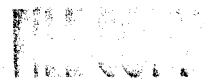


REPORT ON
ACTUARIAL SURVEY
MINNESOTA STATE RETIREMENT SYSTEM
JUNE 30, 1971
3-1/2% INTEREST RATE ASSUMPTION

February 4, 1972



COATES, HERFURTH & ENGLAND

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February 4, 1972

Board of Directors
Minnesota State Retirement System
529 Jackson Street
St. Paul, Minnesota 55101

Gentlemen:

We are pleased to transmit herewith our report on the Actuarial Survey (Investigation and Valuation) of your Retirement System made as of June 30, 1971.

Pursuant to Contract No. E-8154, under which this survey was authorized, the actuarial valuation was carried out on the basis of a 3-1/2% interest rate assumption and on the bases of the other actuarial assumptions developed during the course of the current actuarial investigation carried out as of June 30, 1971 and covering the experience of the members during the preceding three and one-half years. Also, in accordance with the above noted contract, we utilized the entry age normal cost method of funding to determine the unfunded accrued liability of the System.

Contract No. E-8154 authorized a second valuation to be carried out on the basis of a 4% interest assumption and the other assumptions developed during the current investigation. The results of the "4% valuation" will be submitted in a separate actuarial report.

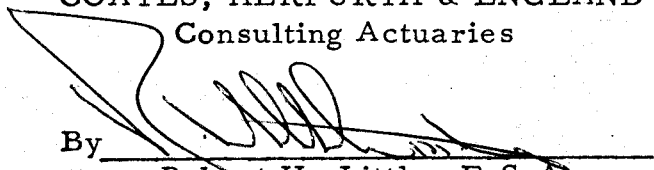
We hereby certify that the actuarial valuation of the Minnesota State Retirement System made as of June 30, 1971 was carried out on the the basis of accepted actuarial methods and procedures and in accordance with the provisions of Minnesota Statutes 1967, Chapter 356. The results of that valuation indicate that the contributions required from the employees and from the State under Minnesota Statutes 1967, Chapter 352, as presently constituted are adequate to provide the benefits that will be paid from the System.

We look forward to the opportunity of discussing this report with you at your convenience.

Very truly yours,

COATES, HERFURTH & ENGLAND
Consulting Actuaries

By


Robert H. Little, F.S.A.

RH L:th

REPORT ON
ACTUARIAL SURVEY
OF THE
MINNESOTA STATE RETIREMENT SYSTEM
AS OF
JUNE 30, 1971
3-1/2% INTEREST RATE ASSUMPTION

SECTION I

INTRODUCTION

Minnesota Statutes 1967, Chapter 356, Section 356.21, Subdivision 3, requires that an actuarial survey be carried out at the close of the fiscal year ending in 1967 and each fourth year thereafter. This report contains the results of the actuarial survey that was carried out as of June 30, 1971 in compliance with this requirement of the State law.

The actuarial survey may, by definition, be divided into the following two principal phases:

1. Phase I - Actuarial Investigation

This phase of the survey consists of an analysis of the experience of the members during the period since the last investigation with respect to rates of separation from active service and salary progression scales for active members and mortality rates among

retired members. This analysis permits the actuary to develop appropriate assumptions with respect to each of these contingencies for use in the valuation phase of the survey. The last such investigation was carried out as of December 31, 1967.

2. Phase II - Actuarial Valuation

This phase of the survey consists of computing the actuarial assets and liabilities of the System on the basis of the actuarial assumptions developed during the course of the investigation together with the specified 3-1/2% interest rate assumption.

The Executive Director of the System furnished us with 64,708 IBM punch cards containing detailed employee information on all members who were actively employed as of June 30, 1971 or who had terminated from active employment during the three and one-half years under investigation. In addition, the Executive Director furnished us with 5,229 IBM punch cards containing detailed information on all retired members who were receiving benefits as of June 30, 1971 or who had died during the three and one-half years under investigation. We were also furnished various listings and tabulations of employee data.

The Executive Director and his staff are to be complimented on the accuracy and completeness of the aforementioned data.

The following Section II of this report sets forth the results of the actuarial investigation and Section III sets forth the results of the actuarial valuation. The schedules contained in Section IV at the end of this report set forth in detail the actuarial assumptions developed during the course of the investigation and the schedules required by law.

SECTION II

RESULTS OF ACTUARIAL INVESTIGATION

In order to carry out an actuarial valuation of the assets and liabilities of your Retirement System the actuary must first adopt assumptions with respect to the following items:

1. Interest earnings that will be realized on the fund over many years in the future.
2. The relative increases in the salary of a member from the date of the valuation to the date of separation from active service.
3. The mortality rates to be experienced among persons retired for age and service.
4. The mortality rates to be experienced among persons retired for disability.
5. The probabilities of members separating from active service on account of:
 - a) Withdrawal without vesting - i.e., withdrawal with refundment and withdrawal prior to completion of ten years of service.
 - b) Death
 - c) Disability
 - d) Age and Service Retirement

We have examined the experience of the members of your Retirement System during the three and one-half year period ending June 30, 1971. We set forth in the following paragraphs of this Section a discussion of the items entering into the investigation.

INTEREST RATE

Your Retirement Law requires that the actuarial valuation be carried out on the basis of a 3-1/2% interest rate assumption.

SALARY SCALES

For the purpose of determining the present value of future contributions as well as the present value of future benefits, salary scales are prepared to measure the relative increases in salaries that members will experience as they advance in age toward retirement. These salary scales are based on average salaries developed separately for males and females by age and length of service. From such averages, index numbers are developed which reflect the increases in salary that a member could expect to receive over his future working lifetime. It should be noted that salary scales developed in the manner just described reflect only increases due to merit, promotion and service. They do not reflect across the board increases due to inflationary pressures.

An examination of the data developed as of June 30, 1971 shows that the salary scales adopted as of December 31, 1967 continue to be appropriate. Accordingly, the salary scales developed as of December 31, 1967 were applied in the current valuation made as of June 30, 1971.

The salary scales are set forth in detail in Schedule 1 at the end of this report.

MORTALITY AFTER AGE AND SERVICE RETIREMENT

The following schedule shows a comparison of the deaths which actually occurred among members retired for age or service and the number expected by the mortality table currently in use which is referred to as the 1937 Standard Annuity Mortality Table:

	<u>MORTALITY AFTER AGE AND SERVICE RETIREMENT</u>	
	<u>Actual Deaths</u>	<u>Deaths Expected by 1937 Standard Annuity Mortality Table</u>
Male	469	482
Female	<u>200</u>	<u>229</u>
Total	669	711

During the period that we have served as Actuary for your System we have made three investigations into the mortality experience of retired lives covering the periods January 1, 1961 to December 31, 1964, January 1, 1965 to December 31, 1967 and the current investigation period, January 1, 1968 to June 30, 1971. Since the results for the current investigation period show, for the first time, fewer actual deaths than those expected by the 1937 Standard Annuity Mortality Table we do not feel that a change in the mortality assumption should be made at this time pending confirmation of this trend by a later investigation.

Another deterrent to a change in mortality assumptions applicable to retired lives if such change ultimately proves to be premature relates to the

fact that annual adjustments in payments from the MAFB Fund must be based on the mortality assumptions then applicable under the System. A strengthening of the mortality assumption would, of course, increase the amount of reserves required to support the benefits being paid. For example, we estimate that a change to the 1971 Group Annuity Mortality Table, the most recently published table based on the experience of retired lives, would increase the reserves for benefits under MAFB Fund by roughly 4% assuming that the 3-1/2% interest assumption is retained. Since mortality improvements will, sooner or later, have to be reflected by a change in assumptions we respectfully suggest that your Board call the problem to the attention of the Legislative Retirement Study Commission with the suggestion that the Commission may wish to suggest legislation which would require, or at least permit, a system to transfer additional funds to the MAFB Fund to cover reserve increases which result from a strengthening of the mortality assumption.

In the light of the foregoing factors, we recommend the continuation of the 1937 Standard Annuity Mortality Table as the basis of the mortality after age and service retirement assumption.

MORTALITY AFTER DISABILITY RETIREMENT

You are currently using the Combined Annuity Mortality Table to reflect rates of mortality after disability retirement. The following table shows a comparison of the actual deaths with those expected by the Combined Annuity Mortality Table:

MORTALITY AFTER DISABILITY RETIREMENT

	<u>Actual Deaths</u>	<u>Expected Deaths Combined Annuity Mortality Table</u>
Male	41	13
Female	<u>15</u>	<u>6</u>
Total	56	19

Although the experience shows that the actual rates of mortality after disability retirement are higher than those which were assumed in the valuation, there are less than 200 members retired for disability and fluctuations can be expected. We therefore recommend that the Combined Annuity Mortality Table be continued in use.

RATES OF SEPARATION FROM ACTIVE SERVICE

The results of the investigation with respect to rates of separation from active service are summarized in the following table. The "Old Expected Separations" are based on the rates developed as of December 31, 1967 which were used in the valuations of your Retirement System as of December 31, 1967, 1968 and 1969. The "New Expected Separations" are based on the rates developed by the current investigation covering the experience of your members from January 1, 1968 through June 30, 1971.

SUMMARY OF ACTUARIAL INVESTIGATION
WITH RESPECT TO RATES OF SEPARATION
FROM ACTIVE SERVICE

	<u>Actual Separations</u>	<u>"Old" Expected Separations</u>	<u>"New" Expected Separations</u>
<u>Withdrawal Without Vesting*</u>			
Male	2,429	2,517	2,517
Female	<u>3,780</u>	<u>3,830</u>	<u>3,830</u>
Total	6,209	6,347	6,347
<u>Death</u>			
Male	358	428	354
Female	<u>113</u>	<u>159</u>	<u>137</u>
Total	471	587	491
<u>Disability Retirement</u>			
Male	74	69	69
Female	<u>34</u>	<u>44</u>	<u>44</u>
Total	108	113	113
<u>Age and Service Retirement</u>			
Male	824	710	824
Female	<u>549</u>	<u>499</u>	<u>549</u>
Total	1,373	1,209	1,373

*Based on experience of members after completing 3 years of service.

WITHDRAWAL WITHOUT VESTING

We received information on those employees who terminated service and received a refundment, those that terminated employment with less than ten years of service but who have not yet received a refundment, and those who terminated service with more than ten years of service and who have not yet received a refundment. Since members must complete ten years of service before acquiring a vested right in their benefits, we combined the terminations with refundment and the terminations with less than ten years of service without refundments for the purpose of developing withdrawal rates.

The withdrawal of members with less than three years of service has a relatively minor financial effect on the fund and, also, the experience of members prior to completion of three years of service is not representative of the experience of members that will ultimately receive disability and service retirement benefits from the System. We, therefore, develop withdrawal rates on the basis of the experience of members after completion of three years of service.

The results of the investigation show that the withdrawal rates developed as of December 31, 1967 are appropriate for continued use.

DEATH

The results of the investigation show that the old probabilities of death in active service for both male and female members produce more "expected" deaths than actually occurred. The rates of mortality used for the current valuation reflect about 16% lower mortality than the old rates.

DISABILITY

The results of the investigation show that the rates of disability developed by the December 31, 1967 investigation are appropriate for continued use.

AGE AND SERVICE RETIREMENT

Rates of age and service retirement are probably the most important single element developed during the course of an actuarial investigation. The liability for age and service retirement benefits depends to a large extent on the ages at which such benefits commence.

The results of the investigation indicate that the rates of age and service retirement developed by the December 31, 1967 investigation are no longer appropriate. The rates of age and service retirement used for the current valuation reflect the actual experience and are about 14% higher than the old rates.

RECOMMENDATIONS ON ACTUARIAL ASSUMPTIONS

Based upon our study and analysis of the information developed by the actuarial investigation of the actual experience of your members during the period January 1, 1968 to June 30, 1971, we respectfully make the following recommendations with respect to the actuarial assumptions to be used for the actuarial valuations to be carried out commencing with the current valuation carried out as of June 30, 1971 which is discussed in the following Section III of this report:

1. In order to comply with your Retirement Law, the actuarial valuations should be carried out on the basis of a 3-1/2% interest rate assumption.
2. We recommend the continuation of the 1937 Standard Annuity Mortality Table for the mortality after age and service retirement assumption.
3. We recommend the continuation of the Combined Annuity Mortality Table as the basis of the assumption for mortality after disability retirement.
4. We recommend the continuation of the salary scales developed by the December 31, 1967 investigation which are set forth in the attached Schedule 1.
5. We recommend the adoption of the rates of separation from active service developed by the current investigation. These rates of separation from active service are set forth in the attached Schedules 2 and 3 and reflect no change in the rates of separation

due to withdrawal without vesting and disability retirement, a reduction in the rates of separation due to death and an increase in the rates of age and service retirement.

Minnesota Statutes 1967, Chapter 356 require an analysis of the effect of the changes in actuarial assumptions. For convenience, this information appears in Section III of this report which deals with the results of the valuation.

SECTION III

RESULTS OF ACTUARIAL VALUATION

The contract under which this valuation was authorized specifies that the actuarial valuation be carried out on the basis of a 3-1/2% interest rate assumption and upon the actuarial assumptions developed during the course of the actuarial investigation carried out as of June 30, 1971 and summarized in Section II of this report. We were also instructed to carry out the actuarial valuation on the basis of an entry age normal cost method of funding. The current valuation was carried out in accordance with the stipulations contained in the aforementioned contract.

Section 352.12 of the Minnesota Statutes 1969 was amended during the 1971 session of the Legislature to provide benefits to the surviving spouse of members who die in active service after becoming eligible to retire. This amendment was, of course, reflected in the current valuation.

The Executive Director furnished us with a financial report setting forth the assets and liabilities of the fund as of June 30, 1971. No physical audit of these assets was made by us and our calculations are based upon the financial report as submitted.

The entry age normal cost method of funding requires the determination of the level contribution rate which, if contributed on behalf of all new employees from the dates of employment to the dates of separation from service, will be adequate to provide all of their benefits. Under this funding method, the unfunded accrued liability is taken as the total liability of the

System for benefits earned in the past as well as those earnable in the future, less the assets on hand, less the present value of future employee contributions and less the present value of future State entry age normal cost contributions.

In order to develop the entry age normal cost contribution rate for new employees, we carried out a complete valuation of active members as of June 30, 1971 who were employed during the preceding four and one-half year period. The results of these calculations indicate that the total entry age normal cost rate amounts to 5.77% of salary.

Employees are required by law to contribute 3% and, accordingly, the State's share of the entry age normal cost contribution rate amounts to 2.77%. We expect the entry age normal cost rate to remain fairly stable unless there is a change in employment practices or in the Retirement Law.

The law requires that the State make the following contributions to the Fund with respect to members contributing at a 3% rate:

- (1) A "matching" contribution equal to 3% of the members' participating salaries, and
- (2) An "additional" contribution equal to one-third of members' contributions, or 1% of participating salary. (The additional contribution was reduced from 1-1/2% to 1% of participating salary effective July 1, 1970.)

We have been advised that it is the intent of the Minnesota Legislature to pay the "additional" contributions referred to above for a limited time only.

The Accounting Balance Sheet shown on the following page was furnished by the Executive Director.

The Actuarial Balance Sheet shown on the page following the Accounting Balance Sheet summarizes the results of the valuation. It will be noted that in the current valuation we have continued to make provision for administrative expenses amounting to .19% of salaries.

MINNESOTA STATE RETIREMENT SYSTEM

ACCOUNTING BALANCE SHEET
AS OF
JUNE 30, 1971

ASSETS

Cash in office	\$ 25.00
Deposits in banks	172,952.17
Short term investments (at cost)	1,944,729.08
Accounts receivable:	
a) Accrued employee contributions	249,149.60
b) Accrued employer contributions	334,095.17
c) Employee back payments	27,453.63
d) Investment maturities and sales	412,295.37
e) Other	6,328.06
Accrued interest in investments	1,032,521.51
Dividends declared & payable, but not yet received	167,711.51
Investment in debt securities at amortized cost	68,264,133.10
Investment in equities at cost	39,493,115.13
Equipment at depreciated cost	5,992.43
Prepaid postage	2,000.00
Participation in MAFB Fund	45,982,892.26
Deferred Yield Adjustment Account	116,073.51
Deferred Charges to Future Participation in the MAFB Fund	502,390.15
Total Assets	<u>\$158,713,857.68</u>

LIABILITIES AND RESERVES

LIABILITIES

Accounts payable:	
a) Annuities	\$ 1,606.70
b) Survivor Benefits	2,608.97
c) Annuitant deposits	1,386.45
d) Accrued expenses	28,035.15
e) Overpaid dividends and prepaid postage	1,145.17
f) Security purchases	105,890.88
Suspense Item:	
a) Unredeemed 6-yr. warrants (cancelled by State Auditor)	<u>3,495.88</u>
Total liabilities	\$ 144,169.20

RESERVES

Employee contribution reserve	43,718,603.03
Survivor benefit reserve	318,304.00
Reserve for participation in MAFB Fund	45,982,892.26
State contribution reserve	68,047,499.04
Annuity stabilization reserve	502,390.15
Total reserves	<u>\$158,569,688.48</u>
Total liabilities and reserves	<u>\$158,713,857.68</u>

MINNESOTA STATE RETIREMENT SYSTEM

ACTUARIAL BALANCE SHEET
AS OF
JUNE 30, 1971

ASSETS

1.	Assets on Hand from Accounting Balance Sheet:		
	a) Participation in MAFB Fund	\$ 45,982,892.26	
	b) All other Assets	<u>112,730,965.42</u>	\$158,713,857.68
2.	Present Value of Employees' Future Contributions (3% of Participating Salary)		61,310,292.00
3.	Present Value of State Future Contributions Applicable to:		
	a) Entry Age Normal Cost (2.77% of Participating Salary)	\$ 56,609,836.00	
	b) Unfunded Accrued Liability (Balance of 3% "Matching" Contribution less .19% for Operating Expenses or .04% of Participating Salary)	817,471.00	
	c) Unfunded Accrued Liability (Portion to be funded by "Additional" Contribution)	<u>20,280,774.93</u>	<u>77,708,081.93</u>
4.	TOTAL ASSETS		<u><u>\$297,732,231.61</u></u>

LIABILITIES

5.	Current Liabilities from Accounting Balance Sheet		\$ 144,169.20
6.	Present Value of Earned and Earnable Benefits Payable to Presently Active Members:		
	a) Retirement Benefits	\$194,895,659.00	
	b) Disability Benefits	16,575,350.00	
	c) Refundments due to death or withdrawal	31,619,593.00	
	d) Surviving Spouse Benefits	<u>4,997,508.00</u>	248,088,110.00
7.	Present Value of Benefits for Deferred Annuitants:		
	a) Retirement Benefits	\$ 2,157,011.00	
	b) Refundments due to death or withdrawal	107,714.00	
	c) Benefits already authorized	<u>5,625.00</u>	2,270,350.00
8.	Present Value of Refundments to former members without vested rights		426,016.00
9.	Benefits Payable from MAFB Fund:		
	a) Reserve for Participation	\$ 45,982,892.26	
	b) Annuity Stabilization Reserve	<u>502,390.15</u>	46,485,282.41
10.	Present Value of Survivor Benefits		<u>318,304.00</u>
11.	TOTAL LIABILITIES		<u><u>\$297,732,231.61</u></u>

The Actuarial Balance Sheet is a convenient device to present the results of an actuarial valuation. The following comments are intended to assist you in your understanding of the items contained in the Actuarial Balance Sheet.

Item 1 shows the assets on hand and was taken directly from the Accounting Balance Sheet.

Item 2 shows the present value of members' future contributions required by law equal to 3% of the members' salaries.

Item 3 shows the present value of State future contributions to the System. We have divided the present value applicable to the State's contributions as follows:

Item 3(a) The portion attributable to the State's share of the total entry age normal cost contribution of 5.77% of members' salaries. After deducting the members' share of 3%, the State's share of the entry age normal cost contribution amounts to 2.77% of members' salaries.

Item 3(b) The portion attributable to the balance of the State's "matching" 3% contribution (.23% of members' salaries less .19% which is allocated for operating expenses) which is being used to pay a portion of the State's share of the cost.

Item 3(c) The portion attributable to the State's "additional" contribution. On the basis of the annualized salaries payable as of June 30, 1971, the 1% "additional" contribution amounts to approximately \$2,583,000.00 per

year and the full amount of the contribution will amortize the \$20,280,774.93 shown in Item 3(c) in a little over nine years. The level annual contribution required to amortize \$20,280,774.93 over the 26-1/2 year period ending on December 31, 1997 is \$1,166,555.00.

Item 5 shows the current liabilities and was taken directly from the Accounting Balance Sheet.

Item 6 shows the actuarially computed present value of all benefits earned to June 30, 1971 and earnable after that date that will be paid from the System to presently active members.

Item 7 shows the actuarially computed present value of all benefits payable from the System to members who have terminated service with vested benefits.

Item 8 shows the actuarially computed present value of refundments that will be paid from the System to members who have terminated service without vested benefits.

The total of \$45,982,892.26 shown for Item 9(a) represents the value of benefits payable from the MAFB Fund to MSRS retirees and may be related to a computed present value on the basis of a 3-1/2% interest assumption and the 1937 Standard Annuity Mortality Table of \$45,036,704 (\$43,158,003 for retirement benefits and \$1,878,701 for disability benefits).

The Annuity Stabilization Reserve of \$502,390.15 shown in Item 9(b) was created by the Legislature in 1971 to control the fluctuation of benefits payable from the MAFB Fund.

CONCLUSIONS

In a Retirement System such as yours where both the benefits and contributions are specified in the Retirement Law, the major purpose of an actuarial valuation is to determine whether or not the prescribed contributions are adequate to provide the benefits that will ultimately be paid under the System. The results of the current valuation show that the benefits to be provided under the System can be financed by the 3% members' contributions and the State's "matching" 3% contributions plus the State's "additional" 1% contribution for approximately nine years.

SECTION IV

REQUIRED EXHIBITS

Minnesota Statutes 1967, Chapter 356, requires, in Section 356.20, Subdivision 4(1), that the actuary of the System prepare an exhibit setting forth certain specified information with regard to the System as of the valuation date, including "Reserves Required" under the System. In an earlier conference with representatives of the State's Employee Retirement System's Interim Commission, we were advised that "Reserve Required", as contemplated in the aforementioned statute, may be defined as the actuarially computed present value applicable to a specified benefit reduced by the actuarially computed present value of any portion of the total entry age normal cost contribution under the System which is applicable to the specified benefit.

The exhibit required by Section 356.20, Subdivision 4(1) of Minnesota Statutes 1967, Chapter 356, is presented on the following pages of this Section IV and we hereby certify that the Reserves Required set forth therein have been computed in accordance with the Entry Age Normal Cost (level Normal Cost) basis in the manner outlined in the definition referred to above.

MINNESOTA STATE RETIREMENT SYSTEM

EXHIBIT REQUIRED BY MINNESOTA STATUTES 1967, CHAPTER 356,
SECTION 356.20, SUBDIVISION 4(1)

AS OF
JUNE 30, 1971

<u>Assets</u>		<u>ASSETS AND UNFUNDED ACCRUED LIABILITY</u>
1. Cash in office	\$	25.00
2. Deposits in banks		172,952.17
3. Short term investments (at cost)		1,944,729.08
4. Accounts receivable:		
a) Accrued employee contributions		249,149.60
b) Accrued employer contributions		334,095.17
c) Employee back payments		27,453.63
d) Investment maturities and sales		412,295.37
e) Other		6,328.06
5. Accrued interest in investments		1,032,521.51
6. Dividends declared & payable, but not yet received		167,711.51
7. Investment in debt securities at amortized cost		68,264,133.10
8. Investment in equities at cost (Market Value \$44,514,062.00)		39,493,115.13
9. Equipment at depreciated cost		5,992.43
10. Prepaid postage		2,000.00
11. Participation in MAFB Fund		45,982,892.26
12. Deferred Yield Adjustment Account		116,073.51
13. Deferred Charges to Future Participation in the MAFB Fund		502,390.15
14. TOTAL ASSETS		<u>\$158,713,857.68</u>
<u>Unfunded Accrued Liability</u>		
15. Unfunded Accrued Liability to be funded by portion of State's 3% "Matching Contribution" in excess of State's share of entry age normal cost contribution and Operating Expenses	\$	817,471.00
16. Unfunded Accrued Liability to be funded by State's "Additional" contribution		<u>20,280,774.93</u>
17. TOTAL UNFUNDED ACCRUED LIABILITY	\$	21,098,245.93
18. TOTAL ASSETS AND UNFUNDED ACCRUED LIABILITY		<u>\$179,812,103.61</u>
<u>CURRENT LIABILITIES AND RESERVES REQUIRED</u>		
<u>Current Liabilities</u>		
19. Accounts Payable:		
a) Annuities	\$	1,606.70
b) Survivor Benefits		2,608.97
c) Annuitant deposits		1,386.45
d) Accrued expenses		28,035.15
e) Overpaid dividends and prepaid postage		1,145.17
f) Security purchases		105,890.88
20. Suspense Item		<u>3,495.88</u>
21. TOTAL CURRENT LIABILITIES	\$	144,169.20
<u>Reserves Required</u>		
22. Total Reserves Required per attached schedule		<u>\$179,667,934.41</u>
23. TOTAL CURRENT LIABILITIES AND RESERVES REQUIRED		<u>\$179,812,103.61</u>
Note: Accumulated contributions, without interest, of members not yet retired amounted to \$43,718,603.03 as of June 30, 1971.		

MINNESOTA STATE RETIREMENT SYSTEM

DETERMINATION OF RESERVES REQUIRED
AS OF
JUNE 30, 1971

Benefits For:	(1)	(2)	(3)
	Present Value of Benefits	Present Value of Applicable Portion of Normal Cost Contribution	Reserves Required (1) - (2)
1. Active Members:			
a) Retirement Benefits	\$194,895,659.00	\$ 78,068,438.00	\$116,827,221.00
b) Disability Benefits	16,575,350.00	10,218,382.00	6,356,968.00
c) Refundments due to death or withdrawal	31,619,593.00	27,385,264.00	4,234,329.00
d) Surviving Spouse Benefits	4,997,508.00	2,248,044.00	2,749,464.00
2. Deferred Annuitants	2,270,350.00	-	2,270,350.00
3. Former Members Without Vested Rights	426,016.00	-	426,016.00
4. Survivors	318,304.00	-	318,304.00
5. Benefits Payable from MAFB Fund:			
a) Reserve for Par- ticipation	45,982,892.26	-	45,982,892.26
b) Annuity Stabilization Reserve	502,390.15	-	502,390.15
6. Total	\$297,588,062.41	\$117,920,128.00	\$179,667,934.41

Minnesota Statutes 1967, Chapter 356, requires, in Section 356.20, Subdivision 4(2) and (3), that there be submitted annually an analysis of the System's income and deductions from income with increases in total reserves required being specifically referred to as a deduction from income. The exhibit required by Section 356.20, Subdivision 4(2) and (3) is presented on the following page of this Section IV. Items of income and deductions from income with the exception of increases in total reserves required were taken directly from statements prepared by the Executive Director.

Inasmuch as any excess of "income" over "deductions from income" must be equal to the reduction in the Unfunded Accrued Liability of the System over the period covered by the analysis, we have confirmed that fact in Item 13 of the exhibit.

MINNESOTA STATE RETIREMENT SYSTEM

EXHIBIT REQUIRED BY MINNESOTA STATUTES 1967, CHAPTER 356,
SECTION 356.20, SUBDIVISION 4(2) and (3)
EIGHTEEN MONTHS ENDING JUNE 30, 1971

ANALYSIS OF INCOME AND DEDUCTIONS FROM INCOME

INCOME

1.	<u>From Employees</u>		
	Employee contributions		\$10,202,363.49
	Employee accrued contributions receivable		465,815.38
	Employee contributions accounts receivable		19,684.07
2.	<u>From Employers</u>		
	Employer contributions		10,209,399.91
	Employer additional contributions		3,921,322.19
	Employer accrued contributions receivable		658,290.12
3.	<u>From Investments</u>		
	Interest on debt securities (net)		5,239,682.31
	Dividends on corporate stock		1,767,230.66
	Premium on bonds called		1,484.52
	MAFB Fund income		3,903,522.91
4.	<u>Other Revenues</u>		
	Interest on back payments by employees		21,486.27
	Employer payments in lieu of interest		452.96
	Adjustment in prior year benefit payments		4,972.39
	Unclaimed benefits cancelled into fund		523.38
	Gain on sales/transfers of securities		152,482.67
	Deferred yield adjustment account		128,813.28
	Annuity Stabilization reserve		502,390.15
5.	TOTAL INCOME		<u>\$37,199,916.66</u>

DEDUCTIONS FROM INCOME

6.	<u>Benefits</u>		
	Retirement benefits		\$ 7,412,912.64
	Survivor benefits		45,869.04
	Interest paid - deaths & compulsory retirees		127,930.64
7.	<u>Refundments</u>		
	Left service		2,488,262.99
	Coverage by other systems		109,490.92
	Employee deaths		469,899.55
	Annuitant deaths		57,811.80
	Erroneous deductions		32,421.78
8.	<u>Operating Expenses</u>		584,449.26
9.	<u>Miscellaneous</u>		
	Interest transferred to TRA Fund		4,616.06
10.	<u>Increase in Total Reserves Required</u>		
	Reserves Required 12-31-69	\$154,638,169.68	
	Reserves Required 6-30-71	<u>179,667,934.41</u>	<u>25,029,764.73</u>
11.	TOTAL DEDUCTIONS FROM INCOME		\$36,363,429.41
12.	EXCESS OF INCOME OVER DEDUCTIONS FROM INCOME		836,487.25
13.	REDUCTION IN UNFUNDED ACCRUED LIABILITY:		
	Unfunded Accrued Liability 12-31-69	\$ 21,934,733.18	
	Unfunded Accrued Liability 6-30-71	<u>21,098,245.93</u>	<u>836,487.25</u>

Minnesota Statutes 1967, Chapter 356, requires, in Section 356.20, Subdivision 4(4), that there be submitted annually an analysis of changes in the membership of the System. Section 356.21, Subdivisions 4 and 5, requires information with respect to the annual payroll and annual annuities of the members of the System as well as certain information with respect to average ages. The exhibit required by Section 356.20, Subdivision 4(4), Section 356.21, Subdivision 4(6), and Section 356.21, Subdivision 5(9) and (10) is presented on the following pages of this Section IV. All of the information was taken directly from an exhibit prepared by the Executive Director.

MINNESOTA STATE RETIREMENT SYSTEM

EXHIBIT REQUIRED BY MINNESOTA STATUTES 1967, CHAPTER 356,
SECTION 356.20, SUBDIVISION 4(4), SECTION 356.21, SUBDIVISION 4(6) AND
SECTION 356.21, SUBDIVISION 5(9) AND (10)
EIGHTEEN MONTHS ENDING JUNE 30, 1971

COVERED EMPLOYEE STATEMENT

ACTIVE EMPLOYEES:

	<u>NUMBER</u>	<u>ANNUALIZED PAYROLL *</u>
Active at January 1, 1970	36,406	\$246,842,443.40
New Entrants, 1/1/70 - 6/30/71	<u>9,832</u>	53,834,305.00
TOTAL:	46,238	

Less Separations from Active Service:

Refundment:	6,366	29,500,467.00
Separation with a Vested Right to a deferred annuity:	67	563,220.00
Separation with neither refundment nor right to a deferred annuity:	1,836	8,146,787.00
Disability	50	391,964.00
Death	225	1,686,378.00
Service Retirement	<u>565</u>	4,366,209.00

TOTAL SEPARATIONS: 9,109

Active at June 30, 1971 37,129 \$258,358,553.00

* Actual salary was given in previous reports. The actual salary for active employees at 1/1/70 was \$201,375,594.94.

AVERAGE ENTRY AGE OF NEW EMPLOYEES

<u>For the Year</u>	<u>Male</u>	<u>Female</u>	<u>Average of Total</u>
1966	31.4	26.1	28.2
1967	32.0	28.1	29.5
1968	31.5	27.4	28.9
1969	31.1	26.8	28.2
1/1/70 - 6/30/71	32.7	28.1	29.7

Average age at entry into State service for all active employees at June 30, 1971:

Average Male	33.3
Average Female	31.7
Total Average	32.0

ANNUITANT STATEMENT

	<u>NUMBER</u>	<u>ANNUAL ANNUITY BENEFIT PAYABLE</u>
(1) SERVICE RETIREMENT ANNUITANTS:		
Receiving at January 1, 1970	3,469	\$4,070,557.44
New	<u>543</u>	<u>733,356.96</u>
TOTAL:	4,012	\$4,803,914.40
Reductions:		
Deaths	<u>271</u>	<u>339,828.48</u>
Receiving at June 30, 1971	3,741	\$4,464,085.92
(2) DISABLED EMPLOYEES:		
Receiving at January 1, 1970	174	\$ 147,884.80
New Disabilities	<u>52</u>	<u>57,733.80</u>
TOTAL:	226	\$ 205,618.60
Reductions:		
Deaths	26	\$ 25,806.64
Disabilities Recovered	<u>2</u>	<u>2,562.84</u>
TOTAL:	28	\$ 28,369.48
Receiving at June 30, 1971	198	\$ 177,249.12
(3) WIDOWS RECEIVING AN ANNUITY OR SURVIVOR BENEFIT:		
A. Beneficiaries of Retired Employees Receiving an Optional or Reversionary Annuity:		
	<u>NUMBER</u>	<u>ANNUAL ANNUITY BENEFIT PAYABLE</u>
Receiving at January 1, 1970	122	\$ 97,206.00
New	<u>18</u>	<u>15,807.84</u>
TOTAL:	140	\$ 113,013.84
Reductions:		
Deaths	<u>6</u>	<u>4,367.04</u>
Receiving at June 30, 1971	134	\$ 108,646.80
B. Spouses Receiving a Survivor Benefit:		
Receiving at January 1, 1970	35	31,307.64
No New Additions		
Reductions:		
Widow Deaths	<u>2</u>	<u>1,560.00</u>
Receiving at June 30, 1971	33	\$ 29,747.64

	<u>NUMBER</u>	<u>ANNUAL SURVIVOR BENEFIT PAYABLE</u>
(4) CHILDREN RECEIVING A SURVIVOR BENEFIT:		
Receiving at January 1, 1970	1	\$ 780.00
No New Additions		
Reductions:		
Deaths	<u>1</u>	<u>780.00</u>
Receiving at June 30, 1971	0	\$.00

(5) DEFERRED ANNUITANTS: (Left State Service before reaching retirement age)

	<u>NUMBER</u>	<u>ANNUAL ANNUITY BENEFIT PAYABLE</u>
Receiving at January 1, 1970	503	\$326,878.68
New Retirements	<u>88</u>	<u>48,691.44</u>
TOTAL:	591	\$375,570.12
Reductions:		
Deaths	<u>26</u>	<u>16,875.60</u>
Receiving at June 30, 1971	565	\$358,694.52

Average Age at Retirement of New Service Annuitants

	<u>YEAR</u>	<u>AVERAGE RETIREMENT AGE</u>
Calendar Year	- 1967	66 years
Calendar Year	- 1968	67 years 4 months
Calendar Year	- 1969	66 years 2 months
1/1/70 - 6/30/70	- 1970	66 years
Fiscal Year	- 1971	65 years 11 months

AVERAGE Age at Retirement of all Existing Service Annuitants:

66 years 2 months

Section 356.21, Subdivision 4 of the Minnesota Statutes 1967 requires an analysis of the increase or decrease in the unfunded liability that occurred since the last valuation. The exhibit shown on the following pages of this Section IV contains the information required by Section 356.21, Subdivision 4(1), (2), (3), (4) and (5).

MINNESOTA STATE RETIREMENT SYSTEM

EXHIBIT REQUIRED BY MINNESOTA STATUTES 1967, CHAPTER 356
SECTION 356.21, SUBDIVISION 4(1), (2), (3), (4) and (5)
EIGHTEEN MONTHS ENDING JUNE 30, 1971

1.	Unfunded Accrued Liability December 31, 1969		\$21,934,733
2.	Change due to current rate of funding and interest requirement (Subdivision 4(4)):		
	a) Past Service Contribution	-\$4,670,011	
	b) 3-1/2% interest requirement	+ <u>1,151,573</u>	- 3,518,438
3.	Change due to actuarial gains (-) or losses (+) because of 1970-71 experience deviations from expected (Subdivision 4(3)):		
	a) Excess interest earnings	- 1,774,733	
	b) Withdrawals	- <u>661,324</u>	
	c) Total Gains	-\$2,436,057	
	d) Disability retirements	+ 46,388	
	e) Deaths in active service	+ 111,169	
	f) Age and Service Retirements	+ 566,570	
	g) Salary increases	+ <u>652,371</u>	
	h) Total Losses	+\$1,376,498	-\$ 1,059,559
4.	Change due to new entrants (Subdivision 4(5))		+ 56,428
5.	Unfunded Accrued Liability June 30, 1971 computed on the basis of the old plan and old actuarial assumptions (Item 1 plus Item 2 plus Item 3 plus Item 4)		17,413,164
6.	Change due to 1970 Plan Amendment to provide Surviving Spouse benefits		+ 2,749,464

7. Change due to new actuarial assumptions
(Subdivision 4(a)):

a) Age and Service retirement rates	+\$ 851,418	
b) Mortality rates	+ <u>84,200</u>	+\$ 935,618

8. Unfunded Accrued Liability June 30,
1971 calculated on basis of amended
Plan and new actuarial assumptions
(Item 5 plus Item 6 plus Item 7) 21,098,246

It will be noted that the foregoing analysis of the change in Unfunded Accrued Liability from December 31, 1969 to June 30, 1971 makes no reference to mortality gains or losses after retirement for age and service or disability. The absence of these gain or loss figures from the analysis reflects the fact that a gain or loss from mortality after retirement will have a bearing on the amount of benefits payable from the MAFB Fund but will not influence the Unfunded Accrued Liability of the System. We did make estimates of the mortality gain or loss on retired lives for the fiscal years ending June 30, 1970 and June 30, 1971 with the following losses resulting:

<u>Year Ended June 30</u>	<u>Mortality Loss on Retired Lives</u>
1970	\$114,000
1971	284,000

The following Schedules 1, 2 and 3 set forth in detail the actuarial assumptions developed during the course of the current survey as of June 30, 1971.

SCHEDULE 1

SALARY SCALES

<u>Age</u>	<u>Male</u>	<u>Female</u>
20	.580	.596
21	.597	.615
22	.614	.633
23	.634	.651
24	.654	.669
25	.674	.687
26	.694	.705
27	.714	.723
28	.734	.741
29	.754	.759
30	.774	.775
31	.793	.790
32	.810	.803
33	.826	.816
34	.840	.829
35	.851	.841
36	.863	.853
37	.874	.864
38	.883	.874
39	.892	.884
40	.901	.893
41	.909	.902
42	.917	.911
43	.924	.919
44	.931	.926
45	.938	.933
46	.942	.939
47	.948	.945
48	.956	.951
49	.960	.957
50	.965	.963
51	.970	.968
52	.974	.973
53	.978	.977
54	.981	.981

SCHEDULE 1

SALARY SCALES

(Continued)

<u>Age</u>	<u>Male</u>	<u>Female</u>
55	.984	.984
56	.987	.987
57	.989	.988
58	.991	.990
59	.993	.991
60	.994	.993
61	.995	.994
62	.997	.996
63	.998	.997
64	.999	.999
65	1.000	1.000
66	1.000	1.000
67	1.000	1.000
68	1.000	1.000
69	1.000	1.000
70	1.000	1.000

SCHEDULE 2

Male Members

Probabilities of Separation from Active Service

(Number Separating at Each Age Per 10,000 Working at That Age)

<u>Age</u>	<u>Withdrawal</u>	<u>Death</u>	<u>Disability</u>	<u>Age and Service Retirement</u>
20	2,400	6		
21	2,250	6		
22	2,080	7		
23	1,920	7		
24	1,760	7		
25	1,600	7		
26	1,470	7		
27	1,340	7		
28	1,230	8		
29	1,130	8		
30	1,040	8	2	
31	950	9	2	
32	890	10	2	
33	830	11	2	
34	770	12	2	
35	720	13	2	
36	680	15	2	
37	640	16	2	
38	600	18	2	
39	560	20	2	
40	530	22	2	
41	500	25	2	
42	480	27	2	
43	460	29	2	
44	430	32	2	
45	410	35	2	
46	390	38	3	
47	370	41	4	
48	350	44	5	
49	340	48	6	

SCHEDULE 2

Male Members
(Continued)

Probabilities of Separation from Active Service

(Number Separating at Each Age Per 10,000 Working at That Age)

<u>Age</u>	<u>Withdrawal</u>	<u>Death</u>	<u>Disability</u>	<u>Age and Service Retirement</u>
50	320	52	7	
51	300	57	8	
52	280	63	10	
53	260	70	12	
54	240	77	14	
55	210	85	17	
56	170	93	20	
57	140	102	23	
58	90	111	28	30
59	40	120	33	30
60		130	38	40
61		140	45	150
62		150	55	150
63		160	68	250
64		170	87	1,350
65		180		2,000
66		190		1,500
67		200		1,900
68		210		2,000
69		220		3,950
70				10,000

SCHEDULE 3

Female Members

Probabilities of Separation from Active Service

(Number Separating at Each Age Per 10,000 Working at That Age)

<u>Age</u>	<u>Withdrawal</u>	<u>Death</u>	<u>Disability</u>	<u>Age and Service Retirement</u>
20	3,700	1		
21	3,550	2		
22	3,390	2		
23	3,230	2		
24	3,070	3		
25	2,910	3		
26	2,750	4		
27	2,600	4		
28	2,430	4		
29	2,270	4		
30	2,120	4		
31	1,970	4		
32	1,820	4		
33	1,680	4		
34	1,540	4		
35	1,410	4	1	
36	1,300	5	1	
37	1,190	5	1	
38	1,090	6	1	
39	1,000	7	2	
40	920	8	2	
41	850	8	2	
42	780	9	3	
43	720	11	3	
44	680	13	3	
45	630	15	3	
46	590	17	4	
47	560	19	4	
48	530	21	4	
49	500	23	5	

SCHEDULE 3

Female Members
(Continued)

Probabilities of Separation from Active Service

(Number Separating at Each Age Per 10,000 Working at That Age)

<u>Age</u>	<u>Withdrawal</u>	<u>Death</u>	<u>Disability</u>	<u>Age and Service Retirement</u>
50	470	25	5	
51	440	27	6	
52	410	30	7	
53	390	33	8	
54	360	36	10	
55	330	39	12	
56	290	43	15	
57	230	47	18	
58	170	51	22	50
59	90	56	26	50
60		61	31	150
61		66	37	150
62		72	44	200
63		78	52	350
64		83	61	1,100
65		88		1,750
66		94		1,450
67		100		1,650
68		106		1,850
69		112		4,700
70				10,000

MSRS VALUATION AS OF JUNE 30, 1971

The purpose of this memorandum is to discuss the valuation report of the Minnesota State Retirement System dated February 4, 1972 which was submitted to the Commission in accordance with Chapter 249 of Minnesota Laws 1967. The valuation was made using the entry age normal cost method and assuming 3 1/2% interest. Since the most recent previous report was made as of December 31, 1969, the current report covers an 18-month period. Both valuation reports were prepared by Coates, Herfurth and England, Consulting Actuaries.

This memo contains the following:

1. Statistical and Valuation Data
2. Discussion of Valuation Results
3. Study of Actuarial Assumptions
4. Conclusion

1. Statistical and Valuation Data

Results of the valuation reports as of December 31, 1969 and June 30, 1971 are shown for comparative purposes. Figures are rounded where necessary for simplicity of presentation.

	<u>As of</u> <u>December 31, 1969</u>	<u>As of</u> <u>June 30, 1971</u>
(1) <u>Membership</u>		
Active Members	36,406	37,129
Inactive Members	7,905	7,759
Retired Members	4,094	4,440
Disabled Members	174	198
Survivors of Deceased Members	36	33
(2) <u>Payroll and Annuities Payable</u>		
Total Annualized Payroll	\$ 246.8 Million	\$ 258.4 Million
Annuities (annual)	4.7 Million	5.1 Million

(3)	<u>Valuation Balance Sheet</u>	<u>As of December 31, 1969</u>	<u>As of June 30, 1971</u>
	Accrued Liability	\$ 154.6 Million	\$ 179.7 Million
	Assets	<u>\$ 132.7 Million</u>	<u>\$ 158.6 Million</u>
	Unfunded Accrued Liability (Deficit)	\$ 21.9 Million	\$ 21.1 Million
	Funding Ratio (Ratio of Assets to Accrued Liability)	85.8%	88.3%

(4)	<u>Normal Cost and Funding Costs</u>	<u>Percent of Covered Payroll</u>	<u>Percent of Covered Payroll</u>
	Normal Cost	5.59%	5.77%
	Normal Cost	5.59%	5.77%
	Interest on Deficit	0.31	0.29
	Expenses	<u>0.19</u>	<u>0.19</u>
	Total ("Minimum Contribution")	6.09%	6.25%
	Normal Cost	5.59%	5.77%
	Amortization by 1997	0.49	0.47
	Expenses	<u>0.19</u>	<u>0.19</u>
	Total ("Required Contribution")	6.27%	6.43%

(5)	<u>Statutory Contributions</u>		
	Employee	3.0 %	3.0 %
	Employer Regular	3.0	3.0
	Employer Additional	<u>1.5 - 1.0 *</u>	<u>1.0</u>
	Total Contributions	7.5 - 7.0%	7.0 %

* 1.5% to June 30, 1970 and 1.0% thereafter.

(6)	<u>Investment Yield (A)</u>	4.59% *	4.46% *
-----	-----------------------------	---------	---------

(A) Ratio of investment income (on an accrual basis) to mean assets.

* Excluding assets in Minnesota Adjustable Fixed Benefit Fund.

2. Discussion of Valuation Results

The normal cost increased from 5.59% on the previous valuation to 5.77% on the current one. The average age of male new entrants during the 18-month period was 32.7 compared with 31.1 during the prior year; the corresponding ages for females were 28.1 and 26.8. The variation in the entry age normal cost method used by the MSRS Actuaries makes the normal cost quite sensitive to recent hiring practices, and the increase in entry ages has produced much of the increase in normal cost. Furthermore, an amendment adding benefits for surviving spouses has contributed to the increase.

As will be discussed in Section 3, a study of the actuarial assumptions suggested the adoption of more conservative mortality rates and of new retirement rates which produce a lower average age at retirement. These new mortality assumptions also added an upward pressure on the normal cost.

During the 18-month period, the unfunded accrued liability decreased from \$21,934,733 to \$21,098,246, a decrease of \$836,487. The change in actuarial assumptions and the addition of the benefits for surviving spouses slowed the rate of funding of the deficit. The MSRS Actuary gives the following complete analysis of the \$836,487 decrease:

Decreases:

Amortization Contribution	\$3,518,438	
Excess Interest Earnings	1,774,733	
Excess Terminations	<u>661,324</u>	
		\$5,954,495

Increases:

New Entrants	\$ 56,428	
Deviations in Salary Rates	652,371	
Deviations in Retirement Rates	566,570	
Deviations in Death Rates	111,169	
Deviations in Disability Rates	46,388	
Improvement in Benefits	2,749,464	
Change in Actuarial Assumptions	<u>935,618</u>	
		<u>\$5,118,008</u>

Net Decrease \$ 836,487

It should be kept in mind that the above figures are for an 18-month period rather than for one year. The last two items, which total \$3,685,082, are non-recurring.

The annualized excess interest earnings are about two-thirds of the gain shown on the last report which appears proper since the current excess is measured from 3.5% rather than from 3%. The annualized gain from terminations is about 60% larger than that on the last report. The annualized loss

from salary rates is about one-sixth of the corresponding figure on the previous report.

The losses from deviations in death rates and deviations in retirement rates should be smaller in future reports since more conservative assumptions on these factors have been adopted.

3. Study of Actuarial Assumptions

As required by the statutes, the 1971 valuation included a report on a study of the actuarial assumptions. On account of the change in the date of the valuation, the study covered a period of three and one-half years rather than four.

The deaths among active lives turned out to be slightly over 80% of expected. Therefore, a new set of death rates was adopted providing for about 16% lower mortality. The actual number of terminations and disablements came out close to the expected number. The assumed retirement rates predicted a number of retirements about 14% too low. Therefore, these rates were adjusted.

The salary scales, which measure increases from longevity, provide for an annual increase at age 25 of about 3% for males and 2.6% for females and then these rates decrease gradually to about 0.3% at age 55. The study indicated no changes in these scales. The MSRS Actuary emphasizes that these scales do not include across the board increases.

The survey also contains a discussion of the mortality among retired participants. This is the third review of this subject since January 1, 1961, and for the first time, the actual number of deaths fell short of the number expected with a ratio of 94.1%. The MSRS Actuary is of the opinion that no change should be considered until a subsequent study confirms this trend. Furthermore, since it appears that under the present law, any strengthening of reserves would result in a decrease in benefits for those already retired, the MSRS Actuary feels that any changes in actuarial assumptions should be deferred until the Commission has the opportunity to study this aspect of the law.

We have already expressed to the Commission staff the opinion that changes in the reserves for retired lives resulting from changes in the assumed interest rate or the assumed death rates should not result in an adjustment in the amount of the retirement benefits but should require an additional transfer to the MAFB Fund or a credit against subsequent transfers. Therefore, we agree with the recommendation of the MSRS Actuary.

4. Conclusion

The 1971 Valuation Report filed by MSRS conforms with the requirements of Chapter 249. Furthermore, this is an excellent Report containing much useful information and much pertinent discussion.

On page 19 of the Report, the MSRS Actuary concludes: "The results of the current valuation show that the benefits to be provided under the System can be financed by the 3% members' contributions and the State's "matching" 3% contributions plus the State's "additional" contribution for approximately 9 years." In our opinion, this conclusion is correct.

Franklin C. Smith
Associate, Society of Actuaries
GEORGE V. STENNES AND ASSOCIATES
Commission Actuaries

REPORT ON
ACTUARIAL VALUATION
MINNESOTA STATE RETIREMENT SYSTEM
JUNE 30, 1971
4% INTEREST RATE ASSUMPTION

February 4, 1972



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DENVER
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COATES, HERFURTH & ENGLAND

CONSULTING ACTUARIES
301 EAST COLORADO BLVD.
PASADENA, CALIFORNIA 91101

TELEPHONE
AREA CODE 213 681-4455

February 4, 1972

Board of Trustees
Minnesota State Retirement System
529 Jackson Street
St. Paul, Minnesota 55101

Gentlemen:

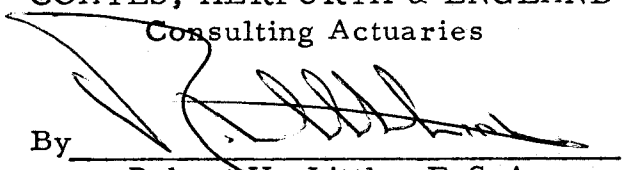
We are pleased to transmit herewith our report on the actuarial valuation of your Retirement System made as of June 30, 1971 on the basis of a 4% interest rate assumption. This valuation was authorized under Contract No. E-8154.

We look forward to the opportunity of discussing this report with you at your convenience.

Very truly yours,

COATES, HERFURTH & ENGLAND
Consulting Actuaries

By


Robert H. Little, F.S.A.

RHL:th

REPORT ON
ACTUARIAL VALUATION
OF THE
MINNESOTA STATE RETIREMENT SYSTEM
AS OF
JUNE 30, 1971

ON THE BASIS OF 4% INTEREST RATE ASSUMPTION

The contract under which this valuation was authorized specified that the actuarial valuation be carried out on the basis of the System as it was constituted on June 30, 1971 using 3-1/2% and 4% interest rate assumptions and the other actuarial assumptions developed during the course of the June 30, 1971 actuarial investigation. This report sets forth the results of the 4% valuation. The results of the 3-1/2% valuation have been submitted in a separate report.

In order to develop the entry age normal cost contribution rate for new employees, we carried out a complete valuation as of June 30, 1971 of active members who were employed during the preceding four and one-half year period. The results of these calculations indicate that the total entry age normal cost rate amounts to 5.28% of salary. This rate compares with a 5.77% rate developed on the basis of a 3-1/2% interest assumption.

Employees are required by law to contribute 3% and, accordingly, the State's share of the entry age normal cost contribution rate amounts to 2.28%.

The law requires that the State make the following contributions to the Fund with respect to members contributing at a 3% rate:

- (1) A "matching" contribution equal to 3% of the members' participating salaries, and
- (2) An "additional" contribution equal to one-third of members' contributions, or 1% of participating salaries, commencing July 1, 1970.

We have been advised that it is the intent of the Minnesota Legislature to pay the "additional" contributions referred to above for a limited time only.

The Actuarial Balance Sheet shown on the following page summarizes the results of the valuation. An Accounting Balance Sheet has not been included in this report because it would duplicate the Accounting Balance Sheet included in our report on the 3-1/2% valuation required by law.

MINNESOTA STATE RETIREMENT SYSTEM

ACTUARIAL BALANCE SHEET
AS OF
JUNE 30, 1971

4% INTEREST RATE ASSUMPTION

ASSETS

1. Assets on Hand from Accounting Balance Sheet:		
a) Participation in MAFB Fund	\$ 45,982,892.26	
b) All other Assets	<u>112,730,965.42</u>	\$158,713,857.68
2. Present Value of Employees' Future Contributions (3% of Participating Salary)		59,071,833.00
3. Present Value of State Future Contributions Applicable to:		
a) Entry Age Normal Cost (2.28% of Participating Salary)	\$ 44,894,593.00	
b) Unfunded Accrued Liability (Balance of 3% "Matching" Contribution less .19% for Operating Expenses or .53% of Participating Salary)	<u>10,436,024.00</u>	
c) Unfunded Accrued Liability (Portion to be funded by "Additional" Contribution)	<u>(461,942.07)</u>	<u>54,868,674.93</u>
4. TOTAL ASSETS		<u><u>\$272,654,365.61</u></u>

LIABILITIES

5. Current Liabilities from Accounting Balance Sheet		\$ 144,169.20
6. Present Value of Earned and Earnable Benefits Payable to Presently Active Members:		
a) Retirement Benefits	\$172,965,835.00	
b) Disability Benefits	<u>15,171,500.00</u>	
c) Refundments due to death or withdrawal	<u>30,603,881.00</u>	
d) Surviving Spouse Benefits	<u>4,435,962.00</u>	223,177,178.00
7. Present Value of Benefits for Deferred Annuitants:		
a) Retirement Benefits	\$ 2,003,531.00	
b) Refundments due to death or withdrawal	<u>107,714.00</u>	
c) Benefits already authorized	<u>5,349.00</u>	2,116,594.00
8. Present Value of Refundments to former members without vested rights		426,016.00
9. Benefits Payable from MAFB Fund:		
a) Reserve for Participation	\$ 45,982,892.26	
b) Annuity Stabilization Reserve	<u>502,390.15</u>	46,485,282.41
10. Present Value of Survivor Benefits		<u>305,126.00</u>
11. TOTAL LIABILITIES		<u><u>\$272,654,365.61</u></u>

The Actuarial Balance Sheet is a convenient device to present the results of an actuarial valuation. The following comments are intended to assist you in your understanding of the items contained in the Actuarial Balance Sheet.

Item 1 shows the assets on hand and was taken directly from the Accounting Balance Sheet.

Item 2 shows the present value of members' future contributions required by law equal to 3% of the members' participating salaries.

Item 3 shows the present value of State future contributions to the System. We have divided the present value applicable to the State's contributions as follows:

Item 3(a) The portion attributable to the State's share of the total entry age normal cost contribution of 5.28% of members' salaries. After deducting the members' share of 3%, the State's share of the entry age normal cost contribution amounts to 2.28% of members' salaries.

Item 3(b) The portion attributable to the balance of the State's "matching" contribution (.72% of members' salaries less .19% which is allocated for operating expense).

Item 3(c) The portion attributable to the State's "additional" contribution. The negative amount shows that the State's matching contribution is more than sufficient to fund all existing benefits for present members.

Item 5 shows the current liabilities and was taken directly from the Accounting Balance Sheet.

Item 6 shows the actuarially computed present value of all benefits earned to June 30, 1971 and earnable after that date that will be paid from the System to presently active members.

Item 7 shows the actuarially computed present value of all benefits payable from the System to members who have terminated service with vested benefits.

Item 8 shows the actuarially computed present value of refundments that will be paid from the System to members who have terminated service without vested benefits.

Item 9 shows the MSRS participation in the MAFB Fund and Item 10 shows the present value of survivor benefits.

The three exhibits presented on the following pages of this report are those which conform to the requirements of Minnesota Statutes 1967, Chapter 356, Section 356.20, Subdivisions 4(1), 4(2) and 4(3), except for the fact that they reflect a 4% interest assumption rather than the 3-1/2% assumption required by Chapter 356.

MINNESOTA STATE RETIREMENT SYSTEM

EXHIBIT REQUIRED BY MINNESOTA STATUTES 1967, CHAPTER 356,
SECTION 356.20, SUBDIVISION 4(1)

AS OF
JUNE 30, 1971

4% INTEREST RATE ASSUMPTION

<u>Assets</u>	<u>ASSETS AND UNFUNDED ACCRUED LIABILITY</u>	
1. Cash in office		\$ 25.00
2. Deposits in banks		172,952.17
3. Short term investments (at cost)		1,944,729.08
4. Accounts receivable:		
a) Accrued employee contributions		249,149.60
b) Accrued employer contributions		334,095.17
c) Employee back payments		27,453.63
d) Investment maturities and sales		412,295.37
e) Other		6,328.06
5. Accrued interest in investments		1,032,521.51
6. Dividends declared & payable, but not yet received		167,711.51
7. Investment in debt securities at amortized cost		68,264,133.10
8. Investment in equities at cost (Market Value \$44,514,062.00)		39,493,115.13
9. Equipment at depreciated cost		5,992.43
10. Prepaid postage		2,000.00
11. Participation in MAFB Fund		45,982,892.26
12. Deferred Yield Adjustment Account		116,073.51
13. Deferred Charges to Future Participation in the MAFB Fund		502,390.15
14. TOTAL ASSETS		<u>\$158,713,857.68</u>

Unfunded Accrued Liability

15. Unfunded Accrued Liability to be funded by portion of State's 3% "Matching Contribution" in excess of State's share of entry age normal cost contribution and Operating Expenses	\$ 10,436,024.00
16. Unfunded Accrued Liability to be funded by State's "Additional" contribution	<u>(461,942.07)</u>
17. TOTAL UNFUNDED ACCRUED LIABILITY	\$ 9,974,081.93
18. TOTAL ASSETS AND UNFUNDED ACCRUED LIABILITY	<u>\$168,687,939.61</u>

CURRENT LIABILITIES AND RESERVES REQUIRED

Current Liabilities

19. Accounts Payable:	
a) Annuities	\$ 1,606.70
b) Survivor Benefits	2,608.97
c) Annuitant deposits	1,386.45
d) Accrued expenses	28,035.15
e) Overpaid dividends and prepaid postage	1,145.17
f) Security purchases	105,890.88
20. Suspense Item	<u>3,495.88</u>
21. TOTAL CURRENT LIABILITIES	\$ 144,169.20

Reserves Required

22. Total Reserves Required per attached schedule	<u>\$168,543,770.41</u>
23. TOTAL CURRENT LIABILITIES AND RESERVES REQUIRED	<u>\$168,687,939.61</u>

Note: Accumulated contributions, without interest, of members not yet retired amounted to \$43,718,603.03 as of June 30, 1971.

MINNESOTA STATE RETIREMENT SYSTEM

DETERMINATION OF RESERVES REQUIRED
AS OF
JUNE 30, 1971

4% INTEREST RATE ASSUMPTION

	(1)	(2)	(3)
	Present Value of Benefits	Present Value of Applicable Portion of Normal Cost Contribution	Reserves Required (1) - (2)
Benefits For:			
1. Active Members:			
a) Retirement Benefits	\$172,965,835.00	\$ 66,554,265.00	\$106,411,570.00
b) Disability Benefits	15,171,500.00	9,254,587.00	5,916,913.00
c) Refundments due to death or withdrawal	30,603,881.00	26,188,513.00	4,415,368.00
d) Surviving Spouse Benefits	4,435,962.00	1,969,061.00	2,466,901.00
2. Deferred Annuitants	2,116,594.00	-	2,116,594.00
3. Former Members Without Vested Rights	426,016.00	-	426,016.00
4. Survivors	305,126.00	-	305,126.00
5. Benefits Payable from MAFB Fund:			
a) Reserve for Par- ticipation	45,982,892.26	-	45,982,892.26
b) Annuity Stabilization Reserve	502,390.15	-	502,390.15
6. Total	\$272,510,196.41	\$103,966,426.00	\$168,543,770.41

MINNESOTA STATE RETIREMENT SYSTEM

EXHIBIT REQUIRED BY MINNESOTA STATUTES 1967, CHAPTER 356,
SECTION 356.20, SUBDIVISION 4(2) and (3)
EIGHTEEN MONTHS ENDING JUNE 30, 1971

4% INTEREST RATE ASSUMPTION

ANALYSIS OF INCOME AND DEDUCTIONS FROM INCOME

INCOME

1. <u>From Employees</u>	
Employee contributions	\$10,202,363.49
Employee accrued contributions receivable	465,815.38
Employee contributions accounts receivable	19,684.07
2. <u>From Employers</u>	
Employer contributions	10,209,399.91
Employer additional contributions	3,921,322.19
Employer accrued contributions receivable	658,290.12
3. <u>From Investments</u>	
Interest on debt securities (net)	5,239,682.31
Dividends on corporate stock	1,767,230.66
Premium on bonds called	1,484.52
MAFB Fund income	3,903,522.91
4. <u>Other Revenues</u>	
Interest on back payments by employees	21,486.27
Employer payments in lieu of interest	452.96
Adjustment in prior year benefit payments	4,972.39
Unclaimed benefits cancelled into fund	523.38
Gain on sales/transfers of securities	152,482.67
Deferred yield adjustment account	128,813.28
Annuity Stabilization reserve	502,390.15
5. TOTAL INCOME	<u>\$37,199,916.66</u>

DEDUCTIONS FROM INCOME

6. <u>Benefits</u>	
Retirement benefits	\$ 7,412,912.64
Survivor benefits	45,869.04
Interest paid - deaths & compulsory retirees	127,930.64
7. <u>Refundments</u>	
Left service	2,488,262.99
Coverage by other systems	109,490.92
Employee deaths	469,899.55
Annuitant deaths	57,811.80
Erroneous deductions	32,421.78
8. <u>Operating Expenses</u>	584,449.26
9. <u>Miscellaneous</u>	
Interest transferred to TRA Fund	4,616.06
10. <u>Increase in Total Reserves Required</u>	
Reserves Required 12-31-69 (3-1/2% Basis)	\$154,638,169.68
Reserves Required 6-30-71 (4% Basis)	<u>168,543,770.41</u>
	13,905,600.73
11. TOTAL DEDUCTIONS FROM INCOME	\$25,239,265.41
12. EXCESS OF INCOME OVER DEDUCTIONS FROM INCOME	\$11,960,651.25
13. REDUCTION IN UNFUNDED ACCRUED LIABILITY:	
Unfunded Accrued Liability 12-31-69 (3-1/2% Basis)	\$ 21,934,733.18
Unfunded Accrued Liability 6-30-71 (4% Basis)	<u>9,974,081.93</u>
	\$11,960,651.25