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March 1991

Board of Directors
Minnesota State Retirement System
529 Jackson at 10th Street
St. Paul, Minnesota

Ladies and Gentlemen:

We are pleased to present our report on the June 30, 1990 actuarial valuation of the Minnesota State Retirement System, General Employees' Retirement Plan.

Our report is divided into the following sections:

The report was completed on the basis of accepted actuarial methods and procedures in accordance with the provisions stipulated in the contract between the State of Minnesota and Deloitte & Touche.

We would be pleased to answer any questions you may have regarding this report.

DELOITTE & TOUCHE

F. Jay Lingo

F. Jay Lingo, F.S.A.

James F. Verlautz

James F. Verlautz, F.S.A.

I. INTRODUCTION AND PURPOSE

The Minnesota State Retirement System (MSRS) administers several retirement funds and plans. The plans administered are the: General State Employees' Plan, Unclassified Employees' Plan, Correctional Employees' Plan, State Patrol Employees' Plan, Judges' Plan, Legislators' Plan, Elective Officers' Plan, Military Affairs Plan, Transportation Pilots' Plan, and a statewide Deferred Compensation Plan for public employees.

The plans that MSRS administers are overseen by the Legislative Commission on Pensions and Retirement (LCPR). The LCPR consists of members of the Minnesota State Senate and Minnesota House of Representatives. Its members duties include:

- Reviewing investment performance.
- Establishing policy for public retirement plans.
- Recommending necessary changes to retirement plan provisions.
- Hiring an actuary to perform annual actuarial valuations and experience studies.
- Overseeing the work of the actuary.

Minnesota Statutes, Sections 356.20 and 356.215, require annual actuarial valuations and periodic experience studies. The Board of Directors is concerned with the valuations and experience studies which must be performed for:

- The General State Employees' Plan;
- The Correctional Employees' Plan;
- The State Patrol Employees' Plan; and
- The Judges' Plan

These valuations and experience studies are prepared by the Wyatt Company, the actuary retained by the LCPR. Since the Minnesota State Retirement System does not have an actuary on staff, it has retained Deloitte & Touche to review, analyze, and critique the actuarial valuations and experience studies.

This report evaluates the accuracy of the Wyatt Company's results and expands on any items of particular significance.

II. COMPARISON OF VALUATION RESULTS

We attempted to duplicate the figures shown in the Wyatt Company's June 30, 1990 valuation reports. In doing so, we had several discussions with the Wyatt Company's personnel who prepared the reports. Where we were able to discover reasonable justification for the Wyatt Company's approach, we adjusted our methods and assumptions to match. (Descriptions of those adjustments are included in Section III.)

In this section of the report, we compare the results that the Wyatt Company reported with our valuation results. Three tables are included. Table A shows the derivation of the unfunded liability. Table B shows the annual contribution requirements under Sections 352 and 356. Table C shows the depth of plan funding based on liabilities incurred to date. These figures are also required for Government Accounting Standards Board (GASB) reporting.

TABLE A (000's Omitted)

	Wyatt Company	Deloitte & Touche	Percentage Difference
Present Value of Benefits:			
Actives:			
Retirement	$1,938,810	$2,000,685	3.2%
Death	122,026	126,988	4.1
Disability	104,538	103,413	(1.1)
Withdrawal	575,271	508,828	(11.5)
Total actives	$2,740,645	$2,739,914	0.0
Deferred Annuitants	29,938	29,174	(2.6)
Former members without vested rights	2,281	2,337	2.5
Participants in MPRI Fund	766,790	769,536	0.4
Non-MPRI Benefit	6,715	6,479	(3.5)
Total	3,546,369	3,547,440	0.0
Portion allocated to future service	838,401	832,128	(0.7)
Accrued liability (reserves required)	$2,707,968	2,715,312	0.3
Valuation assets	2,108,210	2,108,210	0.0
Unfunded accrued liability	$ 599,758	$ 607,102	1.2
Funded ratio	77.9%	77.6%	--

CONTRIBUTIONS

Chapters 352 and 356 set forth requirements about the level of contributions. Chapter 352 prescribes the actual amount of contributions, and Chapter 356 describes the methods used to determine the amount of contribution required to fund the normal cost and the unfunded accrued liability. Together, the actual contribution and required contribution are used to determine the sufficiency of the actual contribution. These calculations are illustrated in Table B. Amounts in parentheses show dollar amount as a percent of payroll.*

TABLE B (000's omitted)

Actuarially Determined Contribution	**Wyatt Company**	**Deloitte & Touche**
1. Normal cost	$ 92,261 (6.10%)	$ 93,592 (6.18%)
2. Assumed operating expense	$ 4,389 (.29%)	$ 4,394 (.29%)
3. Amortization by June 30, 2020 of the unfunded accrued liability	$ 26,941 (1.78%)	$ 27,338 (1.80%)
4. Total Chapter 356 requirement: (1) + (2) + (3)	$123,591 (8.17%)	$125,324 (8.27%)
Prescribed Contributions		
1. Employee contributions	$ 62,811 (4.15%)	$ 62,883 (4.15%)
2. Employer contribution	$ 64,930 (4.29%)	$ 65,004 (4.29%)
3. Total Chapter 352A prescribed contribution	$127,741 (8.44%)	$127,887 (8.44%)
Contribution Sufficiency	.27%	.17%

* Assuming that contributions are paid during each payroll period throughout the year ending June 30, 1991, the Wyatt Company calculates expected annual payroll to be $1,513,522,000.

Our amounts are based on an expected payroll of $1,515,248,000.

The depth of funding indicates the extent to which the accrued benefits are funded and is measured by the ratio of valuation assets to the present value of accrued benefits. These measurements are made on the plan continuation basis (applying all ongoing actuarial assumptions, including assumed salary increases and turnover) and are illustrated as follows:

TABLE C (000's omitted)

Depth of Funding June 30, 1990

		Wyatt Company	Deloitte & Touche	Percentage Difference
1.	Active members	$1,522,443	$1,513,946	(0.6%)
2.	Deferred annuitants	29,938	29,174	(2.6)
3.	Former members without vested rights	2,281	2,337	2.5
4.	Participants in MPRI fund	766,790	769,536	0.4
5.	Participants not in MPRI fund	6,715	6,479	(3.5)
6.	Total present values of accrued benefits	$2,328,167	2,321,472	(0.3)
7.	Valuation assets	2,108,210	2,108,210	0.0
8.	Depth of funding	90.6%	90.8%	--
9.	Depth of funding excluding MPRI members	85.9%	86.3%	--

III. EXPLANATION OF DIFFERENCES

In this section of the report, we present our best explanations for any differences between the Wyatt Company's methods and assumptions and ours, the changes we made where appropriate to be consistent with the Wyatt Company, and the effects of these changes.

Our calculation of expected payroll is $1,515,248. The Wyatt Company calculates this amount to be $1,513,522. The difference occurred after changing salaries to limit them to no more than 10% higher than their previous years salary. Before making the adjustments, we matched the payroll calculation of the Wyatt Company. We were unable to resolve this difference. The difference in salaries causes our present values to be about 0.1% higher than Wyatt's.

Cumulatively, our present value of projected benefits and our accrued liability are very close to The Wyatt Company's. However, when divided into its components we have differences larger in magnitude. We believe this may occur because of differences in how benefits are allocated between withdrawal and retirement.

When we subtracted the actuarial value of assets to derive the unfunded accrued liability, the percentage difference increased to 1.2%. This difference is misleading since it only occurs because the plan is well funded.

The Wyatt Company reports a 0.27% contribution sufficiency. We report only a 0.17% sufficiency. This difference results in part from an interest adjustment that we make to the normal cost that the Wyatt Company does not. The Wyatt Company calculates normal cost as of the beginning of the year and does not make an interest adjustment. Because normal cost is actually paid throughout the year, we feel that it is necessary to adjust the amount by increasing it with one half year of interest.

The Standards for Actuarial Work states that the amortization of unfunded liability is increased by one half year interest because salaries are paid throughout the year. Although the standards do not directly mention an adjustment, we believe that the normal cost should be adjusted in the same manner as the amortization of the unfunded accrued liability.

The Wyatt Company indicated that it has made no assumption changes since last year. The Company continues to assume that the IRS limits on benefits will increase 5% per year. Actual increases over the last two years indicate a 5.4% rate of growth on the IRS limit. We believe that a 5% increase is reasonable.

IV. CHANGES IN THE UNFUNDED LIABILITY

The General Plan currently has an unfunded liability. An unfunded liability is not necessarily undesirable for an ongoing plan, as long as some provision is made to pay off the liability over time. However the unfunded liability becomes a problem when it is so large that it precludes benefit security, or when, like any debt, interest on the liability becomes unmanageable.

Generally, unfunded liabilities tend to decrease over time, although some year-to-year fluctuation is normal. One symptom of a troubled pension plan is a constantly increasing unfunded liability. Annual changes in the unfunded liability occur when:

- Part of the contribution made each year goes to pay the normal costs (including expenses). The remaining contribution is called the past service contribution. The unfunded liability is automatically increased each year by the interest requirement of 8.5%. If the past service contribution is less than the interest requirement, there will be a net increase in the liability. When the past service contribution is greater than the interest requirement, part of the liability is "paid off," and the liability decreases.

- The unfunded liability is an actuarial projection of liabilities based on certain assumptions. To the extent actual experience differs from the assumptions, actuarial gains and losses may occur. An actuarial gain will decrease the unfunded liability; an actuarial loss will increase the unfunded liability.

- The assumptions and techniques used in calculating the unfunded liability are changed when circumstances warrant. These changes can produce increases or decreases in the unfunded liability.

- Changes in the legal, economic, and sociological environment often result in changes to retirement plans. These changes frequently result in improved benefits. When these changes result in higher retirement benefits, unfunded liabilities are increased.

During the year ended June 30, 1990, the General Employees' Fund showed an increase in the unfunded liability for the following reasons.

1. **Contribution Rate**

   The total contributions to the plan were approximately $113 million. However, expected normal cost, expenses and interest combined to equal $139 million. The Wyatt Company decreased the $26 million difference by $9 million, a gain caused by actual salaries being less than the salaries projected last year. The net result was a shortfall of $17 million, which increases the unfunded liability.

2. **Actuarial Gains and Losses**

   The Fund experienced a $49 million gain on investments. There was also a gain of $2 million due to more retirees dying than anticipated.

   The Wyatt Company reported actuarial gains of approximately $35 million from salary increases which were less than expected (in addition to the salary gain described in 1.) offset by a $84 million loss on "other items." Our calculations indicate that both the salary gain and other losses are smaller, but that the net result is reasonable.

   Overall, the Wyatt Company reported a net gain (decrease in unfunded liability) from actuarial experience of $2 million, a very small amount for a plan this size.

3. **Changes in Assumptions and Plan Provisions**

   The only changes since last year's valuation are plan provision changes. The statutory employer contribution rate was decreased from 4.51% to 4.29% of payroll. The statutory employee contribution rate was decreased from 4.34% to 4.15% of payroll. These changes do not affect the unfunded liability as of June 30, 1990, but will in future years.

Changes in Unfunded Actuarial Accrued Liability*
(000's omitted)

A.	Unfunded actuarial accrued liability at beginning of year	$585,144
B.	Change due to interest requirement and current rate of funding	16,718
C.	Expected unfunded actuarial accrued liability at end of year: (A) + (B)	$601,862
D.	Actuarial losses (gains)	(2,104)
E.	Changes in assumptions and plan provisions	0
F.	Unfunded actuarial accrued liability at end of year: (C) + (D) + (E)	$599,758

* Results prepared by the Wyatt Company.

V. SENSITIVITY ANALYSIS

In the course of an actuarial valuation, liabilities and contributions are developed under a single actuarial cost method and one set of actuarial assumptions. However, since it is unlikely that any given assumption will prove to be exactly correct, we analyze the impact of a variation in an assumption. This analysis is called a sensitivity analysis.

We have analyzed the sensitivity to change of three of these assumptions and methods mandated by state law. Each of these plays a major role in determining costs:

1. Interest is currently assumed to be 8.5% for all years until retirement, and 5% thereafter. We examined the effect of changing 8.5% to 7.5%.
2. Salaries are assumed to increase 6.5% each year. We examined the effect of a 6% salary increase assumption.
3. The unfunded liability is amortized as a level percent of future payroll. This approach is not permitted for a private sector plan. We examined the effect of amortizing the unfunded liability using a level dollar amount.

		Value After Change		
	Current Deloitte & Touche	**Interest**	**Salary Increase**	**Amortization**
Unfunded liability	$ 607,102	$ 785,058	$ 555,317	$ 607,102
Actuarially determined contribution:				
Amount	125,324	144,187	119,758	152,391
Percent	8.27%	9.52%	7.90%	10.06%
Sufficiency/ (Deficiency)	.17%	(1.08%)	0.54%	(1.62)%
Plan continuation liability	$2,321,472	$2,484,768	$2,278,117	$2,321,472
Depth of funding:	90.8%	84.9%	92.5%	90.8%

GENERAL EMPLOYEES

VI. SUMMARY OF HISTORICAL VALUATION RESULTS**

(000'S Omitted)

Report as of June 30	Accrued Liability	Valuation Assets	Unfunded Accrued Liability	Normal Cost	Actuarial Contribution	Prescribed Contribution	Sufficiency
1981	831,782	648,943	182,839	52,378 (6.73%)	66,051 (8.49%)	77,796 (10.00%)	1.51
1982	1,004,388	753,250	251,138	54,668 (6.84%)	72,646 (9.09%)	67,898 (8.50%)	(.59)
1983	1,127,574	866,439	261,135	59,653 (6.96%)	78,600 (9.17%)	79,964 (9.33%)	.16
1984	1,267,662	955,850	311,812	55,387 (6.13%)	71,786 (7.95%)	68,874 (7.63%)	(.32)
1985	1,465,114	1,109,683	355,431	62,720 (6.11%)	82,981 (8.08%)	78,349 (7.63%)	(.45)
1986	1,680,837	1,312,577	368,260	61,655 (5.43%)	83,362 (7.34%)	86,654 (7.63%)	.29
1987*	1,894,142	1,518,483	375,659	65,801 (5.45%)	88,150 (7.30%)	92,174 (7.63%)	.33
1988*	2,115,476	1,644,145	471,331	72,086 (5.47%)	100,262 (7.61%)	100,462 (7.63%)	.02
1989*	2,456,686	1,871,542	585,144	86,543 (6.10%)	115,474 (8.14%)	125,507 (8.85%)	.71
1990*	2,707,968	2,108,210	599,758	92,261 (6.10%)	123,591 (8.17%)	127,741 (8.44%)	.27

* As prepared by the Wyatt Co.

** Figures shown in parentheses are as a percentage of payroll under normal retirement age.

GENERAL EMPLOYEES

VI. SUMMARY OF HISTORICAL VALUATION RESULTS (continued) **

Report as of June 30	Active Members Number	Active Members Valuation Payroll	Retired Members* Number	Retired Members* Avg. Annual Benefits	Deferred Annuitants Number	Deferred Annuitants Avg. Annual Benefits	Former Members Without Vested Rights
1981	46,669	777,961,014	9,642	2,432	793	2,944	4,752
1982	43,627	809,410,816	10,211	2,744	880	3,105	4,954
1983	43,191	868,528,661	10,477	2,987	983	3,194	4,881
1984	44,158	922,951,956	10,843	3,271	852	3,859	5,495
1985	44,412	1,048,639,187	11,367	3,651	901	3,944	4,881
1986	45,171	1,135,706,412	11,867	4,069	955	4,029	4,401
1987*	45,707	1,208,043,000	12,341	4,589	1,014	4,271	4,496
1988*	47,040	1,316,671,000	12,877	5,050	1,162	4,501	4,084
1989*	48,653	1,418,160,000	13,079	5,422	1,355	5,235	3,924
1990*	49,576	1,513,522,000	13,385	5,720	1,824	5,741	4,638

* As prepared by the Wyatt Co.
** Including beneficiaries and disabled members.

APPENDIX A

SUMMARY OF EMPLOYEE DATA

The Executive Director gave us employee information for all active members, inactive members, and retired members of the Fund. The following tables summarize the changes in active, inactive, and retired membership during the year.

To reflect anticipated current year salary increases, all salaries provided were increased by 6.5%.

Appendix A (continued)

MINNESOTA STATE RETIREMENT SYSTEM
GENERAL EMPLOYEES' RETIREMENT FUND

Covered General Employees' Census Data as of June 30, 1990

	Number	Annual Payroll
General Actives at June 30, 1989	48,653	$1,418,158,661
New Entrants *	6,318	
Total	54,971	
Less Separations from Active Service:		
Refund of Contributions *	2,553	
Separation with a Deferred Annuity	576	
Separation with Neither Refunds nor Right to a Deferred Annuity	1,406	
Disability	51	
Deaths	71	
Service Retirement	647	
Total Separations	5,304	
Net Adjustments	(96)	
General Actives at June 30, 1990	49,571	1,515,044,767
Military Actives at June 30, 1990	5	202,735
Total Actives at June 30, 1990	49,576	$1,515,247,502

Average Entry Age of New Employees

For the Fiscal Year Ending	Male	Female	Average of Total
6/30/84	29.7	29.4	29.6
6/30/85	31.6	31.0	31.2
6/30/86	32.0	31.2	31.5
6/30/87	32.4	31.9	32.1
6/30/88	33.5	33.6	33.6
6/30/89	32.1	32.2	32.2
6/30/90	34.1	33.9	34.0

* Includes those who entered the plan and terminated during the period from July 1, 1989 to June 30, 1990.

Appendix A (continued)

MINNESOTA STATE RETIREMENT SYSTEM
GENERAL EMPLOYEES' RETIREMENT FUND

General Employees' Annuitant Census
Data as of June 30, 1990

		Number	Annual Annuity Benefit Payable
A.	**Service Retirement Annuitants**		
	Generals		
	Receiving at June 30, 1989	11,547	$64,541,332
	New	757	4,991,361
	Deaths	(469)	(2,265,300)
	Adjustments	(42)	2,243,122
	Receiving at June 30, 1990	11,793	$69,510,515
	Military Affairs		
	Receiving at June 30, 1989	2	$ 34,565
	New	0	0
	Deaths	0	0
	Adjustments	0	1,396
	Receiving at June 30, 1990	2	$ 35,961
	Unclassified Plans		
	Receiving at June 30, 1989	15	$ 42,793
	New	0	0
	Deaths	0	0
	Adjustments	0	1,729
	Receiving at June 30, 1990	15	$ 44,522
	Total service annuitants receiving at June 30, 1990	11,810	$69,590,998

		Number	Annual Annuity Benefit Payable
B.	**Disabled Employees**		
	Receiving at June 30, 1989	665	$2,608,829
	New	61	299,059
	Deaths	(44)	(174,330)
	Adjustments - Net Result	(7)	66,775
	Receiving at June 30, 1990	675	$2,800,333
C.	**Widows Receiving an Annuity or Survivor Benefit**		
	Beneficiaries Receiving an Optional or Reversionary Annuity:		
	Receiving at June 30, 1989	851	$3,689,769
	New	116	645,426
	Deaths	(31)	(135,829)
	Adjustments - Net Result	(36)	(8,723)
	Receiving at June 30, 1990	900	$4,190,643
D.	**Deferred Annuitants**		
	Deferred as of June 30, 1989	1,355	$7,093,137
	New	682	
	Began Receiving	(205)	
	Adjustments - Net Result	(8)	
	Deferred as of June 30, 1990	1,824	$10,333,190

Average Age at Retirement of New Service Annuitants

Fiscal Year Ending	Average Retirement Age
6/30/83	63.3
6/30/84	64.0
6/30/85	64.0
6/30/86	62.6
6/30/87	62.7
6/30/88	62.9
6/30/89	63.3
6/30/90	63.6
All Existing Service Annuitants	64.1

APPENDIX B

MINNESOTA STATE RETIREMENT SYSTEM
GENERAL EMPLOYEES' RETIREMENT FUND

Summary of Principal Plan Provisions as of June 30, 1990

General Employees

1.	**Coverage:**	From first date of employment.
2.	**Service Credit:**	Service is credited from date of coverage.
3.	**Contributions:**	
	a. **Employee:**	4.15% of salary. (Changed from 4.34%)
	b. **State of Minnesota:**	4.29% of salary. (Changed from 4.51%)
4.	**Final Average Salary:**	Monthly average for the highest five successive years of salary.
5.	**Normal Retirement:**	
	a. **Eligibility:**	For participants hired before July 1, 1989, eligibility is the earlier of: o Attainment of age 65 and completion of three years of service. (Changed from five years of service) and o Attainment of age 62 with 30 years of service. For participants hired after June 30, 1989, eligibility is the age at which unreduced Social Security benefits commence and completion of three years of service.
	b. **Benefit Amount:**	1.5% of Average Salary for each year of Allowable Service.

6. **Early Retirement:**

a. **Eligibility:**

For participants hired before July 1, 1989, eligibility is the earlier of:

- o Attainment of age 55 and completion of three years of service; and
- o Completion of 30 years of service.
- o The age at which age plus service equals at least 90. (Rule of 90)

For participants hired after June 30, 1989, eligibility is attainment of age 55 and completion of three years of service.

b. **Benefit Amount:**

For participants hired before July 1, 1989, the benefit is the greater of:

- o 1% of final average salary for each of the first 10 years of service plus 1.5% of final average salary for each subsequent year of service, reduced 0.25% for each month under age 65 (or age 62 if 30 years of service have been completed). No reduction is applied if participant has satisfied the Rule of 90.
- o Normal retirement benefit augmented to age 65 at 3% per year actuarially reduced for each month under age 65.

For participants hired after June 30, 1989, the benefit is: the normal retirement benefit augmented to the age unreduced Social Security benefits commence at 3% per year and actuarially reduced for each month before that age.

7. **Pre-73 lump sum payments:** Participants retired before July 1, 1973 will receive an additional lump sum payment each year. The initial benefit (payable in 1989) is the greater of $25 times each year of service or $400 times each year of service less Social Security and any benefits received from a Minnesota public employee pension plan. Benefits will increase each year by the MPRI fund increase.

8. **Form of Payment:** Life annuity with return on death of any balance of contributions over aggregate monthly payments. Actuarially equivalent options are available, including a 50% or 100% Joint & Survivor annuity which at no extra charge reverts to the life annuity amount if the spouse dies before the member.

9. **Disability Retirement:**

   a. **Eligibility:** Completion of three years of service.

   b. **Benefit Amount:** Normal retirement benefit formula based on service and final average salary to date of disability retirement.

10. **Deferred Service Retirement:**

    a. **Eligibility:** Completion of three years of service and election to leave employee contributions on deposit.

    b. **Benefit Amount:** Retirement benefits payable at early retirement date are determined according to the early retirement benefit formula based on the member's final average salary and service at termination; such amount being subject to an increase of 5% for each year between termination and retirement for years before January 1, 1981; 3% for each year from January 1, 1981 to the January 1 following age 55 and 5% for each year thereafter until early or normal retirement.

11. **Return of Contributions:** Upon termination of employment, a member may elect the return of contributions with 6% interest compounded annually in lieu of all other benefits under the plan.

12. **Surviving Spouse Death Benefit:**

    a. **Eligibility:** Death of member in service at age 50 with at least three years of service or at any age with 30 years of service.

    b. **Benefit Amount:** The surviving spouse may elect one of the following:

    - Refund of member contributions with 6% interest, or

- o 100% of the annuity the member would have received had he retired early (if eligible) and elected a 100% joint and survivor annuity commencing on the later of age 55 or his date of death. Benefit will commence at the later of the members age 55 or date of death.

13. Combined Service Provision:

a. Eligible Members: Members who have had coverage under two or more Minnesota Public Retirement Systems, with a total of at least three years of credited service.

b. Benefit Provisions: Benefits under both plans are based on the highest final average salary, including all years from both plans, and on the plans in effect on the member's last day in covered public employment.

14. Proportionate Annuity: Any member who terminated after attaining age 65 and completing at least one year of service is entitled to a proportionate retirement annuity based on his allowable service credit.

APPENDIX C

ACTUARIAL METHODS AND ASSUMPTIONS

ACTUARIAL METHODS

Chapter 356 of the Minnesota Statutes calls for the determination of normal cost and accrued liability in accordance with the entry age normal cost method, one of several available projected cost methods. For the June 30, 1990 valuation, we used the individual entry age normal method, with salary scale.

The unfunded liability is amortized by the level percent of payroll method. (Each amortization payment is calculated as if the following year's payment would increase by 6.5%.)

ACTUARIAL ASSUMPTIONS

The tables on the following pages summarize the actuarial assumptions used for this valuation.

CHANGES IN ACTUARIAL ASSUMPTIONS

The actuarial assumptions have not been changed since the last valuation.

Appendix C (continued)

MINNESOTA STATE RETIREMENT SYSTEM
GENERAL EMPLOYEES' RETIREMENT FUND

Summary of Actuarial Assumptions and Methods

1.	**Mortality:**	1971 Group Annuity Mortality Table with ages set back eight years for females.
2.	**Post-Disablement Mortality:**	Combined Annuity Mortality Table.
3.	**Withdrawal:**	Graded rates based on actual experience developed by the June 30, 1971 and subsequent experience analyses and set forth in the Separation from Active Service Table.
4.	**Expenses:**	Prior year's expenses expressed as a percentage of prior year's payroll.
5.	**Interest Rate:**	Preretirement - 8.5% per annum. Postretirement - 5% per annum.
6.	**Salary Scale:**	6.5% per annum.
7.	**Assumed Retirement Age:**	Graded rates beginning at age 58 set forth in the Separation from Active Service Table. Twenty-five percent of those eligible to retire under the Rule of 90 are assumed to do so, and members age 65 or over are assumed to retire one year hence.
8.	**Actuarial Cost Method:**	Entry age cost method, with normal cost determined as a level percentage of future covered payroll, on an individual basis.
9.	**Return of Contributions:**	All employees withdrawing after becoming eligible for a deferred benefit are assumed to take the larger of their contributions, accumulated with interest, or the value of their deferred benefit.

Appendix C (continued)

MINNESOTA STATE RETIREMENT SYSTEM
GENERAL EMPLOYEES' RETIREMENT FUND

Male General Members
Separation from Active Service
(Number Separating at Each Age Per 10,000 Working at That Age)

Age	Withdrawal	Death	Disability	Age and Service Retirement
20	2,400	5		
21	2,250	5		
22	2,080	5		
23	1,920	6		
24	1,760	6		
25	1,600	6		
26	1,470	7		
27	1,340	7		
28	1,230	7		
29	1,130	8		
30	1,040	8	2	
31	950	9	2	
32	890	9	2	
33	830	10	2	
34	770	10	2	
35	720	11	2	
36	680	12	2	
37	640	13	2	
38	600	14	2	
39	560	15	2	
40	530	16	2	
41	500	18	2	
42	480	20	2	
43	460	23	3	
44	430	26	3	
45	410	29	3	
46	390	33	5	
47	370	38	7	
48	350	42	9	
49	340	47	11	

Appendix C (continued)

MINNESOTA STATE RETIREMENT SYSTEM
GENERAL EMPLOYEES' RETIREMENT FUND

Male General Members
Separation from Active Service
(Number Separating at Each Age Per 10,000 Working at That Age)

Age	Withdrawal	Death	Disability	Age and Service Retirement
50	320	53	14	
51	300	59	16	
52	280	65	20	
53	260	71	24	
54	240	78	28	
55	210	85	34	
56	170	93	40	
57	140	100	46	
58	90	109	56	50
59	40	119	66	50
60		131	76	150
61		144	90	150
62		159	110	500
63		174	146	350
64		192	174	1,100
65				10,000

Appendix C (continued)

MINNESOTA STATE RETIREMENT SYSTEM
GENERAL EMPLOYEES' RETIREMENT FUND

Female General Members
Separation from Active Service
(Number Separating at Each Age Per 10,000 Working at That Age)

Age	Withdrawal	Death	Disability	Age and Service Retirement
20	3,700	4		
21	3,550	4		
22	3,390	4		
23	3,230	4		
24	3,070	4		
25	2,910	5		
26	2,750	5		
27	2,600	5		
28	2,430	5		
29	2,270	5		
30	2,120	5		
31	1,970	6		
32	1,820	6		
33	1,680	6		
34	1,540	7		
35	1,410	7	1	
36	1,300	7	1	
37	1,190	8	1	
38	1,090	8	1	
39	1,000	9	2	
40	920	9	2	
41	850	10	2	
42	780	10	4	
43	720	11	4	
44	680	12	4	
45	630	13	5	
46	590	14	6	
47	560	15	7	
48	530	16	7	
49	500	18	10	

Appendix C (continued)

MINNESOTA STATE RETIREMENT SYSTEM
GENERAL EMPLOYEES' RETIREMENT FUND

Female General Members
Separation from Active Service
(Number Separating at Each Age Per 10,000 Working at That Age)

Age	Withdrawal	Death	Disability	Age and Service Retirement
50	470	20	10	
51	440	23	12	
52	410	26	14	
53	390	29	16	
54	360	33	20	
55	330	38	24	
56	290	42	30	
57	230	47	36	
58	170	53	44	50
59	90	59	52	50
60		65	62	150
61		71	74	150
62		78	88	200
63		85	104	350
64		93	122	1,100
65				10,000

Deloitte &
Touche

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March 1991

Board of Directors
Minnesota State Retirement System
529 Jackson at 10th Street
St. Paul, Minnesota

Ladies and Gentlemen:

We are pleased to present our report on the June 30, 1990 actuarial valuation of the Minnesota State Retirement System, Correctional Employees' Retirement Plan.

Our report is divided into the following sections:

The report was completed on the basis of accepted actuarial methods and procedures in accordance with the provisions stipulated in the contract between the State of Minnesota and Deloitte & Touche.

We would be pleased to answer any questions you may have regarding this report.

DELOITTE & TOUCHE

F. Jay Lingo, F.S.A.

James F. Verlautz, F.S.A.

I. INTRODUCTION AND PURPOSE

The Minnesota State Retirement System (MSRS) administers several retirement funds and plans. The plans administered are the: General State Employees' Plan, Unclassified Employees' Plan, Correctional Employees' Plan, State Patrol Employees' Plan, Judges' Plan, Legislators' Plan, Elective Officers' Plan, Military Affairs Plan, Transportation Pilots' Plan, and a statewide Deferred Compensation Plan for public employees.

The plans that MSRS administer are overseen by the Legislative Commission on Pensions and Retirement (LCPR). The LCPR consists of members of the Minnesota State Senate and Minnesota House of Representatives. Its members duties include:

- Reviewing investment performance.
- Establishing policy for public retirement plans.
- Recommending necessary changes to retirement plan provisions.
- Hiring an actuary to perform annual actuarial valuations and experience studies.
- Overseeing the work of the actuary.

Minnesota Statutes, Sections 356.20 and 356.215, require annual actuarial valuations and periodic experience studies. The Board of Directors is concerned with the valuations and experience studies which must be performed for:

- The General State Employees' Plan;
- The Correctional Employees' Plan;
- The State Patrol Employees' Plan; and
- The Judges' Plan

These valuations and experience studies are prepared by the Wyatt Company, the actuary retained by the LCPR. Since the Minnesota State Retirement System does not have an actuary on staff, it has retained Deloitte & Touche to review, analyze, and critique the actuarial valuations and experience studies.

This report evaluates the accuracy of the Wyatt Company's results, and expands on any items of particular significance.

II. COMPARISON OF VALUATION RESULTS

We attempted to duplicate the figures shown in the Wyatt Company's June 30, 1990 valuation reports. In doing so, we had several discussions with the Wyatt Company personnel who prepared the reports. Where we were able to discover reasonable justification for the Wyatt Company's approach, we adjusted our methods and assumptions to match. (Descriptions of those adjustments are included in Section III.)

In this section of the report, we compare the results that the Wyatt Company reported with our valuation results. Three tables are included. Table A shows the derivation of the unfunded liability. Table B shows the annual contribution requirements under Sections 352 and 356. Table C shows the depth of plan funding based on liabilities incurred to date. These figures are also required for Government Accounting Standards Board (GASB) reporting.

TABLE A (000's Omitted)

	Wyatt Company	Deloitte & Touche	Percentage Difference
Present Value of Benefits:			
Actives:			
Retirement	$ 75,046	$ 75,407	0.5%
Death	2,972	2,913	(2.0)
Disability	2,073	1,979	(4.5)
Withdrawal	26,622	26,270	(1.3)
Total actives	$106,713	$106,569	(0.1)
Deferred annuitants	4,274	4,253	(0.5)
Former members without vested rights	144	147	2.1
Participants in MPRI Fund	31,241	30,764	(1.5)
Total	$142,372	$141,733	(0.4)
Portion allocated to future service	40,155	39,210	(2.4)
Accrued liability (reserves required)	$102,217	$102,523	0.3
Valuation assets	96,945	96,945	0.0
Unfunded accrued liability	$ 5,272	$ 5,578	5.8
Funded ratio	94.8%	94.6%	--

CONTRIBUTIONS

Chapters 352 and 356 set forth requirements about the level of contributions. Chapter 352 prescribes the actual amount of contributions, and Chapter 356 describes the methods used to determine the amount of contribution required to fund the normal cost and the unfunded accrued liability. Together, the actual contribution and required contribution are used to determine the sufficiency of the actual contribution. These calculations are illustrated in Table B. Amounts in parentheses show dollar amounts as a percent of payroll.*

TABLE B (000's omitted)

		Wyatt Company	Deloitte & Touche
Actuarially Determined Contribution			
1.	Normal cost	$4,552 (9.67%)	$4,559 (9.68%)
2.	Assumed operating expense	$ 264 (.56%)	$ 264 (.56%)
3.	Amortization by June 30, 2020 of the unfunded accrued liability	$ 235 (.50%)	$ 251 (.53%)
4.	Total Chapter 356 requirement: (1) + (2) + (3)	$5,051 (10.73%)	$5,074 (10.77%)
Prescribed Contributions			
1.	Employee contributions	$2,307 (4.90%)	$2,307 (4.90%)
2.	Employer contribution	$2,952 (6.27%)	$2,952 (6.27%)
3.	Total Chapter 352A prescribed contribution	$5,259 (11.17%)	$5,259 (11.17%)
Contribution Sufficiency		0.44%	0.40%

* Assuming that contributions are paid during each payroll period throughout the year ending June 30, 1991. The expected annual payroll is $47,075,000.

The depth of funding indicates the extent to which the accrued benefits are funded and is measured by the ratio of valuation assets to the present value of accrued benefits. These measurements are made on the plan continuation basis (applying all ongoing actuarial assumptions, including assumed salary increases and turnover) and are illustrated as follows:

TABLE C (000's omitted)

Depth of Funding June 30, 1990

		Wyatt Company	Deloitte & Touche	Percentage Difference
1.	Present value of accrued benefits			
	a. Active members	$51,895	$51,910	(0.0%)
	b. Deferred annuitants	4,274	4,253	(0.5)
	c. Former members without vested rights	144	147	2.1
	d. Participation in MPRI Fund	31,241	30,764	(1.5)
	e. Total present values of accrued benefits	$87,554	$87,074	(0.5)
2.	Valuation assets	96,945	96,945	0.0
3.	Depth of funding	110.7%	111.3%	--
4.	Depth of funding excluding MPRI members	116.7%	117.5%	--

III. EXPLANATION OF DIFFERENCES

In this section of the report, we present our best explanations for any differences between the Wyatt Company's methods and assumptions and ours, the changes we made where appropriate to be consistent with the Wyatt Company, and the effects of these changes.

Our calculations for the Correctional Employees' Retirement Plan are very similar to those of the Wyatt Company, and our valuation results in Table A of Section II are very close. Our total present value of benefits is 0.5% lower than the Wyatt Company, while our total accrued liability is only 0.3% higher than the Wyatt Company's total.

When we subtracted the actuarial value of assets to derive the unfunded accrued liability, the percentage difference increased to 5.8%. This difference is small and is larger than the difference in total accrued liability only because the plan is so well funded.

The Wyatt Company reports a 0.44% contribution sufficiency. We report a 0.40% sufficiency. This difference results in part from an interest adjustment that we make to the normal cost that the Wyatt Company does not. The Wyatt Company calculates normal cost as of the beginning of the year and does not make an interest adjustment. Because normal cost is actually paid throughout the year, we feel that it is necessary to adjust the amount by increasing it with one half year of interest.

The Standards for Actuarial Work states that the amortization on unfunded liability is increased by one half year interest because salaries are paid throughout the year. Although the standards do not directly mention an adjustment, we believe that the normal cost should be adjusted in the same manner as the amortization of the unfunded accrued liability.

The Wyatt Company indicated that it has made no assumption changes since last year. The Company continues to assume that the IRS limits on benefits will increase 5% per year. Actual increases over the last two years indicate a 5.4% rate of growth on the IRS limit. We believe that a 5% increase is reasonable.

IV. CHANGES IN THE UNFUNDED LIABILITY

The Correctional Plan currently has an unfunded liability. An unfunded liability is not necessarily bad for an ongoing plan, as long as some provision is made to pay off the liability over time. However, the unfunded liability becomes a problem when it is so large that it precludes benefit security, or when, like any debt, interest on the liability becomes unmanageable.

Generally, unfunded liabilities tend to decrease over time, although some year-to-year fluctuation is normal. One symptom of a troubled pension plan is a constantly increasing unfunded liability. Annual changes in the unfunded liability occur when:

- Part of the contribution made each year goes to pay the normal costs (including expenses). The remaining contribution is called the past service contribution. The unfunded liability is automatically increased each year by the interest requirement of 8.5%. If the past service contribution is less than the interest requirement, there will be a net increase in the liability. When the past service contribution is greater than the interest requirement, part of the liability is "paid off," and the liability decreases.

- The unfunded liability is an actuarial projection of liabilities based on certain assumptions. To the extent actual experience differs from the assumptions, actuarial gains and losses may occur. An actuarial gain will decrease the unfunded liability; an actuarial loss will increase the unfunded liability.

- The assumptions and techniques used in calculating the unfunded liability are changed when circumstances warrant. These changes can produce increases or decreases in the unfunded liability.

- Changes in the legal, economic, and sociological environment often result in changes to retirement plans. These changes frequently result in improved benefits. When these changes result in higher retirement benefits, unfunded liabilities are increased.

During the year ended June 30, 1990, the Correctional Employees' Fund showed a decrease in the unfunded liability for the following reasons.

1. **Contribution Rate**

   The total contributions to the plan were approximately $5,338,000. Expected normal cost, expenses and interest combined to equal $4,814,000. The Wyatt Company increased the $524,000 difference by $282,000, a gain caused by actual salaries being less than the salaries projected by Wyatt last year. The net result was a reduction of $806,000 in the unfunded liability.

2. **Actuarial Gains and Losses**

   The Fund experienced actuarial gains of approximately $1,176,000 because of salary increases which were less than anticipated and $2,419,000 of investment gains. According to the Wyatt Company, the fund also experienced a $95,000 gain on MPRI fund mortality. Our calculations included an MPRI Mortality gain of $250,000, but this is not a major difference.

   The Wyatt Company reported an additional loss of $2,525,000 due to miscellaneous items. This is a relatively large loss for miscellaneous causes, but our calculations produced similar results.

   Overall, the Wyatt Company reported a net gain (decrease in unfunded liability) of $1,165,000.

3. **Changes in Assumptions and Plan Provisions**

   The only change since last year's valuation is plan provision changes. The statutory employer contribution rate was decreased from 8.70% to 6.27% of payroll. This change does not affect the unfunded liability as of June 30, 1990, but will in future years.

Changes in Unfunded Actuarial Accrued Liability*
(000's omitted)

A.	Unfunded actuarial accrued liability at beginning of year	$7,243
B.	Change due to interest requirement and current rate of funding	(806)
C.	Expected actuarial accrued liability at end of year: (A) + (B)	$6,437
D.	Actuarial losses (gains)	(1,165)
E.	Changes in assumptions and plan provisions	0
F.	Unfunded actuarial accrued liability at end of year: (C) + (D) + (E)	$5,272

* Results prepared by the Wyatt Company.

V. SENSITIVITY ANALYSIS

In the course of an actuarial valuation, liabilities and contributions are developed under a single actuarial cost method and one set of actuarial assumptions. However, since it is unlikely that any given assumption will prove to be exactly correct, we analyze the impact of a variation in an assumption. This analysis is called a sensitivity analysis.

We have analyzed the sensitivity to change of three of these assumptions and methods mandated by state law. Each of these plays a major role in determining costs:

1. Interest is currently assumed to be 8.5% for all years until retirement, and 5% thereafter. We examined the effect of changing 8.5% to 7.5%.

2. Salaries are assumed to increase 6.5% each year. We examined the effect of a 6% salary increase assumption.

3. The unfunded liability is amortized as a level percent of future payroll. This approach is not permitted for a private sector plan. We examined the effect of amortizing the unfunded liability using a level dollar amount.

		Value After Change in		
	Current Deloitte & Touche	**Interest**	**Salary Increase**	**Amortization**
Unfunded liability	$ 5,578	$12,371	$ 3,743	$ 5,578
Actuarially determined Contribution:				
Amount	5,074	6,011	4,741	5,319
Percent	10.77%	12.77%	10.07%	11.30%
Sufficiency	0.40%	(1.60%)	1.10%	(.13%)
Plan continuation liability	$87,074	$93,544	$85,432	$87,074
Depth of funding:	111.3%	103.6%	113.5%	111.3%

CORRECTIONAL EMPLOYEES

VI. SUMMARY OF HISTORICAL VALUATION RESULTS**

(000'S Omitted)

Report as of June 30	Accrued Liability	Valuation Assets	Unfunded Accrued Liability	Normal Cost	Actuarial Contribution	Prescribed Contribution	Sufficiency
1981	29,876	26,284	3,592	2,027 (11.05%)	2,301 (12.55%)	3,667 (20.00%)	7.45
1982	34,519	30,400	4,119	2,150 (10.52%)	2,460 (12.04%)	2,568 (12.57%)	.53
1983	39,551	36,068	3,483	2,603 (10.62%)	2,879 (11.75%)	3,998 (16.31%)	4.56
1984	43,888	40,153	3,735	2,562 (9.49%)	2,788 (10.33%)	3,671 (13.60%)	3.27
1985	53,826	48,700	5,126	2,931 (9.43%)	3,269 (10.52%)	4,226 (13.60%)	3.08
1986	58,060	57,472	588	3,113 (9.28%)	3,233 (9.64%)	4,561 (13.60%)	3.96
1987*	72,081	67,488	4,593	3,257 (9.26%)	3,545 (10.08%)	4,782 13.60%)	3.52
1988*	81,454	74,065	7,389	3,586 (9.24%)	4,024 (10.37%)	5,278 (13.60%)	3.23
1989*	92,684	85,441	7,243	4,073 (9.70%)	4,564 (10.87%)	5,709 (13.60%)	2.73
1990*	102,217	96,945	5,272	4,552 (9.67%)	5,051 (10.73%)	5,259 (11.17%)	0.44

* As prepared by the Wyatt Company

** Figures shown in parentheses are as a percentage of payroll under normal retirement age.

CORRECTIONAL EMPLOYEES

VI. SUMMARY OF HISTORICAL VALUATION RESULTS (continued) *

(000'S Omitted)

Report as of June 30	Active Members Number	Active Members Valuation Payroll	Retired Members** Number	Retired Members** Avg. Annual Benefits	Deferred Annuitants Number	Deferred Annuitants Avg. Annual Benefits	Former Members Without Vested Rights
1981	965	18,336,416	275	4,938	5	6,722	38
1982	1,010	20,984,656	293	5,346	10	7,180	39
1983	1,124	25,186,035	295	5,410	12	7,210	27
1984	1,174	26,998,637	326	5,959	25	7,136	95
1985	1,192	31,075,810	329	6,403	29	9,032	79
1986	1,219	33,533,822	328	6,908	35	8,285	83
1987*	1,232	35,155,000	333	7,383	43	7,928	84
1988*	1,267	38,807,000	346	7,983	47	8,572	80
1989*	1,317	41,976,000	357	8,423	58	8,624	57
1990	1,416	47,075,000	364	8,930	113	8,177	45

* Including beneficiaries and disabled members.
** As prepared by the Wyatt Company

APPENDIX A

SUMMARY OF EMPLOYEE DATA

The Executive Director gave us employee information for all active members, inactive members, and retired members of the Fund. The following tables summarize the changes in active, inactive, and retired membership during the year.

To reflect anticipated current year salary increases, all salaries provided were increased by 6.5%.

Appendix B (continued)

b. **Benefit Provisions:** Benefits under both plans are based on the highest final average salary, including all years from both plans, and on the plans in effect on the member's last day in covered public employment.

12. **Proportionate Annuity:** Any member who terminated after attaining age 65 and completing at least one year of service is entitled to a proportionate retirement annuity based on his allowable service credit.

APPENDIX C

ACTUARIAL METHODS AND ASSUMPTIONS

ACTUARIAL METHODS

Chapter 356 of the Minnesota Statutes calls for the determination of normal cost and accrued liability in accordance with the entry age normal cost method, one of several available projected cost methods. For the June 30, 1990 valuation, we used the individual entry age normal method, with salary scale.

The unfunded liability is amortized by the level percent of payroll method. (Each amortization payment is calculated as if the following year's payment would increase by 6.5%.)

ACTUARIAL ASSUMPTIONS

The tables on the following pages summarize the actuarial assumptions used for this valuation.

CHANGES IN ACTUARIAL ASSUMPTIONS

The actuarial assumptions have not been changed since the last valuation.

Appendix C (continued)

MINNESOTA STATE RETIREMENT SYSTEM
CORRECTIONAL EMPLOYEES' RETIREMENT FUND

Summary of Actuarial Assumptions and Methods

1.	**Mortality:**	1971 Group Annuity Mortality Table with ages set back eight years for females.
2.	**Post-Disablement Mortality:**	Combined Annuity Mortality Table.
3.	**Withdrawal:**	Graded rates based on actual experience developed by the June 30, 1971 and subsequent experience analyses and set forth in the Separation from Active Service Table.
4.	**Expenses:**	Prior year's expenses expressed as a percentage of prior year's payroll.
5.	**Interest Rate:**	Preretirement - 8.5% per annum. Postretirement - 5% per annum.
6.	**Salary Scale:**	6.5% per annum.
7.	**Assumed Retirement Age:**	Age 58, or if over age 58, one year from the valuation date.
8.	**Actuarial Cost Method:**	Entry age cost method, with normal cost determined as a level percentage of future covered payroll, on an individual basis.
9.	**Social Security:**	Based on the present law and 6.5% salary scale applicable to current salaries. Future Social Security benefits replace the same proportion of salary as at present.
10.	**Return of Contributions:**	All employees withdrawing after becoming eligible for a deferred benefit were assumed to take the larger of their contributions, accumulated with interest, or the value of their deferred benefit.
11.	**Disability**	All disabilities are assumed to have been occupational.

Appendix C (continued)

MINNESOTA STATE RETIREMENT SYSTEM
CORRECTIONAL EMPLOYEES' RETIREMENT FUND

Male Correctional Members
Separation from Active Service
(Number Separating at Each Age Per 10,000 Working at that Age)

Age	Withdrawal	Death	Disability	Age and Service Retirement
20	2,400	5		
21	2,250	5		
22	2,080	5		
23	1,920	6		
24	1,760	6		
25	1,600	6		
26	1,470	7		
27	1,340	7		
28	1,230	7		
29	1,130	8		
30	1,040	8	2	
31	950	9	2	
32	890	9	2	
33	830	10	2	
34	770	10	2	
35	720	11	2	
36	680	12	2	
37	640	13	2	
38	600	14	2	
39	560	15	2	
40	530	16	2	
41	500	18	2	
42	480	20	2	
43	460	23	3	
44	430	26	3	
45	410	29	3	
46	390	33	5	
47	370	38	7	
48	350	42	9	
49	340	47	11	

Appendix C (continued)

Age	Withdrawal	Death	Disability	Age and Service Retirement
50	320	53	14	
51	300	59	16	
52	280	65	20	
53	260	71	24	
54	240	78	28	
55	210	85	34	
56	170	93	40	
57	140	100	46	
58				10,000

Appendix C (continued)

MINNESOTA STATE RETIREMENT SYSTEM
CORRECTIONAL EMPLOYEES' RETIREMENT FUND

Female Correctional Members
Separation from Active Service
(Number Separating at Each Age Per 10,000 Working at that Age)

Age	Withdrawal	Death	Disability	Age and Service Retirement
20	3,700	4		
21	3,550	4		
22	3,390	4		
23	3,230	4		
24	3,070	4		
25	2,910	5		
26	2,750	5		
27	2,600	5		
28	2,430	5		
29	2,270	5		
30	2,120	5		
31	1,970	6		
32	1,820	6		
33	1,680	6		
34	1,540	7		
35	1,410	7	1	
36	1,300	7	1	
37	1,190	8	1	
38	1,090	8	1	
39	1,000	9	2	
40	920	9	2	
41	850	10	2	
42	780	10	4	
43	720	11	4	
44	680	12	4	
45	630	13	5	
46	590	14	6	
47	560	15	7	
48	530	16	7	
49	500	18	10	

Appendix C (continued)

Age	Withdrawal	Death	Disability	Age and Service Retirement
50	470	20	10	
51	440	23	12	
52	410	26	14	
53	390	29	16	
54	360	33	20	
55	330	38	24	
56	290	42	30	
57	230	47	36	
58				10,000

Appendix A (continued)

MINNESOTA STATE RETIREMENT SYSTEM
CORRECTIONAL EMPLOYEES' RETIREMENT FUND

Covered Correctional Employees' Census Data as of June 30, 1990

	Number	Annual Payroll
Actives at June 30, 1989	1,317	$41,954,249
New Entrants*	200	
Total	1,517	
Less Separations from Active Service:		
Refund of Contributions*	40	
Separation with a Deferred Annuity	32	
Separation with Neither Refund nor Right to a Deferred Annuity	12	
Death	1	
Service Retirement	18	
Disability	0	
Total Separations	103	
Data Adjustments	2	
Actives at June 30, 1990	1,416	$47,074,739

Average Entry Age of New Employees

For the Fiscal Year Year Ending	Male	Female	Average Age at Entry
6/30/84	28.7	32.4	29.4
6/30/85	29.2	28.6	29.0
6/30/86	29.8	32.1	30.4
6/30/87	30.0	30.1	30.0
6/30/88	29.8	31.5	30.3
6/30/89	30.3	29.5	30.1
6/30/90	30.5	31.1	30.7

* Includes those who entered the plan and terminated during the period from July 1, 1989 to June 30, 1990.

Appendix A (continued)

MINNESOTA STATE RETIREMENT SYSTEM
CORRECTIONAL EMPLOYEES' RETIREMENT FUND

Correctional Employees' Annuitant Census
Data as of June 30, 1990

		Number	Annual Annuity Benefit Payable
A.	**Service Retirement Annuitants**		
	Receiving at June 30, 1989	337	$2,865,562
	New	21	294,259
	Deaths	(18)	(80,931)
	Adjustments - Net Result	0	4,016
	Receiving at June 30, 1990	340	$3,082,906
B.	**Disabled Employees**		
	Receiving at June 30, 1989	8	$ 75,929
	New	1	7,418
	Deaths	0	0
	Retirements	0	0
	Adjustments - Net Result	0	2,311
	Receiving at June 30, 1990	9	$ 85,658
C.	**Widows Receiving an Annuity or Survivor Benefit**		
	Beneficiaries Receiving an Optional or Reversionary Annuity:		
	Receiving at June 30, 1989	12	$ 65,427
	New	4	21,703
	Deaths	(1)	(21,399)
	Adjustments - Net Result	0	16,292
	Receiving at June 30, 1990	15	$ 82,023

Appendix A (continued)

		Number	Annual Annuity Benefit Payable
D.	**Children Receiving a Survivor Benefit**	0	$ 0
E.	**Deferred Annuitants**		
	Receiving at June 30, 1989	58	500,172
	New	62	
	Began Receiving	(6)	
	Return of Actives	(1)	
	Adjustments	—	
	Receiving at June 30, 1990	113	$ 924,033

Average Age at Retirement of New Service Annuitants

Fiscal Year Ending	Average Retirement Age
6/30/83	55.6
6/30/84	57.8
6/30/85	57.8
6/30/86	55.4
6/30/87	56.8
6/30/88	58.0
6/30/89	57.2
6/30/90	56.9
All Existing Service Annuitants	58.2

APPENDIX B

MINNESOTA STATE RETIREMENT SYSTEM
CORRECTIONAL EMPLOYEES' RETIREMENT FUND

Summary of Principal Plan Provisions as of June 30, 1990

1.	**Coverage:**		From first date of employment.
2.	**Service Credit:**		Service is credited from date of coverage.
3.	**Contributions:**		
	a.	**Employee:**	4.90% of salary.
	b.	**State of Minnesota:**	6.27% of salary. (Changed from 8.70%).
4.	**Final Average Salary:**		Monthly average for the highest five successive years of salary.
5.	**Normal Retirement:**		
	a.	**Eligibility:**	Attainment of age 55 and completion of three years of service.
	b.	**Retirement Benefit:**	General Plan benefit plus an additional benefit defined below.
	c.	**Additional Benefit:**	Final average salary times 1% for each year of service.
	d.	**Limitation on Additional Benefit:**	That amount which, when added to the General Plan benefit, provides a retirement benefit of 75% of final average salary.
	e.	**Additional Benefits Period:**	84 months or until attainment of age 65, whichever comes first.
	f.	**Minimum Benefit Following Additional Benefit Period:**	That amount which, when added to Social Security benefits, equals the benefit payable during the additional benefit period.

6. **Early Retirement:**

a. Eligibility:	Attainment of age 50 and completion of three years of service. (Changed from age 50 and five years.)
b. Retirement Benefit:	Normal Retirement Benefit actuarially reduced for commencement at age 55.

7. **Disability Retirement:**

a. Eligibility:	
o In line of duty:	All employees are eligible.
o Not in line of duty:	One year of service and less than age 55.
b. Benefit Amount:	
o In line of duty:	50% of average monthly salary plus 2.5% for each year of service in excess of 20 years, offset by Workers' Compensation.
o Not in line of duty:	2.5% of average monthly salary for each year of service, subject to a minimum of 37.5%.
c. Limitation:	At age 62, General Plan benefit based on credited service is payable subject to a minimum benefit based on 15 years of service.

8. **Deferred Service Retirement:**

a. Eligibility:	Completion of three years of service and election to leave employee contributions on deposit.

b. **Benefit Amount:** Retirement benefits payable at normal retirement date are determined according to the normal retirement benefit formula based on the member's final average salary and service at termination; such amount being subject to an increase of 5% for each year between termination and retirement for years before January 1, 1981 and 3% compounded annually thereafter.

9. **Return of Contributions:** Upon termination of employment, a member may elect the return of contributions with 6% interest compounded annually in lieu of all other benefits under the plan.

10. **Surviving Spouse Death Benefit:**

a. **Eligibility:** Death of member in service at age 50 at least with three years of service or at any age with 30 years of service.

b. **Benefit Amount:** The surviving spouse may elect one of:

- o Refund of member contributions with 6% interest; or
- o 100% of the annuity the member would have received had he retired early (if eligible) from the General Employees Retirement Fund and elected a 100% joint and survivor annuity commencing on the later of age 55 or his date of death. Benefit will commence the latter of member age 55 or date of death.

11. **Combined Service Provision:**

a. **Eligible Members:** Members who have had coverage under two or more Minnesota Public Retirement Systems, with a total of at least five years of credited service.

Deloitte & Touche

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March 1991

Board of Directors
Minnesota State Retirement System
529 Jackson at 10th Street
St. Paul, Minnesota

Ladies and Gentlemen:

We are pleased to present our report on the June 30, 1990 actuarial valuation of the Minnesota State Retirement System, State Patrol Employees' Retirement Plan.

Our report is divided into the following sections:

The report was completed on the basis of accepted actuarial methods and procedures in accordance with the provisions stipulated in the contract between the State of Minnesota and Deloitte & Touche.

We would be pleased to answer any questions you may have regarding this report.

DELOITTE & TOUCHE

F. Jay Lingo

F. Jay Lingo, F.S.A.

James F. Verlautz

James F. Verlautz, F.S.A.

I. INTRODUCTION AND PURPOSE

The Minnesota State Retirement System (MSRS) administers several retirement funds and plans. The plans administered are the: General State Employees' Plan, Unclassified Employees' Plan, Correctional Employees' Plan, State Patrol Employees' Plan, Judges' Plan, Legislators' Plan, Elective Officers' Plan, Military Affairs Plan, Transportation Pilots' Plan, and a statewide Deferred Compensation Plan for public employees.

The plans that MSRS administers are overseen by the Legislative Commission on Pensions and Retirement (LCPR). The LCPR consists of members of the Minnesota State Senate and Minnesota House of Representatives. Its members' duties include:

- Reviewing investment performance.
- Establishing policy for public retirement plans.
- Recommending necessary changes to retirement plan provisions.
- Hiring an actuary to perform annual actuarial valuations and experience studies.
- Overseeing the work of the actuary.

Minnesota Statutes, Sections 356.20 and 356.215, require annual actuarial valuations and periodic experience studies. The Board of Directors is concerned with the valuations and experience studies which must be performed for:

- The General State Employees' Plan;
- The Correctional Employees' Plan;
- The State Patrol Employees' Plan; and
- The Judges' Plan

These valuations and experience studies are prepared by the Wyatt Company, the actuary retained by the LCPR. Since the Minnesota State Retirement System does not have an actuary on staff, it has retained Deloitte & Touche to review, analyze, and critique the actuarial valuations and experience studies.

This report evaluates the accuracy of the Wyatt Company's results, and expands on any items of particular significance.

II. COMPARISON OF VALUATION RESULTS

We attempted to duplicate the figures shown in the Wyatt Company's June 30, 1990 valuation reports. In doing so, we had several discussions with the Wyatt Company's personnel who prepared the reports. Where we were able to discover reasonable justification for the Wyatt Company's approach, we adjusted our methods and assumptions to match. (Descriptions of those adjustments are included in Section III.)

In this section of the report, we compare the results that the Wyatt Company reported with our valuation results. Three tables are included. Table A shows the derivation of the unfunded liability. Table B shows the annual contribution requirements under both Chapters 352 and 356. Table C shows the depth of plan funding based on liabilities incurred to date. Table C figures are also required for Government Accounting Standards Board (GASB) reporting.

TABLE A (000's Omitted)

	Wyatt Company	Deloitte & Touche	Percentage Difference
Present Value of Benefits:			
Actives:			
Retirement	$146,408	$146,234	(0.1%)
Death	11,186	11,511	2.9
Disability	14,835	13,944	(6.0)
Withdrawal	15,908	16,768	5.4
Total actives	$188,337	$188,457	0.1
Deferred annuitants	2,096	2,109	0.6
Former members without vested rights	57	63	10.5
Participants in MPRI Fund	84,931	84,811	(0.1)
Participants not in MPRI Fund	8,863	9,119	2.9
Total	$284,284	$284,559	0.1
Portion allocated to future service	76,941	77,361	0.5
Accrued liability (reserves required)	$207,343	$207,198	(0.1)
Valuation assets	185,699	185,699	0.0
Unfunded accrued liability	$21,644	$21,499	(0.7)
Funded ratio	89.6%	89.6%	--

CONTRIBUTIONS

Chapters 352 and 356 set forth requirements about the level of contributions. Chapter 352 prescribes the actual amount of contributions, and Chapter 356 describes the methods used to determine the amount of contribution required to fund the normal cost and the unfunded accrued liability. Together, the excess of actual contributions over required contributions determines the sufficiency of the actual contribution. These calculations are illustrated in Table B. Amounts in parentheses show the dollar amounts as a percent of payroll.*

TABLE B (000's omitted)

Actuarially Determined Contribution	**Wyatt Company**	**Deloitte & Touche**
1. Normal cost	$6,378 (18.53%)	$6,700 (19.46%)
2. Assumed operating expense	$ 272 (.79%)	$ 272 (.79%)
3. Amortization by June 1, 2020 of the unfunded accrued liability	$ 974 (2.83%)	$ 968 (2.81%)
4. Total Chapter 356 requirement: (1) + (2) + (3)	$7,624 (22.15%)	$7,940 (23.06%)
Prescribed Contributions		
1. Employee contributions	$2,926 (8.50%)	$2,926 (8.50%)
2. Employer contribution	$5,122 (14.88%)	$5,122 (14.88%)
3. Total Chapter 352B prescribed contribution	$8,048 (23.38%)	$8,048 (23.38%)
Contribution Sufficiency	1.23%	0.32%

* Assuming that contributions are paid during each payroll period throughout the year ending June 30, 1991. The expected annual payroll is $34,423,000.

The depth of funding indicates the extent to which the accrued benefits are funded and is measured by the ratio of valuation assets to the present value of accrued benefits. These measurements are made on the plan continuation basis (applying all ongoing actuarial assumptions, including assumed salary increases and turnover) and are illustrated as follows:

TABLE C (000's omitted)

Depth of Funding June 30, 1990

		Wyatt Company	Deloitte & Touche	Percentage Difference
1.	Active members	$102,412	$102,660	0.2%
2.	Deferred annuitants	2,096	2,109	0.6
3.	Former members without vested rights	57	63	10.5
4.	Participation in MPRI Fund	84,931	84,811	(0.1)
5.	Participants not in MPRI Fund	8,863	9,119	2.9
6.	Total present values of accrued benefits	$198,359	$198,762	0.2
7.	Valuation assets	185,699	185,699	0.0
8.	Depth of funding	93.6%	93.4%	--
9.	Depth of funding excluding MPRI members	88.8%	88.5%	--

III. EXPLANATION OF DIFFERENCES

In this section of the report, we present our best explanations for any differences between the Wyatt Company's methods and assumptions and ours, the changes we made where appropriate to be consistent with the Wyatt Company, and the effects of these changes.

Our calculations of liabilities are very close to the Wyatt Company's. The difference between our accrued liability and theirs is less than 0.1%. After subtracting the assets, the resulting difference in unfunded accrued liability is 0.7% lower. Last year, this difference was 2.0% higher. The change in results reflects our change in marriage assumption from 100% to 85% to match the Wyatt Company's assumption.

The Wyatt Company reports a 1.23% contribution sufficiency. We report only a 0.32% sufficiency. This difference results almost entirely from an interest adjustment that we make to the normal cost that the Wyatt Company does not. The Wyatt Company calculates normal cost as of the beginning of the year and does not make an interest adjustment. Because normal cost is actually paid throughout the year, we feel that it is necessary to adjust the amount by increasing it with one half year of interest.

The Standards for Actuarial Work states that the amortization of unfunded liability is increased by one half year interest because salaries are paid throughout the year. Although the standards do not directly mention an adjustment, we believe that the normal cost should be adjusted in the same manner as the amortization of the unfunded accrued liability.

We increased the withdrawal liability by 6% to account for the death benefit for future vested terminations. The Wyatt Co. has stated that it calculated this liability directly but is unable to give us the exact amount. We believe that a 6% load is a reasonable approximation for this ancillary benefit.

The Wyatt Company indicated that it has made no assumption changes since last year. The Company continues to assume that the IRS limits on benefits will increase 5% per year. Actual increases over the last two years indicate a 5.4% rate of growth on the IRS limit. We believe that a 5% increase assumption is reasonable.

IV. CHANGES IN THE UNFUNDED LIABILITY

The State Patrol Employees' Plan currently has an unfunded liability. An unfunded liability is not necessarily bad for an ongoing plan, as long as some provision is made to pay off the liability over time. However, the unfunded liability becomes a problem when it is so large that it precludes benefit security, or when, like any debt, interest on the liability becomes unmanageable.

Generally, unfunded liabilities tend to decrease over time, although some year-to-year fluctuation is normal. One symptom of a troubled pension plan is a constantly increasing unfunded liability. Annual changes in the unfunded liability occur when:

- Part of the contribution made each year goes to pay the normal costs (including expenses). The remaining contribution is called the Past Service Contribution. The unfunded liability is automatically increased each year by the interest requirement of 8.5%. When the past service contribution is less than the interest requirement, there will be a net increase in the liability. When the past service contribution is greater than the interest requirement, part of the liability is "paid off," and the liability decreases.

- The unfunded liability is an actuarial projection of liabilities based on certain assumptions. To the extent actual experience differs from the assumptions, actuarial gains and losses may occur. An actuarial gain will decrease the unfunded liability; an actuarial loss will increase the unfunded liability.

- The assumptions and techniques used in calculating the unfunded liability are changed when circumstances warrant. These changes can produce increases or decreases in the unfunded liability.

- Changes in the legal, economic, and sociological environment often result in changes to retirement plans. These changes frequently result in improved benefits. When these changes result in higher retirement benefits, unfunded liabilities are increased.

During the year ended June 30, 1990, the State Patrol Employees' Fund showed a decrease in the unfunded liability for the following reasons.

1. **Contribution Rate**

   The total contributions to the plan were $8.3 million. However, expected normal cost, expenses and interest combined to equal $8.1 million. The Wyatt Company increased the $0.2 million difference by $0.4 million, which was a gain caused by actual salaries being less than the salaries projected by the Wyatt Company last year. The net result was a surplus of about $.6 million, which decreased the unfunded liability.

2. **Actuarial Gains and Losses**

   According to the Wyatt Company, the Fund experienced actuarial gains of $2,777,000 from salary increases and $87,000 from MPRI mortality.

   The Fund experienced a $3,717,000 gain on investments.

   The remaining sources of gain or loss, including Mortality of Other Benefit Recipients, combined to produce a loss of $1,653,000. Overall, there was a net gain (decrease in unfunded liability) from actuarial experience of $4,928,000.

3. **Changes in Assumptions and Plan Provisions**

   The only change since last year's valuation is a change in plan provisions. The statutory employer contribution rate was decreased from 18.90% to 14.88% of payroll. This change does not affect the unfunded liability as of June 30, 1990, but will in future years.

Changes in Unfunded Actuarial Accrued Liability*
(000's omitted)

A.	Unfunded actuarial accrued liability at beginning of year	$27,163
B.	Change due to interest requirement and current rate of funding	(591)
C.	Expected actuarial accrued liability at end of year: (A) + (B)	$26,572
D.	Actuarial losses (gains)	(4,928)
E.	Changes in assumptions and plan provisions	0
F.	Unfunded actuarial accrued liability at end of year: (C) + (D) + (E)	$21,644

* Results prepared by the Wyatt Company.

V. SENSITIVITY ANALYSIS

In the course of an actuarial valuation, liabilities and contributions are developed under a single actuarial cost method and one set of actuarial assumptions. However, since it is unlikely that any given assumption will prove to be exactly correct, we analyzed the impact of a variation in an assumption. This analysis is called a sensitivity analysis.

We have analyzed the sensitivity to change of three of these assumptions and methods mandated by state law. Each of these plays a major role in determining costs:

1. Interest is currently assumed to be 8.5% for all years until retirement, and 5% thereafter. We examined the effect of changing from 8.5% to 7.5%.

2. Salaries are assumed to increase 6.5% each year. We examined the effect of a 6% salary increase assumption.

3. The unfunded liability is amortized as a level percent of future payroll. This approach is not permitted for a private sector plan. We examined the effect of amortizing the unfunded liability using a level dollar amount.

		Value After Change		
	Current Deloitte & Touche	**Interest**	**Salary Increase**	**Amortization**
Unfunded liability	$21,499	$28,707	$19,549	$21,499
Actuarially determined contribution:				
(Amount)	7,940	9,169	7,517	9,004
(Percent)	23.06%	26.64%	21.84%	26.16%
(Sufficiency)	0.32%	(3.26%)	1.54%	(2.78%)
Plan continuation liability	$198,762	$209,753	$195,358	$198,762
Depth of funding:	93.4%	88.5%	95.1%	93.4%

STATE PATROL

VI. SUMMARY OF HISTORICAL VALUATION RESULTS**
(000'S Omitted)

Report as of June 30	Accrued Liability	Valuation Assets	Unfunded Accrued Liability	Normal Cost	Actuarial Contribution	Prescribed Contribution	Suficiency (Deficiency)
1981	100,518	58,720	41,798	3,149 (15.77%)	5,991 (30.00%)	5,591 (28.00%)	(2.00)
1982	111,455	68,183	43,272	3,323 (16.96)	6,243 (31.85%)	5,488 (28.00%)	(3.85)
1983	132,175	78,775	53,400	3,805 (17.65%)	7,469 (34.64%)	6,361 (29.50%)	(5.14)
1984	119,682	86,784	32,898	4,300 (18.68%)	5,973 (25.95%)	6,306 (27.40%)	1.45
1985	134,440	100,486	33,954	4,756 (18.38%)	6,625 (25.60%)	7,090 (27.40%)	1.80
1986	148,524	118,175	30,349	5,080 (18.49%)	6,840 (24.90%)	7,528 (27.40%)	2.50
1987*	160,628	136,397	24,231	5,173 (18.10%)	6,685 (23.39%)	7,832 (27.40%)	4.01
1988*	175,062	148,355	26,707	5,291 (18.08%)	6,986 (23.87%)	8,019 (27.40%)	3.53
1989*	194,434	167,271	27,163	5,740 (17.61%)	7,119 (21.84%)	8,930 (27.40%)	5.56
1990*	207,343	185,699	21,644	6,378 (18.53%)	7,624 (22.15%)	8,048 (23.38%)	1.23

* As prepared by the Wyatt Co.
** Figures shown in parentheses are as a percentage of payroll under normal retirement age.

STATE PATROL

VI. SUMMARY OF HISTORICAL VALUATION RESULTS**
(000'S Omitted)

Report as of June 30	Active Members Number	Active Members Valuation Payroll	Retired Members* Number	Retired Members* Avg. Annual Benefits	Deferred Annuitants Number	Deferred Annuitants Avg. Annual Benefits	Former Members Without Vested Rights
1981	793	19,967,408	312	5,699	25	8,503	10
1982	763	20,922,575	339	6,614	28	8,636	10
1983	774	23,066,558	359	7,736	22	8,858	10
1984	741	23,016,272	397	8,907	21	8,005	10
1985	765	25,875,980	407	9,749	20	10,507	9
1986	769	27,474,215	425	11,183	17	10,478	10
1987*	771	28,583,000	430	12,619	16	10,009	8
1988*	740	29,267,000	455	14,214	16	9,881	8
1989*	765	32,591,000	455 ***	15,506	19	12,340	7
1990*	788	34,423,000	465 ***	16,394	23	12,549	4

* As prepared by the Wyatt Co.
** Including beneficiaries and disabled members.
*** Does not include children.

APPENDIX A

SUMMARY OF EMPLOYEE DATA

The Executive Director gave us employee information for all active members, inactive members, and retired members of the Fund. The following tables summarize the changes in active, inactive, and retired membership during the year.

To reflect anticipated current year salary increases, all salaries provided were increased by 6.5%.

Appendix A (continued)

MINNESOTA STATE RETIREMENT SYSTEM
STATE PATROL RETIREMENT FUND

State Patrol Census Data as of June 30, 1990

	Number	Annual Payroll
Actives at June 30, 1989	765	$32,591,305
New Entrants*	51	
Total	816	
Less Separations from Active Service:		
Refund of Contributions*	1	
Separation with a Vested Right to a Deferred Annuity	5	
Separation with Neither Annuity nor Right to a Deferred Annuity	0	
Death While Eligible; Surviving Spouse Receiving Annuity	0	
Service Retirement	19	
Disability	1	
Death	1	
Total Separations	27	
Data Adjustments	(1)	
Actives at June 30, 1990	788	$34,423,288

Average Entry Age of New Employees

For the Fiscal Year Year Ending	Male	Female	Average Age at Entry
6/30/84	28.0	31.7	28.3
6/30/85	27.8	23.5	27.4
6/30/86	26.5	22.8	26.4
6/30/87	26.0	36.7	26.4
6/30/88	32.5	34.2	32.7
6/30/89	28.7	24.3	28.3
6/30/90	29.5	29.7	29.5

* Includes those who entered the plan and terminated during the period from July 1, 1989 to June 30, 1990.

Appendix A (continued)

MINNESOTA STATE RETIREMENT SYSTEM
STATE PATROL RETIREMENT FUND

State Patrol Census Data as of June 30, 1990

		Number	Annual Annuity Benefit Payable
A.	**Service Retirement Annuitants**		
	Receiving at June 30, 1989	340	$6,096,622
	New	20	458,876
	Deaths	(14)	(202,785)
	Adjustments - Net Result	0	244,223
	Receiving at June 30, 1990	346	$6,596,936
B.	**Disabled Employees**		
	Receiving at June 30, 1989		
	MPRI	11	
	Non-MPRI	3	
		14	$ 181,830
	New (Non-MPRI)	1	21,423
	Deaths (MPRI)	(1)	(8,576)
	Adjustments	0	4,520
	Receiving at June 30, 1990	14	$ 199,197
C.	**Widows Receiving an Annuity or Survivor Benefit**		
	Beneficiaries Receiving an Optional or Reversionary Annuity:		
	Receiving at June 30, 1989	101	$ 764,912
	New	10	71,943
	Deaths	(6)	(40,109)
	Adjustments - Net Result	0	30,133
	Receiving at June 30, 1990	105	$ 826,879

Appendix A (continued)

		Number	Annual Annuity Benefit Payable
D.	**Children Receiving a Survivor Benefit**		
	Receiving at June 30, 1989	7	$ 16,637
	New	0	0
	Reinstated	0	0
	No Longer Eligible	(2)	(4,116)
	Adjustments - Net Result	0	1,702
	Receiving at June 30, 1990	5	$ 14,223
E.	**Deferred Annuitants**		
	Deferred as of June 30, 1989	19	$234,458
	New	5	
	Retirement	(1)	
	Adjustment - Net Results	0	
	Deferred as of June 30, 1990	23	$276,078

Average Age at Retirement of New Service Annuitants

Fiscal Year Ending	Average Retirement Age
6/30/84	58.6
6/30/85	58.3
6/30/86	58.2
6/30/87	57.2
6/30/88	57.5
6/30/89	56.2
6/30/90	58.5
All Existing Service Annuitants	57.8

APPENDIX B

MINNESOTA STATE RETIREMENT SYSTEM
STATE PATROL RETIREMENT FUND

Summary of Principal Plan Provisions as of June 30, 1990

State Patrol Employees

1.	**Coverage:**		From first date of employment.
2.	**Service Credit:**		Service is credited from date of coverage. For State Police Officers hired after July 1, 1961, no service is credited after age 60.
3.	**Contributions:**		
	a.	**Employees:**	8.5% of salary.
	b.	**From the State:**	14.88% of salary. (Changed from 18.9%).
4.	**Final Average Salary:**		Monthly average for the highest five years of salary.
5.	**Normal Retirement:**		
	a.	**Eligibility:**	Attainment of age 55 and completion of three years of service.
	b.	**Benefit Amount:**	2.5% of final average salary for each year of service.
6.	**Early Retirement:**		
	a.	**Eligibility:**	Attainment of age 50 and completion of three years of service. (Changed from age 50 and five years).
	b.	**Benefit Amount:**	Normal Retirement Benefit actuarially reduced for commencement before age 55.
7.	**Form of Payment:**		Life annuity with actuarially equivalent options also available.
8.	**Disability Retirement:**		
	a.	**Eligibility:**	o In line of duty: All participants are eligible.

o Not in line of duty: One year of service.

b. **Benefit Amount:**

- o In line of duty: 50% of average monthly salary plus 2.5% for each year of service in excess of 20 years.
- o Not in line of duty: 2.5% of average monthly salary for each year of service subject to a minimum of 37.5% of average monthly salary.

c. **Death Benefits:** If a member dies while receiving a disability benefit, 50% of his final average salary is payable to the surviving spouse for life.

9. **Deferred Service Retirement:**

a. **Eligibility:** Completion of three years of service.

b. **Benefit Amount:** Retirement benefits payable at normal retirement date are determined according to the normal retirement benefit formula based on the member's final average salary and service at termination; such amount being subject to an increase of 5% for each year between termination and retirement for years before January 1, 1981; 3% for each year from January 1, 1981 to the January 1 following age 55 and 5% each year until early or normal retirement.

10. **Return of Contributions:** If a member terminates before becoming eligible for any other benefits under the plan, his employee contributions are returned with interest at 6%.

11. **Surviving Spouse Death Benefit :**

a. **Eligibility:** Death of member in service.

b. **Benefit Amount:** 50% of final average salary. With three or more years of service, changes to a 100% joint and survivor annuity amount if larger as of the date the employee would have attained age 55.

12. **Children's Death Benefits:**

a.	**Eligibility:**	Death benefits are payable to children (under age 18, or 23 if a student) of members who die in active service.
b.	**Amount:**	10% of final average salary, plus $20 per month prorated equally to such children. Total benefit to spouse and all children must not be less than 50% of salary.
c.	**Maximum:**	Total benefit to spouse and all children may not exceed 70% of final average salary.

13. **Repayment of Contributions:**

a.	**Eligible Members:**	Rehired members.
b.	**Repayment Provision:**	Such rehired member may repay all refunds made to him, including interest at 6% compounded annually. In such case, service previously credited during the prior period at membership is restored. (Interest changed from 5%).

14. **Combined Service Provision:**

a.	**Eligible Members:**	Members who have had coverage under two or more Minnesota Public Retirement Systems, with a total of at least five years of credited service.
b.	**Benefit Provisions:**	Benefits under both plans are based on the highest final average salary including all years from both plans, and on the plans in effect on the member's last day in covered public employment.

15. **Proportionate Annuity:** Any member who terminated after attaining age 65 and completing at least one year of service is entitled to a proportionate retirement annuity based on his allowable service credit.

16. **Pre-1973 Annuitants:**

State Patrol officers who retired before 1973 are entitled to an annual 6% increase in benefits.

Participants who retired before July 1, 1973 will receive an additional lump sum payment each year. The initial benefit is $25 times each year of service or $400 times each year of service less Social Security benefits received from a Minnesota Public Employee Pension plan. Benefits will increase at the same rate as benefits from the MPRI fund increase.

APPENDIX C

ACTUARIAL METHODS AND ASSUMPTIONS

ACTUARIAL METHODS

Chapter 356 of the Minnesota Statutes calls for the determination of normal cost and accrued liability in accordance with the entry age normal cost method, one of several available projected cost methods. For the June 30, 1990 valuation, we used the traditional individual entry age normal method, with normal costs determined as a percentage of salary.

The normal cost as a percentage of payroll for disability, refund, survivor and vested termination benefits is determined by dividing the present value at entry of the applicable benefit by the present value at entry of future compensation.

The unfunded liability is amortized by the level percent of payroll method. (Each amortization payment is calculated as if the following year's payment will increase by 6.5%.)

ACTUARIAL ASSUMPTIONS

The tables on the following pages summarize the actuarial assumptions used for this valuation.

CHANGES IN ACTUARIAL ASSUMPTIONS

The actuarial assumptions have not been changed since the last valuation.

MINNESOTA STATE RETIREMENT SYSTEM
STATE PATROL RETIREMENT FUND

Summary of Actuarial Assumptions and Methods

State Patrol Employees

1.	**Mortality:**	1971 Group Annuity Mortality Table for Males with ages set back eight years for females.
2.	**Withdrawal:**	Rates starting at .03 per 10,000 at age 20 and decreasing to zero at age 55, as set forth in the Separation From Active Service Table.
3.	**Disability:**	The rates of disability were adapted from experience of the New York State Employees' Retirement System, as set forth in the Separation From Active Service Table. 85% of disabilities are assumed to be occupational.
4.	**Expenses:**	Prior year's expenses expressed as a percentage of prior year's payroll.
5.	**Interest Rate:**	8.5% per annum preretirement, 5% per annum postretirement.
6.	**Salary Scale:**	6.5% per annum, disregarding actual salary history. Benefits in excess of IRS Sec. 415 limits caused by salary increases are disregarded.
7.	**Assumed Retirement Age:**	Later of: ▪ Age 58 for State Troopers ▪ Age 58 for State Police Officers hired after 6/30/61 ▪ Age 63 for State Police Officers hired before 7/1/61 and July 1, 1991.
8.	**Actuarial Cost Method:**	Individual level percent entry age cost method.

Appendix C (continued)

9. **Assumed Survivor Status:** 100% assumed married, female spouse three years younger. 6% load on spouse benefits for children's benefits.

10. **Contribution Refund:** All employees withdrawing after becoming eligible for a deferred benefit were assumed to leave their contributions on deposit and receive a deferred annuitant benefit. Effective June 30, 1987, all employees withdrawing after becoming eligible for a deferred benefit were assumed to take the larger of their contributions accumulated with interest or the value of their deferred benefit.

Appendix C (continued)

MINNESOTA STATE RETIREMENT SYSTEM
STATE PATROL RETIREMENT FUND

Separation from Active Service
(Number Separating at Each Age Per 10,000 Working at That Age)

Age	Death* Males	Death* Females	Withdrawal**	Disability**
20	5	4	300	4
21	5	4	290	4
22	5	4	280	5
23	6	4	270	5
24	6	4	260	6
25	6	5	250	6
26	7	5	240	6
27	7	5	230	7
28	7	5	220	7
29	8	5	210	8
30	8	5	200	8
31	9	6	190	9
32	9	6	180	9
33	10	6	170	10
34	10	7	160	10
35	11	7	150	11
36	12	7	140	12
37	13	8	130	13
38	14	8	120	15
39	15	9	110	16
40	16	9	100	18
41	18	10	90	20
42	20	10	80	22
43	23	11	70	24
44	26	12	60	26
45	29	13	50	29
46	33	14	50	32
47	38	15	50	36
48	42	16	50	41
49	47	18	50	46

Appendix C (continued)

Age	Death* Males	Death* Females	Withdrawal**	Disability**
50	53	20	200	50
51	59	23	200	57
52	65	26	200	64
53	71	29	200	72
54	78	33	200	80
55	85	38		88
56	93	42		98
57	100	47		108
58	109	53		118
59	119	59		129
60	131	65		141
61	144	71		154
62	159	78		167

* 1971 Group Annuity Mortality Table, with age set back 8 years for females.

** Same withdrawal and disability rates pertain to males and females.

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March 1991

Board of Directors
Minnesota State Retirement System
529 Jackson at 10th Street
St. Paul, Minnesota

Ladies and Gentlemen:

We are pleased to present our report on the June 30, 1990 actuarial valuation of the Minnesota State Retirement System, Judges' Retirement Fund.

Our report is divided into the following sections:

Section I	-	Introduction and Purpose
Section II	-	Comparison of Valuation Results
Section III	-	Explanation of Differences
Section IV	-	Changes in the Unfunded Liability
Section V	-	Sensitivity Analysis
Section VI	-	Summary of Historical Valuation Results

Appendices

A. Summary of Employee Data
B. Summary of Principal Plan Provisions as of June 30, 1990
C. Actuarial Methods and Assumptions

The report was completed on the basis of accepted actuarial methods and procedures in accordance with the provisions stipulated in the contract between the State of Minnesota and Deloitte & Touche.

We would be pleased to answer any questions you may have regarding this report.

DELOITTE & TOUCHE

F. Jay Lingo

F. Jay Lingo, F.S.A.

James F. Verlautz

James F. Verlautz, F.S.A.

I. INTRODUCTION AND PURPOSE

The Minnesota State Retirement System (MSRS) administers several retirement funds and plans. The plans administered are the: General State Employees' Plan, Unclassified Employees' Plan, Correctional Employees' Plan, State Patrol Employees' Plan, Judges' Plan, Legislators' Plan, Elective Officers' Plan, Military Affairs Plan, Transportation Pilots' Plan, and a statewide Deferred Compensation Plan for public employees.

The plans that MSRS administer are overseen by the Legislative Commission on Pensions and Retirement (LCPR). The LCPR consists of members of the Minnesota State Senate and Minnesota House of Representatives. Its members' duties include:

- Reviewing investment performance.
- Establishing policy for public retirement plans.
- Recommending necessary changes to retirement plan provisions.
- Hiring an actuary to perform annual actuarial valuations and experience studies.
- Overseeing the work of the actuary.

Minnesota Statutes, Sections 356.20 and 356.215, require annual actuarial valuations and periodic experience studies. The Board of Directors is concerned with the valuations and experience studies which must be performed for:

- The General State Employees' Plan;
- The Correctional Employees' Plan;
- The State Patrol Employees' Plan; and
- The Judges' Plan

These valuations and experience studies are prepared by the Wyatt Company, the actuary retained by the LCPR. Since the Minnesota State Retirement System does not have an actuary on staff, it has retained Deloitte & Touche to review, analyze, and critique the actuarial valuations and experience studies.

This report evaluates the accuracy of the Wyatt Company's results, and expands on any items of particular significance.

II. COMPARISON OF VALUATION RESULTS

We attempted to duplicate the figures shown in the Wyatt Company's June 30, 1990 valuation reports. In doing so, we had several discussions with the Wyatt Company's personnel who prepared the reports. Where we were able to discover reasonable justification for the Wyatt Company's approach, we adjusted our methods and assumptions to match. (Descriptions of those adjustments are included in Section III.)

In this section of the report, we compare the results that the Wyatt Company reported with our valuation results. Three tables are included. Table A shows the derivation of the unfunded liability. Table B shows the annual contribution requirements under Chapters 490 and 356. Table C shows the depth of plan funding based on liabilities incurred to date. These figures are also required for Government Accounting Standards Board (GASB) reporting.

TABLE A (000's Omitted)

	Wyatt Company	**Deloitte & Touche**	**Percentage Difference**
Present Value of Benefits:			
Actives:			
Retirement	$ 53,290	$ 53,522	0.4%
Death	8,994	8,026	(10.8)
Disability	4,172	3,814	(8.6)
Withdrawal	--	--	--
Total actives	$66,456	$65,362	(1.6)
Deferred annuitants	154	149	(3.2)
Former members without vested rights	4	4	0.0
Participants in MPRI Fund	24,949	24,661	(1.2)
Retirement and survivor benefits from Judges' Fund	11,171	10,998	(1.5)
Total	$102,734	$101,174	(1.5)
Portion allocated to future service	33,338	31,878	(4.4)
Accrued liability (reserves required)	$ 69,396	$ 69,296	(0.1)
Valuation assets	28,116	28,116	0.0
Unfunded accrued liability	$ 41,280	$ 41,180	(0.2)
Funded ratio	40.5%	40.6%	--

CONTRIBUTIONS

Chapters 490 and 356 set forth requirements about the level of contributions. Chapter 490 prescribes the actual amount of contributions, and Chapter 356 describes the methods used to determine the amount of contribution required to fund the normal cost and the unfunded accrued liability. Together, the actual contribution and required contribution are used to determine the sufficiency of the actual contribution. These calculations are illustrated in Table B. Amounts in parentheses show the dollar amounts as a percent of payroll.*

TABLE B (000's omitted)

Actuarially Determined Contribution	**Wyatt Company**	**Deloitte & Touche**
1. Normal cost	$2,942 (14.24%)	$2,941 (14.57%)
2. Assumed operating expense	$ 72 (.35%)	$ 71 (.35%)
3. Amortization by June 1, 2020 of the unfunded accrued liability	$1,860 (9.00%)	$1,854 (9.18%)
4. Total Chapter 356 requirement: (1) + (2) + (3)	$4,874 (23.59%)	$4,866 (24.10%)
Prescribed Contributions		
1. Employee contributions	$ 891 (4.31%)	$ 870 (4.31%)
2. Employer contribution	$3,771 (18.25%)	$ 0 (0.00%)
3. Total Chapter 490 prescribed contribution	$4,662 (22.56%)	$ 870 (4.31%)
Contribution Sufficiency/(Deficiency)	(1.03%)	
Average Annual State Contribution		19.79%

The Deloitte & Touche results shown here include only those prescribed contributions which are not dependent on the plan's benefit provisions and the plan's actuarial experience, (i.e, the contributions required from the judges themselves). The Wyatt Companys results include an estimate of terminal funding payments to be made by the State. See Section III for further discussion.

* Assuming that contributions are paid during each payroll period throughout the year ending June 30, 1991, the Wyatt Company calculates expected annual payroll to be $20,662,000 and bases its calculations on this amount.

Our calculations are based on an expected annual payroll of $20,191,000. An explanation of the difference in results is on page 5.

The depth of funding indicates the extent to which the accrued benefits are funded and is measured by the ratio of valuation assets to the present value of accrued benefits. These measurements are made on the plan continuation basis (applying all ongoing actuarial assumptions, including assumed salary increases and turnover) and are illustrated as follows:

TABLE C (000's omitted)

Depth of Funding June 30, 1990

		Wyatt Company	Deloitte & Touche	Percentage Difference
1.	Active members	$32,209	$31,990	(0.7%)
2.	Deferred annuitants	154	149	(3.2)
3.	Former members without vested rights	4	4	0.0
4.	Participants in MPRI Fund	24,949	24,661	(1.2)
5.	Participants not in MPRIF	11,171	10,998	(1.5)
6.	Total present values of accrued benefits	$68,487	$67,802	(1.0)
7.	Valuation assets	28,116	28,116	0.0
8.	Depth of funding	41.1%	41.5%	--
9.	Depth of funding excluding MPRIF members	7.3%	8.0%	--

III. EXPLANATION OF DIFFERENCES

In this section of the report, we present our best explanations for any differences between the Wyatt Company's methods and assumptions and ours, the changes we made where appropriate to be consistent with the Wyatt Company, and the effects of these changes.

Our calculation of expected annual payroll was 2.3% lower than the Wyatt Company's calculation. We discussed this difference with the Wyatt Company's personnel. They have since acknowledged that their calculation was in error and that our calculation appears correct. They did not correct their report, so the results shown for the Wyatt Company are based on the overstated salaries.

Our calculations for the Judges' Retirement Plan are similar to those of the Wyatt Company, and our valuation results in Table A of Section II are sufficiently close that any differences could be due to Wyatt's error in salaries.

When determining 60% of the Normal Retirement Benefit to value death benefits, the Wyatt Company projects service and earnings forward to the normal retirement date. Our understanding of the death benefit under this plan is that the beneficiary receives 60% of the participant's accrued benefit at date of death without reduction. Because of this difference, our value of death benefits is consistently lower than the Wyatt Company's.

As noted on page 3, we determined contribution sufficiency in a different manner than the Wyatt Company did. Objections have been raised that showing a zero employer contribution does not adequately convey the State's commitment to funding this plan, and as such misleads the reader into thinking there is a problem with the Judges' Fund. We agree that this is a legitimate argument. However, the language of Chapter 490 indicates that the necessary contributions will be made to ensure that there are sufficient assets to cover benefits. An exhibit that demonstrates a contribution sufficiency using an approach that by definition must produce a sufficiency is not particularly useful. We believe that simply stating the average annual contribution by the State (as a percentage of pay) that is necessary to cover its obligation produces a more meaningful result.

The Wyatt Company indicated that it has made no assumption changes since last year. The Company continues to assume that the IRS limits on benefits will increase 5% per year. Actual increases over the last two years indicate a 5.4% rate of growth on the IRS limit. We believe that a 5% increase assumption is reasonable.

IV. CHANGES IN THE UNFUNDED LIABILITY

The Judges' Plan currently has an unfunded liability. An unfunded liability is not necessarily bad for an ongoing plan, as long as some provision is made to pay off the liability over time. However, the unfunded liability becomes a problem when it is so large that it precludes benefit security, or when, like any debt, interest on the liability becomes unmanageable.

Generally, unfunded liabilities tend to decrease over time, although some year-to-year fluctuation is normal. One symptom of a troubled pension plan is a constantly increasing unfunded liability. Annual changes in the unfunded liability occur when:

- Part of the contribution made each year goes to pay the normal costs (including expenses). The remaining contribution is called the past service contribution. The unfunded liability is automatically increased each year by the interest requirement of 8.5%. If the past service contribution is less than the interest requirement, there will be a net increase in the liability. When the past service contribution is greater than the interest requirement, part of the liability is "paid off," and the liability decreases.

- The unfunded liability is an actuarial projection of liabilities based on certain assumptions. To the extent actual experience differs from the assumptions, actuarial gains and losses may occur. An actuarial gain will decrease the unfunded liability; an actuarial loss will increase the unfunded liability.

- The assumptions and techniques used in calculating the unfunded liability are changed when circumstances warrant. These changes can produce increases or decreases in the unfunded liability.

- Changes in the legal, economic, and sociological environment often result in changes to retirement plans. These changes frequently result in improved benefits. When these changes result in higher retirement benefits, unfunded liabilities are increased.

During the year ended June 30, 1990, the Judges' Fund showed a small decrease in the unfunded liability for the following reasons.

1. **Contribution Rate**

   The total contributions to the plan were $6,279,000. However, expected normal cost, expenses and interest combined equal $6,110,000. The Wyatt Company increased the $169,000 difference by $97,000, a gain caused by actual salaries being less than the salaries projected last year. The net result is a surplus of $266,000 which decreases the unfunded liability.

2. **Actuarial Gains and Losses**

   The Wyatt Company calculated a loss of $423,000 from salary increases larger than expected. However, this amount is based on incorrect salaries. The Wyatt Company's mistake results in an approximate salary increase of 8.0%. Our calculation using actual salaries results in an average salary increase of 5.5%. The assumed salary increase is 6.5%. We calculate a gain of $158,000 due to salaries rising by less than expected. The difference between our amount and the Wyatt Company's is $581,000.

   The Fund experienced a gain on investments of approximately $239,000. According to the Wyatt Company, the MPRI fund experienced a mortality loss of $496,000 caused by retirees living longer than expected. In addition, higher than anticipated mortality for non-MPRI annuitants caused a gain of about $474,000. The remaining sources of gain and loss combined to produce a gain of $162,000.

   The Wyatt Company calculated a net loss due to all the above gains and losses of $44,000. We calculate the net effect to be a $1,580,000 gain. The biggest cause for this difference is the difference in the salaries used to calculate the amounts.

3. **Changes in Assumptions and Plan Provisions**

   There have been no changes in assumptions or plan provisions in the last year.

Changes in Unfunded Actuarial Accrued Liability*
(000's omitted)

A.	Unfunded actuarial accrued liability at beginning of year	$41,502
B.	Change due to interest requirement and current rate of funding	(266)
C.	Expected actuarial accrued liability at end of year: (A) + (B)	$41,236
D.	Actuarial losses (gains)	44
E.	Changes in assumptions and plan provisions	0
F.	Unfunded actuarial accrued liability at end of year: (C) + (D) + (E)	$41,280

* Results prepared by the Wyatt Company

V. SENSITIVITY ANALYSIS

In the course of actuarial valuation, liabilities and contributions are developed under a single actuarial cost method and one set of actuarial assumptions. However, since it is unlikely that any given assumption will prove to be exactly correct, we analyze the impact of a variation in an assumption. This analysis is called a sensitivity analysis.

We have analyzed the sensitivity to change of three of these assumptions and methods mandated by state law. Each of these plays a major role in determining costs:

1. Interest is currently assumed to be 8.5% for all years until retirement, and 5% thereafter. We examined the effect of changing 8.5% to 7.5%.

2. Salaries are assumed to increase 6.5% each year. We examined the effect of a 6% salary increase assumption.

3. The unfunded liability is amortized as a level percent of future payroll. This approach is not permitted for a private sector plan. We examined the effect of amortizing the unfunded liability using a level dollar amount.

	Current Deloitte & Touche	Value After Change: Interest	Value After Change: Salary Increase	Value After Change: Amortization
Unfunded liability	$41,180	$42,789	$40,673	$41,180
Actuarially determined contribution:				
Amount	4,866	5,047	4,815	6,702
Percent	24.10%	25.00%	23.85%	33.19%
Deficiency	19.79%	20.69%	19.54%	28.88%
Plan continuation liability	$67,802	$70,418	66,871	$67,802
Depth of funding:	41.47%	39.93%	42.05%	41.47%

JUDGES

VI. SUMMARY OF HISTORICAL VALUATION RESULTS**

(000'S Omitted)

Report as of June 30	Accrued Liability	Valuation Assets	Unfunded Accrued Liability	Normal Cost	Actuarial Contribution	Prescribed Employee Contribution
1981	32,615	8,514	24,101	1,564 (14.73%)	3,198 (30.12%)	496 (4.67%)
1982	35,217	8,740	26,477	1,537 (15.17%)	3,318 (32.74%)	460 (4.54%)
1983	40,556	11,049	29,507	1,807 (15.09%)	3,830 (31.99%)	543 (4.54%)
1984	42,378	11,792	30,586	1,950 (13.84%)	3,484 (24.73%)	589 (4.18%)
1985	46,843	13,784	33,059	2,041 (13.47%)	3,752 (24.77%)	611 (4.04%)
1986	51,102	15,983	35,119	2,225 (13.39%)	4,110 (24.73%)	675 (4.06%)
1987*	54,034	18,781	35,253	2,180 (13.63%)	4,152 (25.96%)	601 (3.76%)
1988*	59,708	20,760	38,948	2,567 (15.00%)	4,833 (28.25%)	759 (4.44%)
1989*	64,854	23,352	41,502	2,675 (14.26%)	4,558 (24.30%)	806 (4.30%)
1990*	69,396	28,116	41,280	2,942 (14.24%)	4,874 (23.59%)	891 (4.31%)

* As prepared by the Wyatt Company

** Figures shown in parentheses are as a percentage of payroll under normal retirement age.

JUDGES

VI. SUMMARY OF HISTORICAL VALUATION RESULTS**

(000'S Omitted)

Report as of June 30	Active Members Number	Active Members Valuation Payroll	Retired Members[2] Number	Retired Members[2] Avg. Annual Benefits	Deferred Annuitants Number	Deferred Annuitants Avg. Annual Benefits	Former Members Without Vested Rights
1981	220	10,618,500	126	11,715	4	7,048	3
1982	220	10,616,226	128	12,703	5	10,105	1
1983	229	12,685,000	135	13,906	5	10,105	0
1984	244	14,083,111	136	14,873	4	9,334	2
1985	239	15,145,615	139	16,136	8	18,810	0
1986	242	16,616,138	138	17,594	8	19,276	0
1987[1]	238	15,999,000	152	19,047	7	18,137	1
1988[1]	246	17,109,000	161	20,301	5	19,940	0
1989[1]	257	18,759,000	166	21,673	4	18,090	0
1990[1]	262	20,191,000 [3]	178	22,685	2	15,824	1

(1) As prepared by the Wyatt Company.
(2) Including beneficiaries and disabled members.
(3) Provided by Deloitte & Touche as correction of the Wyatt Company's result.

APPENDIX A

SUMMARY OF EMPLOYEE DATA

The Executive Director gave us employee information for all active members, inactive members, and retired members of the Fund. The following tables summarize the changes in active, inactive, and retired membership during the year.

To be consistent with the Wyatt Co., salaries used in the valuation were different than those that the Executive Director provided. All salaries were taken from the salary history of Constitutional Officers, Judges, Legislators, and related positions prepared by the Department of Employee Relations in June 1989. We are unclear as to why these salaries vary so significantly from those included in the MSRS data base.

To reflect anticipated current year salary increases, all salaries provided were increased to a level half-way between the approved salaries of January 1, 1990 and January 1, 1991.

Appendix A (continued)

MINNESOTA STATE RETIREMENT SYSTEM
JUDGES' RETIREMENT FUND

Covered Judges' Retirement Fund Employee Census Data as of June 30, 1990

	Number	Annual Payroll
Judges' Retirement Fund		
Actives at June 30, 1989	257	$18,686,446
New Entrants*	23	
Total	280	
Less Separations from Active Service:		
Disability	1	
Terminated with Refund	1	
Service Retirement	16	
Death	1	
Total Separations	19	
Data Adjustments	0	
Actives at June 30, 1990	261	$20,114,110
Supreme Court Justices' Plan		
Actives at June 30, 1990	1 *	$ 76,539 **
Total Active Judges at June 30, 1990	262	$20,190,649

Average Entry Age of New Employees

For the Fiscal Year Year Ending	Average Age at Entry
6/30/86	47.2
6/30/87	46.4
6/30/88	44.6
6/30/89	44.5
6/30/90	44.2

* No change from June 30, 1989.
** Was $72,539 as of June 30, 1989.

Appendix A (continued)

MINNESOTA STATE RETIREMENT SYSTEM
JUDGES' RETIREMENT FUND

Judges' Retirement Fund Annuitant Census
Data as of June 30, 1990

		Number	Annual Annuity Benefit Payable
A.	**Service Retirement Annuitants**		
	Receiving at June 30, 1989	97	$2,561,932
	New	16	386,064
	Deaths	(5)	(91,481)
	Adjustments - Net Result	(3)	21,527
	Receiving at June 30, 1990	105	$2,878,042
	Non-MPRIF	16	554,501
	MPRIF	89	2,323,541
		105	$2,878,042
B.	**Disabled Employees**		
	Receiving at June 30, 1989	5	$ 129,056
	New	1	27,894
	Adjustments - Net Result	3	75,078
	Receiving at June 30, 1990	9	$ 232,028
	Non-MPRIF	1	23,655
	MPRIF	8	208,373
		9	$ 232,028
C.	**Widows Receiving an Annuity or Survivor Benefit & Children**		
	Receiving at June 30, 1989	66	$ 941,646
	New	3	47,138
	Deaths	(5)	(78,988)
	Adjustments - Net Result	0	34,157
	Receiving at June 30, 1990	64	$ 943,953
	Non-MPRIF	55	773,089
	MPRIF	9	170,864
		64	$ 943,953

Appendix A (continued)

		Number	Annual Annuity Benefit Payable
D.	**Deferred Annuitants**		
	Receiving at June 30, 1989	4	72,362
	New	0	0
	Return to Work	(1)	(4,804)
	Adjustments	(1)	(35,910)
	Deferred at June 30, 1990	2	$ 31,648

Average Age at Retirement of New Service Annuitants *

Fiscal Year Ending	Average Retirement Age
6/30/84	69.2
6/30/85	68.0
6/30/86	69.1
6/30/87	67.3
6/30/88	65.6
6/30/89	65.3
6/30/90	67.7

* Not including District or Supreme Court, or County Paid Judges or Widows

APPENDIX B

MINNESOTA STATE RETIREMENT SYSTEM
JUDGES' RETIREMENT FUND

Summary of Principal Plan Provisions as of June 30, 1990

JUDGES' PLAN

1.	**Coverage:**	From first date as a Judge.
2.	**Types of Coverage:**	
	a. **Including Social Security:**	All Judges except those excluded by Item 2(b) are covered by Social Security.
	b. **Not Including Social Security:**	Judges before January 1, 1974 were given the opportunity to elect not to be covered under Social Security.
3.	**Contributions:**	
	a. **From Judges:**	Judges pay the Social Security Tax rate applied to the entire salary, plus an additional .5% of salary. For those Judges with Social Security coverage, the additional contribution is 1.25%, and the appropriate portion of the total contribution is forwarded to Social Security.
	b. **From the State:**	The State provides any additional funds necessary to meet obligations as Judges retire.
4.	**Final Average Salary:**	Monthly average for the highest five years of salary within the last 10 years.

Appendix B (continued)

5. **Normal Retirement:**

a. **Eligibility:**	Earlier of: o Attainment of age 65 and completion of five years of service; or o Attainment of age 70.
b. **Benefit Amount:**	2.5% of final average salary for each year of service before June 30, 1980, plus 3% of final average salary for each year thereafter.
c. **Maximum Benefit:**	65% of annual salary in the year immediately preceding retirement.

6. **Early Retirement:**

a. **Eligibility:**	Attainment of age 62 and completion of five years of service.
b. **Benefit Amount:**	Normal retirement benefit formula based on service and final average salary to date of early retirement, but reduced 1/2% for each month that actual retirement precedes age 65.

7. **Form of Payment:**	Life annuity with no guarantees upon death. Joint and survivor options are available.

8. **Disability Retirement:**

a. **Eligibility:**	None other than disablement while in office.
b. **Benefit Amount:**	o Full salary for the first two years of disability paid outside the plan.

Appendix B (continued)

- o After two years of disability, an annuity computed in the same way as the full benefit amount for service retirement, subject to a minimum of 25% of final average salary.

9.	**Deferred Service : Retirement:**	Any annuity benefit described above may be deferred until the early or normal retirement date.
10.	**Return of Contributions:**	Upon termination of employment, if a Judge qualifies for no other benefits under this plan, he will receive his contributions, accumulated with interest, at a rate of 5% compounded annually.
11.	**Pre-Retirement Survivor's Annuity:**	60% of the annuity determined in the same manner as normal service retirement benefits, assuming the Judge retired on his date of death. Subject to minimum of 25% of final average salary.
12.	**Post-Retirement Survivor's Annuity:**	
	a. Joint and Survivor Election:	In lieu of receiving benefits in the standard life annuity form of payment, a retiring Judge may elect actuarially reduced benefits in the joint and survivor annuity form.
	b. Prior Survivor's Benefits:	Judges who were in office before January 1, 1974 and who continue to make additional contributions of 4% of salary receive benefits in the 50% joint and survivor form, with no actuarial reduction.

13. Social Security Offset: For Judges participating in Social Security, Judge's Plan benefits are reduced by 50% of the primary Social Security benefit payable.

SUPREME COURT JUSTICES' PLAN

1. Coverage: Supreme Court Justices as of December 31, 1973 who elected coverage under Chapter 490.025 in lieu of coverage under Chapters 490.121 through 490.132.

2. Retirement With Continuation of Compensation:

- **a. Eligibility:** Attainment of age 70 and completion of 12 years of Supreme Court service, or 15 years of service as a Supreme Court Judge and Judge of District Court.

- **b. Benefit Amount:** Continuation of final compensation until the end of the term to which the Supreme Court Justice was elected.

  50% of final salary plus an additional 2.5% of final salary for each year of Supreme Court service in excess of 12, except for service after age 73; payable after the continuation of compensation ceases. The maximum benefit is 75% of final salary.

3. Retirement Without Continuation of Compensation:

- **a. Eligibility:** Earlier of:

  o Attainment of age 65 and completion of 12 years of Supreme Court service; or

  o Attainment of age 70 and completion of two full terms.

- **b. Benefit Amount:** 50% of final salary plus an additional 2.5% of final salary for each year of Supreme Court service in excess of 12.

Appendix B (continued)

4. **Disability Benefits:**

a. **Eligibility:**	Disablement after completion of two full terms.
b. **Benefit Amount:**	50% of final salary plus an additional 2.5% of final salary for each year of Supreme Court service in excess of 12 years.

5. **Contributions from Judges:**	4% of salary to provide a 50% joint and survivor benefit with no actuarial reduction.

APPENDIX C

ACTUARIAL METHODS AND ASSUMPTIONS

ACTUARIAL METHODS

Chapter 356 of the Minnesota Statutes calls for the determination of normal cost and accrued liability in accordance with the entry age normal cost method, one of several available projected cost methods. For the June 30, 1990 valuation, we used the individual entry age normal method, with salary scale.

The unfunded liability is amortized by the level percent of payroll method. (Each amortization payment is calculated as if the following year's payment would increase by 6.5%.)

ACTUARIAL ASSUMPTIONS

The tables on the following pages summarize the actuarial assumptions used for this valuation.

CHANGES IN ACTUARIAL ASSUMPTIONS

The actuarial assumptions have not been changed since the last valuation.

Appendix C (continued)

MINNESOTA STATE RETIREMENT SYSTEM
JUDGES' RETIREMENT FUND

Summary of Actuarial Assumptions and Methods

JUDGES' RETIREMENT FUND

1.	**Mortality:**	1971 Group Annuity Mortality Table for Males with ages set back eight years for females.
2.	**Withdrawal:**	None.
3.	**Disability:**	Graded rates on actual experience, as adjusted by the June 30, 1979 experience analysis and as set forth in the Separation From Active Service Table.
4.	**Expenses:**	Prior year's expenses expressed as a percentage of prior year's payroll.
5.	**Interest Rate:**	8.5% per annum preretirement, 5% per annum postretirement.
6.	**Salary Scale:**	6.5%.
7.	**Assumed Retirement Age:**	Later of age 68 or one year hence.
8.	**Actuarial Cost Method:**	Entry age cost method, with normal cost determined as a level percentage of future payroll on an individual basis.

9. **Social Security:**

a. **Primary Amount:**	Maximum current primary amount ($975.00 per month for 1990 assuming retirement at normal retirement age. Delayed retirement credit increases this amount if retirement occurs after the normal retirement age), increasing with salary scale.
b. **Level Contribution Rate:**	7.65%.
c. **Covered Annual Wages:**	Current annual wage base ($51,300 for 1990), increasing with salary scale.

SUPREME COURT JUSTICES

1. **Mortality (Pre- and PostRetirement):**	1971 Group Annuity Mortality Table for Males with ages set back eight years for females.
2. **Withdrawal:**	None.
3. **Interest Rate:**	8.5% preretirement, 5% postretirement.
4. **Salary Scale:**	6.5% per annum, disregarding actual salary history. Benefits in excess of IRC Sec. 415 limits caused by salary increases are disregarded.
5. **Expenses:**	Prior year expenses expressed as a percentage of prior year's payroll.
6. **Retirement Age:**	Latest of: o Attainment of age 70; o Completion of 12 years of service; or o One year from valuation date.

Appendix C (continued)

MINNESOTA STATE RETIREMENT SYSTEM
JUDGES' RETIREMENT FUND

Male Judges
Separation from Active Service
(Number Separating at Each Age Per 10,000 Working at That Age)

Age	Death	Disability	Age and Service Retirement	Age	Death	Disability	Age and Service Retirement
20	5			45	29	3	
21	5			46	33	5	
22	5			47	38	7	
23	6			48	42	9	
24	6			49	47	11	
25	6			50	53	14	
26	7			51	59	16	
27	7			52	65	20	
28	7			53	71	24	
29	8			54	78	28	
30	8	2		55	85	34	
31	9	2		56	93	40	
32	9	2		57	100	46	
33	10	2		58	109	56	
34	10	2		59	119	66	
35	11	2		60	131	76	
36	12	2		61	144	90	
37	13	2		62	159	110	
38	14	2		63	174	136	
39	15	2		64	192	174	
40	16	2		65	213		
41	18	2		66	236		
42	20	2		67	263		
43	23	3		68			10,000
44	26	3					

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Appendix C (continued)

MINNESOTA STATE RETIREMENT SYSTEM
JUDGES' RETIREMENT FUND

Male Judges
Separation from Active Service
(Number Separating at Each Age Per 10,000 Working at That Age)

Age	Death	Disability	Age and Service Retirement	Age	Death	Disability	Age and Service Retirement
20	4			45	13	5	
21	4			46	14	6	
22	4			47	15	7	
23	4			48	16	7	
24	4			49	18	10	
25	5			50	20	10	
26	5			51	23	12	
27	5			52	26	14	
28	5			53	29	16	
29	5			54	33	20	
30	5			55	38	24	
31	6			56	42	30	
32	6			57	47	36	
33	6			58	53	44	
34	7			59	59	52	
35	7	1		60	65	62	
36	7	1		61	71	74	
37	8	1		62	78	88	
38	8	1		63	85	104	
39	9	2		64	93	122	
40	9	2		65	100		
41	10	2		66	109		
42	10	4		67	119		
43	11	4		68			10,000
44	12	4					