amortization period is computed and is the period of years over which the Board established pension employer contribution rate and the employee contribution rate will finance the unfunded liabilities. With the amortization periods shown above, the unfunded liability is expected to rise in dollar amount for several years before beginning to decline, although it is expected to decline steadily as a percentage of payroll (see page A-7).

Retirement, Survivor, & Disability Allowances Method of Financing Future Benefits for Present Active Members December 31, 2018

Normal cost and the allocation of present values between service rendered before and after the valuation date were determined using an individual entry-age actuarial cost method having the following characteristics:

- (i) The annual normal costs for each individual active member, payable from the date of employment to the date of retirement, are sufficient to accumulate the value of the member's benefit at the time of retirement; and
- (ii) each annual normal cost is a constant percentage of the member's year-by-year projected covered pay.

Actuarial Accrued Liabilities, \$1,158,179,566, less pension assets of \$769,097,204 resulted in unfunded actuarial accrued liabilities of \$389,082,362, which were amortized as a level percent of payroll over 23 years. The characteristics of this method are illustrated on the following page. Actuarial accrued liabilities represent the portion of present values not covered by future normal cost contributions.

Retirement, Survivor, and Disability Allowances Financing Unfunded Actuarial Accrued Liabilities

Level % of Payroll Amortization: Closed Amortization (\$ Thousands)

Year	Unfunded Actuarial Accrued Liability	Annual UAL Contributions
		Dollars
1	\$ 389,082	\$ 24,602
2	391,812	25,500
3	393,810	26,431
4	394,989	27,395
5	395,255	28,395
6	394,504	29,432
7	392,626	30,506
8	389,499	31,619
9	384,992	32,774
10	378,963	33,970
11	371,258	35,210
12	361,710	36,495
13	350,139	37,827
14	336,350	39,208
15	320,131	40,639
16	301,254	42,122
17	279,472	43,660
18	254,519	45,253
19	226,107	46,905
20	193,924	48,617
21	157,635	50,392
22	116,877	52,231
23	71,259	54,137
24	20,360	21,085

Retirement, Survivor, and Disability Allowances
Actuarial Present Value of Future Benefits
Present Retired Lives and Vested Deferred Cases
December 31, 2018

Benefits Payable	Number	Monthly Amount	Actuarial Value
From Pension Reserve Fund:			
Regular Retirements	1,248	\$4,814,570	\$607,292,206
Disability Retirements	141	423,165	54,062,611
Total Benefits Payable from Pension Reserve Fund	1,389	5,237,735	661,354,817
From Survivor Benefit Fund:			
Surviving Spouses, Dependent Children & Dependent Parents	282	405,847	40,510,979
Total Benefits Payable from Survivor Benefit Fund	282	405,847	40,510,979
Total Retirement Benefits Payable	1,671	5,643,582	701,865,796
Total Vested Deferred Benefits Payable	17	45,473	5,087,115
Grand Total	1,688	\$5,689,055	\$706,952,911

Retirement, Survivor, and Disability Allowances Development of Actuarial Accrued Liabilities December 31, 2018

Actuarial Present Value, December 31, of	(1) Total Actuarial Present Value	(2) Portion Covered By Future Normal Cost Contributions	(3) Actuarial Accrued Liabilities (1) - (2)
Age & service allowances based on service rendered before and likely to be rendered after valuation date	\$ 619,175,338	\$ 172,767,737	\$ 446,407,601
Disability allowances likely to be paid to present active members who become totally and permanently disabled	26,584,383	22,250,191	4,334,192
Survivor benefits likely to be paid to spouses and children of present active members who die before retiring	1,853,865	1,088,874	764,991
Separation benefits (refunds of contributions and deferred allowances likely to be paid on behalf of present active members)	11,929,765	12,209,894	(280,129)
Retirement benefits likely to be paid to current retirants and beneficiaries and to present inactive members	<u>706,952,911</u>	<u>0</u>	<u>706,952,911</u>
Total	\$ 1,366,496,262	\$ 208,316,696	\$ 1,158,179,566
Member portion	<u>248,880,700</u>	<u>155,013,505</u>	<u>93,867,195</u>
Employer portion	\$ 1,117,615,562	\$ 53,303,191	\$ 1,064,312,371

Retirement, Survivor, and Disability Allowances

Summary Statement of System Resources and Obligations

December 31, 2018

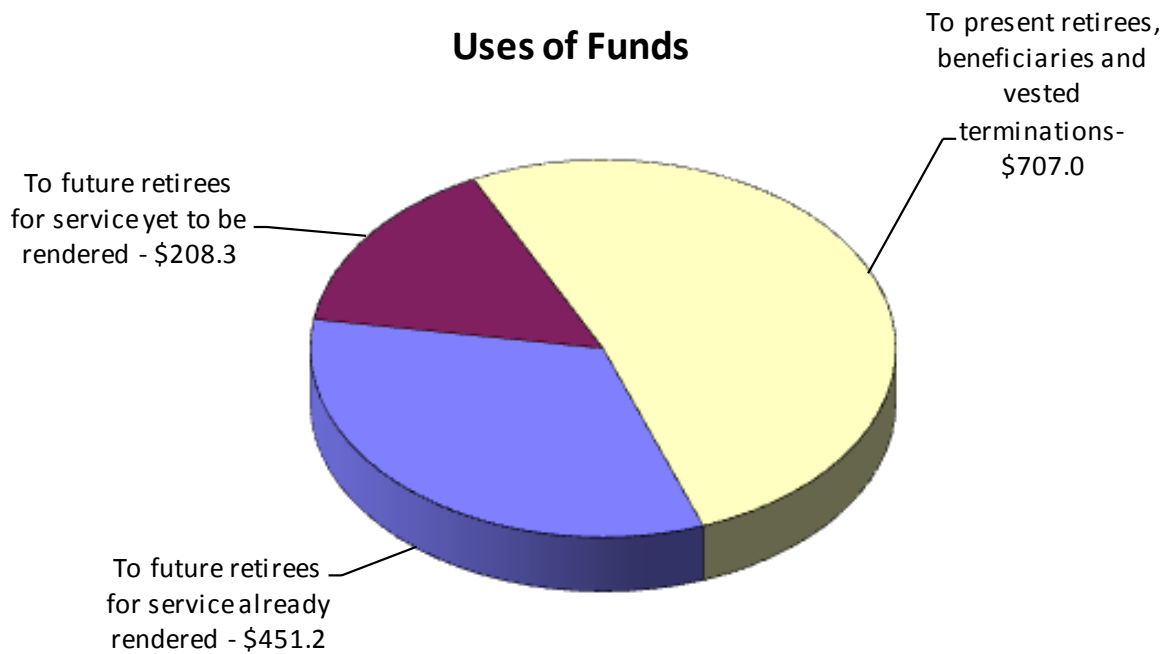
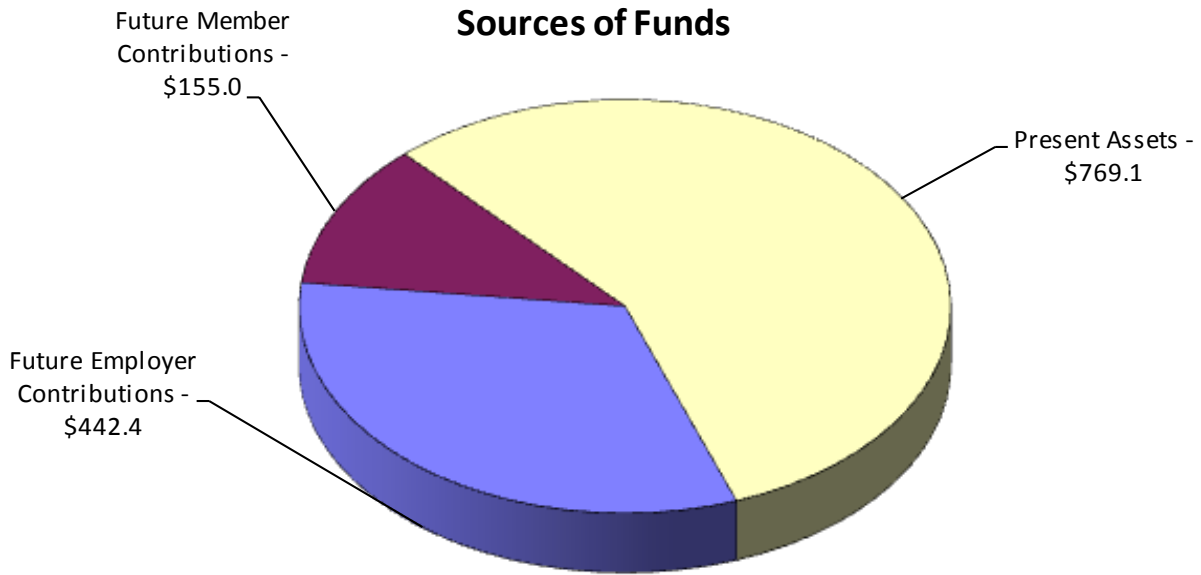
Present Resources and Expected Future Resources

A. Present valuation assets			
1. Net assets from system financial statements	\$	817,308,534	
2. Market value adjustment		61,246,932	
3. Health assets		109,458,262	
4. Valuation assets: 1 + 2 - 3		769,097,204	\$ 769,097,204
B. Actuarial present value of expected future employer contributions			
1. For normal costs		53,303,191	
2. For unfunded actuarial accrued liability		389,082,362	
3. Total		442,385,553	
C. Actuarial present value of expected future member contributions			
		155,013,505	
D. Total Present and Expected Future Resources			
		1,366,496,262	\$ 1,366,496,262

Actuarial Present Value of Expected Future Benefit Payments

A. To retirants and beneficiaries		\$	701,865,796
B. To terminated members			5,087,115
C. To present active members			
1. Allocated to service rendered prior to valuation date (actuarial accrued liability)			451,226,655
2. Allocated to service likely to be rendered after valuation date			208,316,696
3. Total			659,543,351
D. Total Actuarial Present Value of Expected Future Benefit Payments			
		1,366,496,262	\$ 1,366,496,262

Retirement, Survivor, and Disability Allowances Financing \$1,366.5 Million of Benefit Promises December 31, 2018



Retirement, Survivor, and Disability Allowances Comparative Statement

Valuation Date December 31	Number of Active Members	Annual Payroll	Actuarial Accrued Liabilities			Unfunded/ Payroll	% Funded	Funding Years
			Total	Funded	Unfunded			
1999 *	1,445	\$ 66,017,381	\$ 577,010,085	\$ 546,510,779	\$ 30,499,306	0.5	94.7%	20
2000 #	1,489	69,028,285	594,222,603	570,039,631	24,182,972	0.4	95.9%	8
2001	1,520	76,344,002	636,715,458	551,279,438	85,436,020	1.1	86.6%	31
2002 #	1,548	78,997,065	663,069,805	527,604,456	135,465,349	1.7	79.6%	32
2003	1,542	81,737,962	702,799,017	545,981,513	156,817,504	1.9	77.7%	32
2004 *	1,562	81,757,707	734,464,371	569,858,387	164,605,984	2.0	77.6%	34
2005 #	1,573	83,408,155	773,856,164	591,922,200	181,933,964	2.2	76.5%	35
2006 *	1,592	85,878,329	807,760,712	653,493,046	154,267,666	1.8	80.9%	28
2007	1,597	93,752,908	866,255,394	700,860,707	165,394,687	1.8	80.9%	27
2008	1,544	94,301,538	904,522,377	603,265,803	301,256,574	3.2	66.7%	N/A
2009	1,547	94,824,789	940,084,346	620,356,505	319,727,841	3.4	66.0%	N/A
2010 #	1,537	94,767,852	1,017,770,449	630,971,500	386,798,949	4.1	62.0%	N/A
2011	1,520	93,126,449	1,047,699,686	623,360,121	424,339,565	4.6	59.5%	N/A
2012 *	1,645	98,117,403	966,310,485	658,428,914	307,881,571	3.1	68.1%	30
2013 #	1,613	98,519,844	989,101,470	690,605,582	298,495,888	3.0	69.8%	30
2014	1,622	99,211,756	1,012,752,337	712,285,604	300,466,733	3.0	70.3%	29
2015 #	1,621	99,983,224	1,078,984,597	739,848,920	339,135,677	3.4	68.6%	30
2016	1,670	108,788,871	1,127,927,927	763,667,712	364,260,215	3.3	67.7%	29
2017 *	1,650	112,705,188	1,153,619,256	774,670,663	378,948,593	3.4	67.2%	27
2018	1,668	116,009,622	1,189,763,175	769,097,204	420,665,971	3.6	64.6%	31
2018 #	1,668	116,009,622	1,230,584,465	769,097,204	461,487,261	4.0	62.5%	39
2018 *	1,668	116,009,622	1,158,179,566	769,097,204	389,082,362	3.4	66.4%	23

* Plan amended.

Revised actuarial assumptions or methods.

While no one or two numeric indices can fully describe the financial condition of a retirement plan, ***the ratio of unfunded actuarial accrued liabilities to active member payroll ("Unfunded/Payroll" above) is significant.*** Unfunded actuarial accrued liabilities represent a kind of debt, while active member payroll represents the Plan's capacity to collect contributions to pay toward debt --- thus ***the ratio is a relative index of condition. The lower the ratio, the greater the financial strength, and vice-versa.***

Changes in Average Pay

Year	Number of Active Members	Total Payroll	Average Pay	% Change from Prior Year in		
				Average Pay	N.A.E.+	CPI
2004	1,562	\$81,757,707	\$52,342	(1.3)%	4.6%	3.3%
2005	1,573	83,408,155	53,025	1.3%	3.7%	3.4%
2006	1,592	85,878,329	53,944	1.7%	4.6%	2.6%
2007	1,597	93,752,908	58,706	8.8%	4.5%	4.1%
2008	1,544	94,301,538	61,076	4.0%	2.3%	0.1%
2009	1,547	94,824,789	61,296	0.4%	(1.5)%	2.7%
2010	1,537	94,767,852	61,658	0.6%	2.4%	1.5%
2011	1,520	93,126,449	61,267	(0.6)%	3.1%	3.0%
2012	1,645	98,117,403	59,646	(2.6)%	3.1%	1.7%
2013	1,613	98,519,844	61,079	2.4%	1.3%	1.5%
2014	1,622	99,211,756	61,166	0.1%	3.5%	0.8%
2015	1,621	99,983,224	61,680	0.8%	3.5%	0.7%
2016	1,670	108,788,871	65,143	5.6%	1.1%	2.1%
2017	1,650	112,705,188	68,306	4.9%	3.5%	2.1%
2018	1,668	116,009,622	69,550	1.8%	N/A	1.9%
10-Year Average				1.3%	2.2% *	1.8%

+ National Average Earnings published by the Social Security Administration.

* 9-year average.

Over long periods of time, the change in average pay is an approximate measure of the impact of inflation and “Across the Board” pay increases on member pays. In years when the number of members decreases, the change in average pay may tend to be greater than actual pay increases experienced by members. In years when the number of members increases the change in average pay may tend to be less than actual pay increases experienced by members.

Retirement, Survivor, and Disability Benefits in Pay Status Comparative Statement

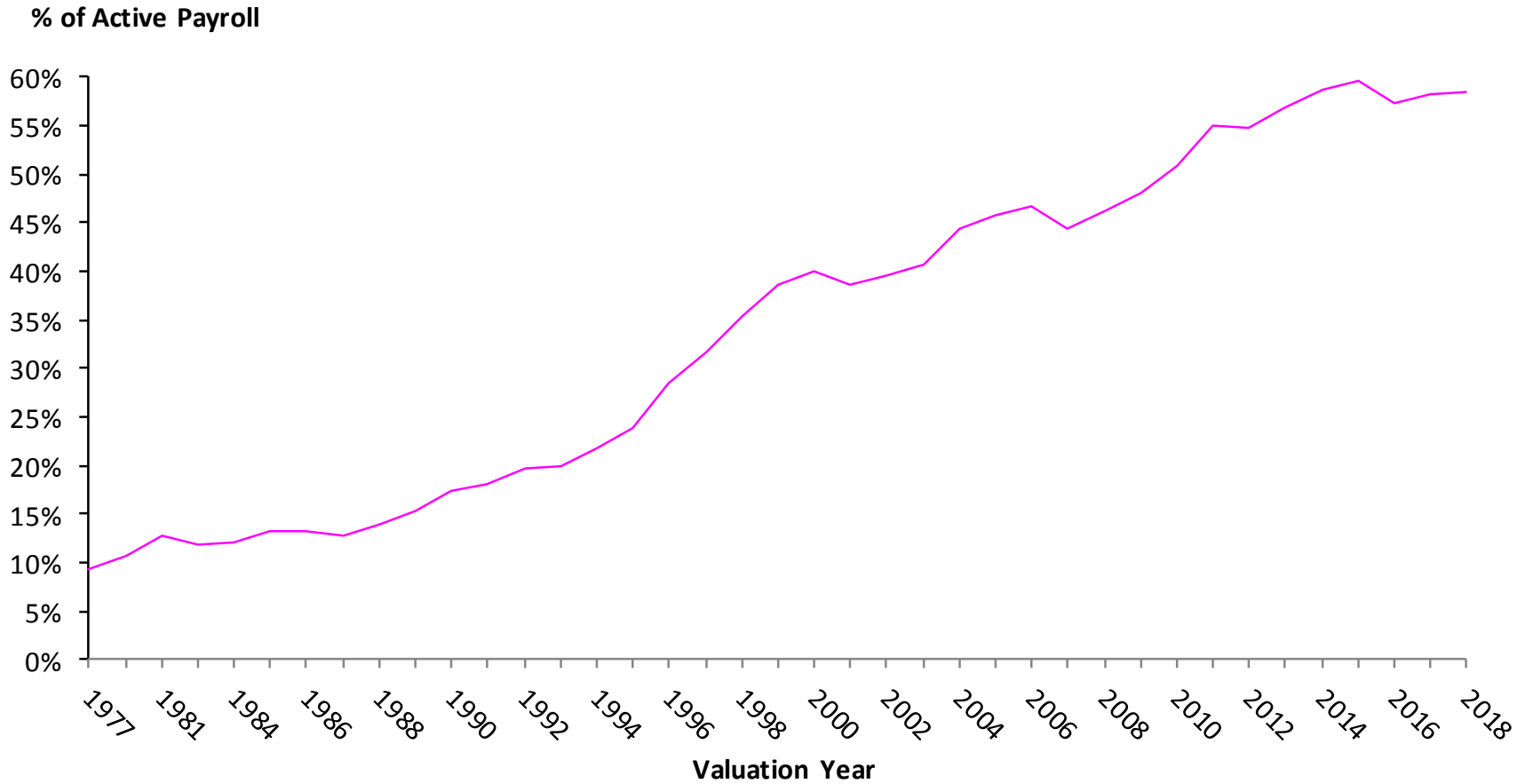
Valuation Date December 31	Number of Retirees and Beneficiaries	Monthly Pensions	Active Payroll	Average Amount	% of Active Member Pays
1999 *	1,123	\$ 2,123,471	\$ 66,017,381	\$ 1,891	38.6%
2000 #	1,174	2,300,464	69,028,285	1,960	40.0%
2001	1,207	2,460,308	76,344,002	2,038	38.7%
2002	1,231	2,603,108	78,997,065	2,115	39.5%
2003	1,253	2,770,149	81,737,962	2,211	40.7%
2004	1,282	3,023,341	81,757,707	2,358	44.4%
2005 #	1,301	3,177,731	83,408,155	2,443	45.7%
2006 *	1,337	3,341,805	85,878,329	2,499	46.7%
2007	1,359	3,470,329	93,752,908	2,554	44.4%
2008	1,371	3,628,092	94,301,538	2,646	46.2%
2009	1,385	3,793,054	94,824,789	2,739	48.0%
2010 #	1,424	4,011,554	94,767,852	2,817	50.8%
2011	1,465	4,270,807	93,126,449	2,915	55.0%
2012 *	1,497	4,470,542	98,117,403	2,986	54.7%
2013 #	1,523	4,667,280	98,519,844	3,065	56.8%
2014	1,558	4,857,703	99,211,756	3,118	58.8%
2015 #	1,548	4,976,942	99,983,224	3,215	59.7%
2016	1,580	5,204,873	108,788,871	3,294	57.4%
2017 *	1,637	5,471,803	112,705,188	3,343	58.3%
2018 *#	1,671	5,643,582	116,009,622	3,377	58.4%

* Plan amended.

Revised actuarial assumptions or methods.

Pensions expressed as a % of payroll exceed contribution income by a considerable margin. This is a normal and expected condition in a funded plan such as HPRS, but it does have implications for cash flow and investment planning.

Retirement, Survivor, and Disability Allowances Being Paid Expressed as a % of Active Member Payroll December 31, 2018



Short-Term Solvency Test

The HPRS financing objective is to pay for the benefits through contributions that remain approximately level from year-to-year as a percent of member payroll. If the contributions to the System are level in concept and soundly executed, the System will *pay all promised benefits when due – the ultimate test of financial soundness*.

Short-term solvency test is one means of checking a system’s progress under its funding program. In a short-term solvency test, the plan’s present assets (cash and investments) are compared with: 1) Active member contributions on deposit; 2) The liabilities for future benefits to present retired lives; and 3) The liabilities for service already rendered by active members. In a system that has been following the discipline of level percent financing, the liabilities for active member contributions on deposit (1) and the liabilities for future benefits to present retired lives (2) will be fully covered by present assets (except in rare circumstances). In addition, the liabilities for service already rendered by active members (3) will be partially covered by the remainder of the present assets. Generally, if the system has been using level cost financing, the funded portion of Column 3 will increase over time.

Accrued Liabilities and Assets Allocated to Retirement, Survivor and Disability Allowances

Valuation Year	(1) Active Member Contributions	(2) Retirants, Beneficiaries & Vested Deferreds	(3) Active Members (Employer Financed Portion)	Valuation Assets	Portion of Accrued Liabilities Covered by Reported Assets		
					(1)	(2)	(3)
1999 *	\$ 55,558,145	\$ 333,340,728	\$ 188,111,212	\$ 546,510,779	100%	100%	84%
2000 #	59,455,707	358,422,165	176,344,731	570,039,631	100%	100%	86%
2001	63,969,216	374,228,361	198,517,881	551,279,438	100%	100%	57%
2002 #	68,794,904	391,098,788	203,176,113	527,604,456	100%	100%	33%
2003	73,358,075	412,818,959	216,621,983	545,981,513	100%	100%	28%
2004 *	77,100,466	445,084,791	212,279,114	569,858,387	100%	100%	22%
2005 #	77,779,569	463,476,318	232,600,277	591,922,200	100%	100%	22%
2006 *	82,720,940	482,998,754	242,041,018	653,493,046	100%	100%	36%
2007	89,279,853	509,179,659	267,795,882	700,860,707	100%	100%	38%
2008	94,749,356	511,626,943	298,146,078	603,265,803	100%	99%	0%
2009	101,131,517	528,087,050	310,865,779	620,356,505	100%	98%	0%
2010 #	104,503,065	583,714,389	329,552,995	630,971,500	100%	90%	0%
2011	104,701,161	618,984,073	324,014,452	623,360,121	100%	84%	0%
2012 *	108,311,937	586,311,106	271,687,442	658,428,914	100%	94%	0%
2013 #	113,334,067	601,342,081	274,425,322	690,605,582	100%	96%	0%
2014	117,441,639	622,719,141	272,591,557	712,285,604	100%	96%	0%
2015 #	122,286,821	662,562,480	294,135,296	739,848,920	100%	93%	0%
2016	127,311,764	688,936,795	311,679,368	763,667,712	100%	92%	0%
2017 *	130,494,700	717,621,283	305,503,273	774,670,663	100%	90%	0%
2018	136,360,012	737,185,860	316,217,303	769,097,204	100%	86%	0%
2018 #	138,404,915	755,974,712	336,204,838	769,097,204	100%	83%	0%
2018 *	138,101,643	706,952,911	313,125,012	769,097,204	100%	89%	0%

* Plan amendment.

Assumption or method change.

Summary of Unfunded Actuarial Accrued Liabilities

Each time a new benefit is added which applies to service already rendered, an “unfunded actuarial accrued liability” is created. In addition, if actual financial experiences are less favorable than assumed financial experiences, the difference is added to unfunded actuarial accrued liabilities.

In an inflationary economy, the value of the dollar is decreasing. This environment results in employee pays increasing in dollar amounts resulting in unfunded actuarial accrued liabilities increasing in dollar amounts, all at a time when the actual substance of these items may be decreasing. Looking at just dollar amounts of unfunded actuarial accrued liabilities can be misleading. Unfunded actuarial accrued liabilities divided by active employee payroll provides an index, which aids understanding. The smaller ratio of unfunded liabilities to active member payroll, the stronger the system. Observation of this relative index over a period of years will give an indication of whether the system is becoming financially stronger or weaker.

Summary of Assets and Actuarial Accrued Liabilities for Retirement, Survivor, and Disability Allowances

Valuation Year	Actuarial Accrued Liability (AAL)	Valuation Assets	Unfunded Actuarial Accrued Liability (UAAL)	Ratio of Assets to AAL	Active Member Payroll	UAAL as a % of Active Member Payroll
1999 *	\$ 577,010,085	\$546,510,779	\$ 30,499,306	94.7%	\$66,017,381	46.2%
2000 #	594,222,603	570,039,631	24,182,972	95.9%	69,028,285	35.0%
2001	636,715,458	551,279,438	85,436,020	86.6%	76,344,002	111.9%
2002 #	663,069,805	527,604,456	135,465,349	79.6%	78,997,065	171.5%
2003	702,799,017	545,981,513	156,817,504	77.7%	81,737,962	191.9%
2004 *	734,464,371	569,858,387	164,605,984	77.6%	81,757,707	201.3%
2005 #	773,856,164	591,922,200	181,933,964	76.5%	83,408,155	218.1%
2006 *	807,760,712	653,493,046	154,267,666	80.9%	85,878,329	179.6%
2007	866,255,394	700,860,707	165,394,687	80.9%	93,752,908	176.4%
2008	904,522,377	603,265,803	301,256,574	66.7%	94,301,538	319.5%
2009	940,084,346	620,356,505	319,727,841	66.0%	94,824,789	337.2%
2010 #	1,017,770,449	630,971,500	386,798,949	62.0%	94,767,852	408.2%
2011	1,047,699,686	623,360,121	424,339,565	59.5%	93,126,449	455.7%
2012 *	966,310,485	658,428,914	307,881,571	68.1%	98,117,403	313.8%
2013 #	989,101,470	690,605,582	298,495,888	69.8%	98,519,844	303.0%
2014	1,012,752,337	712,285,604	300,466,733	70.3%	99,211,756	302.9%
2015 #	1,078,984,597	739,848,920	339,135,677	68.6%	99,983,224	339.2%
2016	1,127,927,927	763,667,712	364,260,215	67.7%	108,788,871	334.8%
2017 *	1,153,619,256	774,670,663	378,948,593	67.2%	112,705,188	336.2%
2018	1,189,763,175	769,097,204	420,665,971	64.6%	116,009,622	362.6%
2018 #	1,230,584,465	769,097,204	461,487,261	62.5%	116,009,622	397.8%
2018 *	1,158,179,566	769,097,204	389,082,362	66.4%	116,009,622	335.4%

* Plan amendment.

Assumption or method change.

The figures on this page do not include liabilities and assets related to post-retirement Health Care and Medicare reimbursement.

Schedule of Employer Contributions

Year Ended December 31	Actual Contributions	Percent of Required Contributed
2000	\$13,210,189	100%
2001	13,901,313	100%
2002	14,923,893	100%
2003	16,361,339	100%
2004	17,205,610	100%
2005	18,467,789	100%
2006	19,263,941	98%
2007	19,956,700	92%
2008	20,302,216	96%
2009	20,453,914	102%
2010	21,211,944	93%
2011	22,966,338	85%
2012	23,766,361	78%
2013	22,908,182	65%
2014	22,325,421	75%
2015	22,895,242	100%
2016	25,383,684	100%
2017	26,109,836	100%
2018	26,014,314	100%

This information is presented in draft form for review by the System's auditor. Please let us know if there are any changes so that we may maintain consistency with the System's financial statements.

The amounts reported in this schedule do not include contributions for post-employment Health Care benefits.

Notes to Trend Data

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

Valuation Date	December 31, 2018
Actuarial Cost Method	Entry Age
Amortization Method	Level Percent Closed
Remaining Amortization Period	23 years for retirement allowances in determining the Annual Required Contribution
Asset Valuation Method	4-year smoothed market 20 % Corridor
Actuarial Assumptions:	
Investment Rate of Return	7.25%
Projected Salary Increases	3.8% - 13.5%
Includes Wage Inflation at	3.5%

Other Requested CAFR Information

As of December 31, 2018, the actuarial present value of credited projected benefits for current employees is shown below:

	Actuarial Present Value of Credited Projected Benefits
Current Employees	
Accumulated employee contributions including allocated investment income	\$ 136,360,012
Employer - financed vested	225,355,405
Employer - financed non-vested	28,905,269

As of December 31, 2018, there were 766 vested active members and 902 non-vested active members.

Risk Commentary

Determination of the actuarial accrued liability, the computed amortization period, and the funded ratio requires the use of assumptions regarding future economic and demographic experience. Risk measures, as illustrated in this report, are intended to aid in the understanding of the effects of future experience differing from the assumptions used in the course of the actuarial valuation. Risk measures may also help with illustrating the potential volatility in actuarial measurements that results from the differences between actual experience and the actuarial assumptions.

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

Examples of risk that may reasonably be anticipated to significantly affect the plan's future financial condition include:

- (1) Investment Risk – The risk that actual investment returns may differ from the expected investment returns. For HPRS, this risk is enhanced since members of HPRS do not participate in Social Security resulting in a larger asset base.
- (2) Contribution Risk – HPRS is a plan that has a fixed employer contribution rate of 26.50% of payroll and a fixed maximum employee contribution rate of 14.0% of payroll. The Board may establish employee contribution rates up to the maximum. Currently, HPRS is at the maximum employer and employee contributions rates. In addition, the Board makes the determination of how much of the contributions are allocated to the pension and retiree health portions of HPRS. Currently, all of the contributions are allocated to the pension program. Contribution risk is the risk that the current level of contributions may be insufficient to fund the current pension benefit structure of HPRS while maintaining the ORC requirement of an amortization period of no greater than 30 years.

Summary of Risk Measures

Valuation Date December 31,	Funded Ratio		UAAL	Total Actuarial Value			Standard Deviation of
	Based on AVA	Based on MVA	Amortization Period	Total UAAL / Total Payroll	of Assets / Total Payroll	Total AAL / Total Payroll	Investment Return / Total Payroll
2006 *	81 %	85 %	28	1.8	7.6	9.4	**
2007	81	83	27	1.8	7.5	9.2	**
2008	67	56	N/A	3.2	6.4	9.6	**
2009	66	63	N/A	3.4	6.5	9.9	**
2010 #	62	64	N/A	4.1	6.7	10.7	**
2011	60	58	N/A	4.6	6.7	11.3	**
2012 *	68	67	30	3.1	6.7	9.8	**
2013 #	70	74	30	3.0	7.0	10.0	**
2014	70	73	29	3.0	7.2	10.2	98 %
2015 #	69	65	30	3.4	7.4	10.8	92
2016	68	64	29	3.3	7.0	10.4	87
2017 *	67	68	27	3.4	6.9	10.2	92
2018 *#	66	62	23	3.4	6.6	10.0	81

* Plan amendment.

Assumption or method change.

** Unavailable.

Summary of Risk/Maturity Measures (Concluded)

An explanation of the significance of the risk metrics presented on the preceding page follows:

- (1) **Funded Ratio (Funding Value of Assets basis)** – This is the most widely known measure of a plan's financial strength. The trend in the funded ratio is much more important than the absolute ratio. A trend approaching 100% is desirable.
- (2) **Funded Ratio (Market Value of Assets basis)** – This is similar to the above, except that the asset value used is the market value.
- (3) **UAAL Amortization Period** – Periods above about 17 to 20 years indicate that the UAAL payment is less than the interest on the UAAL. This situation is referred to as “negative amortization.” Negative amortization is increasingly viewed as undesirable.
- (4) **UAAL / Total Payroll** – The ratio of UAAL to payroll gives an indication of the plan sponsor's ability to pay off the UAAL. A declining ratio is desirable. A ratio above approximately 3.0 or 4.0 may indicate difficulty in discharging the unfunded liability in some circumstances.
- (5) **Total Value of Assets / Total Payroll** – The ratio of assets to payroll gives an indication of both maturity and volatility. Many systems have ratios between 5.0 and 7.0. Social Security Replacement Plans may fall above that range. A high ratio can indicate volatility of contribution rates or amortization period.
- (6) **Total AAL / Total Payroll** – This is similar to above. It illustrates the expected ratio of assets to payroll when the plan has a funded ratio of 100%.
- (7) **Standard Deviation of Investment Return / Total Payroll** – The portfolio standard deviation measures the volatility of investment return. When divided by payroll it gives the effect of a one standard deviation asset gain or loss as a percent of payroll. This theoretically may happen once every 6 years.

SECTION B

POST-RETIREMENT HEALTH CARE AND MEDICARE REIMBURSEMENT

Post-Retirement Health Care and Medicare Reimbursement Provisions Evaluated and/or Considered

Benefits Provided

Since July 1, 1974, the Retirement System has made Health Care available for every benefit recipient and eligible dependent under a hospitalization and health care policy administered by Aetna and Medical Mutual of Ohio. This Plan is secondary to Medicare or any other Health Care coverage. Depending on Medicare coverage, members are enrolled in either the fully-insured Medicare Advantage plan or the self-insured plan. Each year the Board establishes participant premium rates, any necessary co-payments for the retiree, spouse, or dependent children, and any other changes in plan design for the following calendar year. The member premiums for calendar year 2019 used for valuation purposes are as follows:

Premium Scale for Members or Spouses Ineligible for Medicare

Age	Monthly Premium		
	Retiree	Spouse	Surviving Spouse
60+	\$145	\$195	\$ 145
56-59	\$205	\$255	\$ 205
52-55	\$400	\$450	\$ 400
<52	\$628	\$678	\$ 628

Premium Scale for Members or Spouses Eligible for Medicare

Monthly Premium		
Retiree	Spouse	Surviving Spouse
\$35	\$175	\$100

The dependent child premium is \$138 per month for each child in calendar year 2019.

After calendar year 2019, member and spouse premiums presented above are assumed to increase by the health trend assumption shown on page B-9.

Post-Retirement Health Care and Medicare Reimbursement Provisions Evaluated and/or Considered (Concluded)

Benefits Provided (Continued)

Basic Plan coverage provides for a portion of payment of all reasonable and customary hospital expenses. All hospital admissions must be pre-certified prior to an elective admission. Emergency confinements require notification within 48 hours following admission. If a covered person is in a network area, he or she must use a preferred provider for the maximum benefit.

All other medical expenses are covered at the rate of 80% of reasonable and customary charges.

Designated surgical procedures require a second opinion. Designated outpatient procedures must be pre-certified. For in-network activity, the annual out-of-pocket maximum is \$1,500 per individual or \$3,000 per family (out of network amounts are \$5,000 and \$10,000, respectively) for Medical Mutual. Each covered person not eligible for Medicare must meet a \$500 annual deductible (\$1,000 for out of network). For in-network activity for members in the insured Medicare Advantage, the annual out-of-pocket maximum is \$2,000 per individual. Members in the insured Medicare Advantage plan do not have a deductible requirement.

A mail-order prescription drug plan is also available. Each 90-day prescription submitted via mail order has a co-payment of \$10.00 for generic and \$30.00 for brands. Each 34-day prescription has a co-payment of \$5.00 for generic and \$15.00 for brands. Members will be responsible for the full cost of non-formulary drugs.

Administration: The medical program is administered by AETNA and Medical Mutual of Ohio for hospital-medical-surgical coverage and by ESI for retail/mail order prescription drug coverage.

Stop Loss Coverage: The non-Medicare population is fully self-insured and stop loss coverage is maintained.

Medicare Part B Reimbursements: None.

Dental/Vision: Premiums for benefit recipients are deducted from benefit payments. The Dental/Vision member premium amounts for calendar year 2019 are as follows:

	Premium Scale for Dental/Vision		
	Monthly Premium		
	Retiree	Spouse	Surviving Spouse
Dental	\$5	\$20	\$5
Vision	\$5	\$ 5	\$5

Dental and vision premiums are increased using a trend assumption of 3.50% for all years.

Post-Retirement Health Care and Medicare Reimbursement

Year	Covered Lives	Amounts Paid to Vendors (Including Medicare Part B)							Retiree/Spouse	Retiree Drug	Net Paid by OHPRS	Per	Valuation Payroll	% of Payroll
		Medical	Drugs	Medicare Part B	Dental	Vision	Wellness	Total	Premiums and Other Adjustments	Subsidy and Prescription Drug Rebates		Covered Life		
1985	697	\$ 427,361	\$ 60,015	\$ 28,272				\$ 515,648			\$ 515,648	\$ 740	\$ 32,500,428	1.6%
1986	715	787,245	80,911	30,457				898,613			898,613	1,257	34,757,277	2.6%
1987	731	559,832	115,544	38,037				713,413			713,413	976	39,938,912	1.8%
1988	761	522,747	145,847	57,461				726,055			726,056	954	40,674,634	1.8%
1989	810	1,043,650	186,795	77,869				1,308,314	\$ 97,864		1,406,178	1,736	43,053,057	3.3%
1990	925	1,009,153	213,716	77,363				1,300,232	(94,251)		1,205,981	1,304	45,679,355	2.6%
1991	976	1,267,327	251,004	86,740				1,605,071	180,583		1,785,654	1,830	48,488,406	3.7%
1992	1,045	1,643,276	298,493	97,117				2,038,886	76,046		2,114,932	2,024	50,235,996	4.2%
1993	1,081	1,553,628	299,410	118,109				1,971,147	(90,525)		1,880,622	1,740	55,781,585	3.4%
1994	1,133	1,239,008	320,360	141,384				1,700,752	3,314		1,704,066	1,504	58,116,787	2.9%
1995	1,225	1,512,523	364,096	149,440				2,026,059	(66,834)		1,959,225	1,599	59,825,356	3.3%
1996	1,379	1,353,932	491,525	155,769				2,001,226	21,382		2,022,608	1,467	59,239,349	3.4%
1997	1,499	1,623,640	849,321	166,743				2,639,704	(140,526)		2,499,178	1,667	62,233,299	4.0%
1998	1,602	2,147,334	1,122,248	171,223				3,440,805	(311,917)		3,128,888	1,953	65,153,864	4.8%
1999	1,772	3,315,914	1,364,990	197,606				4,878,510	619,894		5,498,404	3,103	66,017,381	8.3%
2000	1,848	3,190,885	1,684,300	203,157				5,078,342	(358,082)		4,720,260	2,554	69,028,285	6.8%
2001	1,900	3,730,167	1,960,825	231,046				5,922,038	138,317		6,060,355	3,190	76,344,002	7.9%
2002	1,943	4,147,534	2,431,297	260,772	\$194,893	\$ 80,909		7,115,405	(200,021)		6,915,384	3,559	78,997,065	8.8%
2003	1,912	4,256,046	2,681,414	290,506	209,429	82,097		7,519,492	(507,642)		7,011,850	3,667	81,737,962	8.6%
2004	1,928	4,074,972	2,710,367	347,585	230,994	84,136		7,448,054	(641,707)		6,806,347	3,530	81,757,707	8.3%
2005	1,958	6,015,277	2,980,755	422,045	364,139	124,658		9,906,874	(552,570)		9,354,304	4,777	83,408,155	11.2%
2006	2,078	4,999,822	2,832,743	503,034	408,667	127,266		8,871,532	(198,141)		8,673,391	4,174	85,878,328	10.1%
2007	2,085	6,580,455	3,513,662	572,127	464,402	130,029		11,260,675	(980,539)		10,280,136	4,931	93,752,908	11.0%
2008	2,103	5,087,073	3,274,896	632,293	453,002	121,599	\$ 79,679	9,648,542	(784,381)	\$ (317,381)	8,546,780	4,064	94,301,538	9.1%
2009	2,095	4,983,739	3,430,089	673,450	495,272	133,296	86,007	9,801,853	(902,320)	(513,668)	8,385,865	4,003	94,824,789	8.8%
2010	2,166	6,380,294	3,709,855	713,317	453,276	133,141	57,747	11,447,630	(911,076)	(471,909)	10,064,645	4,647	94,767,852	10.6%
2011	2,269	6,755,757	4,053,343	770,183	528,824	157,600	95,210	12,360,917	(1,268,402)	(795,523)	10,296,992	4,538	93,126,449	11.1%
2012	2,310	6,393,584	4,301,087	839,451	594,292	149,962	24,604	12,302,980	(1,277,430)	(873,601)	10,151,949	4,395	98,117,403	10.3%
2013	2,359	7,872,163	4,110,260	896,970	612,575	158,197	53,440	13,703,605	(1,562,609)	(1,060,462)	11,080,534	4,697	98,519,844	11.2%
2014	2,356	7,624,000	4,722,043	874,164	619,286	167,660	48,728	14,055,881	(1,747,403)	(1,533,886)	10,774,592	4,573	99,211,756	10.9%
2015	2,400	7,087,732	5,245,815	601,860	593,016	162,417	68,263	13,759,103	(2,397,055)	(1,568,533)	9,793,515	4,081	99,983,224	9.8%
2016	2,399	7,331,598	6,115,492	311,820	621,659	182,959	31,455	14,594,983	(2,918,533)	(1,433,489)	10,242,961	4,270	108,788,871	9.4%
2017	2,310	8,091,247	6,488,074	0	642,998	181,102	53,566	15,456,987	(3,885,594)	(2,137,648)	9,433,745	4,084	112,705,188	8.4%
2018	2,175	8,153,321	6,718,221	0	690,084	172,901	27,951	15,762,478	(4,062,903)	(3,161,059)	8,538,516	3,926	116,009,622	7.4%

Separate information for dental and vision was not available for years prior to 2002. Retiree drug subsidy and prescription drug rebates are included beginning with calendar year 2008.

Post-Retirement Health Care and Medicare Reimbursement



Assumptions for Health Care Coverages December 31, 2018

Development of Health Care Rates: Based on the 2018 retired life data, the HPRS portion of the total health care rates was developed as follows:

	HPRS Monthly Rates [Age 59 Central Age]	
	This Year	Prior Year
	Gross Rate	Gross Rate
A. One-person without Medicare	\$ 956.14	\$ 851.50
B. One-person with Medicare*	217.96	227.88
C. Two-persons without Medicare	1,912.28	1,703.00
D. Two-persons with Medicare*	435.92	455.76
E. Child	316.79	330.26

* Includes a reduction to the premium due retiree drug subsidies and prescription drug rebates.

The above rates are estimates that are suitable for the purpose of this valuation. Use of the above rates for any other purpose would require review. Pre-Medicare rates are lower than would be expected when compared with other retired groups. This may be attributable to a higher than average amount of coordination of benefit claims for younger HPRS retirees. Many younger retirees likely have other employment. Please see page B-6 for age specific rates used for valuation purposes. Employment related primary coverages for recipients and dependents have been reflected in the age based specific premium rates.

James E. Pranschke is a Member of the American Academy of Actuaries (MAAA) and meets the Qualification Standards of the American Academy of Actuaries to certify the per capita retiree health care rates shown above and on page B-6 as well as the trend rates presented on page B-9.

James E. Pranschke

 James E. Pranschke, FSA, MAAA, FCA

Assumptions for Health Care Coverages Age Specific HPRS Monthly Gross Rates

Age	Gross Rate		Age	Gross Rate		Age	Gross Rate	
	Male	Female		Male	Female		Male	Female
16	\$ 263.93	\$ 265.96	51	\$ 625.38	\$ 753.31	86	\$ 354.70	\$ 361.50
17	262.07	278.18	52	661.14	778.02	87	353.25	362.45
18	253.92	286.15	53	698.35	802.07	88	351.84	363.18
19	241.01	291.13	54	737.19	825.66	89	350.54	363.69
20	226.06	295.82	55	777.75	849.19	90	349.42	363.81
21	211.82	303.29	56	820.03	873.32	91	348.43	363.31
22	200.38	315.98	57	863.97	898.75	92	347.53	361.87
23	193.00	335.10	58	909.37	926.17	93	346.64	359.21
24	190.08	360.59	59	956.14	956.14	94	345.68	355.06
25	191.39	391.26	60	1,004.51	989.10	95	344.57	349.21
26	196.21	425.24	61	1,054.96	1,025.29	96	343.27	341.50
27	203.67	460.32	62	1,107.82	1,064.75	97	341.75	331.81
28	212.94	494.29	63	1,163.32	1,107.30	98	339.99	320.11
29	223.33	525.19	64	1,221.51	1,152.78	99	339.99	320.11
30	234.35	551.47	65	287.76	271.41	100	339.99	320.11
31	245.59	572.11	66	292.59	278.09	101	339.99	320.11
32	256.86	586.74	67	297.58	284.64	102	339.99	320.11
33	268.18	595.63	68	302.71	291.06	103	339.99	320.11
34	279.80	599.61	69	308.02	297.32	104	339.99	320.11
35	291.99	599.92	70	313.47	303.33	105	339.99	320.11
36	304.99	598.00	71	318.87	309.06	106	339.99	320.11
37	318.90	595.25	72	323.98	314.48	107	339.99	320.11
38	333.61	592.88	73	328.64	319.56	108	339.99	320.11
39	348.91	591.79	74	332.84	324.24	109	339.99	320.11
40	364.62	592.48	75	336.67	328.52	110	339.99	320.11
41	380.74	595.06	76	340.28	332.47	111	339.99	320.11
42	397.45	599.54	77	343.80	336.24	112	339.99	320.11
43	415.00	606.05	78	347.27	339.94	113	339.99	320.11
44	433.70	614.90	79	350.57	343.64	114	339.99	320.11
45	453.91	626.46	80	353.44	347.26	115	339.99	320.11
46	476.12	641.11	81	355.65	350.63	116	339.99	320.11
47	500.79	658.98	82	356.98	353.63	117	339.99	320.11
48	528.25	679.90	83	357.38	356.25	118	339.99	320.11
49	558.47	703.27	84	356.99	358.46	119	339.99	320.11
50	591.05	728.11	85	356.01	360.21	120	339.99	320.11

Assumptions for Health Care Coverages

December 31, 2018

Eligibility for Medicare Coverage: All benefit recipients were assumed to be eligible for Medicare A and B on attainment of age 65.

Health Care Inflation: If the price for any product or service were to increase faster than wages for an indefinite period, eventually that product or service would be priced out of the market and either the product or service would not be offered or substituted with an affordable product or service. For this reason, health care inflation was assumed to equal wage inflation in the long term. The assumed point in time when health care inflation reduces to wage growth inflation is uncertain. Our assumptions are based on an approximate 5 to 10-year horizon. Short-term assumptions are described on page B-9.

Retiree health valuations require an assumption about how the health costs that the System is absorbing will change over the years. This assumption includes more than just “health inflation.” It includes the impact of:

- The introduction of new procedures and medications and how they are priced.
- The utilization of services and products by covered retirees and their dependents and how that utilization changes over the years.

Retiree health valuations use a health cost trend assumption that changes over the years. The near term rates reflect the fact that currently employers are seeing sharp increases in the cost of health goods and services. If this trend is projected to continue for years to come, it implies that years from now virtually all our expenditures will be for health care. The seemingly more reasonable alternative is that in the not too distant future inflation in medical expenses will decrease to a level at or near wage inflation. It is on this basis that we project premium rates will continue to exceed wage inflation for the next 5 - 10 years, but by less each year until leveling off at an ultimate rate, assumed to be 3.5% in this valuation.

The trend assumption is established by reviewing the System’s historical trends and evaluating its relationship with national trends. Comparative trends obtained from a variety of resources including trend surveys from major insurers and benefit consulting groups. This information is added to information we have collected from analysis done in conjunction with many retiree health valuations we have completed for other clients.

This analysis is done separately for the prescription drug program and the remainder of the medical benefits since the trends and forces driving the trends are quite different in these two segments. Review of the System’s recent experience indicates trends typical of our comparative trends for both prescription drug and medical. The trends used in this valuation are found on page B-9.

Post-Retirement Health Premium and Medicare Reimbursement Selection of Assumptions December 31, 2018

In order to prepare actuarial studies of the coverages, it is necessary to make assumptions regarding future events such as:

1. When people will retire and how long people will live after retirement.
2. Whether or not people will quit employment prior to eligibility for a benefit.
3. Whether or not people will die in service or become disabled.
4. Rates of Investment Return and pay increases.
5. The proportion of retirees electing coverage for a spouse after retirement.
6. Rates of increase in health care premium.
7. Effect of managed care program on future claims.

Regarding items 1 through 4, the assumptions from the regular December 31, 2018 valuations were used. For current retirees, actual health care coverage elections were used. For future retirees, it was assumed that 90% of males and 50% of females who retire and elect healthcare coverage would also elect coverage for a spouse at retirement, and that coverage would be available to surviving spouses of deceased retirees and active members.

For purposes of the solvency projections, an investment return assumption of 7.25% was chosen by default to be the same rate used in the Pension Plan valuations. It is uncertain how much longer retiree health fund assets can be invested in the same manner as pension assets given the current solvency period of the retiree health fund.

Post-Retirement Health Premium and Medicare Reimbursement Selection of Assumptions December 31, 2018 (Concluded)

Three alternate assumptions for near term health care cost increases were considered and are shown below. A brief description of each of the alternate assumptions follows:

Alternate A (Optimistic): The Alternate A assumption assumes that the employer share of per capita costs would increase at 6.00% next year, 5.50% the second year, 5.25% the third year, 5.00% the fourth year, 4.75% the fifth year, 4.50% the sixth year, 4.25% the seventh year, 4.00% the eighth year, 3.75% the ninth year and no faster than 3.50% per year thereafter.

Alternate B (Intermediate): In the middle of the range of probable conditions is the view that short-term health care trends will rise somewhat over the next few years before declining to the level of overall GDP growth. This is the assumption set upon which Governmental Accounting Standards Board (GASB) Statements No. 74 and No. 75 information is based.

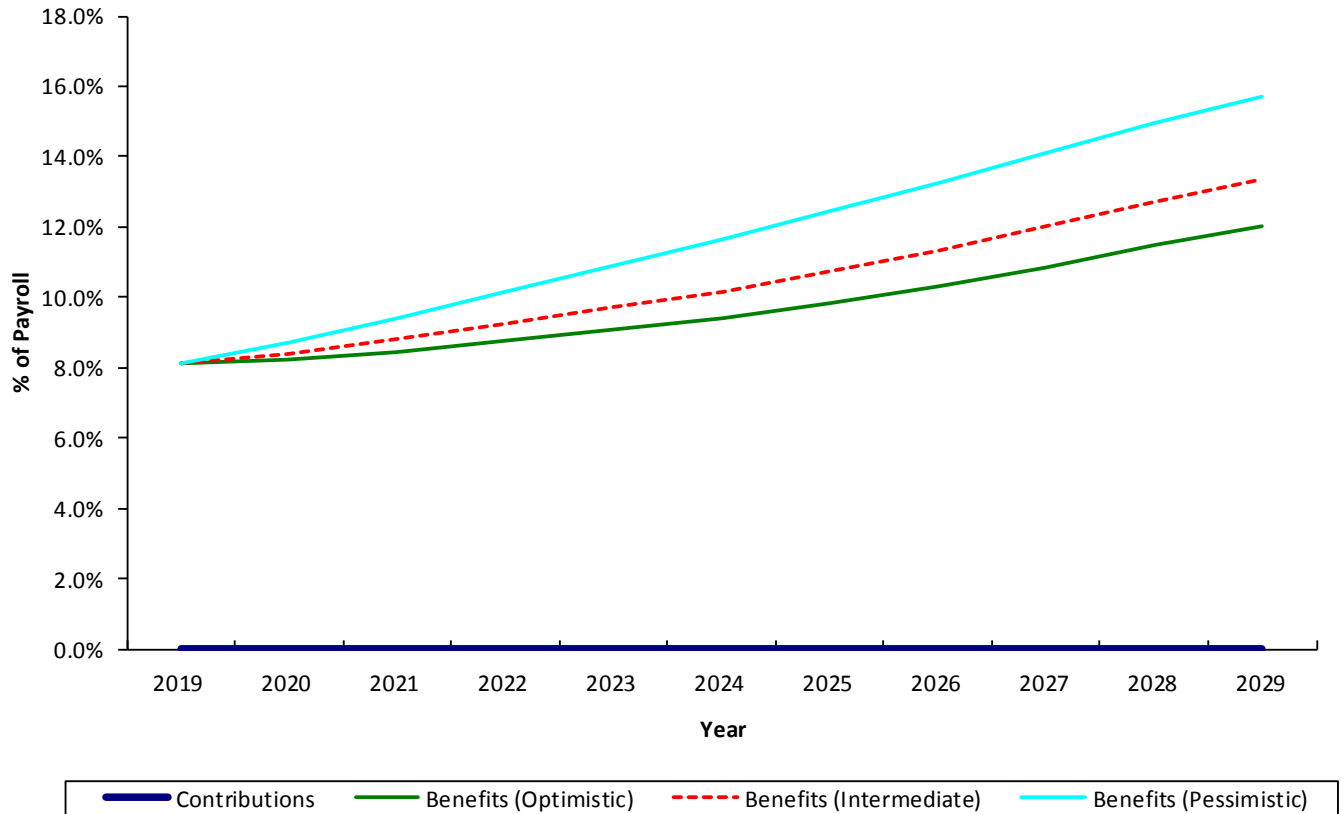
Alternate C (Pessimistic): This scenario envisions poorer experience than the other two.

Year	Health Trend Assumption		
	Medical and Prescription Drug		
	Alt. A Optimistic	Alt. B Intermediate	Alt. C Pessimistic
2019			
2020	6.00%	8.25%	12.00%
2021	5.50%	7.50%	11.00%
2022	5.25%	7.00%	10.00%
2023	5.00%	6.50%	9.00%
2024	4.75%	6.00%	8.00%
2025	4.50%	5.50%	7.00%
2026	4.25%	5.00%	6.00%
2027	4.00%	4.50%	5.00%
2028	3.75%	4.00%	4.25%
2029	3.50%	3.50%	3.50%
2030	3.50%	3.50%	3.50%
2031	3.50%	3.50%	3.50%
2032	3.50%	3.50%	3.50%
2033 & Later	3.50%	3.50%	3.50%

Post-Retirement Health Care and Medicare Reimbursement Projected Benefits December 31, 2018

Year Ended 12/31	Projected Benefits as a % of Payroll		
	Alt. A Optimistic	Alt. B Intermediate	Alt. C Pessimistic
2019	8.1%	8.1%	8.1%
2020	8.2%	8.4%	8.7%
2021	8.5%	8.8%	9.4%
2022	8.8%	9.3%	10.2%
2023	9.1%	9.7%	10.9%
2024	9.4%	10.2%	11.6%
2025	9.8%	10.7%	12.4%
2026	10.3%	11.3%	13.2%
2027	10.9%	12.0%	14.1%
2028	11.5%	12.7%	15.0%
2033	14.3%	15.8%	18.6%
2038	14.3%	15.9%	18.7%
2043	12.9%	14.3%	16.9%
2048	13.2%	14.6%	17.2%
2053	14.7%	16.3%	19.2%
2058	15.9%	17.6%	20.7%
2063	16.0%	17.8%	20.9%
2068	15.8%	17.5%	20.6%
2073	15.4%	17.0%	20.0%
2078	15.5%	17.2%	20.2%

Contributions vs. Benefit Payouts



The above chart assumes that there will be assets sufficient to pay the benefits. Under the intermediate assumptions, unless significant investment gains and/or contribution increases arise, the retiree health fund is expected to run out of money in 2030. At that point, the retiree health plan would become “pay as you go.” Benefits would have to be reduced well below the present levels, because benefits paid out could not exceed contribution income. Given the assumed contribution level, benefits would actually have to be completely eliminated.

Post-Retirement Health Care and Medicare Reimbursement Alternative B: Intermediate Health Trend

Determination of the Actuarially Determined Employer Contribution for the Period July 1, 2019 to June 30, 2020	Contributions Expressed as Percents of Payroll
Normal Cost	6.44%
UAL Payment (30-year amortization)	7.01%
Total (Annual Required Contribution)	13.45%

Accrued Health and Medicare Reimbursement Liabilities, \$262,004,655 were more than applicable assets of \$109,458,262.

The calculations above show the employer's Actuarially Determined Employer Contribution (ADEC) for the year ended June 30, 2020. The System's ADEC for the year ended December 31, 2019 will be ½ of 12.28% and ½ of the 13.45% shown above.

Notes to Trend Data

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

Valuation Date	December 31, 2018
Actuarial Cost Method	Entry Age
Amortization Method	Level Percent Open
Remaining Amortization Period	30 years for retiree health benefits in determining the Actuarially Determined Employer Contribution
Asset Valuation Method	4-year smoothed market 20 % Corridor
Actuarial Assumptions:	
Investment Rate of Return	7.25%
Projected Salary Increases	3.8% - 13.5%
Includes Wage Inflation at	3.5%
Health Trend	Intermediate Trend (See Page B-9)

Experience Gain / (Loss)

Gains/(Losses) During the Year Ended December 31, 2018 Resulting from Differences Between Assumed and Actual Experience

A. Derivation of Actuarial Gain/(Loss):

1. Unfunded Actuarial Accrued Liability (UAAL) - Previous Valuation	\$ 137,950,283
2. Total Normal Cost for Year Ending 12/31/2018	6,196,530
3. Total Contributions (employer) for Year Ending 12/31/2018	4,623,201
4. Interest on:	
a. UAAL: Discount Rate* x (1)	10,691,147
b. Normal Cost and Contributions: Discount Rate / 2 x [(2) - (3)]	60,966
c. Net Total: (a) + (b)	10,752,113
5. Change in UAAL due to Benefit Changes	-
6. Change in UAAL due to Assumptions (Trend/Discount Rate)	20,587,069
7. Expected UAAL Current Year:	
(1) + (2) - (3) + (4c) + (5) + (6)	170,862,794
8. Actual UAAL Current Year	152,546,393
9. Experience Gain/(Loss): (7) - (8)	\$ 18,316,401

B. Approximate Portion of Gain/(Loss) due to Investments \$ (4,936,105)

C. Approximate Portion of Gain/(Loss) due to Liabilities: (A.9) - (B) \$ 23,252,506

* Discount rate is 7.75%.

Type of Activity

	Gain/(Loss)
1. Premiums. Gains and losses resulting from actual premiums in valuation year versus that assumed from prior valuation.	\$ 11,890,612
2. Investment Income. If there is greater investment income than assumed, there is a gain. If less income, a loss.	(4,936,105)
3. All Other Sources. Gains and losses resulting from demographic experience, data adjustments, timing of financial transactions, etc.	11,361,894
4. Composite Gain/(Loss) During Year.	\$ 18,316,401

Short-Term Healthcare Solvency Test

The HPRS financing objective is to pay for the benefits through contributions that remain approximately level from year-to-year as a percent of member payroll. If the contributions to the System are level in concept and soundly executed, the System will *pay all promised benefits when due – the ultimate test of financial soundness*.

Short-term solvency test is one means of checking a system’s progress under its funding program. In a short-term solvency test, the plan’s present assets (cash and investments) are compared with: 1) The liabilities for future benefits to present retired lives; and 2) The liabilities for service already rendered by active members. In a system that has been following the discipline of level percent financing, the liabilities for future benefits to present retired lives (1) will be fully covered by present assets (except in rare circumstances). In addition, the liabilities for service already rendered by active members (2) will be partially covered by the remainder of the present assets. Generally, if the system has been using level cost financing, the funded portion of Column 2 will increase over time.

Accrued Liabilities and Assets Allocated to Retirement, Survivor and Disability Healthcare

Valuation Year	(1) Retirants, Beneficiaries & Vested Deferreds	(2) Active Members (Employer Financed Portion)	Healthcare Valuation Assets	Portion of Accrued Liabilities Covered by Reported Assets	
				(1)	(2)
2013	\$ 253,784,322	\$ 157,683,503	\$ 99,817,173	39%	0%
2014	246,744,210	191,817,484	102,083,923	41%	0%
2015 #	177,574,474	199,108,639	103,812,807	58%	0%
2016	195,195,607	217,156,476	106,550,139	55%	0%
2017 *#	125,764,087	122,323,654	110,137,458	88%	0%
2018	117,772,305	132,350,773	109,458,262	93%	0%
2018 #	120,357,969	141,646,686	109,458,262	91%	0%

* Plan amendment.

Assumption or method change.

Post-Retirement Health and Medicare Reimbursement Results with Alternate Health Inflation Assumptions December 31, 2018

Optimistic, Intermediate and Pessimistic assumption sets were described on page B-9. For each assumption set, four questions are asked.

Question 1. How long will the Health Care fund remain solvent if the present employer contribution rate allocation, “Funding Level 1”, is not changed?

Question 2. What is the lowest employer contribution rate, “Funding Level 2”, that would maintain the solvency of the fund for 20 years?

Question 3. What is the lowest employer contribution rate, “Funding Level 3”, that would maintain the solvency of the fund for 30 years?

Question 4. What is the lowest employer contribution rate, “Funding Level 4”, that would maintain the solvency of the fund indefinitely?

The answers to these questions are summarized below. In reviewing the answers, it is important to keep in mind that the alternates are intended to be helpful in understanding the range of potential outcomes. They are not predictions.

Assumption Set	Funding Level 1			Funding Level 2			Funding Level 3			Funding Level 4		
	Employer Rate Allocation			Lowest Employer Rate to Maintain Solvency of Fund for 20 Years			Lowest Employer Rate to Maintain Solvency of Fund for 30 Years			Lowest Employer Rate to Maintain Solvency of Fund Indefinitely		
	%	Fund Solvent Until	Prior Valuation %	%	Fund Solvent Until	Prior Valuation %	%	Fund Solvent Until	Prior Valuation %	%	Fund Solvent Until	Prior Valuation %
A (Optimistic)	0.00%	2030	0.00%	4.60%	2039	4.10%	6.60%	2049	6.10%	9.50%	Indefinitely	8.90%
B (Intermediate)	0.00%	2030	0.00%	5.60%	2039	5.10%	7.60%	2049	7.20%	10.80%	Indefinitely	10.10%
C (Pessimistic)	0.00%	2029	0.00%	7.40%	2039	6.90%	9.60%	2049	9.20%	13.10%	Indefinitely	12.40%

The above results show that:

- Under the optimistic assumptions, the employer rate will need to be raised prior to 2030 in order to maintain the solvency of the fund. The ultimate rate needed to support the plan would be 9.50% of payroll if the increase were made today.
- Under the intermediate assumptions, the employer rate will need to be raised prior to 2030 in order to maintain the solvency of the fund. The ultimate rate needed to support the plan would be 10.80% of payroll if the increase were made today.
- Under the pessimistic assumptions, the employer rate will need to be raised prior to 2029 in order to maintain the solvency of the fund. The ultimate rate needed to support the plan would be 13.10% of payroll if the increase were made today.

The following pages show projected fund activity based upon Alternate Assumptions A, B and C, and Funding Levels 1, 2, 3 and 4.

Post-Retirement Health Care & Medicare Reimbursement
Cash Flow Projection
Optimistic Assumptions: A
Funding Level 1
(\$ in Thousands)

Calendar Year	Fund Balance BOY	Contributions	Benefits	Net	Investment Return %	Investment Return \$	Fund Balance EOY		% of Payroll	
							Nominal \$	Real \$	Contrib.	Benefits
2019	\$109,458	\$0	\$ 9,761	\$ (9,760)	7.25%	\$7,586	\$107,284	\$107,284	0.00%	8.14%
2020	107,284	0	10,203	(10,203)	7.25%	7,413	104,494	100,960	0.00%	8.24%
2021	104,494	0	10,824	(10,824)	7.25%	7,188	100,858	94,152	0.00%	8.46%
2022	100,858	0	11,569	(11,569)	7.25%	6,898	96,187	86,755	0.00%	8.77%
2023	96,187	0	12,337	(12,337)	7.25%	6,532	90,382	78,763	0.00%	9.08%
2024	90,382	0	13,142	(13,142)	7.25%	6,082	83,322	70,155	0.00%	9.38%
2025	83,322	0	14,157	(14,157)	7.25%	5,534	74,699	60,768	0.00%	9.81%
2026	74,699	0	15,312	(15,312)	7.25%	4,867	64,254	50,503	0.00%	10.29%
2027	64,254	0	16,676	(16,676)	7.25%	4,061	51,639	39,215	0.00%	10.86%
2028	51,639	0	18,215	(18,215)	7.25%	3,091	36,515	26,792	0.00%	11.48%
2029	36,515	0	19,740	(19,740)	7.25%	1,940	18,715	13,267	0.00%	12.03%
2030	18,715	0	21,456	(21,456)	7.25%	588	(2,153)	(1,475)	0.00%	12.65%
2031	(2,153)	0	23,283	(23,283)	7.25%	(990)	(26,426)	(17,488)	0.00%	13.27%

Funding Level 1 is the present contribution rate for post-retirement Health Care and Medicare reimbursement. The fund remains solvent until 2030 in this projection.

Post-Retirement Health Care & Medicare Reimbursement
Cash Flow Projection
Optimistic Assumptions: A
Funding Level 2
(\$ in Thousands)

Calendar Year	Fund Balance BOY	Contributions	Benefits	Net	Investment Return %	Investment Return \$	Fund Balance EOY		% of Payroll	
							Nominal \$	Real \$	Contrib.	Benefits
2019	\$ 109,458	\$ 5,517	\$ 9,761	\$ (4,243)	7.25%	\$ 7,784	\$ 112,999	\$112,999	4.60%	8.14%
2020	112,999	5,697	10,203	(4,506)	7.25%	8,031	116,524	110,975	4.60%	8.24%
2021	116,524	5,882	10,824	(4,942)	7.25%	8,271	119,853	108,710	4.60%	8.46%
2022	119,853	6,067	11,569	(5,502)	7.25%	8,492	122,843	106,116	4.60%	8.77%
2023	122,843	6,251	12,337	(6,086)	7.25%	8,688	125,445	103,204	4.60%	9.08%
2024	125,445	6,443	13,142	(6,699)	7.25%	8,855	127,601	99,979	4.60%	9.38%
2025	127,601	6,640	14,157	(7,517)	7.25%	8,982	129,066	96,311	4.60%	9.81%
2026	129,066	6,844	15,312	(8,468)	7.25%	9,054	129,652	92,141	4.60%	10.29%
2027	129,652	7,064	16,676	(9,612)	7.25%	9,055	129,095	87,377	4.60%	10.86%
2028	129,095	7,300	18,215	(10,915)	7.25%	8,968	127,148	81,961	4.60%	11.48%
2029	127,148	7,549	19,740	(12,191)	7.25%	8,781	123,738	75,964	4.60%	12.03%
2030	123,738	7,803	21,456	(13,653)	7.25%	8,482	118,567	69,324	4.60%	12.65%
2031	118,567	8,071	23,283	(15,212)	7.25%	8,051	111,406	62,035	4.60%	13.27%
2032	111,406	8,361	25,125	(16,764)	7.25%	7,476	102,118	54,155	4.60%	13.82%
2033	102,118	8,666	26,873	(18,207)	7.25%	6,751	90,662	45,790	4.60%	14.26%
2034	90,662	8,985	28,449	(19,464)	7.25%	5,876	77,074	37,074	4.60%	14.57%
2035	77,074	9,322	29,842	(20,520)	7.25%	4,853	61,407	28,131	4.60%	14.73%
2036	61,407	9,675	30,800	(21,125)	7.25%	3,695	43,977	19,187	4.60%	14.64%
2037	43,977	10,032	31,505	(21,473)	7.25%	2,419	24,923	10,356	4.60%	14.45%
2038	24,923	10,400	32,391	(21,991)	7.25%	1,019	3,951	1,564	4.60%	14.33%
2039	3,951	10,792	32,885	(22,093)	7.25%	(505)	(18,647)	(7,028)	4.60%	14.02%

Funding Level 2 is the lowest funding level that will keep the fund solvent for 20 years.

Post-Retirement Health Care & Medicare Reimbursement
Cash Flow Projection
Optimistic Assumptions: A
Funding Level 3
(\$ in Thousands)

Calendar Year	Fund Balance BOY	Contributions	Benefits	Net	Investment Return %	Investment Return \$	Fund Balance EOY		% of Payroll	
							Nominal \$	Real \$	Contrib.	Benefits
2019	\$ 109,458	\$ 7,916	\$ 9,761	\$ (1,844)	7.25%	\$ 7,870	\$ 115,484	\$115,484	6.60%	8.14%
2020	115,484	8,174	10,203	(2,029)	7.25%	8,300	121,755	117,638	6.60%	8.24%
2021	121,755	8,439	10,824	(2,385)	7.25%	8,742	128,112	119,594	6.60%	8.46%
2022	128,112	8,705	11,569	(2,864)	7.25%	9,186	134,434	121,252	6.60%	8.77%
2023	134,434	8,969	12,337	(3,368)	7.25%	9,626	140,692	122,605	6.60%	9.08%
2024	140,692	9,245	13,142	(3,897)	7.25%	10,061	146,856	123,649	6.60%	9.38%
2025	146,856	9,527	14,157	(4,630)	7.25%	10,481	152,707	124,227	6.60%	9.81%
2026	152,707	9,820	15,312	(5,492)	7.25%	10,874	158,089	124,257	6.60%	10.29%
2027	158,089	10,135	16,676	(6,541)	7.25%	11,227	162,775	123,613	6.60%	10.86%
2028	162,775	10,474	18,215	(7,741)	7.25%	11,524	166,558	122,209	6.60%	11.48%
2033	170,160	12,434	26,873	(14,439)	7.25%	11,819	167,540	103,503	6.60%	14.26%
2038	145,652	14,922	32,391	(17,469)	7.25%	9,934	138,117	71,842	6.60%	14.33%
2043	103,085	17,996	35,302	(17,306)	7.25%	6,854	92,633	40,569	6.60%	12.95%
2048	35,946	21,814	43,496	(21,682)	7.25%	1,829	16,093	5,934	6.60%	13.16%
2049	16,093	22,638	46,232	(23,594)	7.25%	321	(7,180)	(2,558)	6.60%	13.48%

Funding Level 3 is the lowest funding level that will keep the fund solvent for 30 years.

**Post-Retirement Health Care & Medicare Reimbursement
Cash Flow Projection
Optimistic Assumptions: A
Funding Level 4
(\$ in Thousands)**

Calendar Year	Fund Balance BOY	Contributions	Benefits	Net	Investment Return %	Investment Return \$	Fund Balance EOY		% of Payroll	
							Nominal \$	Real \$	Contrib.	Benefits
2019	\$ 109,458	\$ 11,394	\$ 9,761	\$1,634	7.25%	\$ 7,994	\$ 119,086	\$119,086	9.50%	8.14%
2020	119,086	11,765	10,203	1,562	7.25%	8,690	129,338	124,964	9.50%	8.24%
2021	129,338	12,148	10,824	1,324	7.25%	9,424	140,086	130,772	9.50%	8.46%
2022	140,086	12,530	11,569	961	7.25%	10,191	151,238	136,408	9.50%	8.77%
2023	151,238	12,910	12,337	573	7.25%	10,985	162,796	141,867	9.50%	9.08%
2024	162,796	13,307	13,142	165	7.25%	11,809	174,770	147,152	9.50%	9.38%
2025	174,770	13,714	14,157	(443)	7.25%	12,655	186,982	152,110	9.50%	9.81%
2026	186,982	14,135	15,312	(1,177)	7.25%	13,514	199,319	156,663	9.50%	10.29%
2027	199,319	14,588	16,676	(2,088)	7.25%	14,376	211,607	160,697	9.50%	10.86%
2028	211,607	15,076	18,215	(3,139)	7.25%	15,229	223,697	164,133	9.50%	11.48%
2033	268,815	17,898	26,873	(8,975)	7.25%	19,168	279,008	172,366	9.50%	14.26%
2038	320,704	21,479	32,391	(10,912)	7.25%	22,860	332,652	173,031	9.50%	14.33%
2043	393,614	25,904	35,302	(9,398)	7.25%	28,200	412,416	180,621	9.50%	12.95%
2048	499,159	31,399	43,496	(12,097)	7.25%	35,756	522,818	192,788	9.50%	13.16%
2053	618,232	37,648	58,357	(20,709)	7.25%	44,080	641,603	199,202	9.50%	14.73%
2058	732,204	44,653	74,629	(29,976)	7.25%	52,011	754,239	197,168	9.50%	15.88%
2063	845,078	52,996	89,486	(36,490)	7.25%	59,961	868,549	191,170	9.50%	16.04%
2068	967,715	63,036	105,062	(42,026)	7.25%	68,654	994,343	184,272	9.50%	15.83%
2078	1,283,253	88,957	144,982	(56,025)	7.25%	91,029	1,318,257	173,189	9.50%	15.48%
2088	1,608,735	125,400	210,904	(85,504)	7.25%	113,570	1,636,801	152,444	9.50%	15.98%
2098	1,804,604	176,898	297,778	(120,880)	7.25%	126,503	1,810,227	119,521	9.50%	15.99%
2108	1,669,430	249,637	412,112	(162,475)	7.25%	115,213	1,622,168	75,928	9.50%	15.68%
2118	632,298	352,020	586,645	(234,625)	7.25%	37,436	435,109	14,438	9.50%	15.83%

Funding Level 4 is the lowest funding level that will keep the fund solvent indefinitely, i.e., throughout the entire 100-year projection period assuming all assumptions are realized.

**Post-Retirement Health Care & Medicare Reimbursement
Cash Flow Projection
Intermediate Assumptions: B
Funding Level 1
(\$ in Thousands)**

Calendar Year	Fund Balance BOY	Contributions	Benefits	Net	Investment Return %	Investment Return \$	Fund Balance EOY		% of Payroll	
							Nominal \$	Real \$	Contrib.	Benefits
2019	\$109,458	\$0	\$ 9,761	\$ (9,761)	7.25%	\$7,586	\$107,283	\$107,283	0.00%	8.14%
2020	107,283	0	10,415	(10,415)	7.25%	7,405	104,273	100,747	0.00%	8.41%
2021	104,273	0	11,253	(11,253)	7.25%	7,157	100,177	93,516	0.00%	8.80%
2022	100,177	0	12,220	(12,220)	7.25%	6,825	94,782	85,488	0.00%	9.26%
2023	94,782	0	13,213	(13,213)	7.25%	6,398	87,967	76,658	0.00%	9.72%
2024	87,967	0	14,236	(14,236)	7.25%	5,868	79,599	67,020	0.00%	10.16%
2025	79,599	0	15,476	(15,476)	7.25%	5,216	69,339	56,407	0.00%	10.72%
2026	69,339	0	16,849	(16,849)	7.25%	4,423	56,913	44,733	0.00%	11.32%
2027	56,913	0	18,429	(18,429)	7.25%	3,466	41,950	31,857	0.00%	12.00%
2028	41,950	0	20,176	(20,176)	7.25%	2,319	24,093	17,678	0.00%	12.71%
2029	24,093	0	21,875	(21,875)	7.25%	963	3,181	2,255	0.00%	13.33%
2030	3,181	0	23,779	(23,779)	7.25%	(621)	(21,219)	(14,534)	0.00%	14.02%

Funding Level 1 is the present contribution rate for post-retirement Health Care and Medicare reimbursement. The fund remains solvent until 2030 in this projection.

Post-Retirement Health Care & Medicare Reimbursement
Cash Flow Projection
Intermediate Assumptions: B
Funding Level 2
(\$ in Thousands)

Calendar Year	Fund Balance BOY	Contributions	Benefits	Net	Investment Return %	Investment Return \$	Fund Balance EOY		% of Payroll	
							Nominal \$	Real \$	Contrib.	Benefits
2019	\$ 109,458	\$ 6,716	\$ 9,761	\$ (3,045)	7.25%	\$ 7,827	\$ 114,240	\$114,240	5.60%	8.14%
2020	114,240	6,935	10,415	(3,480)	7.25%	8,158	118,918	113,255	5.60%	8.41%
2021	118,918	7,161	11,253	(4,092)	7.25%	8,475	123,301	111,838	5.60%	8.80%
2022	123,301	7,386	12,220	(4,834)	7.25%	8,766	127,233	109,909	5.60%	9.26%
2023	127,233	7,610	13,213	(5,603)	7.25%	9,024	130,654	107,489	5.60%	9.72%
2024	130,654	7,844	14,236	(6,392)	7.25%	9,243	133,505	104,605	5.60%	10.16%
2025	133,505	8,084	15,476	(7,392)	7.25%	9,414	135,527	101,132	5.60%	10.72%
2026	135,527	8,332	16,849	(8,517)	7.25%	9,521	136,531	97,030	5.60%	11.32%
2027	136,531	8,599	18,429	(9,830)	7.25%	9,546	136,247	92,217	5.60%	12.00%
2028	136,247	8,887	20,176	(11,289)	7.25%	9,473	134,431	86,655	5.60%	12.71%
2029	134,431	9,190	21,875	(12,685)	7.25%	9,292	131,038	80,446	5.60%	13.33%
2030	131,038	9,499	23,779	(14,280)	7.25%	8,989	125,747	73,522	5.60%	14.02%
2031	125,747	9,825	25,806	(15,981)	7.25%	8,544	118,310	65,879	5.60%	14.71%
2032	118,310	10,179	27,851	(17,672)	7.25%	7,944	108,582	57,583	5.60%	15.32%
2033	108,582	10,550	29,791	(19,241)	7.25%	7,183	96,524	48,751	5.60%	15.81%
2034	96,524	10,938	31,540	(20,602)	7.25%	6,260	82,182	39,531	5.60%	16.15%
2035	82,182	11,349	33,086	(21,737)	7.25%	5,179	65,624	30,063	5.60%	16.33%
2036	65,624	11,779	34,147	(22,368)	7.25%	3,956	47,212	20,598	5.60%	16.23%
2037	47,212	12,213	34,927	(22,714)	7.25%	2,609	27,107	11,264	5.60%	16.01%
2038	27,107	12,661	35,908	(23,247)	7.25%	1,132	4,992	1,976	5.60%	15.88%
2039	4,992	13,138	36,454	(23,316)	7.25%	(473)	(18,797)	(7,084)	5.60%	15.54%

Funding Level 2 is the lowest funding level that will keep the fund solvent for 20 years.

Post-Retirement Health Care & Medicare Reimbursement
Cash Flow Projection
Intermediate Assumptions: B
Funding Level 3
(\$ in Thousands)

Calendar Year	Fund Balance BOY	Contributions	Benefits	Net	Investment Return %	Investment Return \$	Fund Balance EOY		% of Payroll	
							Nominal \$	Real \$	Contrib.	Benefits
2019	\$ 109,458	\$ 9,115	\$ 9,761	\$ (646)	7.25%	\$ 7,913	\$ 116,725	\$116,725	7.60%	8.14%
2020	116,725	9,412	10,415	(1,003)	7.25%	8,427	124,149	119,951	7.60%	8.41%
2021	124,149	9,718	11,253	(1,535)	7.25%	8,946	131,560	122,813	7.60%	8.80%
2022	131,560	10,024	12,220	(2,196)	7.25%	9,459	138,823	125,210	7.60%	9.26%
2023	138,823	10,328	13,213	(2,885)	7.25%	9,961	145,899	127,143	7.60%	9.72%
2024	145,899	10,645	14,236	(3,591)	7.25%	10,449	152,757	128,617	7.60%	10.16%
2025	152,757	10,971	15,476	(4,505)	7.25%	10,913	159,165	129,481	7.60%	10.72%
2026	159,165	11,308	16,849	(5,541)	7.25%	11,341	164,965	129,661	7.60%	11.32%
2027	164,965	11,670	18,429	(6,759)	7.25%	11,718	169,924	129,042	7.60%	12.00%
2028	169,924	12,061	20,176	(8,115)	7.25%	12,029	173,838	127,550	7.60%	12.71%
2033	176,619	14,318	29,791	(15,473)	7.25%	12,251	173,397	107,122	7.60%	15.81%
2038	147,830	17,183	35,908	(18,725)	7.25%	10,047	139,152	72,381	7.60%	15.88%
2043	99,074	20,723	39,120	(18,397)	7.25%	6,524	87,201	38,190	7.60%	14.35%
2048	23,362	25,120	48,200	(23,080)	7.25%	867	1,149	424	7.60%	14.58%
2049	1,149	26,068	51,235	(25,167)	7.25%	(818)	(24,836)	(8,849)	7.60%	14.94%

Funding Level 3 is the lowest funding level that will keep the fund solvent for 30 years.

Post-Retirement Health Care & Medicare Reimbursement
Cash Flow Projection
Intermediate Assumptions: B
Funding Level 4
(\$ in Thousands)

Calendar Year	Fund Balance BOY	Contributions	Benefits	Net	Investment Return %	Investment Return \$	Fund Balance EOY		% of Payroll	
							Nominal \$	Real \$	Contrib.	Benefits
2019	\$ 109,458	\$ 12,953	\$ 9,761	\$ 3,192	7.25%	\$ 8,050	\$ 120,700	\$120,700	10.80%	8.14%
2020	120,700	13,375	10,415	2,960	7.25%	8,857	132,517	128,036	10.80%	8.41%
2021	132,517	13,810	11,253	2,557	7.25%	9,699	144,773	135,147	10.80%	8.80%
2022	144,773	14,245	12,220	2,025	7.25%	10,569	157,367	141,936	10.80%	9.26%
2023	157,367	14,677	13,213	1,464	7.25%	11,462	170,293	148,401	10.80%	9.72%
2024	170,293	15,128	14,236	892	7.25%	12,378	183,563	154,555	10.80%	10.16%
2025	183,563	15,590	15,476	114	7.25%	13,312	196,989	160,251	10.80%	10.72%
2026	196,989	16,069	16,849	(780)	7.25%	14,254	210,463	165,422	10.80%	11.32%
2027	210,463	16,584	18,429	(1,845)	7.25%	15,192	223,810	169,964	10.80%	12.00%
2028	223,810	17,139	20,176	(3,037)	7.25%	16,117	236,890	173,814	10.80%	12.71%
2033	285,483	20,347	29,791	(9,444)	7.25%	20,359	296,398	183,109	10.80%	15.81%
2038	340,992	24,418	35,908	(11,490)	7.25%	24,310	353,812	184,037	10.80%	15.88%
2043	419,661	29,449	39,120	(9,671)	7.25%	30,079	440,069	192,731	10.80%	14.35%
2048	534,499	35,696	48,200	(12,504)	7.25%	38,303	560,298	206,609	10.80%	14.58%
2053	664,385	42,800	64,685	(21,885)	7.25%	47,384	689,884	214,192	10.80%	16.32%
2058	788,773	50,763	82,729	(31,966)	7.25%	56,041	812,848	212,489	10.80%	17.60%
2063	912,389	60,248	99,191	(38,943)	7.25%	64,753	938,199	206,500	10.80%	17.78%
2068	1,047,762	71,662	116,447	(44,785)	7.25%	74,358	1,077,335	199,652	10.80%	17.55%
2078	1,402,425	101,130	160,671	(59,541)	7.25%	99,543	1,442,427	189,502	10.80%	17.16%
2088	1,785,507	142,560	233,735	(91,175)	7.25%	126,183	1,820,515	169,555	10.80%	17.71%
2098	2,064,902	201,105	330,020	(128,915)	7.25%	145,087	2,081,074	137,404	10.80%	17.72%
2108	2,065,144	283,797	456,721	(172,924)	7.25%	143,528	2,035,748	95,287	10.80%	17.38%
2118	1,252,505	400,191	650,160	(249,969)	7.25%	81,851	1,084,387	35,982	10.80%	17.55%

Funding Level 4 is the lowest funding level that will keep the fund solvent indefinitely, i.e., throughout the entire 100-year projection period assuming all assumptions are realized.

**Post-Retirement Health Care & Medicare Reimbursement
Cash Flow Projection
Pessimistic Assumptions: C
Funding Level 1
(\$ in Thousands)**

Calendar Year	Fund Balance BOY	Contributions	Benefits	Net	Investment Return %	Investment Return \$	Fund Balance EOY		% of Payroll	
							Nominal \$	Real \$	Contrib.	Benefits
2019	\$109,458	\$0	\$ 9,761	\$ (9,763)	7.25%	\$7,586	\$107,281	\$107,281	0.00%	8.14%
2020	107,281	0	10,771	(10,771)	7.25%	7,392	103,902	100,388	0.00%	8.70%
2021	103,902	0	12,011	(12,011)	7.25%	7,103	98,994	92,412	0.00%	9.39%
2022	98,994	0	13,404	(13,404)	7.25%	6,697	92,287	83,238	0.00%	10.16%
2023	92,287	0	14,829	(14,829)	7.25%	6,160	83,618	72,868	0.00%	10.91%
2024	83,618	0	16,277	(16,277)	7.25%	5,479	72,820	61,312	0.00%	11.62%
2025	72,820	0	17,939	(17,939)	7.25%	4,637	59,518	48,418	0.00%	12.43%
2026	59,518	0	19,701	(19,701)	7.25%	3,609	43,426	34,132	0.00%	13.24%
2027	43,426	0	21,645	(21,645)	7.25%	2,373	24,154	18,343	0.00%	14.10%
2028	24,154	0	23,760	(23,760)	7.25%	900	1,294	949	0.00%	14.97%
2029	1,294	0	25,772	(25,772)	7.25%	(830)	(25,308)	(17,941)	0.00%	15.70%

Funding Level 1 is the present contribution rate for post-retirement Health Care and Medicare reimbursement. The fund remains solvent until 2029 in this projection.

**Post-Retirement Health Care & Medicare Reimbursement
Cash Flow Projection
Pessimistic Assumptions: C
Funding Level 2
(\$ in Thousands)**

Calendar Year	Fund Balance BOY	Contributions	Benefits	Net	Investment Return %	Investment Return \$	Fund Balance EOY		% of Payroll	
							Nominal \$	Real \$	Contrib.	Benefits
2019	\$109,458	\$ 8,875	\$ 9,761	\$ (888)	7.25%	\$ 7,904	\$116,474	\$116,474	7.40%	8.14%
2020	116,474	9,165	10,771	(1,606)	7.25%	8,387	123,255	119,087	7.40%	8.70%
2021	123,255	9,462	12,011	(2,549)	7.25%	8,845	129,551	120,937	7.40%	9.39%
2022	129,551	9,760	13,404	(3,644)	7.25%	9,262	135,169	121,915	7.40%	10.16%
2023	135,169	10,056	14,829	(4,773)	7.25%	9,629	140,025	122,024	7.40%	10.91%
2024	140,025	10,365	16,277	(5,912)	7.25%	9,940	144,053	121,289	7.40%	11.62%
2025	144,053	10,682	17,939	(7,257)	7.25%	10,184	146,980	119,568	7.40%	12.43%
2026	146,980	11,010	19,701	(8,691)	7.25%	10,345	148,634	116,825	7.40%	13.24%
2027	148,634	11,363	21,645	(10,282)	7.25%	10,408	148,760	112,970	7.40%	14.10%
2028	148,760	11,743	23,760	(12,017)	7.25%	10,355	147,098	107,930	7.40%	14.97%
2029	147,098	12,144	25,772	(13,628)	7.25%	10,176	143,646	101,833	7.40%	15.70%
2030	143,646	12,552	28,019	(15,467)	7.25%	9,860	138,039	94,549	7.40%	16.52%
2031	138,039	12,983	30,410	(17,427)	7.25%	9,383	129,995	86,029	7.40%	17.33%
2032	129,995	13,451	32,819	(19,368)	7.25%	8,731	119,358	76,318	7.40%	18.06%
2033	119,358	13,941	35,106	(21,165)	7.25%	7,895	106,088	65,539	7.40%	18.63%
2034	106,088	14,454	37,159	(22,705)	7.25%	6,878	90,261	53,876	7.40%	19.02%
2035	90,261	14,997	38,975	(23,978)	7.25%	5,685	71,968	41,504	7.40%	19.23%
2036	71,968	15,565	40,221	(24,656)	7.25%	4,334	51,646	28,777	7.40%	19.12%
2037	51,646	16,139	41,128	(24,989)	7.25%	2,849	29,506	15,885	7.40%	18.86%
2038	29,506	16,731	42,275	(25,544)	7.25%	1,224	5,186	2,698	7.40%	18.70%
2039	5,186	17,360	42,910	(25,550)	7.25%	(539)	(20,903)	(10,505)	7.40%	18.29%

Funding Level 2 is the lowest funding level that will keep the fund solvent for 20 years.

**Post-Retirement Health Care & Medicare Reimbursement
Cash Flow Projection
Pessimistic Assumptions: C
Funding Level 3
(\$ in Thousands)**

Calendar Year	Fund Balance BOY	Contributions	Benefits	Net	Investment Return %	Investment Return \$	Fund Balance EOY		% of Payroll	
							Nominal \$	Real \$	Contrib.	Benefits
2019	\$109,458	\$11,514	\$9,761	\$ 1,751	7.25%	\$ 7,998	\$119,207	\$119,207	9.60%	8.14%
2020	119,207	11,889	10,771	1,118	7.25%	8,683	129,008	124,645	9.60%	8.70%
2021	129,008	12,275	12,011	264	7.25%	9,363	138,635	129,417	9.60%	9.39%
2022	138,635	12,662	13,404	(742)	7.25%	10,024	147,917	133,413	9.60%	10.16%
2023	147,917	13,046	14,829	(1,783)	7.25%	10,660	156,794	136,637	9.60%	10.91%
2024	156,794	13,447	16,277	(2,830)	7.25%	11,266	165,230	139,119	9.60%	11.62%
2025	165,230	13,858	17,939	(4,081)	7.25%	11,833	172,982	140,721	9.60%	12.43%
2026	172,982	14,284	19,701	(5,417)	7.25%	12,347	179,912	141,409	9.60%	13.24%
2027	179,912	14,742	21,645	(6,903)	7.25%	12,796	185,805	141,102	9.60%	14.10%
2028	185,805	15,235	23,760	(8,525)	7.25%	13,165	190,445	139,735	9.60%	14.97%
2033	194,198	18,086	35,106	(17,020)	7.25%	13,470	190,648	117,779	9.60%	18.63%
2038	162,300	21,705	42,275	(20,570)	7.25%	11,030	152,760	79,459	9.60%	18.70%
2043	109,559	26,177	46,014	(19,837)	7.25%	7,232	96,954	42,462	9.60%	16.88%
2048	29,229	31,730	56,687	(24,957)	7.25%	1,225	5,497	2,027	9.60%	17.15%
2049	5,497	32,928	60,260	(27,332)	7.25%	(581)	(22,416)	(7,986)	9.60%	17.57%

Funding Level 3 is the lowest funding level that will keep the fund solvent for 30 years.

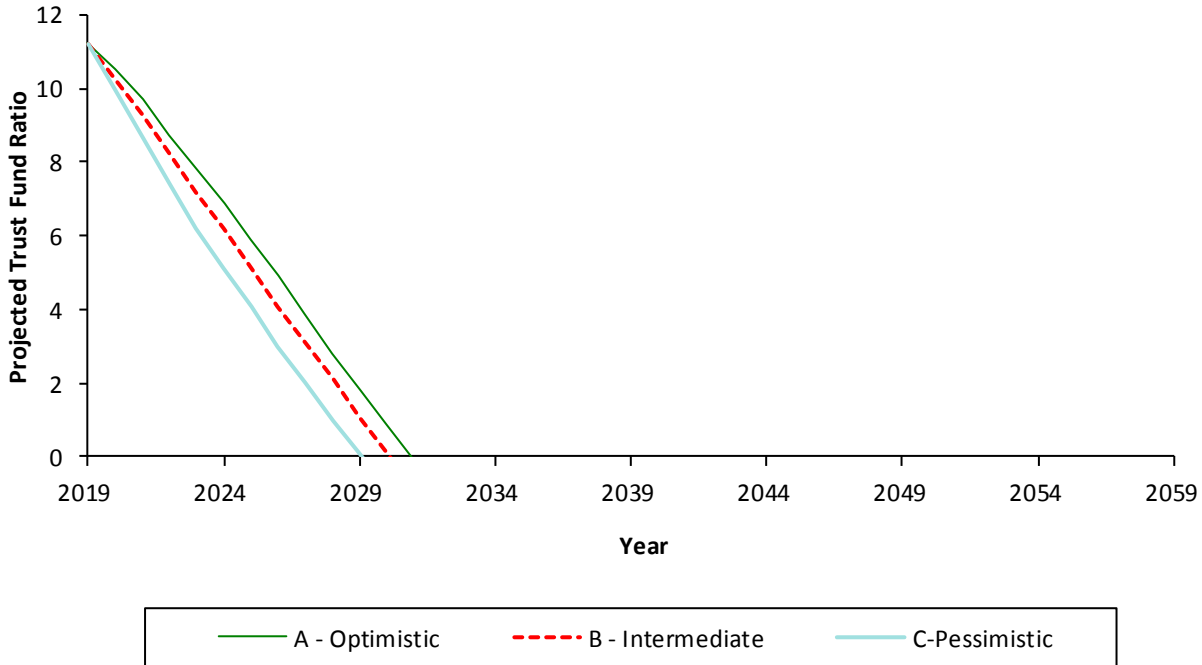
Post-Retirement Health Care & Medicare Reimbursement
Cash Flow Projection
Pessimistic Assumptions: C
Funding Level 4
(\$ in Thousands)

Calendar Year	Fund Balance BOY	Contributions	Benefits	Net	Investment Return %	Investment Return \$	Fund Balance EOY		% of Payroll	
							Nominal \$	Real \$	Contrib.	Benefits
2019	\$ 109,458	\$ 15,711	\$ 9,761	\$ 5,948	7.25%	\$ 8,149	\$ 123,555	\$ 123,555	13.10%	8.14%
2020	123,555	16,224	10,771	5,453	7.25%	9,153	138,161	133,489	13.10%	8.70%
2021	138,161	16,751	12,011	4,740	7.25%	10,186	153,087	142,908	13.10%	9.39%
2022	153,087	17,278	13,404	3,874	7.25%	11,238	168,199	151,706	13.10%	10.16%
2023	168,199	17,803	14,829	2,974	7.25%	12,301	183,474	159,887	13.10%	10.91%
2024	183,474	18,349	16,277	2,072	7.25%	13,376	198,922	167,487	13.10%	11.62%
2025	198,922	18,910	17,939	971	7.25%	14,457	214,350	174,374	13.10%	12.43%
2026	214,350	19,491	19,701	(210)	7.25%	15,533	229,673	180,521	13.10%	13.24%
2027	229,673	20,116	21,645	(1,529)	7.25%	16,597	244,741	185,859	13.10%	14.10%
2028	244,741	20,789	23,760	(2,971)	7.25%	17,637	259,407	190,335	13.10%	14.97%
2033	313,268	24,680	35,106	(10,426)	7.25%	22,338	325,180	200,890	13.10%	18.63%
2038	373,570	29,618	42,275	(12,657)	7.25%	26,630	387,543	201,583	13.10%	18.70%
2043	460,195	35,720	46,014	(10,294)	7.25%	32,995	482,896	211,488	13.10%	16.88%
2048	588,272	43,298	56,687	(13,389)	7.25%	42,170	617,053	227,537	13.10%	17.15%
2053	732,540	51,915	76,092	(24,177)	7.25%	52,243	760,606	236,150	13.10%	19.20%
2058	868,328	61,574	97,319	(35,745)	7.25%	61,673	894,256	233,770	13.10%	20.70%
2063	1,000,720	73,079	116,657	(43,578)	7.25%	70,991	1,028,133	226,294	13.10%	20.91%
2068	1,143,893	86,923	136,921	(49,998)	7.25%	81,141	1,175,036	217,758	13.10%	20.64%
2078	1,516,397	122,667	188,862	(66,195)	7.25%	107,567	1,557,769	204,655	13.10%	20.17%
2088	1,895,868	172,920	274,757	(101,837)	7.25%	133,802	1,927,833	179,550	13.10%	20.81%
2098	2,107,397	243,932	387,952	(144,020)	7.25%	147,626	2,111,003	139,380	13.10%	20.83%
2108	1,908,864	344,236	536,871	(192,635)	7.25%	131,491	1,847,720	86,486	13.10%	20.43%
2118	604,867	485,417	764,281	(278,864)	7.25%	33,862	359,865	11,941	13.10%	20.63%

Funding Level 4 is the lowest funding level that will keep the fund solvent indefinitely, i.e., throughout the entire 100-year projection period assuming all assumptions are realized.

Post-Retirement Health Care & Medicare Reimbursement

Projected Trust Fund Ratios Based on 0.00% Employer Contribution Rate December 31, 2018



The **trust fund ratio** is the ratio of the fund balance at the beginning of the year to the projected benefit payout during the year. It is one measure of the Plan's ability to pay benefits. A trust fund ratio on the order of about 15 to 25 is expected in a plan that is funding health care payouts as a level percentage of payroll. Given the experience of the last several years, very few, if any plans, are likely to be able to report such a trust fund ratio.

Approximate IRC Section 401(h) Computation (\$ in Thousands)

Year	(1) Covered Pay	(3) Pension		(4) PUCNC \$	(5) Health Contribution	(6) (4) + (5)	(7) Sum of (5)	(8) Sum of (6)	(9) IRC Ratio (7) / (8)
		(2) EANC %	PUCNC %						
1999	\$69,030	24.96%	26.08%	\$ 18,003.0	\$3,278.9	\$21,281.9	\$ 33,616.4	\$ 216,929.5	15.5%
2000	68,505	24.96%	26.08%	17,866.1	3,254.0	21,120.1	36,870.4	238,049.6	15.5%
2001	74,140	23.10%	23.63%	17,519.3	3,521.7	21,041.0	40,392.1	259,090.6	15.6%
2002	79,594	23.14%	23.71%	18,871.7	3,780.7	22,652.4	44,172.8	281,743.0	15.7%
2003	80,641	21.88%	22.72%	18,321.6	3,395.7	21,717.3	47,568.5	303,460.3	15.7%
2004	81,931	21.91%	22.83%	18,704.8	2,867.6	21,572.4	50,436.1	325,032.7	15.5%
2005	85,828	21.68%	22.59%	19,388.5	3,006.4	22,394.9	53,442.5	347,427.6	15.4%
2006	87,563	20.99%	21.83%	19,115.0	3,384.8	22,499.8	56,827.3	369,927.4	15.4%
2007	95,032	20.78%	21.92%	20,831.0	4,575.1	25,406.1	61,402.4	395,333.5	15.5%
2008	93,029	20.81%	21.89%	20,364.0	4,668.0	25,032.0	66,070.4	420,365.5	15.7%
2009	93,339	21.21%	22.92%	21,393.3	4,794.7	26,188.0	70,865.1	446,553.5	15.9%
2010	92,226	21.23%	23.25%	21,445.7	3,699.8	25,145.5	74,564.9	471,699.0	15.8%
2011	92,790	21.72%	24.03%	22,297.8	2,418.4	24,716.2	76,983.3	496,415.2	15.5%
2012	96,022	21.80%	24.19%	23,227.8	2,553.0	25,780.8	79,536.3	522,196.0	15.2%
2013	100,250	18.23%	20.37%	20,418.9	4,718.7	25,137.6	84,255.0	547,333.6	15.4%
2014	100,569	18.13%	21.00%	21,117.3	5,859.3	26,976.6	90,114.3	574,310.2	15.7%
2015	101,751	18.13%	21.01%	21,375.1	5,637.4	27,012.5	95,751.7	601,322.7	15.9%
2016	112,811	19.70%	21.55%	24,305.2	5,944.6	30,249.8	101,696.3	631,572.5	16.1%
2017	116,038	19.73%	21.18%	24,574.0	6,777.8	31,351.8	108,474.1	662,924.3	16.4%
2018	115,613	19.10%	20.50%	23,700.0	7,784.3	31,484.3	116,258.4	694,408.6	16.7%

The approximate computations above indicate compliance with IRC Section 401(h) because the ratio in Column 9 is below 25%. The ratio in Column 9 would appear lower if the computations were extended farther into the past.

SECTION C

PENSION GAIN/LOSS ANALYSIS

Gain (Loss) Analysis

Purpose of Gain/Loss Analysis. Regular actuarial valuations provide information about the composite change in unfunded actuarial accrued liabilities -- whether or not the liabilities are increasing or decreasing, and by how much.

However, valuations do not show the portion of the change attributable to each risk area within the Retirement System: the rate of investment income on plan assets; the rates of withdrawal of active members who leave covered employment; the rates of mortality; the rates of disability; the rates of salary increases; the assumed ages at actual retirement. In an actuarial valuation, assumptions are made as to what these rates will be for the next year and for decades in the future.

The objective of a gain and loss analysis is to determine the portion of the change in unfunded actuarial accrued liabilities attributable to each risk area.

The fact that actual experience differs from assumed experience is to be expected. The future cannot be predicted with precision. Changes in the valuation assumption for a risk area should be made when the differences between assumed and actual experience have been observed to be sizable and persistent. One year's gain and loss analysis may or may not be indicative of ***long-term trends, which are the basis of financial assumptions.***

Development of Total Gain (Loss) January 1, 2018 to December 31, 2018

Unfunded Accrued Liabilities (UAL), January 1	\$378,948,593
Normal Cost	22,033,532
Contributions	40,665,318
Interest	28,646,534
Expected UAL Before Any Changes	388,963,341
Effect of Changes in Assumptions and Benefits	(31,583,609)
Expected UAL After All Changes	357,379,732
Actual UAL	389,082,362
Gain (Loss) for Year from Experience	\$ (31,702,629)

This page measures the actual gain or loss for the year after adjusting for the effect of benefit and assumption changes.

Analysis of Financial Experience for the Year Ended December 31, 2018 and 2017

Gains and Losses in Pension Accrued Liabilities Resulting from Differences Between Assumed Experience and Actual Experience

Type of Activity	Gain or (Loss) for Year Ended 12/31	
	2018	2017
Age & Service Retirements. If members retire at older ages or with lower final average pay than assumed, there is a gain. If younger ages or higher average pays, a loss.	\$ 111,533	\$ (57,648)
Disability Retirements. If disability claims are less than assumed, there is a gain. If more claims, a loss.	608,891	721,566
Death-in-Service Benefits. If more liabilities are released by death-in-service claims than assumed, there is a gain. If smaller releases, a loss.	(76,487)	(92,407)
Withdrawal From Employment. If more liabilities are released by withdrawals than assumed, there is a gain. If smaller releases, a loss.	809,781	493,727
Pay Increases. If there are smaller pay increases than assumed, there is a gain. If greater increases, a loss.	459,716	(2,883,793)
Investment Income. If there is greater investment return on pension assets than assumed, there is a gain. If less return, a loss.	(31,264,298)	(9,943,102)
Other. Miscellaneous gains and losses resulting from data adjustments, timing of financial transactions, valuation methods, DROP account interest crediting, etc.	(2,351,765)	1,189,070
Gain (or Loss) During Year from Experience	\$ (31,702,629)	\$ (10,572,587)
Non-Recurring Items (Effect of Benefit/Assumption Changes)	31,583,609	4,179,186
Composite Gain (or Loss) During Year	\$ (119,020)	\$ (6,393,401)

Investment Gain (Loss)
Development of Portion Attributable to Retirement,
Survivor and Disability Allowances
January 1, 2018 to December 31, 2018

Assets, Beginning of Year	\$774,670,663
Net Cash Flow	(33,064,874)
Assumed Investment Return	58,755,713
Expected Assets End of Year	\$800,361,502
Actual Assets End of Year	769,097,204
Gain (Loss) for Year	\$(31,264,298)

The total investment gain (loss) was \$(36,200,403), including the gain (loss) on health assets.

Active Member Population Reconciliation January 1, 2018 to December 31, 2018

	Actual	Expected
Active Members Beginning of Year	1,650	
Plus New Hires	101	
Minus Retirements	42	42.7
Minus Deaths	0	0.5
Minus Disabilities	7	6.9
Minus Other Terminations*	40	25.4
Returned to Active Status	6	
Plus or Minus Data Correction	0	
Active Members End of Year	1,668	

* Includes 1 LOA member.

SECTION D

FINANCIAL INFORMATION

Current Asset Information Furnished for the Valuation December 31, 2018

Balance Sheet

Current Assets (Market Value)*	Fund Balance
Cash & Short-Term Investments	\$ 10,480,198
Fixed Income	144,457,792
Stocks	427,774,080
Real Estate	47,022,848
Alternatives	190,061,833
Other Short-Term	51,674
Deferred Outflows - Pension	237,280
Accruals & Receivables	<u>(28,393,809)</u>
Total Current Assets	<u>\$ 791,691,896</u>
Employees' Savings Fund	\$ 93,867,195
Employer Accumulation Fund	101,827,574
Pension Reserve Fund	621,613,765
Survivors Benefit Fund	0
Health Care Fund	101,827,574
Income Fund	<u>(101,827,574)</u>
Total Fund Balance	<u>\$ 817,308,534</u>

* Does not include \$25,616,638 for DROP Account Balances.

Revenues and Expenditures

	Year Ended December 31,	
	2018	2017
Net Assets Held in Trust for Pension and Postemployment Health Care Benefits	\$ 876,106,076	\$ 798,818,976
DROP Liabilities	<u>21,563,609</u>	<u>25,196,087</u>
Total	\$ 897,669,685	\$ 824,015,063
Revenues**		
Employee contributions		
For non-DROP members	13,166,387	13,437,937
For DROP members	1,285,262	1,066,982
Employer contributions (net)	30,836,870	31,228,561
Investment income (net)		
Non-DROP investment income	(43,173,319)	115,952,501
DROP investment income	(3,831)	(3,098)
Miscellaneous	<u>0</u>	<u>0</u>
Total	2,111,369	161,682,883
Expenditures		
Benefit payments		
Retirees and Beneficiaries	66,779,510	64,344,739
From DROP account	4,688,079	10,948,064
Health insurance	8,538,516	9,433,745
Refund of member contributions	716,739	1,074,973
Administrative expenses	1,639,676	1,641,465
Death benefit	<u>110,000</u>	<u>100,000</u>
Total	82,472,520	87,542,986
Net Addition to Assets	<u>(80,361,151)</u>	<u>74,139,897</u>
Net Assets Held in Trust for Pension and Postemployment Health Care Benefits	\$ 791,691,896	\$ 876,591,351
DROP Liabilities	<u>25,616,638</u>	<u>21,563,609</u>
Total	<u>\$ 817,308,534</u>	<u>\$ 898,154,960</u>

** Revenues include transfers to and from systems.

CAFR Asset Information Furnished for the Valuation December 31, 2018 Additions by Source

Pension Benefits						Other Postemployment Benefits			
Year	Contributions		Net Investment Income	Transfers from Other Systems	Total	Employer Contributions & Retiree Drug Subsidy and Prescription Drug Rebates		Net Investment Income	Total
	Member*	Employer							
2009	\$9,503,526	\$20,453,914	\$ 109,523,583	\$ 1,009,422	\$ 140,490,445	\$4,794,710	\$ 21,030,418	\$ 25,825,128	
2010	9,221,920	21,211,944	72,158,093	329,335	102,921,292	3,699,814	17,734,416	21,434,230	
2011	9,278,533	22,966,338	(16,039,272)	608,366	16,813,965	2,418,411	(2,746,073)	(327,662)	
2012	9,641,772	23,766,361	63,783,964	557,316	97,749,413	2,553,023	10,199,419	12,752,442	
2013	10,037,246	22,908,182	115,874,530	1,353,520	150,173,478	4,718,651	17,893,377	22,612,028	
2014	11,577,268	22,325,421	45,104,959	586,929	79,594,577	5,859,320	6,799,267	12,658,587	
2015	13,686,292	22,895,242	(5,649,718)	947,265	31,879,081	5,637,420	(647,032)	4,990,388	
2016	14,101,171	25,383,684	46,423,126	773,206	86,681,187	5,944,616	6,834,760	12,779,376	
2017	14,504,919	26,109,836	101,482,224	619,110	142,716,089	6,777,825	14,467,179	21,245,004	
2018	14,451,649	26,014,314	(37,810,306)	410,250	3,065,907	7,784,260	(5,852,119)	1,932,141	

* Does not include service purchases.

Deductions by Type

Pension Benefits						Other Postemployment Benefits		
Year	Benefits#	Refunds	Transfers to		Total	Benefits	Administrative	Total
			Other Systems	Administrative				
2009	\$46,009,029	\$ 1,076,685	\$ 406,147	\$ 758,818	\$ 48,250,679	\$ 8,899,533	\$ 123,210	\$ 9,022,743
2010	49,106,165	476,936	566,615	637,943	50,787,659	10,536,554	106,450	10,643,004
2011	57,288,210	451,682	1,797,986	948,319	60,486,197	11,092,515	159,271	11,251,786
2012	57,110,650	179,614	377,994	859,477	58,527,735	11,025,550	137,943	11,163,493
2013	61,528,826	943,433	467,462	909,929	63,849,650	12,140,996	140,676	12,281,672
2014	64,525,978	2,177,476	165,945	1,031,473	67,900,872	12,308,478	156,176	12,464,654
2015	66,213,253	857,626	160,888	1,084,161	68,315,928	11,362,048	157,150	11,519,198
2016	65,720,438	1,730,725	416,679	1,352,722	69,220,564	11,676,450	193,246	11,869,696
2017	75,392,803	1,074,973	140,562	1,437,267	78,045,605	11,571,393	204,198	11,775,591
2018	71,577,589	716,739	210,895	1,435,864	73,941,087	11,699,575	203,812	11,903,387

Includes death benefits.

Development of Funding Value of Retirement System Assets December 31, 2018

	2016	2017	2018	2019	2020	2021
A. Funding Value From Prior Year	\$ 846,399,059	\$ 871,949,848	\$ 884,808,121			
B. Market Value End of Year	824,015,063	898,154,960	817,308,534			
C. Market Value Beginning of Year	805,644,760	824,015,063	898,154,960			
D. Non-Investment Net Cash Flow	(33,341,615)	(41,809,506)	(37,184,001)			
E. Investment Return:						
E1. Market Total: B - C - D	51,711,918	115,949,403	(43,662,425)			
E2. Assumed Rate	7.75%	7.75%	7.75%	7.25%		
E3. For Immediate Recognition	64,303,939	65,955,995	67,131,749			
E4. Amount for Phased-In Recognition E1-E3	(12,592,021)	49,993,408	(110,794,174)			
F. Phased-In Recognition of Investment Return:						
F1. Current Year: 25% x E4	(3,148,005)	12,498,352	(27,698,544)			
F2. First Prior Year	(17,852,208)	(3,148,005)	12,498,352	\$ (27,698,544)		
F3. Second Prior Year	(2,786,357)	(17,852,208)	(3,148,005)	12,498,352	\$ (27,698,544)	
F4. Third Prior Year	18,375,035	(2,786,355)	(17,852,206)	(3,148,006)	12,498,352	\$ (27,698,542)
F5. Total Recognized Phased-In	\$ (5,411,535)	\$ (11,288,216)	\$ (36,200,403)	\$ (18,348,198)	\$ (15,200,192)	\$ (27,698,542)
G. Funding Value End of Year:						
G1. Preliminary Funding Value End of Year: A + D + E3 + F5	\$ 871,949,848	\$ 884,808,121	\$ 878,555,466			
G2. Corridor Percent	20%	20%	20%			
G3. Upper Corridor Limit: (100% + G2) x B	988,818,076	1,077,785,952	980,770,241			
G4. Lower Corridor Limit: (100% - G2) x B	659,212,050	718,523,968	653,846,827			
G5. Funding Value End of Year	\$ 871,949,848	\$ 884,808,121	\$ 878,555,466			
H. Difference between Market Value and Funding Value	\$ (47,934,785)	\$ 13,346,839	\$ (61,246,932)	\$ (42,898,734)	\$ (27,698,542)	\$ -
I. Funding Value Rate of Return	7.1 %	6.4 %	3.6 %			
J. Market Value Rate of Return	6.6 %	14.4 %	(5.0)%			

The asset valuation method recognizes assumed investment income (line E2) fully each year. Differences between actual and expected investment income (line E3) are phased-in over a closed 4-year period. When investment markets are performing well, Funding Value will tend to lag market value. When investment markets are performing poorly, Funding Value will tend to exceed market value. From a Funding standpoint, the asset valuation method is *neutral*.

Separation of Assets between Pension and Health December 31, 2018

	Pension	Health	Total
A. Market Value Beginning of Year	\$786,356,140	\$ 111,798,820	\$898,154,960
B. Member Contributions			
B1. Pension Contributions	13,166,387		13,166,387
B2. DROP Contributions	1,285,262		1,285,262
B3. Retiree Health Contributions		4,062,903	4,062,903
C. Other Contributions			
C1. Employer Contributions	26,014,314	4,623,201	30,637,515
C2. Transfers	199,355		199,355
C3. Retiree Drug Subsidy and Prescription Drug Rebates		3,161,059	3,161,059
D. Benefits Paid			
D1. Pension Benefits	66,779,510		66,779,510
D2. Benefit Payments from DROP Account	4,688,079		4,688,079
D3. HPRS Paid Retiree Health Benefits		11,699,575	11,699,575
D4. HPRS Paid Medicare Part B Benefits		0	0
D5. Member Paid Retiree Health Benefits		4,062,903	4,062,903
E. Refunds of Member Contributions	716,739	0	716,739
F. Death Benefits	110,000	0	110,000
G. Administrative Expenses	1,435,864	203,812	1,639,676
H. Net External Cash Flow (B + C - D - E - F - G)	(33,064,874)	(4,119,127)	(37,184,001)
I. Other Changes in Market Value	(37,810,306)	(5,852,119)	(43,662,425)
J. Market Value End of Year (A + H + I)	715,480,960	101,827,574	817,308,534
K. Funding Value Adjustment	53,616,244	7,630,688	61,246,932
L. Funding Value End of Year (J + K)	\$769,097,204	\$109,458,262	\$878,555,466

Line J is allocated in proportion to Line I.

SECTION E

SUMMARY OF MEMBER DATA

Active Members as of December 31, 2018 by Attained Age and Years of Service*

Attained Age	Years of Service to Valuation Date							Totals	
	0-4	5-9	10-14	15-19	20-24	25-29	30 Up	No.	Payroll
20-24	111							111	\$ 4,757,333
25-29	229	58						287	15,878,875
30-34	72	147	11	1				231	14,367,950
35-39	24	49	99	51				223	15,862,375
40	1	8	20	30	5			64	4,862,917
41		8	10	35	16			69	5,382,911
42		2	8	31	13			54	4,155,952
43		2	5	31	18			56	4,304,681
44		1	11	19	39	2		72	5,746,463
45		1	9	16	32	6		64	5,082,745
46		1	5	13	27	15		61	4,772,558
47			6	11	26	22		65	5,290,515
48			2	14	26	21		63	4,993,322
49			1	17	18	27		63	5,065,434
50				10	12	24	1	47	3,767,245
51				6	8	22	3	39	3,370,001
52		1		3	5	15	7	31	2,641,795
53					4	11	2	17	1,477,357
54				3	5	7	6	21	1,665,955
55				1	1	10	2	14	1,201,975
56				1		2	1	4	353,470
57					1	5	2	8	743,485
58						2	1	3	193,930
59							1	1	70,378
60									
Totals	437	278	187	293	256	191	26	1,668	\$ 116,009,622

* Includes 154 DROP members.

While not used in the valuations, the following group averages are computed and shown for their general interest.

Age: 38.2 years
Service: 13.3 years
Annual Pay: \$69,550

Active Members by Ages of Entry into Service December 31, 2018

Entry Age Nearest Birthday	Number	Cumulative Number	Percent	Cumulative Percent
Less than 18	0	0	0.00%	0.00%
18	14	14	0.84%	0.84%
19	47	61	2.82%	3.66%
20	93	154	5.57%	9.23%
21	190	344	11.39%	20.62%
22	247	591	14.81%	35.43%
23	227	818	13.61%	49.04%
24	183	1,001	10.97%	60.01%
25	161	1,162	9.65%	69.66%
26	107	1,269	6.42%	76.08%
27	86	1,355	5.16%	81.24%
28	68	1,423	4.07%	85.31%
29	49	1,472	2.94%	88.25%
30	46	1,518	2.76%	91.01%
31	37	1,555	2.22%	93.23%
32	48	1,603	2.87%	96.10%
33	37	1,640	2.22%	98.32%
34	20	1,660	1.20%	99.52%
35	2	1,662	0.12%	99.64%
36	0	1,662	0.00%	99.64%
37	4	1,666	0.24%	99.88%
38	1	1,667	0.06%	99.94%
39	0	1,667	0.00%	99.94%
40 & Up	1	1,668	0.06%	100.00%
Total	1,668			

Active DROP Members as of December 31, 2018 by Attained Age and Years of Service

Attained Ages	DROP			
	No.	Annual Benefit	Annual Pay	DROP Account Balance
48	16	\$ 776,446	\$ 1,360,521	\$ 566,526
49	22	1,064,283	1,913,878	1,400,151
50	25	1,216,966	2,215,289	2,391,293
51	18	907,153	1,613,166	2,590,349
52	17	753,877	1,381,324	2,316,325
53	19	883,396	1,666,915	2,906,024
54	16	693,195	1,374,895	2,953,151
55	9	406,093	780,915	1,683,580
56	5	197,949	391,250	1,226,021
57	5	227,505	492,462	1,595,322
58	2	78,192	124,081	577,819
Totals	154	\$ 7,205,056	\$ 13,314,696	\$ 20,206,562

Average Age: 52.0 yrs.

Average Age at DROP: 49.8 yrs.

Average Service: 27.7 yrs.

Average Service at DROP: 24.6 yrs.

Average Annual Pay: \$86,459

Age and Service Pensions Being Paid December 31, 2018 by Attained Ages

Attained Ages	Number	Monthly Pensions	Number Married	Average Age of Spouse
48 & Under	11	\$ 37,603	4	48
49	13	50,214	5	48
50	18	65,674	10	50
51	22	74,386	9	50
52	18	65,292	12	47
53	27	107,254	19	54
54	31	111,970	19	52
55	39	144,919	21	52
56	35	126,891	21	54
57	37	149,193	27	56
58	40	158,108	31	57
59	53	218,695	43	56
60	48	189,724	37	58
61	36	146,812	31	59
62	36	149,629	32	61
63	49	200,099	44	60
64	33	143,089	28	63
65	23	106,041	22	63
66	36	161,712	33	62
67	44	178,310	37	64
68	44	178,766	39	65
69	37	154,964	32	67
70	50	195,422	44	68
71	67	262,287	55	68
72	45	184,122	37	71
73	37	150,428	33	70
74	50	194,304	48	71
75	34	125,018	30	73
76	45	158,395	38	72
77	32	118,565	26	73
78	22	80,498	20	75
79	21	85,317	17	77
80	22	69,009	20	77
81	20	71,567	18	77
82	12	38,890	9	79
83	9	26,886	8	81
84	6	19,028	3	79
85 & Over	46	115,488	31	79
Totals	1,248	\$ 4,814,570	993	

Disability Pensions Being Paid December 31, 2018 by Attained Age

Attained Ages	Number	Monthly Pensions	Number Married	Average Age of Spouse
32	1	\$ 2,298		
33	1	2,338	1	36
35	1	2,506		N/A
36	1	2,023		N/A
38	3	7,881	3	37
39	1	3,444		N/A
40	4	11,034	2	40
41	1	1,928		N/A
43	3	8,645		N/A
44	3	7,739	2	42
45	3	9,021	2	45
46	7	20,607	5	46
47	8	22,731	6	38
48	6	18,391	4	47
49	4	13,081	3	44
50	7	20,553	1	49
51	5	14,090	3	46
52	5	13,459	3	52
53	4	11,904	3	58
54	6	20,219	2	52
55	4	12,472	4	52
56	5	18,628	3	50
57	3	12,819	3	58
58	6	18,402	5	57
59	5	15,884	5	56
60	6	17,827	4	59
61	6	20,324	4	59
62	3	10,129	2	63
63	2	7,197	2	65
65	3	9,482	3	63
66	3	8,625	2	65
67	3	10,011	2	64
68	1	2,032	1	63
69	2	6,091	2	67
70	6	14,688	6	64
71	1	2,737	1	71
72	2	5,959	1	61
74	2	6,082	1	76
75	2	4,510	2	74
81	1	3,404	0	N/A
89	1	1,970	1	85
Totals	141	\$423,165	94	

Dependents Being Paid as of December 31, 2018 Tabulated by Attained Age

Attained Ages	Number	Monthly Pensions
14 & Under	5	\$ 750
14	2	300
17	1	191
18	2	364
19	3	539
20	2	383
21	2	406
22	1	164
23	3	515
24	1	150
31	1	1,906
32	1	1,121
38	1	911
39	1	1,148
41	3	3,105
44	1	911
45	1	1,314
46	1	1,383
48	2	2,668
50	1	1,461
52	2	3,237
53	1	1,358
54	4	5,088
56	4	5,627
57	2	4,297
58	2	3,603
59	3	4,985
60	1	1,226
61	4	6,586
62	1	1,104
63	6	9,645
64	3	3,959
65	2	3,441
66	4	8,466
67	7	10,875
68	6	9,917
69	8	16,233
70-79	80	135,624
80-89	85	120,038
90 & Over	22	30,851
Totals	282	\$405,847

Active Member Valuation Data, 2009 to 2018

Actuarial Valuation as of December 31	Number of Active Members	Annual Payroll	Average Annual Salary	% Increase in Average Pay
2009	1,547	\$ 94,824,789	\$61,296	0.4 %
2010	1,537	94,767,852	61,658	0.6
2011	1,520	93,126,449	61,267	(0.6)
2012	1,645	98,117,403	59,646	(2.6)
2013	1,613	98,519,844	61,079	2.4
2014	1,622	99,211,756	61,166	0.1
2015	1,621	99,983,224	61,680	0.8
2016	1,670	108,788,871	65,143	5.6
2017	1,650	112,705,188	68,306	4.9
2018	1,668	116,009,622	69,550	1.8

Retirants and Beneficiaries Valuation Data, 2009 to 2018

Actuarial Valuation as of December 31	Added to Rolls		Removed from Rolls		Number of People	Total Monthly Benefits	Average Benefit
	No.	Monthly Benefits	No.	Monthly Benefits			
2009	45	\$ 207,598	31	\$42,636	1,385	\$ 3,793,054	\$2,739
2010	64	259,964	25	41,464	1,424	4,011,554	2,817
2011	73	327,709	32	68,456	1,465	4,270,807	2,915
2012	79	281,692	47	81,957	1,497	4,470,542	2,986
2013	61	267,055	35	70,317	1,523	4,667,280	3,065
2014	66	250,714	31	60,291	1,558	4,857,703	3,118
2015	73	258,562	83 *	139,323	1,548	4,976,942	3,215
2016	69	298,031	37	70,100	1,580	5,204,873	3,294
2017	83	323,187	26	56,257	1,637	5,471,803	3,343
2018	72	260,622	38	88,843	1,671	5,643,582	3,377

* Includes Alternate Payee records, which were combined with Participant records beginning with the December 31, 2015 valuation.

Of the 1,671 retirants and beneficiaries as of December 31, 2018, 1,248 are service retirees, 141 are disability retirees and 282 are survivor beneficiaries. The average monthly benefits are \$3,858 for service retirees, \$3,001 for disability retirees and \$1,439 for survivor beneficiaries.

Number of Retired Lives Covered by Medical Mutual, AETNA & Medicare Advantage Comparative Schedule

	Census Date											
	12/18	12/17	12/16	12/15	12/14	12/13	12/12	12/11	12/10	12/09	12/08	12/07
Recipients:												
w/o Medicare A	546	606	654	685	645	672	702	NA	732	692	762	751
Medicare A	874	841	821	780	753	717	669	NA	596	580	398	503
Spouses:												
w/o Medicare A	217	253	287	302	325	330	355	NA	365	368	518	372
Medicare A	434	402	386	372	360	338	305	NA	257	267	232	242
Dependent Children	104	208	251	261	273	302	279	NA	216	165	167	154
Orphans	0	0	0	0	0	0	0	NA	0	23	26	63
Totals	2,175	2,310	2,399	2,400	2,356	2,359	2,310	2,269	2,166	2,095	2,103	2,085

A summary of recipients and dependents covered by AETNA, Medicare Advantage and Medical Mutual of Ohio follows:

	AETNA		Medicare Advantage		Medical Mutual		Totals
	Network	Non-Network	Network	Non-Network	Network	Non-Network	
2008	1,262	2			818	21	2,103
2009	1,260	0			835	0	2,095
2010	190	0	819	0	1,157	0	2,166
2011	197	0	891	0	1,181	0	2,269
2012	183	0	975	0	1,152	0	2,310
2013	162	0	1,056	0	1,141	0	2,359
2014	0	0	1,114	0	1,242	0	2,356
2015	0	0	1,152	0	1,248	0	2,400
2016	0	0	1,207	0	1,192	0	2,399
2017	0	0	1,244	0	1,066	0	2,310
2018	0	0	1,259	0	866	0	2,125

Number of Retired Lives Covered by Medical Mutual, AETNA & Medicare Advantage Added and Removed from Rolls*

Actuarial Valuation as of December 31	Added to Rolls No.	Removed from Rolls No.	Retirees with Healthcare, Dental or Vision Coverage
2016			1,395
2017	78	87	1,386
2018	42	77	1,351

* The number of lives was compiled from data files provided by HPRS Staff. This is the number of retired members covered and will differ from the number of actual lives covered based on the type of coverage elected, as shown in the schedules above.

Deferred Pensions as of December 31, 2018 Tabulated by Attained Age

Attained Ages	Number	Annual Pensions
42	2	\$ 32,545
43	1	39,759
44	1	42,452
46	2	80,567
47	4	129,775
48	1	44,651
49	3	63,597
50	2	79,614
51	1	32,711
Totals	17	\$ 545,670

A **deferred retirant** is a member who has left active service with at least 15 (and in most cases 20) years of service credit, and has not withdrawn his accumulated contributions. Such members are entitled to a pension upon attaining eligibility age.

SECTION F

ASSUMPTIONS USED IN THE VALUATION

Summary of Valuation Method and Assumptions

December 31, 2018

The actuarial assumptions used in the valuation are shown in this section of the report. The assumptions were established for the December 31, 2015 actuarial valuation, following a 5-year experience study covering the period January 1, 2010 through December 31, 2014. They were adopted by the Board after obtaining the advice of the Actuary and other professionals. The actuarial assumptions were updated in conjunction with the Actuarial Assumptions Review dated February 12, 2019. The assumptions represent estimates of future experience.

Economic Assumptions

The investment return rate used in making the valuations was 7.25% per year, compounded annually (net after investment expenses). The real rate of return is defined to be the portion of total investment return, which is more than the wage inflation rate. Considering other financial assumptions, the 7.25% investment return rate translates to an assumed real rate of return of 3.75% over the wage inflation rate of 3.50%. In order to assume a 3.75% real return over wage inflation, it would be necessary to realize about a 4.75% real return over the assumed price inflation of 2.50%, after accounting for investment expenses and the difference between wage increases and price increases. The economic assumptions were reviewed as part of the Actuarial Assumptions Review dated February 12, 2019. The investment return and price inflation assumptions were first used in the December 31, 2018 valuation.

Pay increase assumptions for individual active members are shown for sample ages on page F-4. Part of the assumed increase at each age is for merit and/or seniority, and the other 3.50% recognizes changes in wage levels due to broad economic effects, including inflation and real wage growth.

The active member payroll is assumed to increase 3.50% annually, which is the portion of the individual pay increase assumptions attributable to broad economic effects.

The number of active members is assumed to continue at the present number.

Non-Economic Assumptions

The pre-retirement mortality tables used in evaluating allowances to be paid were the RP-2014 employees mortality table for males and females, adjusted for mortality improvement back to the observation period base year of 2006. The base year for females was then established to be 2012. Mortality rates for a particular calendar year are determined by applying the MP-2018 mortality improvement scale to the above described tables. This assumption was first used in the December 31, 2018 valuation.

The healthy retiree mortality tables used in evaluating allowances to be paid were the RP-2014 Healthy Annuitant mortality table for males and females, adjusted for mortality improvement back to the observation period base year of 2006. The base year for females was then established to be 2012. Mortality rates for a particular calendar year are determined by applying the MP-2018 mortality improvement scale to the above described tables. This assumption was first used in the December 31, 2018 valuation.

The disabled retiree mortality tables used in evaluating allowances to be paid were the RP-2014 disabled mortality table for males and females, adjusted for mortality improvement back to the observation period base year of 2006. The base year for females was then established to be 2012. Mortality rates for a particular calendar year are determined by applying the MP-2018 mortality improvement scale to the above described tables. This assumption was first used in the December 31, 2018 valuation.

The probabilities of age and service retirement are shown on page F-4.

The probabilities of withdrawal from service, disability and death-in-service are shown for sample ages on page F-4. The pre-retirement mortality tables used were the RP-2014 employees mortality table for males and females, adjusted for mortality improvement back to the observation period base year of 2006. The base year for females was then established to be 2012. Mortality rates for a particular calendar year are determined by applying the MP-2018 mortality improvement scale to the above described tables. Fifty percent of disability retirements are assumed to be non-duty related and fifty percent are assumed to be duty related. This assumption was first used in the December 31, 2018 valuation.

The entry age normal actuarial cost method of valuation was used in determining liabilities and normal cost. For GASB Statement Nos. 67 and 68 purposes, the DROP entry date is assumed to be the date of retirement for normal cost purposes.

Differences in the past between assumed experience and actual experience (“actuarial gains and losses”) become part of actuarial accrued liabilities.

Unfunded actuarial accrued liabilities are amortized to produce payments (principal & interest), which are level percent of payroll contributions.

Non-Economic Assumptions (Concluded)

Employer contributions were assumed to be paid in equal installments throughout the employer fiscal year.

Present assets (cash & investments) were used with a market value adjustment that spreads differences between actual and assumed return over a closed four-year period for funding valuation purposes. Funding value is not permitted to deviate from market value by more than 20%. Details of the method may be found in the body of the funding valuation report on page D-3. Assets may be used in the valuation prior to the final audit. For GASB Statement Nos. 67 and 68 purposes, the market value of assets is used.

The data about persons now covered and about present assets were furnished by the System's administrative staff. Although examined for general reasonableness, the data was not audited by the Actuary.

The actuarial valuation computations were made by or under the supervision of a Member of the American Academy of Actuaries (MAAA) who has experience performing public plan valuations.

Single Life Retirement Values* (7.25% Interest)

Sample Attained Ages	Present Value of \$1 Monthly for Life		Future Life Expectancy (years)	
	Men	Women	Men	Women
50	\$147.17	\$150.55	34.10	36.03
55	140.18	143.79	29.39	31.11
60	131.52	135.29	24.87	26.38
65	121.01	125.08	20.60	21.94
70	108.30	112.57	16.58	17.73
75	93.18	97.61	12.84	13.82
80	76.33	80.79	9.51	10.31

* Applicable to calendar year 2018. Values for future years are determined using the MP-2018 projection scale.

The present values shown above are for illustrative purposes only and do not include the value of future post-retirement increases.

Separations from Active Employment & Salary Scale

Sample Ages	Percent of Active Members Separating Within Next Year					Salary Increase Assumptions for an Individual Member			
	Disability	Death*		Service	Other	Service	Merit & Seniority	Base (Economic)	Increase Next Year
		Men	Women						
20	0.08%	0.0430%	0.0214%	1	10.00%	1-2	10.00%	3.50%	13.50%
25	0.08%	0.0559%	0.0206%	2-5	4.00%	3-5	3.00%	3.50%	6.50%
30	0.23%	0.0567%	0.0247%	6-15	1.00%	6-10	1.00%	3.50%	4.50%
35	0.42%	0.0670%	0.0358%	16-20	0.75%	11 & Up	0.30%	3.50%	3.80%
40	0.70%	0.0757%	0.0517%	21 & up	0.50%				
45	0.85%	0.1044%	0.0751%						
50	1.13%	0.1723%	0.1126%						
55	1.32%	0.2868%	0.1807%						

* Applicable to calendar year 2018. Rates in future years are determined by the above rates and the MP-2018 projection scale.

Probabilities of Age & Service Retirement		
Retirement Ages	Percents of Eligible Members Retiring Within Next Year with an Unreduced Benefit	Percents of Eligible Members Retiring Within Next Year with a Reduced Benefit
48	30%	3.0%
49	15%	2.0%
50	15%	2.0%
51	15%	2.0%
52	15%	
53	15%	
54	10%	
55	30%	
56	25%	
57	30%	
58	30%	
59	40%	
60 & Over	100%	

In addition, it was assumed that 100% of eligible members age 55 and older would retire upon attaining 34 years of service. A member was assumed eligible for unreduced retirement at age 48 or greater with 25 or more years of service or age 52 or greater with 20 or more years of service. A member was assumed eligible for reduced retirement at age 48 or greater with 20 or more years of service.

It was assumed that members eligible to DROP would either retire or "DROP in" at first eligibility for unreduced retirement. 100% of members still working 8 years after first reaching retirement eligibility are assumed to retire.

Additions to and Removals from Active Membership Actual and Expected Numbers

Year Ended December 31	Number Added During Year		Retirement		Disability Retirement		Death-in- Service		Other Terminations		Active Members
	A	E	A	E	A	E	A	E	A	E	
	2009	49	74.5	21	50.0	10	7.0	0	0.9	15	
2010	51	79.7	39	54.5	4	7.1	1	0.9	17	17.2	1,537
2011	74	61.4	50	36.8	5	7.2	1	1.0	35	16.4	1,520
2012	204	63.9	37	38.8	10	7.2	1	1.0	31	16.9	1,645
2013	54	67.1	34	36.5	7	7.2	0	0.9	45	22.5	1,613
2014	84	62.3	40	36.2	3	7.4	1	0.8	31	17.9	1,622
2015	92	62.8	44	36.4	4	7.4	1	0.8	44	18.2	1,621
2016	152	74.5	39	40.3	6	7.4	3	0.6	55	26.2	1,670
2017	91	85.4	62	48.8	6	7.2	0	0.6	43	28.8	1,650
2018	107	75.5	42	42.7	7	6.9	0	0.5	40	25.4	1,668
Total	958	707.1	408	421.0	62	72.0	8	8.0	356	206.1	

A: Actual
E: Expected

The following pages summarize the removals from active membership by age group and years of accrued service.

Age and Service Retirements During Calendar Year 2018

Age Group	Years of Accrued Service				Total
	15-19	20-24	25-29	30 Plus	
Under 20					
20-24					
25-29					
30-34					
35-39					
40-44					
45					
46					
47					
48			10		10
49			6		6
50			4		4
51			5		5
52			1		1
53			2		2
54		1	6		7
55			2		2
56		1	2		3
57			1		1
58					
59				1	1
60 & Over					
Totals		2	39	1	42

Disability Retirements During Calendar Year 2018

Age Group	Years of Accrued Service							Total
	0-4	5-9	10-14	15-19	20-24	25-29	30 Plus	
Under 20								
20-24								
25-29								
30-34			1					1
35-39								
40-44				1	1			2
45-49				2	2			4
50 & Over								
Totals			1	3	3			7

Death-in-Service Terminations During Calendar Year 2018

Age Group	Years of Accrued Service							Total
	0-4	5-9	10-14	15-19	20-24	25-29	30 Plus	
Under 20								
20-24								
25-29								
30-34								
35-39								
40-44								
45-49								
50 & Over								
Totals								0

Withdrew and Eligible for Deferred Benefit Terminations During Calendar Year 2018

Age Group	Years of Accrued Service							Total
	0-4	5-9	10-14	15-19	20-24	25-29	30 Plus	
Under 20								
20-24								
25-29								
30-34								
35-39								
40-44						1		1
45-49				1	2	1		4
50 & Over								
Totals				1	2	2		5

Leave of Absence During Calendar Year 2018

Age Group	Years of Accrued Service							Total
	0-4	5-9	10-14	15-19	20-24	25-29	30 Plus	
Under 20								
20-24								
25-29								
30-34	1							1
35-39								
40-44								
45-49								
50 & Over								
Totals	1							1

Withdraw and Refunded Terminations During Calendar Year 2018

Age Group	Years of Accrued Service							Total
	0-4	5-9	10-14	15-19	20-24	25-29	30 Plus	
Under 20								
20-24	6							6
25-29	10	1						11
30-34	5	4						9
35-39	3							3
40-44	4							4
45-49	1							1
50 & Over								
Totals	29	5						34

Miscellaneous and Technical Assumptions

Administrative Expenses:	For administrative expenses, a 1.20% of payroll load is added to the normal cost.
Assumptions Related to House Bill 362 Signed Into Law February 8, 2018:	Survivor benefits were assumed to be \$911.25 for calendar year 2019. Increases for future years were assumed to be 0%. In addition, to estimate the effects of future decreases to the normal cost, payroll was assumed to increase by 3.65% for purposes of determining the computed amortization period.
Benefit Service:	Exact fractional service is used to determine the amount of benefit payable.
Decrement Relativity:	Decrement rates are used directly from the experience study, without adjustment for multiple decrement table effects.
Decrement Timing:	Decrements of all types are assumed to occur mid-year.
Eligibility Testing:	Eligibility for benefits is determined based upon the age nearest birthday and service nearest whole year on the date the decrement is assumed to occur.
Miscellaneous Loading Factors:	A load of 0.75% of payroll is used to measure the effect of military service purchases.
Other:	Disability and turnover decrements do not operate during retirement eligibility. For death-in-service, two children are assumed to receive benefits for a 10-year period.
Pay Increase Timing:	Beginning of year. This is equivalent to assuming that reported pays represent amounts paid to members during the year ended on the valuation date.

SECTION G

FINANCIAL PRINCIPLES AND OPERATIONAL TECHNIQUES

Financial Principles and Operational Techniques of the Retirement System

Promises Made, and To Be Paid For. As each year is completed, the Retirement System in effect hands an “IOU” to each member then acquiring a year of service credit -- the “IOU” says: “The Ohio State Highway Patrol Retirement System owes you one year’s worth of retirement benefits, payments in cash commencing when you qualify for retirement.”

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

The objective of level percent-of-payroll financing is that this year’s taxpayers contribute the money to cover the IOUs being handed out this year. By following this objective, **the employer contribution rate will remain approximately level from year-to-year** --- and will not have to be increased for future generations of taxpayers.

(There are systems which have a design for deferring contributions to future taxpayers, lured by a lower contribution rate now and putting aside the consequence that the contribution rate must then relentlessly grow much greater over decades of time.)

An inevitable by-product of the level-cost design is the accumulation of reserve assets, for decades, and the income produced when the assets are invested. **Invested assets are a by-product and not the objective.** Investment income becomes the third contributor for benefits to employees, and is interlocked with the contribution amounts required from employees and employer.

Translated to actuarial terminology, this level-cost objective means that the contribution rates must total at least the following:

Normal Cost (the value assigned to service being rendered this year)

. . . plus . . .

Interest on Unfunded Actuarial Accrued Liabilities (the difference between liabilities for service already rendered and the accrued assets of the Retirement System).

Computing Contributions To Support System Benefits From a given schedule of benefits and from the employee data and asset data furnished by the system, the actuary determines the contribution rates to support the benefits, by means of **an actuarial valuation**.

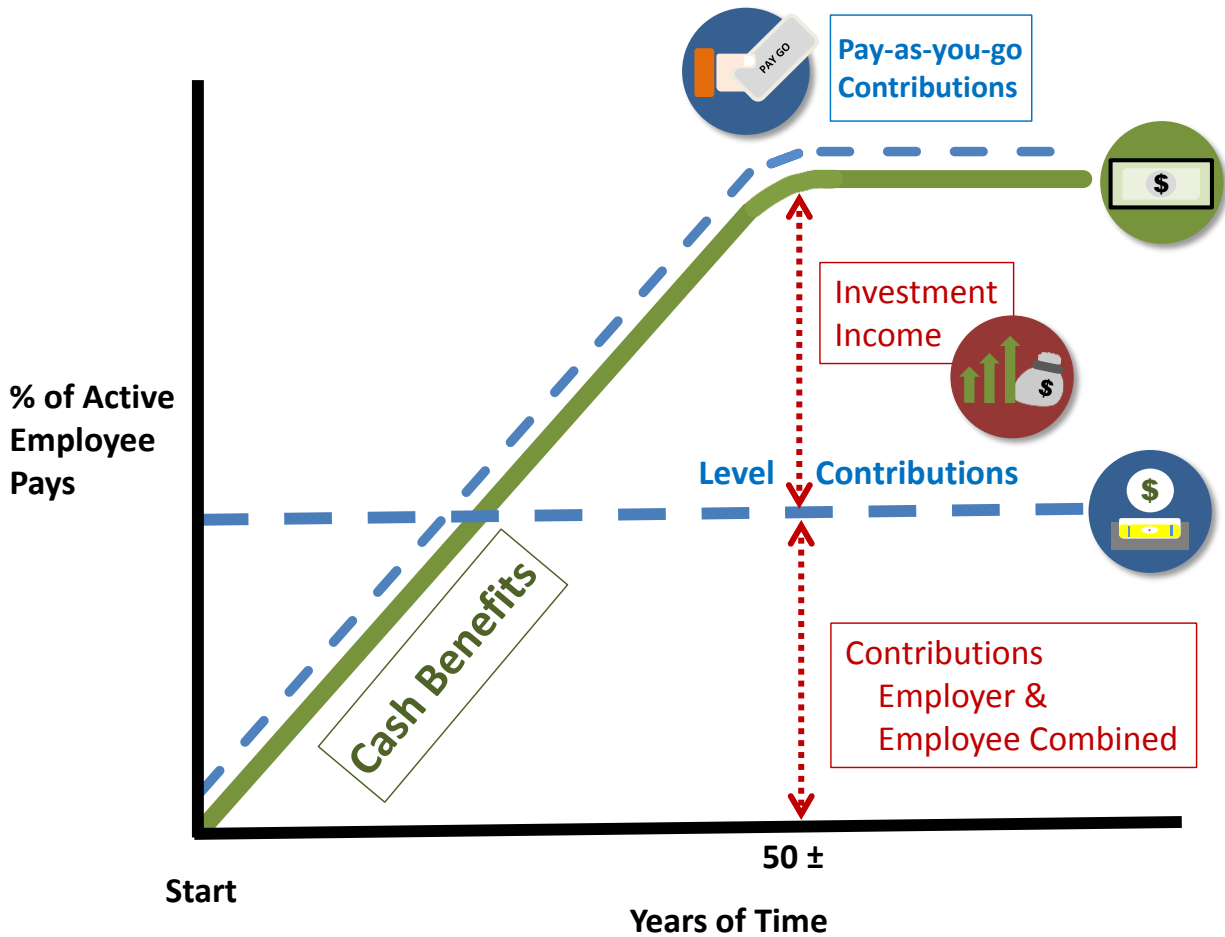
An actuarial valuation has a number of ingredients such as: the rate of investment return which plan assets will earn; the rates of withdrawal of active members who leave covered employment; the rates of mortality; the rates of disability; the rates of pay increases and the assumed age or ages at actual retirement.

In an actuarial valuation the actuary must assume what the above rates will be, for the next year and for decades in the future. Only the subsequent actual experience of the plan can indicate the degree of accuracy of the assumptions.

(Concluded on Next Page)

Financial Principles and Operational Techniques of the Retirement System (Concluded)

Reconciling Differences Between Assumed Experience and Actual Experience Once actual experience has occurred and has been observed, it will not coincide exactly with assumed experience, regardless of the skill of the actuary and the many calculations made. Most retirement systems cope with such differences by having annual actuarial valuations. Each actuarial valuation is a complete recalculation of assumed future experience, taking into account all past differences between assumed and actual experience. The result is ***continuing adjustments to the financial position.***



CASH BENEFITS LINE. This relentlessly increasing line is the fundamental reality of retirement plan financing. It happens each time a new benefit is added for future retirements (and happens regardless of the design for contributing for benefits).

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

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

Actuarial Valuation Process

The **actuarial valuation** is the mathematical process by which the contribution rate is determined, and the flow of activity constituting the valuation may be summarized as follows:

- A. **Covered people data** furnished by plan administrator, including:
 - Retired lives now receiving benefits
 - Former employees with vested benefits not yet payable
 - Active employees

- B. + **Asset data** (cash & investments), furnished by the plan administrator

- C. + **Benefit provisions** which specify eligibility and amounts of pensions

- D. + **Assumptions concerning future experience in various risk areas**, which are established by the Retirement Board after consulting with the actuary

- E. + **The funding method** for employer contributions (the long-term, planned pattern for employer contributions)

- F. + **Mathematically combining the assumptions, the funding method, and the data**

- G. = Determination of:
 - Plan Financial Position and/or
 - New Employer Contribution Rate

Meaning of “Unfunded Actuarial Accrued Liabilities”

“Actuarial accrued liabilities” are the portion of the present value of plan promises to pay benefits in the future that are not covered by future normal cost contributions. A liability has been established (“accrued”) because the service has been rendered but the resulting monthly cash benefit may not be payable until years in the future. Actuarial accrued liabilities are the result of complex mathematical calculations, which are made by the plan’s actuary.

If “actuarial accrued liabilities” exceed the plan’s accrued assets (cash & investments), the difference is **“unfunded actuarial accrued liabilities.”** This is the usual condition. If the plan’s assets equaled the plan’s “actuarial accrued liabilities,” then the plan would be termed “fully funded.” This is an unusual condition.

Each time a plan adds a new benefit, which applies to service already rendered, an “actuarial accrued liability” is created, which is also an “unfunded actuarial accrued liability” because the plan can’t print instant cash to cover the value of the new benefit promises. Payment for such unfunded actuarial accrued liabilities is spread over a period of years, commonly in the 15-30 year range.

Unfunded actuarial accrued liabilities can occur in another way: if actual plan experience is less favorable than assumed plan experience, the difference is added to unfunded actuarial accrued liabilities. In plans where benefits are directly related to an employee’s pay near time of retirement, unfunded actuarial accrued liabilities rose dramatically during the 1970’s. Unexpected rates of pay increase created additional actuarial accrued liabilities, which could not be matched by reasonable investment results. More recent experience has generally been more favorable with some reductions in unfunded actuarial accrued liabilities.

The existence of unfunded actuarial accrued liabilities is not bad, but the changes from year to year in the amount of unfunded actuarial accrued liabilities are important, --- “bad” or “good” or somewhere in between.

Even though unfunded actuarial accrued liabilities don’t constitute a bill payable immediately, it is important that policy-makers prevent the amount from becoming unreasonably high and ***it is vital for plans to have a sound method for making payments toward them*** so that they are controlled.



August 16, 2019

Mr. Mark R. Atkeson, Executive Director
Ohio State Highway Patrol Retirement System
Mettler Toledo Building
1900 Polaris Parkway, Suite 201
Columbus, OH 43240

Dear Mark:

Enclosed are four bound copies of the December 31, 2018 actuarial valuation of the Ohio State Highway Patrol Retirement System.

Sincerely,

A handwritten signature in black ink that reads "Mita Drazilov". The signature is written in a cursive, flowing style.

Mita D. Drazilov, ASA, FCA, MAAA

MDD:dks:sc
Enclosures

cc: Schneider Downs
Attn: Mr. Brandon Embreus (+1 report copy)