Milliman Proposal

Actuarial Consulting Services

June 12, 2014

Minnesota Legislative Commission on Pensions and Retirement

Timothy J. Herman, FSA, EA, MAAA
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June 12, 2014

Mr. Lawrence A. Martin
Executive Director
Legislative Commission on Pensions and Retirement
55 State Office Building
100 Constitution Avenue
St. Paul, Minnesota 55155

Dear Mr. Martin:

We are pleased to present the enclosed proposal in response to the Legislative Commission on Pensions and Retirement's Request for Proposal (RFP). We look forward to continuing our relationship with the LCPR.

Milliman, Inc. is a major nationwide firm of consulting actuaries and is particularly well qualified to carry out this work:

- **Dedicated Team with Institutional Knowledge of the Minnesota Plans.** From 1992 to 2002, Milliman was the retained actuary for the Commission. In this capacity, Milliman prepared the actuarial valuations, experience studies, legislative cost analysis, etc. Since 2009, Milliman has been the Commission Actuary. In this capacity, Milliman has prepared the actuarial audit and review services similar to those requested in this RFP. The lead consultants for this assignment will be Tim Herman and Bill Hogan, who are both Principals and Consulting Actuaries of the Milwaukee pension practice. Mr. Hogan's experience with the Minnesota retirement funds spans the entire 17 year period and Mr. Herman's experience includes 12 years for which Milliman provided services to the Commission. We will leverage this extensive institutional knowledge of the Minnesota retirement plans as we provide services to the Commission.

- **Firm-wide Public Sector Experience and Resources which are Second to None**. We serve over 250 public pension clients. This means we have national exposure to the issues facing state and local government retirement systems. Our consultants continually keep abreast of any emerging issues or legislation relating to public plans and we will keep you informed about them. We frequently collaborate on new or complicated issues and peer review each other's client assignments. We often attend and speak at industry wide gatherings specializing in governmental plans (e.g. NASRA, NCPERS, and GFOA conferences). We are active on committees and task forces developing new standards for the public sector.

- **Valuation Systems to Handle Complex Plan Provisions**. Milliman uses its own proprietary valuation system (VAL 2000) which is maintained by a corporate team of actuaries and programmers. We have consistently used this system to program extremely complex public pension plans. The State of Minnesota plans are currently coded on our system so there will be no transition issues.

- **A fresh perspective for today's needs.** We understand that the value of an actuary is not limited to informing you of what has happened but also includes providing analysis and consultation on what is likely to happen in the future. Our valuation systems are designed to readily provide future cash flow information to assist you with budgeting and forecasting. We also maintain tools for more sophisticated modeling so you can view what the future may hold under multiple scenarios.

The main body of our proposal is organized so as to be consistent with the requested proposal requirements as specified in Section X of the RFP. We do propose to provide all services outlined in Section I of the RFP. The following information is presented in our proposal:

We believe that no conflict of interest, real or apparent, exists with regard to this proposal or to the services proposed herein. No employee of Milliman is a State of Minnesota public official nor does any employee have any financial interest in conflict with the State. The only consulting relationship that Milliman, Inc. has with any Minnesota public employee pension plan, employer or organization is shown in Section IX. The various insurance consulting relationships are totally independent and unrelated and have not and will not involve any member of the consulting team providing services to the LCPR. This proposal has been arrived at independently. None of its contents or fees have been disclosed to any other bidders or competitor and no attempt has been made to influence the submission of any other firm.

All services provided under a contract arising from this RFP would be performed in accordance with generally accepted actuarial procedures. All information provided by the State would be handled in the strictest of confidence and would be released only at the expressed direction of the Commission. All services would be completed in accordance with the timetable outlined in Section II of the RFP.

We are pleased to have the opportunity to make this proposal. We would be glad to discuss it with the Subcommittee on Actuarial Services during a personal interview.

Respectfully submitted,

Milliman, Inc.

Timothy J. Herman, FSA, EA, MAAA
Principal and Consulting Actuary

William V. Hogan, FSA, EA, MAAA
Principal and Consulting Actuary

TJH/cmw

SECTION I: MINIMUM QUALIFICATION STANDARDS

We hereby certify that Milliman, Inc. meets the definition of an approved actuary in Minnesota Statutes, Section 356.215. The following information is provided for the Commission's consideration.

1. Sufficient Firm Size

Milliman, Inc. has grown to a firm of over 2,800 employees of whom over 500 are actuaries that are Fellows of the Society of Actuaries (FSA) or the Casualty Actuarial Society (FCAS). This growth provides Milliman with significant resources to meet the Legislative Commission's needs. The primary members of the proposed consulting team for the Minnesota Legislative Commission on Pensions and Retirement are all F.S.A.'s, have over 10 years of public plan experience; and the lead consultants are both principals of the Firm.

2. Prior Public Pension Experience By Actuarial Firm

For Milliman, governmental actuarial services are a priority, as the firm's largest clients are in the public sector. Our experience performing actuarial services for large public employee retirement systems dates back to our engagement with the Washington State Employees Retirement System in 1947. Milliman has performed actuarial studies or valuations for over two-thirds of the state retirement systems.

Milliman is involved in all aspects of PERS (Public Employee Retirement System), including development of contribution rates, recommendation of benefit design changes, working with PERS staff on administrative matters (disclosure, communication and recordkeeping) and actuarial audits. Our consultants have experience testifying before governing bodies: legislatures, city councils, and other governing boards. Our extensive involvement in all levels of public plans means we understand the complications of changes from different points of view; participants, administrators, legislature, taxpayers, etc.

Please see Section II.2 for more information about Milliman's extensive experience in providing actuarial services for large statewide systems.

3. Prior Public Pension Experience By Assigned Firm Personnel

From 1992 to 2002, Milliman was the retained actuary for the Commission. In this capacity, Milliman prepared the actuarial valuations, experience studies, legislative cost analysis, etc for the Minnesota retirement plans. Since 2009, Milliman has been the Commission Actuary. In this capacity, Milliman has prepared the actuarial audit and review services similar to those requested in this RFP. The lead consultants for this assignment will be Tim Herman and Bill Hogan, who are both Principals and Consulting Actuaries of the Milwaukee pension practice. Mr. Hogan's experience with the Minnesota retirement funds spans the entire 17 year period and Mr. Herman's experience includes 12 years for which Milliman provided services to the Commission. Our general expertise with public plans, combined with the institutional knowledge of the Minnesota plans, will allow us to "hit the ground running" once a contract is negotiated.

Please see Sections II.3 and III of our proposal for additional information about the significant public sector experience of the lead consultants assigned to work on this contract.

4. Prior Reviewing/Auditing Actuary Experience

Both the firm and the Milliman consultants assigned to provide services to the Commission have significant experience in reviewing and auditing the work products of other actuaries. Milliman is well known in the public sector community for the breadth and depth of our audits.

5. Accessibility

The senior consultants pledge to be available on limited notice to respond to requests or to meet with the Commission. Our prior track record of availability to the Commission is solid and the Commission can be assured of continued availability.

6. Contractual Issues

Milliman’s policy is to have a signed Consulting Services Agreement with every client. Milliman and the LCPR already had a Contract to provide Actuarial Review and Auditing Services for the past six years (see Appendix C). If this proposal is accepted, we will work with you to provide the requested services under a similar agreement.

SECTION II: FIRM INFORMATION

1. Structure, Operational Method and Communication Capability

ABOUT MILLIMAN

Milliman was founded in 1947, and was officially incorporated on July 5, 1957. We provide a full range of actuarial and other consulting services to our clients in the areas of:

- Employee benefits, investment, and compensation consulting services
- Health consulting services
- Life and financial consulting services
- Property and casualty consulting services

Milliman is a global firm of consultants and actuaries with more than 50 offices in the US and overseas. Milliman employs approximately 2,800 people, including a professional staff of over 1,300 qualified actuaries and consultants.

Milliman is wholly owned and managed by approximately 400 Principals, who have been elected in recognition of their technical, professional and business achievements. Our sole business is providing independent consulting services. We are not affiliated with any public accounting or brokerage firms. The consultants of the firm are not permitted to own stock in any insurance or reinsurance company, nor are our consultants allowed to own stock in client organizations. In these ways, Milliman is able to provide analyses and opinions that are totally independent and objective.

Milliman offers a wide range of consulting expertise to state and municipal retirement systems. We have experience with several hundred public retirement systems. Our expertise covers all aspects of public retirement systems including actuarial valuations, experience investigations, development of plan costs, actuarial reviews, working with staff on administrative, disclosure, communication and record keeping issues, and testifying before legislative committees and governing boards.

Because of our commitment to public sector actuarial consulting, we are able to provide all services in-house. The services will be provided by staff in our Brookfield, Wisconsin office. We will use Milliman's proprietary pension valuation system to complete the actuarial computations. This system is maintained by our Systems and Programming staff located in our corporate office in Seattle. We will call upon additional resources from throughout the firm as necessary to provide you with high-quality, cost-effective consulting services. With our network of experienced Milliman consultants, we will be able to help you address your issues quickly and efficiently.

Milliman's Employee Benefits Resource Group monitors all new employee benefits developments in both public and private sectors for the entire firm. The Group prepares internal continuing education sessions and periodicals to keep Milliman consultants and clients up-to-date with trends, changes and potential changes affecting the employee benefits arena. You may view some of these materials on our website at www.milliman.com.

COMMUNICATION CAPABILITY

Plan sponsors need an actuarial firm that can communicate at a non-technical level and do formal and informal presentations to a wide spectrum of audiences. Milliman's team is known for our personal, hands-on approach and for our plain-English style of communication. We are known for our ability to take complex technical subjects and present them in lay terms.

Many of our projects require us to present the results of our work to non-technical audiences, in both oral and written form, and we are very comfortable with this type of communication. Our annual presentations to the Minnesota LCPR require us to present the results of a technical actuarial audit in a 20-30 minute PowerPoint presentation. As another example, our work for the City of Wichita involved a condensed discussion of annual valuation results presented to the City Council. Tim and Bill are both confident public speakers who enjoy the opportunity to explain their work to non-actuarial audiences.

2. Public Plan Experience

For Milliman, governmental actuarial services are a priority, as the firm's largest clients are in the public sector. Milliman has performed actuarial studies or valuations for over two-thirds of the state retirement systems.

Milliman is involved in all aspects of PERS (Public Employee Retirement System), including development of contribution rates, recommendation of benefit design changes, working with PERS staff on administrative matters (disclosure, communication and recordkeeping) and actuarial audits. Our consultants have experience testifying before governing bodies: legislatures, city councils, and other governing boards. Our extensive involvement in all levels of public plans means we understand the complications of changes from different points of view; participants, administrators, legislature, taxpayers, etc. Messrs. Herman and Hogan have recently testified to both the Minnesota Legislative Commission on Pensions and Retirement and Mr. Herman has presented to the Board of Trustees and City Council for the City of Wichita pension plans.

Milliman's experience performing actuarial services for large public employee retirement systems dates back to our engagement with the Washington State Employees Retirement System in 1947. The following chart details our current PERS clients with at least 75,000 members.

Retirement System	Client Since	Number of Members	Market Value of Assets ($ billions)
California State Teachers' Retirement System	1999	848,000	146.0
Florida Retirement System	1986	982,000	119.4
Idaho Public Employees Retirement System	1965	77,000	11.0
Los Angeles County Employees Retirement Association	1999	149,000	30.5
Minnesota Legislative Commission on Pensions and Retirement *	1991-2003, 2009	300,000	42.0

* *The proposed project team annually completes an actuarial review of the actuarial valuations for selected funds of the retirement systems administered by the Duluth Teachers Retirement Fund Association (DTRFA), the Minnesota Public Employees Retirement Association (PERA), the Minnesota State Retirement System (MSRS), the Minnesota Teachers Retirement Association (TRA), and the St. Paul Teachers Retirement Association (StPTRFA).*

Retirement System	Client Since	Number of Members	Market Value of Assets ($ billions)
New Jersey Teachers' Pension and Annuity Fund	1995	236,000	25.0
Oregon Public Employees Retirement System	2012	300,000	55.0
Puerto Rico Government Employees Retirement System	2009	252,000	1.2
Puerto Rico Teachers Retirement System	2007	81,000	1.9
Puerto Rico Government Employees Retirement System	2009	252,000	1.2
Texas County and District Retirement System	1999	218,000	15.5

Milliman, Inc. makes a financial commitment to PERS. Along with the Pension Research Council, Milliman, Inc. funded the preparation of *Retirement System for Public Employees* by Thomas P. Bleakney of Milliman, Inc. This text is used as an introduction to PERS for groups such as legislators and system trustees, and has been used as part of the syllabus for the Society of Actuaries.

Every year our firm sponsors speakers at educational meetings such as:

- Government Finance Officers Associations (GFOA)
- National Conference of Public Employee Retirement Systems (NCPERS)
- National Council of Teacher Retirement (NCTR)
- National Association of State Retirement Administrators (NASRA)
- National Conference of State Legislatures (NCSL)
- International Foundation of Employee Benefit Plans (IFEBP)

MILLIMAN PUBLIC PENSION FUNDING STUDY

In November 2013, Milliman released its second Public Pension Funding Study, which independently measures the aggregate funded status of the 100 largest U.S. public pension plans using basic actuarial principles and reported plan liabilities and assets. The aggregate accrued liability information provided has been determined on a uniform basis with respect to the interest rate assumption across all of the plans in the study. This uniform approach allows for an accurate picture of the overall funded status of these 100 pension plans based on an independent application of Actuarial Standards Board (ASB) standards of practice, actual investment portfolios, and current capital market assumptions. We are not aware of any other study that has taken this approach and we feel this is an important story that needs to be told. A copy of the study is included in Appendix D.

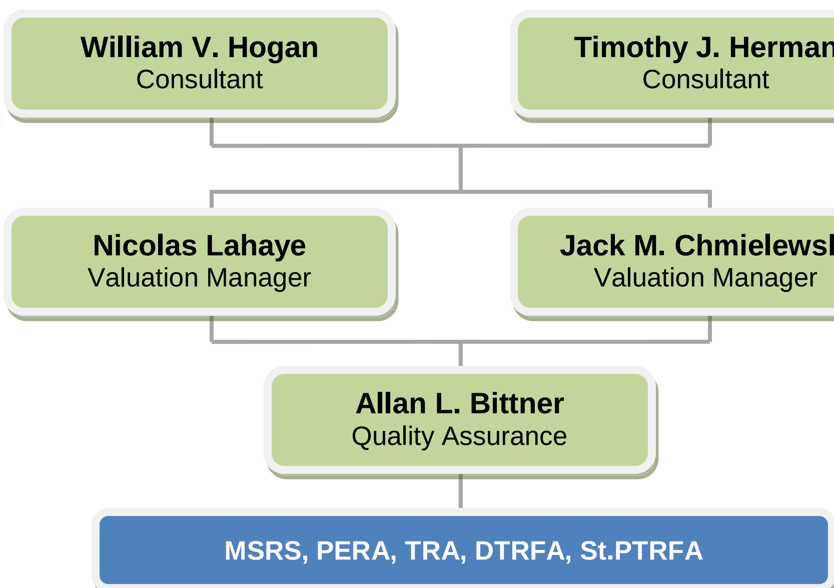
3. Assigned Personnel and Experience

The entire list of qualified Milliman public plan actuaries would be available for assistance with work under this contract. We are happy to work with the Commission and staff to assure assignment of a qualified and compatible team. We propose the following consulting team, providing the institutional knowledge from prior and current service to the Commission and assuring depth of expertise which will help to assure continuity of uninterrupted service to the State of Minnesota should any of the team members be unable to continue in their assigned position.

Name	Role/ Responsibilities	Years Actuarial Experience	Public Plan Experience	Degree	Actuarial Credentials
Timothy J. Herman	Primary Actuary and Consultant	22 years	19 years	MS Actuarial Science	Enrolled Actuary FSA, MAAA
William V. Hogan	Primary Actuary and Consultant	36 years	27 years	BS Actuarial Science	Enrolled Actuary FSA, MAAA, CAPP
John M. Chmielewski	Secondary Actuary and Valuation Manager	10 years	10 years	BS Actuarial Science	Enrolled Actuary FSA, MAAA
Nicolas Lahaye	Secondary Actuary and Valuation Manager	13 years	13 years	BS Actuarial Science	Enrolled Actuary FSA, MAAA
Allan L. Bittner	Secondary Actuary and Quality Assurance	17 years	17 years	MS Actuarial Science	Enrolled Actuary FSA, MAAA

We have assembled this team to provide the State of Minnesota with the optimum combination of experience, expertise and accessibility. As noted on the individual resumes in Appendix A, each of the primary and secondary actuaries is a Fellow of the Society of Actuaries and a Member of the American Academy of Actuaries. Each has considerable experience in their field of specialization and has worked extensively in the public employer arena.

We anticipate that the bulk of the work will be performed in the firm's Milwaukee office. The work will be split between two work teams as follows:



Since being rehired by the Commission in 2009, Milliman has delivered replication valuations of TRA, DTRFA, St.PTRFA, MSRS General, MSRS State Patrol, MSRS Correctional, PERA General, PERA Police & Fire, PERA Local Correctional, and the MERF division of PERA funds. The proposed project team outlined above has delivered the actuarial valuation review services, review of optional annuity form table changes, and completed a special assignment regarding a change in the interest rate assumption to use a select and ultimate basis without skipping a beat.

The Milwaukee office (with a total staff of over 240 employees) have 25 professionals working full-time in the retirement plan consulting unit. If needed, additional resources from other offices who have significant public plan experience will be utilized.

4. REFERENCES

As requested we provide below the names, addresses and phone numbers of reference contacts at several of our largest retirement plan clients.

California State Teachers Retirement System	**Contact:**	**Mr. Ed Derman** Deputy Chief Executive Office California STRS 100 Waterfront Place West Sacramento, CA 95605 ederman@calstrs.com	916.229.3712
State of Florida **Division of Retirement**	**Contact:**	**Mr. Garry Green** 1317 Winewood Boulevard Building 8 Tallahassee, FL 32399 garry.green@dms.myflorida.com	850.414.6349
Bureau of Local Retirement Systems	**Contact:**	**Mr. Keith Brinkman** 1317 Winewood Boulevard Building 8 Tallahassee, FL 32399 keith.brinkman@dms.myflorida.com	850.414.6315
Idaho Public Employees Retirement System	**Contact:**	**Mr. Donald Drum** Executive Director Idaho Public Employees Retirement System 607 North 8th Street Boise, ID 83702 don.drum@persi.idaho.gov	208.334.2451
Los Angeles County **Employees Retirement Association**	**Contact:**	**Gregg Rademacher** Chief Executive Officer 300 North Lake Avenue, Suite 820 Pasadena, CA 91101 grademacher@lacera.com	626.564.2494
New Jersey Teachers' Pension and Annuity Fund	**Contact:**	**Mr. John Megariotis** Assistant Director, Finance State of New Jersey Division of Pensions & Benefits 50 West State Street Trenton, NJ 08625-0295	609.292.3674
Oregon Public Employees Retirement System	**Contact:**	**Mr. Paul Cleary** Executive Director Oregon PERS (OPERS) 11410 SW 68th Parkway Tigard, OR 97223 paul.cleary@pers.state.or.us	503.603.7701

Puerto Rico Government Employee Retirement System	**Contact:**	**Lcdo. Francisco del Castillo Orozco** Administrador Interino Administración de los Sistemas de Retiro de los Empleados de Gobierno y la Judicatura Plaza Retiro 437 Ave. Ponce de León, Pda. 32½ San Juan, PR 00917-3711 787.754.4545 ext. 1129
Puerto Rico Teachers Retirement System	**Contact:**	**Ms. Wanda Santiago Lopez** Interim Executive Director Capital Center Building, North Tower, 8th Floor #235 Arterial Hostos Avenue PO Box 191879 Hato Rey, PR 00919-1879 787.754.8611
Texas County & District Retirement System	**Contact:**	**Gene Glass** Director Barton Oaks Plaza IV, 5th Floor 901 Mopac Expressway South Austin, TX 78746 512.637.3345 gene@tcdrs.org

5. Client Additions and Subtractions

Milliman does not maintain a comprehensive client database from which the requested information could be retrieved. We have done our best to gather the requested information. Due to the number of public sector clients, we have limited this information to public clients over 1,000 lives.

Shown below are three lists: ***First*** is the list of ongoing public employee pension plans Milliman, Inc. has added to its client list during the last five years; ***second*** is the list of special project work for public employee pension plans (limited to those with 1,000 participants or more) added during the last five years; ***third*** is the list of public employee pension plans Milliman, Inc. has lost as clients during the last five years.

In addition, Milliman has over 1,000 public clients for GASB 45 (postretirement medical benefit) valuations. A list can be provided upon request.

Public Pension Plans Added

ONGOING WORK:

City of Portland Fire & Police Disability & Retirement Fund
Erlanger Medical Center
Metropolitan Transit Authority of Harris County
Oregon PERS
Town of Westport, CT

Public Pension Plans Added
SPECIAL PROJECT WORK:
Alameda County Employees Retirement Association
City and County of San Francisco Employees Retirement System
City of Dallas Pension Plan
City of Detroit
Contra Costa County Employees Retirement Association
LEOFF 2 Retirement Board and Pension Funding Council audit of the Washington State Actuary
Marin County Employees Retirement Association
Orange County Employees Retirement System
PA Budget Office
San Bernardino County Employees Retirement Association
San Diego County Employees Retirement Association

Public Pension Plans Lost
City of Omaha Metropolitan Utilities District Retirement System
City of Roanoke Employees' Retirement System
City of Wichita Retirement Systems
Iowa Public Employees Retirement System
Kansas City Board of Public Utilities Retirement Pension Plan
Kansas City, MO, Police Retirement Systems
Kansas Public Employees Retirement System
Oklahoma Public Employees Retirement System
Omaha School Employees Retirement System
Santa Barbara County Employees' Retirement System

6. Firm's Valuation System

We will continue to use our proprietary valuation system, VAL 2000, described in further detail below.

Milliman consults or is system actuary to many of the country's largest and most complex state systems. Two things all state systems have in common are complexity and significance, which make it vital that:

- Policy makers have precise information reflecting the complexity and significance of the system, and
- The actuary fully understands, and hence can fully explain, the developed results

Our proprietary software provides another layer of independent review – we are not just confirming that parameters were properly entered in third-party software which may also be used by the Fund Actuary. Because of this, Milliman has its own proprietary valuation software and financial projection systems. Our software and systems are fully customizable, recognizing the complexity and significance of each state system. Consulting actuaries are supported by a highly experienced, dedicated systems' and programming team, most of whom also hold actuarial credentials. The proposed service team has extensive experience with our valuation system and the Minnesota retirement plans that are covered by the scope of services are already coded on our system. When summarizing analysis, our actuaries know their results and never have to speculate – this is due to our major client-focused commitment to our proprietary software and systems

VAL 2000 FUNCTIONS, FEATURES AND CAPABILITIES

Milliman's Systems & Programming (S&P) pension group has been developing, maintaining and supporting Milliman's pension systems since 1969. For over 40 years, S&P's challenge has been implementing comprehensive, powerful and flexible systems that manage data correctly while providing optimal latitude in meeting client requirements. The success of this commitment is demonstrated in VAL 2000, our proprietary defined benefit valuation package that analyzes historical information to project current and future values of benefits and investment.

Because Milliman has developed the valuation system, we are able to code the system as necessary to properly value public sector benefit plans. For example, VAL 2000 was recently modified to allow for a timing parameter that governs when decrements occur during the valuation year, allowing for more accurate modeling of teacher systems and giving us more flexibility when matching results produced by other actuarial firms.

VAL 2000 Functions, Features and Capabilities

Designed and developed by actuaries for use by consultants and clients, VAL 2000 meets the requirements of a full spectrum of defined benefit plans, including public, corporate, multiemployer, not-for-profit and tax-exempt plans. It produces all the items necessary for determining annual plan costs and meeting financial disclosure requirements.

VAL 2000 was designed based on input by a large group of Milliman consultants and the inherent diversity of plan designs, constraints and structures. At the highest level, key functions of VAL 2000 include:

- Specifying plan provisions and actuarial assumptions.
- Maintaining participant data, including reconciliation from one valuation to the next.
- Valuing liabilities.
- Calculating costs, including gain/loss analysis.
- Consolidating results in a series of standard reports.

Design, Development and Implementation Standards

The premier design standards for VAL 2000 are reliability (data integrity) and flexibility (power). These standards are supported by Microsoft Windows™ development technologies that include MS Visual Basic on WIN 98, 2000 and XP operating systems running current versions of MS Office on a networked desktop platform. Visual Basic screens are the front end to a Fortran system that VAL 2000 accesses for calculations. The entire development and operating environment makes VAL 2000 easily adaptable to changes in regulatory or business rule requirements in addition to providing a level of customization that helps users meet unique client requirements.

VAL 2000 User Experience

As a Windows-based software package, VAL 2000 requires minimal technical training but a good understanding of actuarial data and solid analytical skills. Considerable effort was taken to place as much technology "under the hood" so analysts can focus on their valuations, not the technology. As a result, analysts can efficiently and effectively interact with the data in straightforward, uncomplicated terms to deliver comprehensive, accurate solutions and analyses to clients as quickly as possible. One-site training, Help desk support and a full suite of documentation, including Quick Reference Guides, module-specific Operating Manuals, Formula Reference Manuals and context sensitive On-line Help, contribute to enhancing user proficiency and accuracy.

DATA RETENTION

Milliman, Inc. will not destroy or otherwise dispose of any data obtained from the various pension plans or other data sources without the prior approval of the Commission Chair or of the Executive Director of the Commission.

Milliman, Inc., in handling demographic data obtained from the pension plans and in dealing with any person or party other than the Commission Executive Director or the authorized representatives of the applicable pension plan, will conform to the applicable requirements of the Minnesota Government Data Practices Act, Minnesota Statutes, Chapter 13.

Any information received by Milliman, Inc. from the Legislative Commission on Pensions and Retirement or from a statewide or major local Minnesota public employee retirement plan must be considered "confidential information." However, unless contrary to Minnesota Statutes, Chapter 13, information received from the Legislative Commission on Pensions and Retirement or a retirement plan will not be considered confidential information if (1) the information is or comes to be generally available to the public through no fault of Milliman, Inc., (2) the information was independently developed by Milliman, Inc. without resort to information provided to Milliman, Inc. by or on behalf of the Legislative Commission on Pensions and Retirement or a retirement plan, or (3) Milliman, Inc. appropriately receives the information from another source which is not under an obligation of confidentiality to the Legislative Commission on Pensions and Retirement. Milliman, Inc. agrees that confidential information shall not be disclosed to any third party without prior written consent by the Commission Executive Director, or as compelled by subpoena or similar judicial instrument. In the case of a subpoena or similar judicial instrument, Milliman, Inc. shall provide reasonable advance notice to the Commission Executive Director to allow the Legislative Commission on Pensions and Retirement to seek a protective order.

7. Potential Conflicts of Interest

Shown below are all Milliman, Inc. current or prior consulting relationships with Minnesota public employee plans, governmental employing unit, or public employee labor union:

PAST CONTRACTUAL ARRANGEMENTS

Plan or Employer	Type of Consulting	Milliman, Inc. Office/Staff
City of Bloomington, Minnesota	Casualty Consulting	Milwaukee/Casualty
Minnesota Self-Insurers Security Fund	Casualty Consulting	Milwaukee/Casualty
Workers Comp Reinsurers Association	Workers Compensation	Milwaukee/Casualty
Minnesota Assigned Risk Plan	Casualty Consulting	Minneapolis/Casualty

CURRENT CONTRACTUAL ARRANGEMENTS

Plan or Employer	Type of Consulting	Milliman, Inc. Office/Staff
Minnesota Legislative Commission on Pension and Retirement	Ongoing Pension	Milwaukee/Pension
Bloomington Fire Relief Association	Ongoing Pension	Chicago/Pension
City of Hibbing	GASB 45 Valuation	Minneapolis/Pension
City of Rochester	Health Consulting	Milwaukee/Health
Minnesota Department of Human Services	Health Consulting	Milwaukee/Health
Minnesota Service Cooperatives	Health Consulting	Minneapolis/Health
League of Minnesota Cities Insurance Trust	Casualty Consulting	Milwaukee/Casualty
Hennepin County Medical Center	Casualty Consulting and GASB 45 Valuation	Milwaukee/Casualty, Health, and Pension
Hennepin County	Health Consulting and GASB 45 Valuation	Milwaukee/Health and Pension
Hibbing Public Utilities	GASB 45 Valuation	Milwaukee Health and Chicago Pension

Milliman expects to continue the current contractual arrangements during the contract with the Commission. With the Commission's permission, Mr. Herman expects to continue to provide quality assurance support to the Chicago Pension Practice for the ongoing relationship with the Bloomington Fire Relief Association. If a conflict were to arise, Mr. Herman would be replaced by another qualified Milliman actuary on the Bloomington Fire account.

8. Audited Annual Financial Report

Milliman is not a publicly held company so a copy of our most recent audited financial report has not been included. If the Commission feels it needs any specific financial information regarding the firm, we will provide it upon request.

SECTION III: APPROACH AND WORK PLAN

OUR UNDERSTANDING OF LCPR's GOALS

The Minnesota Legislative Commission on Pensions and Retirement was established to (1) study Minnesota public pension plans and retirement topics, (2) make recommendations that further sound pension policy for public plans, (3) arrange for the review or audit of the annual actuarial valuation and related actuarial work for the major and statewide Minnesota public employee pension plans, and (4) analyze proposed legislation that impacts the public pension plans in the state. In order to meet their goals and objectives, the Commission wishes to retain an actuarial firm to assist the Commission in the review or audit of regular actuarial valuations, experience studies, actuarial cost studies, and other actuarial work provided to the major and statewide Minnesota public pension plans by their actuarial advisers and to provide input and suggestions to the Commission.

SCOPE OF SERVICES

The services to be provided can be categorized into the following broad service areas:

- Review/audit of actuarial valuation reports
- Review/audit of experience studies
- Review standards for actuarial work
- Review/audit of proposed benefit changes in legislation
- Support services including analysis with respect to but not limited to, optional form factors, service purchase programs, and privatization gains/losses,
- Education and consulting to Commission and staff as needed.
- Prepare special studies or research

WORK PLAN

From 1992 to 2002, Milliman was the retained actuary for the Commission. In this capacity, Milliman prepared the actuarial valuations, experience studies, legislative cost analysis, etc for the Minnesota retirement plans. Since 2009, Milliman has been the Commission Actuary. In this capacity, Milliman has prepared the actuarial audit and review services similar to those requested in this RFP. The lead consultants for this assignment will be Tim Herman and Bill Hogan, who are both Principals and Consulting Actuaries of the Milwaukee pension practice. Mr. Hogan's experience with the Minnesota retirement funds spans the entire 17 year period and Mr. Herman's experience includes 12 years for which Milliman provided services to the Commission. Our general expertise with public plans, combined with the institutional knowledge of the Minnesota plans, will allow us to "hit the ground running" once a contract is negotiated.

The following table provides an overview of the requested services and the applicable due dates.

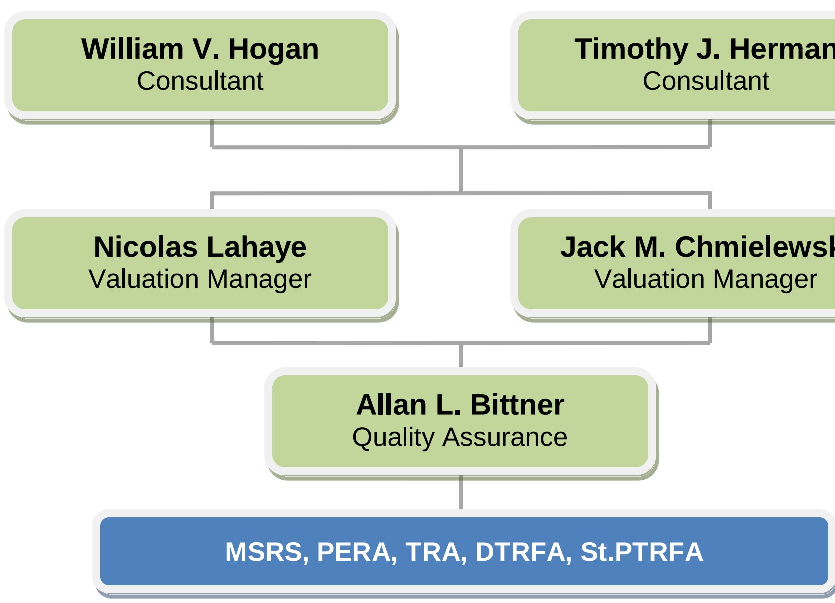
Fiscal Year Ending:	06/30/2015	06/30/2016	06/30/2017	06/30/2018	06/30/2019
Review Actuarial Standards	01/30/2015	N/A	N/A	N/A	N/A
Actuarial Valuation Review	04/01/2015	04/01/2016	04/01/2017	04/01/2018	04/01/2019
Replication Valuation	MSRS General	PERA General	TRA	St.PTRFA	PERA P&F
Reasonableness Review	11 other funds	11 other funds	11 other funds	11 other funds	11 other funds

Fiscal Year Ending:	06/30/2015	06/30/2016	06/30/2017	06/30/2018	06/30/2019
Experience Study Review	06/30/2015*	N/A	N/A	N/A	N/A
Legislative Cost Estimate Review	Due Date as requested	Due Date as requested	Due Date as requested	Due Date as requested	Due Date as requested
Optional Form Factor Review	Due Date as requested	Due Date as requested	Due Date as requested	Due Date as requested	Due Date as requested
Prior Service Credit Purchase Review	Due Date as requested	Due Date as requested	Due Date as requested	Due Date as requested	Due Date as requested
Additional Requested Services	Due Date as requested	Due Date as requested	Due Date as requested	Due Date as requested	Due Date as requested

* *The due date is shown for illustrative purposes assuming that the last experience study is filed with the Commission on May 1, 2015. The experience study review is due 60 days following the date the last of the three experience studies (MSRS General, PERA General, and TRA) is filed with the Commission.*

We propose to organize the work among two teams. While all staff is available as needed, the "primary team" is the team expected to provide most, if not all, of the actuarial and consulting services for the public systems to which they are assigned. Given the nature of our work, it is possible for workloads to vary significantly from year to year, particularly during the legislative session. By having two teams available as backup to the primary team, we can ensure the Commission that the required services can be performed in the timeframe requested.

The basic services outlined in the RFP will be split between the two work teams as follows:



Mr. William V. Hogan will have overall responsibility for the work performed for the Commission and will coordinate all work with the Commission staff. Mr. Hogan is located in the Milwaukee office. It is expected that either Mr. Hogan or Mr. Herman will present reports and results to the Commission. In the event that neither Mr. Herman nor Mr. Hogan is available, one of Messrs. Bittner, Chmielewski, or Lahaye would be competent replacements.

The consultants who will be working on this contract have considerable experience in auditing the actuarial work performed by other firms. In addition, as a major provider of actuarial services to public retirement systems, we also have been on the other side of an audit and we understand the retained actuary's perspective. As professionals, we are confident that we can work with the actuaries retained by the individual systems to identify any differences that might arise as the result of the replication work we will be performing and we will keep the LCPR informed of those differences.

REVIEW OF COMMISSION'S STANDARDS FOR ACTUARIAL WORK

The proposed team will review the Standards for Actuarial Work adopted by the LCPR last updated and revised on August 11, 2010. The review will include conformity to applicable industry standards of actuarial practice, applicability given legislative changes since August 11, 2010, and consistency of work. The results of the Standards for Actuarial Work review and proposed revision will consist of a written report on its findings and on its proposed revisions by January 30, 2015. A presentation will be made by a senior Milliman, Inc. team member to the LCPR at a schedule meeting of the Commission summarizing the review findings and proposed revisions.

REVIEW AND REPLICATION OF ACTUARIAL VALUATIONS

For the actuarial valuations of the statewide and major local retirement plans, the proposed team will review each document for conformity with the applicable requirements of Minnesota Statutes, Section 356.215, of the Commission's Standards For Actuarial Work and with the applicable Actuarial Standards of Practice (ASOPs) issued by the Actuarial Standards Board, will perform a parallel actuarial calculation for the scheduled retirement plans and identify differences and inconsistencies, and assess the remaining valuations for the reasonableness of the presented valuation results. The valuation replication and the review shall be completed by April 1 of the year following the actuarial valuation date.

For the replication valuations, we will follow the steps set out below:

Step 1: Verify demographic data used in valuation

Step 2: Verify application of actuarial cost method and application of actuarial assumptions

Step 3: Reproduce and confirm valuation results via replication valuation

Step 4: Review funding calculations

Step 5: Summarize findings

The schedule for the replication valuation is outlined in the chart on the previous page. In years when a replication is not necessary, we will review the written valuation reports for adherence to the review standards in the Minnesota statutes, as well as the ASOPs. If we are not comfortable with the valuation results or feel an additional level of review is necessary, we may ask for some individual trace lives to review the detailed coding of the benefits. This is most likely to occur if plan provisions are changed, assumptions are changed or unusual valuation results occur.

As a result of our most recent review of the Minnesota plans, it has come to our attention that some actuarial firms may refuse to provide sample life information. If we are unable to obtain sample life information, we will work with the Commission and its staff to identify acceptable review procedures that fit within the proposed pricing.

REVIEW OF EXPERIENCE STUDIES

For the 2008-2014 experience studies of MSRS General, PERA General, and TRA, the proposed team will review the studies for conformity with the applicable requirements of Minnesota Statutes, Section 356.215, of the Commission's Standards For Actuarial Work, and with the ASOPs and will review each study for the reasonableness of the presented results and recommendations of assumptions by the applicable retirement plan consulting actuary. The review will be completed 60 days following the date on which the last of the three experience studies is filed with the Commission.

REVIEW OF ACTUARIAL COST ESTIMATES OF PROPOSED LEGISLATION

For actuarial cost estimates related to proposed legislation during the Legislative Session, the proposed team will review the actuarial cost estimate for the reasonableness of its assumptions, the reasonableness of its methodology, and the reasonableness of its results. The review will be conducted within five business days following the date on which the estimate is provided to Milliman. If the requested work is of such a nature that more time is necessary to prepare a reasonable opinion, Milliman will notify the LCPR and the parties may agree that more time shall be provided or the scope of the project may be redefined in order to meet the original timeline.

REVIEW OF OPTIONAL ANNUITY FORM TABLE CHANGES OR ANNUITY RESERVE FACTOR CHANGES

For any optional annuity form table change or any annuity reserve factor change occurring after July 1, 2014, the proposed team will review the table or factor results for conformity with the applicable requirements of Minnesota Statutes, Section 356.215, of the Commission's Standards For Actuarial Work and with the ASOPs and for the reasonableness of the results. The results of the review will be reported to the Commission within 30 days of the receipt of the assignment from the executive director of the Commission.

REVIEW OF PRIOR SERVICE CREDIT PURCHASE PAYMENT AMOUNT DETERMINATIONS

For any prior service credit purchase payment amount determinations prepared after July 1, 2014, the proposed team will review the determination for conformity with Minnesota Statutes, Section 356.551, and for the reasonableness of the results. The results of the review will be reported to the Commission within 30 days of the receipt of the assignment from the executive director of the Commission.

REVIEW OF PRIVATIZATION GAIN AND LOSS CALCULATIONS

For any privatization gain and loss calculations after July 1, 2014, the proposed team will review the calculations for conformity with Minnesota Statutes, Chapter 352F or 353F and Minnesota Statutes, Section 356.215, of the Commission's Standards For Actuarial Work and with the ASOPs and for the reasonableness of the results. The results of the review will be reported to the Commission within 30 days of the receipt of the assignment from the executive director of the Commission.

QUALITY ASSURANCE

Assuring the highest quality professional services is essential to our success. Milliman has developed an extensive formal program of documentation requirements and both pre-release and post-release peer review procedures. These procedures assist Milliman in providing a high-quality work product in an efficient manner.

Milliman has multi-layered checking and peer review process to ensure the quality of its work. Essential components of this process include the following:

- All of our analysis, whether it is released externally or not, is checked in detail by a consultant who was not involved directly with the original work. The checking process encompasses data entry, spreadsheet formulas, computer code, documentation, report text, and other items. It includes an assessment of the reasonableness of the results, as well as the technical accuracy of the calculations. The checking is documented via printouts and emails.

- Work products delivered to clients must be signed by a Milliman consultant to whom the firm has granted “signature authority”. Consultants obtain signature authority by achieving the highest professional designation available to them, demonstrating a high level of professional experience and technical ability, and demonstrating a thorough knowledge of the firm’s guidelines on checking and peer review. All signature authority candidates must pass a file review conducted by the firm’s Quality Committee.

- Work products delivered to clients are subject to a formal peer review procedure. The peer review is performed by a consultant with signature authority who was not directly involved in completing the project. Each project is assigned a risk level, and projects with higher risk level are subject to a more stringent peer review process, such as signoff by a principal of the firm or—in extreme cases—by one of the firm’s national practice directors.

- All of our work product is documented in client files. Client files contain data sources (de-identified where necessary), technical analysis and work papers, client communications, and evidence of checking and peer review. Client files retained by each Milliman office are subject to “post-release peer review” by the firm’s Quality Committee on a rolling three-year cycle. Any deficiencies are communicated and may subject the office to additional review in the future.

This project, like all others we perform, will be subject to our usual checking and peer review processes. All valuations and cost analysis will be checked before results are communicated, and all of our correspondence and reports will receive a thorough peer review. We will retain detailed files on our work in order to be able to address issues that arise after our reports have been delivered.

The Milwaukee office's compliance with the pre-release and post-release peer review program assures that Milliman's high quality standards have been met.

SECTION IV: ACTUARIAL SERVICES COMPENSATION

We do not charge for computer expenses.

There will not be any development cost charged to the State of Minnesota.

The following services will be provided on a fixed fee basis:

	Fiscal Year Ending				
Project Scope	06/30/2015	06/30/2016	06/30/2017	06/30/2018	06/30/2019
Review Actuarial Standards	$10,000	N/A	N/A	N/A	N/A
Actuarial Valuation Review	$89,500	$92,200	$94,500	$97,400	$99,300
Replication Valuation	MSRS General	PERA General	TRA	St.PTRFA	PERA P&F
Reasonableness Review	11 other funds	11 other funds	11 other funds	11 other funds	11 other funds
Experience Study Review	$24,000*	N/A	N/A	N/A	N/A

* *Peer review audit of the experience studies for MSRS General, PERA General, and TRA.*

Other services to the Commission will be billed based on actual time charges for each member of the team.

	Fiscal Year 2014 Hourly Billing Rates
Primary Actuary	$375 - $490
Secondary Actuary	$250 - $375
Other Professional Staff	$125 - $225
Actuarial Assistants	$100 - $150
Technical and Clerical	$90 - $115

Rates shown are for 2014. Billing rate ranges in subsequent years will increase by CPI-U. The proposed project team charges the same billing rates to all of the Milwaukee office clients.

Our billing procedures would be to submit actual time charges on a monthly basis (toward the end of the following month). Charges for those services included in the fixed fee contract price will be capped if and when the total price reaches 90% of the fixed fee until the services are completed. At such time, the remainder of the fixed fee will be billed (similar to our current contract).

We would be happy to work with the Commission and to prepare any billing detail to assist in the process of allocating costs for actuarial services.

SECTION V: AFFIRMATIVE ACTION COMPLIANCE

A copy of Milliman's current certificate of compliance issued by the Minnesota Commissioner of Human Rights is attached.

Minnesota Department of
HUMAN RIGHTS

CERTIFICATE OF COMPLIANCE

MILLIMAN, INC. is hereby certified as a contractor by the Minnesota Department of Human Rights. This certificate is valid from 1/13/2014 to 1/13/2018.

This certification is subject to revocation or suspension prior to its expiration if the department issues a finding of noncompliance or if your organization fails to make a good faith effort to implement its affirmative action plan.

Minnesota Department of Human Rights

FOR THE DEPARTMENT BY:

Kevin M. Lindsey, Commissioner

AN EQUAL OPPORTUNITY EMPLOYER

Freeman Building • 625 Robert Street North • Saint Paul, Minnesota 55155
Tel 651.539.1100 • MN Relay 711 or 1.800.627.3529 • Toll Free 1.800.657.3704 • Fax 651.296.9042 • mn.gov/mdhr

Minnesota Department of
HUMAN RIGHTS

January 13, 2014

MILLIMAN, INC.
ATTN: Brenda Mueller
1301 FIFTH AVE
SUITE 3800
SEATTLE, WA 98101

Your organization's affirmative action plan has been approved by the Minnesota Department of Human Rights. The department's review of your equal employment opportunity policies and practices indicates compliance with Minnesota Statutes, Sec. 363A.36.

The Certificate of Compliance is enclosed. This certification is subject to revocation or suspension prior to its expiration if the department issues a finding of noncompliance or if your organization fails to make a good faith effort to implement its affirmative action plan.

Also enclosed is an Annual Report form packet, which includes:

- A sample annual report;
- Affirmative Action Plan Progress Report spreadsheet;
- the Affirmative Action Progress Report narrative

The Annual Report form packet must be completed and submitted annually during the certification period whether a state contract has been awarded to you or not. The MDHR website (mn.gov/mdhr) has the complete packet in an excel version. **This packet must be submitted together or it will be rejected. <u>You must submit reports as required and promptly notify us of any address or status changes.</u>**

If you have any questions, please contact Compliance Services at 651-539-1095 or compliance.mdhr@state.mn.us.

Sincerely,

Kevin M. Lindsey, Commissioner
Minnesota Department of Human Rights

Enclosures: Certificate of Compliance
Annual Report Form Packet
Posters (2)

AN EQUAL OPPORTUNITY EMPLOYER

Freeman Building • 625 Robert Street North • Saint Paul, Minnesota 55155
Tel 651.539.1100 • MN Relay 711 or 1.800.627.3529 • Toll Free 1.800.657.3704 • Fax 651.296.9042 • mn.gov/mdhr

SECTION VI: WORKERS' COMPENSATION COMPLIANCE

A copy of Milliman's current certificate of compliance regarding Milliman's workers' insurance coverage requirements of Minnesota law for any Minnesota employees is attached.

ACORD®

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY): 06/25/2013

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER
Parker, Smith & Feek, Inc.
2233 112th Avenue NE
Bellevue, WA 98004

CONTACT NAME:
PHONE (A/C, No, Ext): 425-709-3600 | FAX (A/C, No): 425-709-7460
E-MAIL ADDRESS:

INSURER(S) AFFORDING COVERAGE	NAIC #
INSURER A : Pacific Indemnity Co.	
INSURER B :	
INSURER C :	
INSURER D :	
INSURER E :	
INSURER F :	

INSURED
Milliman, Inc.
1301 Fifth Ave., Suite 3800
Seattle, WA 98101

COVERAGES CERTIFICATE NUMBER: REVISION NUMBER:

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSR	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
	GENERAL LIABILITY COMMERCIAL GENERAL LIABILITY CLAIMS-MADE / OCCUR GEN'L AGGREGATE LIMIT APPLIES PER: POLICY / PRO-JECT / LOC						EACH OCCURRENCE	$
							DAMAGE TO RENTED PREMISES (Ea occurrence)	$
							MED EXP (Any one person)	$
							PERSONAL & ADV INJURY	$
							GENERAL AGGREGATE	$
							PRODUCTS - COMP/OP AGG	$
								$
	AUTOMOBILE LIABILITY ANY AUTO ALL OWNED AUTOS / SCHEDULED AUTOS HIRED AUTOS / NON-OWNED AUTOS						COMBINED SINGLE LIMIT (Ea accident)	$
							BODILY INJURY (Per person)	$
							BODILY INJURY (Per accident)	$
							PROPERTY DAMAGE (Per accident)	$
								$
	UMBRELLA LIAB / OCCUR EXCESS LIAB / CLAIMS-MADE DED / RETENTION $						EACH OCCURRENCE	$
							AGGREGATE	$
								$
A	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY Y/N ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? (Mandatory in NH) If yes, describe under DESCRIPTION OF OPERATIONS below	N / A		71719457 ** All States except WA, OH, ND, WY	6/30/2013	6/30/2014	X WC STATU-TORY LIMITS / OTH-ER	
							E.L. EACH ACCIDENT	$ 1,000,000
							E.L. DISEASE - EA EMPLOYEE	$ 1,000,000
							E.L. DISEASE - POLICY LIMIT	$ 1,000,000

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (Attach ACORD 101, Additional Remarks Schedule, if more space is required)
SAMPLE CERTIFICATE.

CERTIFICATE HOLDER

SAMPLE CERTIFICATE

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE
Melissa Keith

ACORD 25 (2010/05) The ACORD name and logo are registered marks of ACORD

1 of 1 MILLIMAN (MAK00)

SECTION VII: STATEMENT OF CAPACITY

Milliman, Inc. currently has the resources available to provide the services requested including the production of actuarial valuations and experience study reports as specified in Minnesota Statutes Section 356.215 and the current Commission Standards for Actuarial work.

SECTION VIII: SAMPLE OF WORK PRODUCTS

Copies of Milliman's work products including actuarial valuations, experience studies and benefit cost studies are included in Appendix B.

SECTION IX: PAST OR CURRENT MINNESOTA RELATIONSHIPS

Any past or current contractual arrangements with a Minnesota public employee pension plan, a Minnesota public employing unit, an organization of Minnesota public employees or a comparable group with an interest in Minnesota public pension policy making are listed below:

PAST CONTRACTUAL ARRANGEMENTS

Plan or Employer	Type of Consulting	Milliman, Inc. Office/Staff
City of Bloomington, Minnesota	Casualty Consulting	Milwaukee/Casualty
Minnesota Self-Insurers Security Fund	Casualty Consulting	Milwaukee/Casualty
Workers Comp Reinsurers Association	Workers Compensation	Milwaukee/Casualty
Minnesota Assigned Risk Plan	Casualty Consulting	Minneapolis/Casualty

CURRENT CONTRACTUAL ARRANGEMENTS

Plan or Employer	Type of Consulting	Milliman, Inc. Office/Staff
Minnesota Legislative Commission on Pension and Retirement	Ongoing Pension	Milwaukee/Pension
Bloomington Fire Relief Association	Ongoing Pension	Chicago/Pension
City of Hibbing	GASB 45 Valuation	Minneapolis/Pension
City of Rochester	Health Consulting	Milwaukee/Health
Minnesota Department of Human Services	Health Consulting	Milwaukee/Health
Minnesota Service Cooperatives	Health Consulting	Minneapolis/Health
League of Minnesota Cities Insurance Trust	Casualty Consulting	Milwaukee/Casualty
Hennepin County Medical Center	Casualty Consulting and GASB 45 Valuation	Milwaukee/Casualty, Health, and Pension
Hennepin County	Health Consulting and GASB 45 Valuation	Milwaukee/Health and Pension
Hibbing Public Utilities	GASB 45 Valuation	Milwaukee Health and Chicago Pension

Milliman expects to continue the current contractual arrangements during the contract with the Commission. With the Commission's permission, Mr. Herman expects to continue to provide quality assurance support to the Chicago Pension Practice for the ongoing relationship with the Bloomington Fire Relief Association. If a conflict were to arise, Mr. Herman would be replaced by another qualified Milliman actuary on the Bloomington Fire account.

William V. Hogan

FSA, EA, MAAA, FCA
Principal, Consulting Actuary

CURRENT RESPONSIBILITY

Bill is a principal and consulting actuary with the Milwaukee office of Milliman. He joined the firm in 1988. Bill is in charge of managing the Milwaukee office pension practice. He also continues to serve as a lead consultant for a number of clients with work relating to various types of retirement plans, both public and private. His responsibilities include consulting on pension actuarial work, pension administration and compliance, the actuarial valuation of retiree medical benefits to other post-employment benefits such as life insurance, nonqualified pension benefits, gift annuity reserve valuations, and expert analysis and testimony involving pension matters.

EXPERIENCE

Bill has been doing actuarial work since 1978. His work has been primarily with defined benefit and defined contribution plan consulting and administration, retiree medical plan consulting, and other actuarial matters involving retirement programs including expert analysis and testimony. Bill has served both private and public employee retirement systems on a variety of subjects, including employee benefit plan design, experience studies, actuarial valuations, cost estimates, individual benefit calculations, and merger and acquisition consulting. In addition, Bill has provided expert witness services with respect to retirement benefits since he started with Milliman in 1988. These services have been provided in divorce actions, damage awards, and lost earnings.

PRESENTATIONS AND PUBLICATIONS

Bill has been a speaker on pension and employee benefits matters at seminars, meetings of the Society of Actuaries, Milliman technical meetings, and before various other groups. He has also taught classes for the International Foundation of Employee Benefit Plans.

PROFESSIONAL DESIGNATIONS

- Fellow, Society of Actuaries
- Fellow, Conference of Consulting Actuaries
- Member, American Academy of Actuaries
- Enrolled Actuary, ERISA
- Member, Wisconsin Retirement Plan Professionals Ltd.

EDUCATION

- BS, Actuarial Science, University of Illinois

15800 W. Bluemound Road, Suite 100
Brookfield, WI 53005-6043
Tel +1 262 784 2250 Fax +1 262 923 3687
Email bill.hogan@milliman.com

Timothy J. Herman

FSA, EA, MAAA
Principal and Consulting Actuary

CURRENT RESPONSIBILITY

Tim is a principal and consulting actuary in the Milwaukee office of Milliman. He has 20 years of experience and rejoined the firm in 2011. Tim is currently the lead consultant for a number of clients with work relating to various types of retirement plans.

EXPERIENCE

Tim has spent over 20 years providing retirement consulting services to plan sponsors that range from small privately held companies to large publicly traded companies and large public plans. He has served plan sponsors on a variety of subjects, including employee benefit plan design, experience studies, actuarial valuations, cost estimates, individual benefit calculations, merger and acquisition consulting and plan governance issues. He has also performed stochastic projections of both assets and liabilities for several large public plan clients. He has assisted several public employers with the analysis of the impact of their retiree medical plan under Government Account Standards Board (GASB) Statement Number 45.

Tim served on the Society of Actuaries Education and Examination Committee. He has been a speaker on pension and employee benefit matters at Milliman technical meetings and at various professional meetings. He has also taught classes in the Certified Employee Benefits Specialists program (CEBS).

PROFESSIONAL DESIGNATIONS

- Fellow, Society of Actuaries
- Enrolled Actuary, ERISA
- Member, American Academy of Actuaries
- Director, Wisconsin Retirement Plan Professionals Ltd.

EDUCATION

- BS, Mathematics, University of Wisconsin
- MS, Actuarial Science, University of Wisconsin

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Nicolas Lahaye

FSA, EA, MAAA
Actuary

CURRENT RESPONSIBILITY

Nicolas is an actuary with the Milwaukee office of Milliman. He currently supervises the actuarial work on a number of retirement clients. He joined the firm in 2001.

EXPERIENCE

Nicolas has supervised client projects in the areas of plan funding, experience analysis, benefit studies, and other areas of financial management relating to retirement programs. He has been involved in asset/liability studies, including stochastic projections of both assets and liabilities, and helping clients to assess and manage the volatility of their retirement programs. He also supervises the analysis of Other Post-Employment Benefits (OPEB) under GASB 45 and Accounting for Pensions under GASB 27 for several public entities.

PROFESSIONAL DESIGNATIONS

- Fellow, Society of Actuaries
- Enrolled Actuary, ERISA
- Member, American Academy of Actuaries

EDUCATION

- BS, Actuarial Science,
  Laval University

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milliman.com

John "Jack" M. Chmielewski

FSA, EA, MAAA
Actuary

CURRENT RESPONSIBILITY

Jack is an actuary with the Milwaukee office of Milliman. He currently supervises the actuarial work on a number of retirement clients. He joined the firm in 2002.

EXPERIENCE

Jack has supervised client projects in the areas of plan funding, experience analysis, benefit studies, and other areas of financial management relating to retirement programs. He also monitors our compliance work with corporate clients including nondiscrimination testing, preparation of electronic government forms and review of pension distribution paperwork. Jack has been involved in asset/liability studies, including stochastic projections of both assets and liabilities, and helping clients to assess and manage the volatility of their retirement programs. He also supervises the analysis of Other Post-Employment Benefits (OPEB) under GASB 45 and Accounting for Pensions under GASB 27 for several public entities.

PROFESSIONAL DESIGNATIONS

- Fellow, Society of Actuaries
- Enrolled Actuary, ERISA
- Member, American Academy of Actuaries

EDUCATION

- BS, Actuarial Science, Drake University

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milliman.com

Milliman Bio

Allan L. Bittner

FSA, EA, MAAA
Principal, Consulting Actuary

CURRENT RESPONSIBILITY

Allan is a principal and consulting actuary with the Milwaukee office of Milliman. He joined the firm in 1997.

EXPERIENCE

Allan has supervised client projects in the areas of plan funding, experience analysis, benefit studies, and other areas of financial management relating to retirement programs. He has performed stochastic projections of assets and liabilities for several large public plan clients.

Allan is also a member of the Milliman Actuarial Retirement Calculator (MARC) team. He provides input on actuarial issues relating to the development and installation of MARC. He has also been responsible for the testing of several MARC installations.

PROFESSIONAL DESIGNATIONS

- Fellow, Society of Actuaries
- Enrolled Actuary, ERISA
- Member, American Academy of Actuaries

EDUCATION

- BS, Mathematics/English, Marquette University
- MS, Actuarial Science, University of Wisconsin, Madison

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Email allan.bittner@milliman.com

Minnesota Legislative Commission on Pensions and Retirement

Replication of the Actuarial Valuation of the Minnesota State Retirement System State Patrol Retirement Fund as of July 1, 2013

Prepared by:

Milliman, Inc.

William V. Hogan, FSA, EA, MAAA
Principal and Consulting Actuary

Timothy J. Herman, FSA, EA, MAAA
Principal and Consulting Actuary

January 31, 2014

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Milliman

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January 31, 2014

Minnesota Legislative Commission
on Pensions and Retirement
State Office Building, Room 55
100 Rev. Dr. Martin Luther King Jr. Boulevard
St. Paul, Minnesota 55155

Attention: Mr. Lawrence A. Martin, Executive Director

Ladies and Gentlemen:

The enclosed report presents the findings and comments resulting from a review and replication of the July 1, 2013 actuarial valuation of the State Patrol Retirement Fund (Fund) administered by the Minnesota State Retirement System (MSRS). An overview of our major findings is included in the Executive Summary section of the report. More detailed commentary and information is provided in the sections that follow.

We pursued this analysis and review with a constructive mindset. We looked to identify any possible suggestions that might improve understanding of or confidence in the actuarial services being provided. Naturally, some of the comments may be viewed as personal preference or nit-picky in nature. While we are not trying to impose our own preferences or biases on the Fund or the retained actuary, neither did we hesitate to make such comments if we believed that some change, however minor, would improve the actuarial functions.

This report has been prepared for use by the Minnesota Legislative Commission on Pensions and Retirement (LCPR) in their oversight role with regard to the Fund. It has been prepared using Milliman valuation systems in a manner that would be used by Milliman to prepare a full actuarial valuation of the Fund. We recognize that there are hundreds of thousands of complex calculations performed by the actuarial valuation system. For this reason, even the smallest differences between valuation systems can produce noticeable differences in the valuation results between two different actuaries.

In preparing this report, we have relied without audit on the employee data, plan provisions, value of the plan assets and other plan financial information as provided by various involved entities including your office, MSRS, Fund actuary and others. We have reviewed this data for reasonableness and for consistency with previously supplied information. If any of this information as summarized in this report is inaccurate or incomplete, the results shown could be materially affected and this report may need to be revised.

Actuarial assumptions, including discount rates, mortality tables, and others identified in this report, and actuarial cost methods are those used by the Fund Actuary and as prescribed by statute or adopted by the applicable Board and approved by the LCPR. These parties are responsible for selecting the plan's funding policy, actuarial valuation methods, asset valuation methods, and assumptions. The policies, methods, and assumptions used in this valuation are those that have been so prescribed and are described in the Actuarial Basis of this report.

This valuation report is only an estimate of the System's financial condition as of a single date. It can neither predict the System's future condition nor guarantee future financial soundness. Actuarial valuations do not affect the ultimate cost of System benefits, only the timing of System contributions. While the valuation is based on an array of individually reasonable assumptions, other assumption sets may also be reasonable and valuation results based on those assumptions would be different. No one set of assumptions is uniquely correct. Determining results using alternative assumptions is outside the scope of our engagement.

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

On the basis of the foregoing we hereby certify that, to the best of our knowledge and belief, this report is complete and accurate and has been prepared in accordance with generally recognized and accepted actuarial principles and practices which are consistent with the principles prescribed by the Actuarial Standards Board (ASB) and the Code of Professional Conduct and Qualification Standards for Public Statements of Actuarial Opinion of the American Academy of Actuaries.

Milliman's work is prepared solely for the use and benefit of the LCPR. To the extent that Milliman's work is not subject to disclosure under applicable public records laws, Milliman's work may not be provided to third parties without Milliman's prior written consent unless allowed under the Legislative Commission on Pensions and Retirement Contract for Actuarial Review and Auditing Consulting Services dated July 18, 2013. Milliman does not intend to benefit or create a legal duty to any third party recipient of its work product. No third party recipient of Milliman's work product should rely upon Milliman's work product. Such recipients should engage qualified professionals for advice appropriate to their own specific needs.

Any distribution of the enclosed report must be in its entirety including this cover letter, unless prior written consent is obtained from Milliman, Inc. This report has been prepared in accordance with the terms and provisions of the Legislative Commission on Pensions and Retirement Contract for Actuarial Review and Auditing Consulting Services effective July 18, 2013.

We, William V. Hogan, FSA, and Timothy J. Herman, FSA, are actuaries for Milliman, Inc. We are members of the American Academy of Actuaries and Fellows of the Society of Actuaries, and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein.

We look forward to making a personal presentation of our findings in briefings to the Minnesota Legislative Commission on Pensions and Retirement and to relevant staff members.

Respectfully submitted,

Milliman, Inc.

William V. Hogan, FSA, EA, MAAA
Principal and Consulting Actuary

Timothy J. Herman, FSA, EA, MAAA
Principal and Consulting Actuary

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Executive Summary

Purpose and Scope of the Actuarial Replication Audit

In accordance with Minnesota Statutes, Section 356.214, Subdivision 4, the LCPR has engaged Milliman, Inc. to perform a replication of the July 1, 2013 actuarial valuation of the Fund administered by MSRS.

In performing the replication of the actuarial valuation, we follow several well defined steps. These steps involve a review and cleansing of the data used in the actuarial valuation, an assessment of the plan provisions to be valued, an analysis of the actuarial assumptions to be applied, a review of the reported value of plan assets as of the valuation date, and preparation of the actuarial calculations using appropriate computer programming and summarizing the results. All of the above steps are to be applied in accordance with the requirements of Minnesota statutes and the Actuarial Standards For Actuarial Work adopted by the LCPR.

In conducting our work, we initially prepared the above steps independently from the work of the Fund Actuary. After completing that work, we conducted a review of some individual benefit trace information in order to identify any key differences in programming or technique. We then prepared a summary of the key valuation results, showing a comparative of our results to those of the Fund Actuary.

It is important to recognize that the actuarial valuation process, while very sophisticated in its calculation methodology, is still an estimate of the financial value of benefits payable on contingent events, most of which occur many years into the future. As such, a considerable amount of uncertainty and variability surrounds those estimates. As actuaries we recognize this fact and are comfortable that small differences (in percentages) in the results do not change the overall financial results portrayed in the valuation. Furthermore, the actuarial software used by different firms has implicit differences that create differences in the valuation numbers. For this reason, we believe the comparison of valuation results should be evaluated in terms of percentage differences. To provide some context to our comments, in a replication audit, where the differences that are identified can also be quantified, we generally expect to be within 1%-2% on the calculation of the present value of future benefits and within 4%-5% on the calculation of the actuarial accrued liability and normal cost. The wider range on the latter items is because there tends to be more variability in how different actuarial software programs allocate the total liability (present value of future benefits) to past and future years of service.

Please note, the actuarially required contribution rate includes a component for the amortization of the unfunded actuarial liability (UAL). For a given level of UAL, annual amortization payments are calculated as increasing by 3.75% per year ("level percent amortization"). If future experience follows the actuarial assumptions, this should result in amortization payments that keep pace with the assumed growth in overall compensation. Please note that with the current amortization period of 24 years, amortization payments in the short term will not be large enough to cover interest on the UAL, which means that as a dollar amount the UAL is expected to grow for several years. This situation is sometimes referred to as "negative amortization". The negative amortization will continue until the amortization period becomes short enough, and the amortization payments become large enough, such that the amortization payments will be enough to cover both interest and principal, and from that point forward the UAL as a dollar amount will start to decline progressively until ultimately reaching zero by the end of the amortization period.

Statement of Findings

In general, we found the actuarial calculations by the Fund Actuary to be reasonably consistent with our own separate calculations to within a reasonable degree of tolerance. Where we saw differences, we attempted to identify the reasons. Overall, we are satisfied that the July 1, 2013 actuarial valuation results for the Fund as prepared by the Fund Actuary present a fair and reasonable representation of the present value of future benefits. We note some differences in the individual components of the actuarial liabilities and contribution requirements for the Fund.

The following commentary provides our main conclusions on the various areas of our review:

- Plan Provisions: We started with the summary of plan provisions for the Fund that Milliman reviewed last year. We then applied any adjustments to these provisions as a result of legislative changes that were identified in the LCPR summaries. After reviewing the actuarial report prepared by the Fund Actuary, we believe that their summary of plan provisions is consistent with our understanding of the current plan provisions.

- Membership Data: Our raw data counts match exactly with the counts as summarized by MSRS. After applying our own cleansing methods, our valuation data count was the same as the count as reported by the Fund Actuary.

  Our conclusion is that the Fund Actuary is reasonably reflecting the data received from MSRS to within a reasonable degree of tolerance with our own determinations.

- Actuarial Assumptions and Methods: In general, we believe that the assumptions and methods employed by the Fund Actuary are consistent with statutes and the Standards for Actuarial Work.

- Actuarial Value of Assets: We believe that the Fund Actuary has fairly and correctly presented the actuarial value of assets.

- Valuation System Results: Based upon our own valuation system results, we were able to match the Fund Actuary valuation results within 0.1% on the present value of future benefits and within 0.7% on the actuarial liabilities. We are about 0.24 percentage points lower on the Normal Cost rate. These values track very well to the Fund Actuary calculations in total. However, we note some differences in how those totals are split by decrement and group.

- Valuation Report: We believe the actuarial valuation report prepared by the Fund Actuary provides all of the information required by the Standards for Actuarial Work. Overall, the work by the Fund Actuary is comprehensive and thorough. We note that the Actuarial Standards call for identification of the Actuarial Gain or Loss related to mortality. The report provides this information for current benefit recipients.

- COLA: As part of legislation enacted in 2013, the annual Cost of Living Adjustment (COLA) applied to the pensions of retired Members was changed from 1.5% to 1.0% per year if the Accrued Liability Funded Ratio is less than 85%. However, if the Fund achieves at least 85%, but less than 90% funded ratio on the market value of assets to actuarial liability, the COLA will increase to 1.5%. If the Fund achieves a 90% or higher funded ratio on the market value of assets to actuarial liability, the COLA will increase to 2.5%. The valuation by the Fund Actuary assumes that the lower 1.0% COLA will remain in place for all years. As stated in the Fund Actuary's report, this assumption is based on the projections that indicate the Fund is not expected to reach an 85% funded ratio in the next 15 years. We believe this assumption is reasonable.

Principal Valuation Results

This section provides a summary of the key measurements from the July 1, 2013 Actuarial Valuation. As the numbers show, we were able to reasonably match the primary data totals with those shown by the Fund Actuary in almost all cases.

Principal Valuation Results

	Actuarial Valuation as of	
	July 1, 2013 (Fund Actuary)	July 1, 2013 (Milliman)
Contributions (% of Payroll)		
Normal Cost Rate	20.78%	20.54%
UAAL Amortization Payment	20.17%	20.71%
Expenses	0.29%	0.29%
Total Required Contributions (Chapter 356)	41.24%	41.54%
Statutory Contributions (Chapter 352B)	32.56%	32.56%
Contribution (Deficiency)/Sufficiency	(8.68)%	(8.98)%
Unfunded Actuarial Accrued Liability (dollars in thousands)		
Based upon AVA	$189,531	194,611
Based upon MVA	148,649	153,729
Funding Ratios (dollars in thousands)		
Accrued Benefit Funding Ratio		
Current Assets (AVA)	$552,319	552,319
Current Benefit Obligations	722,827	727,470
Funding Ratio	76.41%	75.92%
Accrued Liability Funding Ratio		
Current Assets (AVA)	$552,319	552,319
Current Assets (MVA)	593,201	593,201
Actuarial Accrued Liability	741,850	746,930
Funding Ratio (AVA)	74.45%	73.95%
Funding Ratio (MVA)	79.96%	79.42%
Projected Benefit Funding Ratio		
Current and Expected Future Assets	$772,336	770,645
Current and Expected Future Benefit Obligations	853,902	855,049
Funding Ratio	90.45%	90.13%
Participant Data		
Active Members		
Number	845	845
Projected Annual Earnings (dollars in thousands)	$64,136	$64,128
Average Projected Annual Earnings	75,901	75,891
Average Age	41.9	41.9
Average Service	12.6	12.5
Service Retirements	748	748
Survivors	50	50
Disability Retirements	185	185
Deferred Retirements	41	41
Terminated Other Non-vested	18	18
TOTAL	1,887	1,887

Plan Assets

Statement of Plan Net Assets for Year Ended June 30, 2013
(dollars in thousands)

We received asset information from MSRS which provided assets by class as of June 30, 2013. We have reviewed these assets and summarized them below. Our summary exactly matches the summary provided by the Fund actuary in their Actuarial Valuation Report.

	Market Value	
	Fund Actuary	**Milliman**
Assets Held in Trust		
Cash, Equivalents, Short-term Securities	$ 15,451	$ 15,451
Fixed Income	136,228	136,228
Equity	441,300	441,300
Other*	57,861	57,861
Total Cash, Investments, and Other Assets	**$650,840**	**$650,840**
Amounts Receivable	590	590
Total Assets	**$651,430**	**$651,430**
Amounts Payable*	(58,229)	(58,229)
Net Assets Held in Trust for Pension Benefits	**$593,201**	**$593,201**

* Includes $57,861 in Securities Lending Collateral for fiscal year ending June 30, 2013.

Plan Assets

Reconciliation of Plan Assets
(dollars in thousands)

The following exhibit shows the revenue, expenses and resulting assets of the Fund as reported by MSRS for the Plan's Fiscal year July 1, 2012 to June 30, 2013.

We received this information directly from MSRS and summarized it below. Our summary matches the summary provided by the Fund actuary.

Change in Assets	**Market Value**	
Year Ending	**Fund Actuary**	**Milliman**
1. Fund Balance at Market Value at Beginning of Year	$ 549,956	$ 549,956
2. Contributions		
a. Member	$ 7,703	$ 7,703
b. Employer	11,482	11,482
c. Other Sources	0	0
d. Total Contributions	19,185	19,185
3. Investment Income		
a. Investment Income/(Loss)	$ 77,129	$ 77,129
b. Investment Expenses	(814)	(814)
c. Net Investment Income/(Loss)	76,315	76,315
4. Other	0	0
5. Total Income: *(2.d) + (3.c.) + (4.)*	**$ 95,500**	**$ 95,500**
6. Benefits Paid		
a. Annuity Benefits	$ (52,057)	$ (52,057)
b. Refunds	(7)	(7)
c. Total Benefits Paid	(52,064)	(52,064)
7. Expenses		
a. Other	(1)	(1)
b. Administrative	(190)	(190)
c. Total Expenses	(191)	(191)
8. Total Disbursements: *(6.c.) + (7.c.)*	**(52,255)**	**(52,255)**
9. Fund Balance at Market Value at End of Year (1.) + (5.) + (8.)	**$593,201**	**$593,201**
10. Approximate Return on Market Value of Assets	14.3%	14.3%

Plan Assets

Actuarial Asset Value
(dollars in thousands)

Based upon the assets reported to us by MSRS and prior year actuarial valuation information regarding unrecognized asset returns, we have constructed the Actuarial Value of Assets for the July 1, 2013 Actuarial Valuation. Our calculation matches the Fund actuary.

			June 30, 2013
1.	Market Value of Assets Available for Benefits		$593,201
2.	Determination of Average Balance		
	a. Total Assets Available at Beginning of Year		549,956
	b. Total Assets Available at End of Year		593,201
	c. Net Investment Income for Fiscal Year		76,315
	d. Average Balance *[a. + b. – c.]/2*		533,421
3.	Expected Return *[8.0% * 2.d.]*		42,674
4.	Actual Return		76,315
5.	Current Year Asset Gain/(Loss) *[4. – 3.]*		33,641
6.	Unrecognized Asset Returns		
		Original Amount	**Unrecognized Amount**
	a. Year Ended June 30, 2013	$ 33,641	$ 26,913
	b. Year Ended June 30, 2012	(34,239)	(20,543)
	c. Year Ended June 30, 2011	70,693	28,277
	d. Year Ended June 30, 2010	31,175	6,235
	e. Unrecognized Return Adjustment		40,882
7.	**Actuarial Value at End of Year** *(1. – 6.e.)*		**$552,319**
8.	Approximate Return on Actuarial Value of Assets During Fiscal Year		5.8%
9.	Ratio of Actuarial Value of Assets to Market Value of Assets		0.93

Development of Costs

Actuarial Valuation Balance Sheet

(dollars in thousands)

The actuarial balance sheet is based on the fundamental equation that at any given time the present value of benefits to be paid in the future must be equal to the assets on hand plus the present value of future contributions to be received. The total rate of contribution is determined as the amount which will make the total present and potential assets balance with the total present value of future benefits. The members' rate of contribution is fixed at the current schedule. The employer's rate of contribution is the balance required to cover the total rate of contribution.

The contributions made in excess of amounts required for current benefit payments are accumulated as a reserve to help meet benefit payments in later years. It is this reserve system which permits the establishment of a level rate of contribution each year.

	June 30, 2013 (Fund Actuary)	June 30, 2013 (Milliman)
A. Actuarial Value of Assets	$ 552,319	$ 552,319
B. Expected Future Assets		
1. Present Value of Expected Future Statutory Supplemental Contributions	107,965	110,206
2. Present Value of Future Normal Cost Contributions	112,052	108,120
3. Total Expected Future Assets (1. + 2.)	220,017	218,326
C. Total Current and Expected Future Assets	$ 772,336	$ 770,645
D. Current Benefit Obligations		
1. Benefit Recipients		
a. Service Retirements	439,129	439,076
b. Disability	24,210	24,202
c. Survivors	43,666	43,963
2. Deferred Retirement with Augmentation	6,711	6,675
3. Former Members without Vested Rights	60	96
4. Active Members	209,051	213,458
5. Total Current Benefit Obligations	722,827	727,470
E. Expected Future Benefit Obligations	131,075	127,579
F. Total Current and Expected Future Benefit Obligations	853,902	855,049
G. Unfunded Current Benefit Obligations (D.5. – A.)	170,508	175,151
H. Unfunded Current and Future Benefit Obligations (F. – C.)	81,566	84,404

Development of Costs

Determination of Unfunded Actuarial Accrued Liability and Supplemental Contribution Rate

(dollars in thousands)

In the tables that follow the Commentary in this section, we provide the calculations which ultimately determine the required supplemental contribution rate. From these tables, a critical calculation is the Actuarial Present Value of Projected Benefits. This calculation reflects the actuary's estimate of the total present value cost of all benefits yet to be paid by the Fund to the current members (active and inactive). In replication audits, we typically strive to be within 2% of the actuary's calculation. If that level cannot be achieved, then it is important to identify the differences in more detail. In general, our calculations are within the 2% threshold with the exception of Former Members without vesting rights. The table below shows, as a percentage, the ratio of the numbers calculated by Milliman to the numbers reported by the Fund Actuary.

	Actuarial Present Value of Projected Benefits
Active Members	100.27%
Deferred Members	99.46
Former Members without Vested Rights	160.00
Benefit Recipients	100.05
Total	100.13%

The tables that follow the Actuarial Present Value of Projected Benefits are designed to determine how much of the Actuarial Present Value of Projected Benefits is to be funded by the future "normal cost" contributions (Actuarial Present Value of Future Normal Cost) versus how much belongs to past contributions (Actuarial Accrued Liability). This allocation does not change the total costs determined in the Actuarial Present Value of Projected Benefits. It simply allocates cost to past versus future based upon the Entry Age Normal Actuarial Cost Method. In replication audits, we typically look to be within 5% of the actuary's calculations for active member Actuarial Accrued Liability. The larger range recognizes that different valuation systems have different ways of rounding service and ages. In addition, the Entry Age Method requires projection of theoretical past amounts which can be handled somewhat differently between actuarial valuation systems. The table below shows, as a percentage, the ratio of the numbers calculated by Milliman to the numbers reported by the Fund Actuary.

	Actuarial Accrued Liability
Active Members	102.12%
Deferred Members	99.46
Former Members without Vested Rights	160.00
Benefit Recipients	100.05
Total	100.68%

Development of Costs

Determination of Unfunded Actuarial Accrued Liability and Supplemental Contribution Rate
(dollars in thousands)

Once the Actuarial Accrued Liability is determined, it is compared to the Actuarial Value of Assets to determine the unfunded liability. The difference between these numbers is then amortized to the statutory amortization date of June 30, 2037 based upon the present value of future payrolls. Because this calculation is based upon the difference of two relatively close numbers, any change in one of the numbers can have a large impact when viewed as a percentage.

For example, if the Actuarial Accrued Liability is $1,000 and the Actuarial Value of Assets is $900, then unfunded liability is $100. If the Actuarial Accrued Liability is reduced by $25, the unfunded liability becomes $75. In this example, the reduction in the Actuarial Accrued Liability of 2.5% generates a reduction of 25% in both the unfunded liability and the supplemental contribution rate.

Based upon the above, it should be expected that small deviations in the amount of Actuarial Accrued Liability will have a larger impact on the supplemental contribution rate. It is evidenced here where our calculation of the Actuarial Accrued Liability is 0.7% higher than the Fund Actuary but our supplemental contribution percentage rate is 2.7% higher than the Fund Actuary.

Development of Costs

Determination of Unfunded Actuarial Accrued Liability and Supplemental Contribution Rate

(dollars in thousands)

		Actuarial Present Value of Projected Benefits	
		Fund Actuary	Milliman
1.	Active Members		
	A. Retirement Annuities	$ 315,759	$ 314,703
	B. Disability Benefits	16,487	15,983
	C. Survivor's Benefits	4,133	4,412
	D. Deferred Retirements	3,485	5,521
	E. Refunds	262	418
	F. Total	340,126	341,037
2.	Deferred Retirements with Future Augmentation	6,711	6,675
3.	Former Members without Vested Rights	60	96
4.	Benefit Recipients	507,005	507,241
5.	Total	853,902	855,049

		Actuarial Present Value of Future Normal Costs	
		Fund Actuary	Milliman
1.	Active Members		
	A. Retirement Annuities	$ 96,978	$ 93,568
	B. Disability Benefits	8,839	8,406
	C. Survivor's Benefits	2,760	2,537
	D. Deferred Retirements	2,871	3,226
	E. Refunds	604	383
	F. Total	112,052	108,120
2.	Deferred Retirements with Future Augmentation	0	0
3.	Former Members without Vested Rights	0	0
4.	Benefit Recipients	0	0
5.	Total	112,052	108,120

Development of Costs

Determination of Unfunded Actuarial Accrued Liability and Supplemental Contribution Rate

(dollars in thousands)

	Actuarial Accrued Liability	
	Fund Actuary	Milliman
A. Determination of Actuarial Accrued Liability (AAL)		
1. Active Members		
A. Retirement Annuities	$ 218,781	$ 221,135
B. Disability Benefits	7,648	7,577
C. Survivor's Benefits	1,373	1,875
D. Deferred Retirements	614	2,295
E. Refunds	(342)	36
F. Total	228,074	232,918
2. Deferred Retirements with Future Augmentation	6,711	6,675
3. Former Members without Vested Rights	60	96
4. Benefit Recipients	507,005	507,241
5. Total	741,850	746,930
B. Determination of Unfunded Actuarial Accrued Liability (UAAL)		
1. Actuarial Accrued Liability	$ 741,850	$ 746,930
2. Current Assets (AVA)	552,319	552,319
3. Unfunded Actuarial Accrued Liability (AVA)	189,531	194,611
4. Current Assets (MVA)	593,201	593,201
5. Unfunded Actuarial Accrued Liability (MVA)	148,649	153,729
C. Determination of Supplemental Contribution Rate*		
1. Present value of future payrolls through the amortization date of June 30, 2037	939,640	939,522
2. Supplemental Contribution Rate (AVA) (B.3. / C.1.)	20.17%	20.71%
3. Supplemental Contribution Rate (MVA) (B.5. / C.1.)	15.82%	16.36%

*The amortization of the unfunded actuarial accrued liability (UAAL) using the current amortization method results in initial payments less than the "interest only" payment on the UAAL. Payments less than the interest only amount will result in the UAAL increasing for an initial period of time.

Development of Costs

Determination of Contribution Sufficiency/(Deficiency)

(dollars in thousands)

In this section, we compare the statutory contributions provided under Chapter 352B of Minnesota statutes (352B contributions) to the required contributions under Chapter 356 of Minnesota statutes (356 contributions). The difference between these amounts results in a reported contribution sufficiency or deficiency.

With respect to the 352B contributions, the percentage is set by statute and we agree with the percentages reported by the Fund Actuary. The dollar amount is determined by applying the statutory percentage to the member compensation provided in the data file and projected (and annualized where necessary) with expected pay increases for the upcoming year. While reasonably close, our projection methodology was slightly different from the Fund Actuary resulting in a small dollar difference.

With respect to the 356 contributions, the total is equal to the sum of the Normal Cost (Entry Age Normal method) plus the supplemental contribution calculated earlier in this report plus an allowance for expected administrative expenses. Typically, in a replication audit, it is desirable to be within 5% of the actuary's Normal Cost. In this case, our Normal Cost percentage is 1.2% lower than the Fund Actuary. We note that our components of Normal Cost are somewhat different from the Fund Actuary. This is not an uncommon result as the treatment of where to categorize certain costs on an "entry age" basis between actuarial valuation systems quite often results in these differences.

As mentioned earlier, the supplemental contributions are highly leveraged to the value of the Actuarial Accrued Liability and on the projected payroll. In this case, our supplemental contribution percentage is higher by 2.7% but this is based upon an Actuarial Accrued Liability that is higher by 0.7% and a projected payroll that matches the Fund Actuary very closely.

Similar to the 352B contributions, we arrive at the same expense allowance percentage and dollar contribution.

As a result of the above, our calculation of the Contribution Sufficiency/Deficiency is a deficiency of (8.98)%. This compares to a deficiency reported by the Fund Actuary of (8.68)%. The difference of 0.30% is primarily the result of the supplemental contribution and Normal Cost difference.

Development of Costs

Determination of Contribution Sufficiency/(Deficiency)

(dollars in thousands)

	Fund Actuary July 1, 2013 Percent of Payroll	Fund Actuary July 1, 2013 Dollar Amount	Milliman July 1, 2013 Percent of Payroll	Milliman July 1, 2013 Dollar Amount
A. Statutory Contributions – Chapter 352B				
1. Employee Contributions	12.40%	$ 7,953	12.40%	$7,952
2. Employer Contributions	18.60	11,929	18.60	11,928
3. Supplemental Contributions				
a. 1993 Legislation	1.56	1,000	1.56	1,000
4. Total	32.56	20,882	32.56	20,880
B. Required Contributions – Chapter 356				
1. Normal Cost				
A. Retirement Benefits	17.96	11,518	17.75%	11,382
B. Disability Benefits	1.69	1,084	1.64	1,052
C. Survivor Benefits	0.54	346	0.53	340
D. Deferred Retirement Benefits	0.48	308	0.58	372
E. Refunds	0.11	71	0.04	26
F. Total	20.78	13,327	20.54	13,172
2. Supplemental Contribution Amortization by June 30, 2037 of Unfunded Actuarial Accrued Liability	20.17	12,936	20.71	13,281
3. Allowance for Expenses	0.29	186	0.29	186
4. Total	41.24	26,449	41.54	26,639
C. Contribution Sufficiency/(Deficiency) (A.4. – B.4.)	(8.68)%	$ (5,567)	(8.98)%	$ (5,759)

Note: Projected annual payroll for fiscal year beginning on the valuation date:
$64,136 for Fund actuary and $64,128 for Milliman.

Actuarial Cost Method

Liabilities and contributions in this report are computed using the Individual Entry Age Normal Cost Method. This method is prescribed by Minnesota Statutes.

The objective under this method is to fund each member's benefits under the Plan as payments which are level as a percentage of salary, starting at original participation date (or employment date), and continuing until the assumed date of retirement, termination, disability or death. For valuation purposes, entry age for each member is determined as the age at valuation minus years of service as of the valuation date.

At any given date, a liability is calculated equal to the contributions which would have been accumulated if this method of funding had always been used, the current plan provisions had always been in place, and all assumptions had been precisely accurate. The difference between this liability and the assets (if any) which are held in the Fund is the unfunded liability. The unfunded liability is typically funded over a chosen period in accordance with the amortization schedule.

A detailed description of the calculation follows:

The normal cost for each active member under the assumed retirement age is determined by applying to earnings the level percentage of salary which, if contributed each year from date of entry into the Plan until the assumed retirement (termination, disability or death) date, is sufficient to provide the full value of the benefits expected to be payable.

- The present value of future normal costs is the total of the discounted values of all active members' normal cost, assuming these to be paid in each case from the valuation date until retirement (termination, disability or death) date.

- The present value of projected benefits is calculated as the value of all benefit payments expected to be paid to the Plan's current members, including active and retired members, beneficiaries, and terminated members with vested rights.

- The accrued liability is the excess of the present value of projected benefits over the present value of future normal costs.

- The unfunded liability is the excess of the accrued liability over the assets of the Fund, and represents that part of the accrued liability which has not been funded by accumulated past contributions.

Change in Actuarial Cost Method

None

Asset Valuation Method

The assets are valued based on a five-year moving average of expected and market values (five-year average actuarial value) determined as follows:

At the end of each plan year, an average asset value is calculated as the average of the market asset value at the beginning and end of the fiscal year net of investment income for the fiscal year;

The investment gain or (loss) is taken as the excess of actual investment income over the expected investment income based on the average asset value as calculated above;

The investment gain or (loss) so determined is recognized over five years at 20% per year;

The asset value is, the sum of the market asset value plus the scheduled recognition of investment gains or (losses) during the current and the preceding four fiscal years.

Summary of Actuarial Assumptions

The following assumptions were used in valuing the liabilities and benefits under the plan. All assumptions are prescribed by Statutes, the LCPR, or the Board of Directors.

Investment Return	Select and Ultimate Rates: July 1, 2013 to June 30, 2017 7.00% per annum post-retirement 8.00% per annum pre-retirement July 1, 2017 and later 7.50% per annum post-retirement 8.50% per annum pre-retirement
Benefit Increases After Retirement	Payment of 1.00% annual benefit increases after retirement are accounted for by using the 7.50% post-retirement assumption (7.00% during 4-year select period), as required by Minnesota Statute. This valuation does not reflect any potential additional benefit increases payable if the plan's funding ratio exceeds 85%.
Salary Increases	Reported salary for prior fiscal year, with new hires annualized, increased to current fiscal year and annually for each future year according to the ultimate rates in the rate table based upon service.
Inflation	3.00% per year
Payroll Growth	3.75% per year
Mortality	
Healthy Pre-retirement	RP-2000 non-annuitant generational mortality table projected with mortality improvement scale AA, white collar adjustment.
Healthy Post-retirement	RP-2000 annuitant generational mortality table projected with mortality improvement scale AA, white collar adjustment, set back two years for males and set forward one year for females.
Disabled	RP-2000 annuitant generational mortality table projected with mortality improvement scale AA, white collar adjustment, set back two years for males and set forward one year for females.
Retirement	Members retiring from active status are assumed to retire according to the age related rates shown in the rate table. Members who have attained the highest assumed retirement age are assumed to retire in one year.
Withdrawal	Select and Ultimate rates based on actual experience. Ultimate rates after the third year are shown in rate table. Select rates in the first three years are:

Year	Select Withdrawal Rates
1	5%
2	2%
3	2%

Summary of Actuarial Assumptions (continued)

Disability	Age-related rates based on experience; see table of sample rates. All incidences are assumed to be duty-related.
Allowance for Combined Service Annuity	Liabilities for former members are increased by 30.00% to account for the effect of some participants having eligibility for a Combined Service Annuity.
Administrative Expenses	Prior year administrative expenses expressed as percentage of prior year projected payroll.
Refund of Contributions	All employees withdrawing after becoming eligible for a deferred benefit take the larger of their contributions accumulated with interest or the value of their deferred benefit. The liability for former members without vesting rights is the account balance at the valuation date.
Commencement of Deferred Benefits	Members receiving deferred annuities (including current terminated deferred members) are assumed to begin receiving benefits at age 55.
Percentage Married	85% of active members are assumed to be married. Actual marital status is used for members in payment status.
Age of Spouse	Females are assumed to be two years younger than their male spouses.
Eligible Children	Each member may have two dependent children depending on member's age. Assumed first born child born at member's age 28 and second born child at member's age 31.
Form of Payment	Married members retiring from active status are assumed to elect subsidized joint and survivor form of annuity as follows: Males: 15% elect 50% Joint & Survivor option 25% elect 75% Joint & Survivor option 35% elect 100% Joint & Survivor option Females: 25% elect 50% Joint & Survivor option 30% elect 75% Joint & Survivor option 5% elect 100% Joint & Survivor option Remaining married members and unmarried members are assumed to elect the Straight Life option.
Eligibility Testing	Eligibility for benefits is determined based upon the age and service on the date the decrement is assumed to occur. Age is calculated as the age nearest birthday at the valuation date. Service at the valuation date is as reported by the fund. For mid-year decrements, 0.5 is added to each calculated age and service.
Decrement Operation	Withdrawal decrements do not operate during retirement eligibility.
Service Credit Accruals	It is assumed that members accrue one year of service credit per year.

Summary of Actuarial Assumptions (continued)

Unknown Data for Certain Members	There are no members reported with missing gender or birth dates. In cases where submitted data was missing or incomplete, the following assumptions were applied: <u>Data for active members:</u> There were no members reported with missing salary and no members reported with missing service. <u>Data for terminated members:</u> There were two members reported without a benefit. We calculated benefits for these members using the reported Average Salary, credited service and termination date. <u>Data for members receiving benefits:</u> There were no members reported without a benefit. There were no survivors reported with an expired benefit. There were no retirees reported with a bounce back annuity and an unreasonable reduction factor.
Changes in Actuarial Assumptions	The post-retirement investment return assumption was changed from 7.0% (6.5% for the select period ending June 30, 2017 to 7.5% (7.0% for the select period ending June 30, 2017) to reflect the post-retirement change from 1.5% to 1.0%.

Summary of Actuarial Assumptions (continued)

Summary of Rates

	Rate (%)					
	Healthy Post-Retirement Mortality*		Healthy Pre-Retirement Mortality*		Disability Mortality	
Age	Male	Female	Male	Female	Male	Female
20	0.03%	0.02%	0.10%	0.03%	0.10%	0.03%
25	0.04	0.02	0.11	0.03	0.11	0.03
30	0.04	0.03	0.12	0.05	0.12	0.05
35	0.06	0.05	0.15	0.08	0.15	0.08
40	0.09	0.06	0.23	0.11	0.23	0.11
45	0.13	0.10	0.34	0.17	0.34	0.17
50	0.20	0.16	0.52	0.25	0.52	0.25
55	0.33	0.26	0.57	0.39	0.57	0.39
60	0.56	0.47	0.57	0.61	0.57	0.61
65	1.11	0.87	0.92	1.01	0.92	1.01
70	1.93	1.52	1.58	1.69	1.58	1.69

* *The rates shown above are further adjusted in the valuation to apply generational mortality improvement using projection scale AA.*

	Withdrawal Rates After Third Year		Disability Retirement	
Age	**Male**	**Female**	**Male**	**Female**
20	1.47%	1.47%	0.03%	0.03%
25	1.13	1.13	0.05	0.05
30	0.80	0.80	0.06	0.06
35	0.47	0.47	0.09	0.09
40	0.40	0.40	0.14	0.14
45	0.40	0.40	0.23	0.23
50	0.00	0.00	0.40	0.40
55	0.00	0.00	0.70	0.70
60	0.00	0.00	1.13	1.13
65	0.00	0.00	0.00	0.00

Summary of Actuarial Assumptions (concluded)

Summary of Rates

Age	Retirement
50	7%
51	6
52	6
53	6
54	3
55	65
56	50
57	30
58	20
59	20
60+	100

Salary Scale	
Year	Increase
1	8.00%
2	7.50
3	7.00
4	6.75
5	6.50
6	6.25
7	6.00
8	5.85
9	5.70
10	5.55
11	5.40
12	5.25
13	5.10
14	4.95
15	4.80
16	4.65
17	4.50
18	4.35
19	4.20
20	4.05
21+	4.00

Summary of Plan Provisions

This summary of provisions reflects the interpretation of applicable Statutes for purposes of preparing this valuation. This interpretation is not intended to create or rescind any benefit rights in conflict with any Minnesota Statutes.

Plan Year	July 1 through June 30
Eligibility	State troopers, conservation officers, certain crime bureau and gambling enforcement officers, and certain other persons listed in Minnesota Statutes 352B.011 subdivision 10.
Contributions	Percent of Salary **Effective Date** / **Member** / **Employer** July 1, 2011 – June 30, 2014: 12.40% / 18.60% July 1, 2014 – June 30, 2016: 13.40% / 20.10% July 1, 2016 and later: 14.40% / 21.60% Member contributions are "picked up" according to the provisions of Internal Revenue Code 414(h).
State Contributions	$1 million paid annually on October 1 until both the Public Employees Retirement Association Police and Fire Plan and the State Patrol Plan become 90% funded (on a Market Value of Assets basis).
Allowable Service	Service during which member contributions were deducted. Includes period receiving temporary Worker's Compensation and reduced salary from employer. See Normal Retirement benefit definition below for information about service limits.
Salary	Salaries excluding lump sum payments at separation.
Average Salary	Average of the five highest years of Salary. Average Salary is based on all Allowable Service if less than five years. Average Salary is based on all years without regard to any service limits.

Summary of Plan Provisions (continued)

Retirement	
Normal Retirement Benefit	
Age/Service Requirement	Age 55 and three years (ten years if first hired after June 30, 2013) of Allowable Service.
Amount	3.00% of Average Salary for each year of Allowable Service up to 33 years. Members with at least 28 years of service as of July 1, 2013 are not subject to this service limit. Member contributions made after the service cap will be refunded at retirement.
Early Retirement Benefit	
Age/Service Requirement	Age 50 and three years (ten years if first hired after June 30, 2013) of Allowable Service.
Amount	Normal Retirement Benefit based on Allowable Service and Average Salary at retirement reduced by 1/10% for each month that the member is under age 55. If the effective date of retirement is after June 30, 2015, the reduction is 0.34% for each month that the member is under age 55 at the time of retirement.
Form of Payment	Life annuity. Actuarially equivalent options are: 50%, 75%, or 100% Joint and Survivor, or 15-year certain. If a Joint and Survivor benefit is elected and the beneficiary predeceases the annuitant, the annuitant's benefit increases to the Life Annuity amount. This "bounce back" is subsidized by the plan.
Benefit Increases	Benefit recipients receive future annual 1.0% benefit increases. When the funding ratio reaches 85%, the benefit increase will increase to 1.5%; the benefit will revert to 2.5% when the funding ratio reaches 90% (funding ratio is determined using Market Value of Assets). A benefit recipient who has been receiving a benefit for at least 12 full months as of June 30 will receive a full increase. Members receiving benefits for at least one month but less than 12 full months as of June 30 will receive a pro rata increase.

Summary of Plan Provisions (continued)

Disability	
Occupational Disability Benefit	
Age/Service Requirement	Member who cannot perform his duties as a direct result of a disability relating to an act of duty.
Amount	60% of Average Salary plus 3.00% of Average Salary for each year in excess of 20 years of Allowable Service (pro rata for completed months). Payments cease at age 65 or earlier if disability ceases or death occurs. Benefits may be paid upon re-employment but salary plus benefit cannot exceed current salary of position held at time of disability.
Non-Duty Disability Benefit	
Age/Service Requirement	At least one year of Allowable Service and disability not related to covered employment.
Amount	Normal Retirement Benefit based on Allowable Service (minimum of 15 years) and Average Salary at disability without reduction for commencement before age 55. Payments cease at age 65 or earlier if disability ceases or death occurs. Benefits may be paid upon re-employment but salary plus benefit cannot exceed current salary of position held at time of disability.
Retirement After Disability	
Age/Service Requirement	Age 65 with continued disability.
Amount	Optional annuity continues. Otherwise, normal retirement benefit equal to the disability benefit paid, or an actuarially equivalent option.
Form of Payment	Same as for retirement.
Benefit Increases	Same as for retirement.

Summary of Plan Provisions (continued)

Death	
Surviving Spouse Benefit	
Age/Service Requirement	Member who is active or receiving a disability benefit or former member.
Amount	50% of Average Salary if member was active or occupational disability and either had less than three years (five years if first hired after June 30, 2013) of Allowable Service or was under age 55. Annuity is paid for life. Surviving spouse receives the 100% joint and survivor benefit commencing on the member's 55th birthday if member was active or a disability with three years (five years if first hired after June 30, 2013) of Allowable Service. A spouse who had been receiving the 50% benefit shall be entitled to the greater benefit. The surviving spouse of a former member receives the 100% joint and survivor benefit commencing on the member's 55th birthday if former member had three years (five years if first hired after June 30, 2013) of Allowable Service.
Benefit Increases	Same as for retirement.
Surviving Dependent Children's Benefit	
Age/Service Requirement	Member who is active or receiving a disability benefit. Child must be unmarried, under age 18 (or 23 if full-time student) and dependent upon the member.
Amount	10% of Average Salary for each child and $20 per month prorated among all dependent children. Benefit must not be less than 50% nor exceed 70% of Average Salary.
Benefit Increases	Same as for retirement.
Refund of Contributions	
Age/Service Requirement	Member dies before receiving any retirement benefits and survivor benefits are not payable.
Amount	Member contributions with 6.00% interest compounded daily until June 30, 2011 and 4.00% thereafter.

Summary of Plan Provisions (continued)

Termination	
<u>Refund of Contributions</u>	
Age/Service Requirements	Termination of state service.
Amount	Member contributions with 6.00% interest compounded daily to June 30, 2011 and 4.00% thereafter. If a member is vested, a deferred annuity may be elected in lieu of a refund.
<u>Deferred Benefit</u>	
Age/Service Requirements	Three years (ten years if first hired after June 30, 2013) of Allowable Service.
Amount	Benefit is computed under law in effect at termination and increased by the following annual augmentation percentage: (a.) 0.00% before July 1, 1971; (b.) 5.00% from July 1, 1971 to January 1, 1981; (c.) 3.00% thereafter (2.50% if hired after June 30, 2006) until January 1, 2012; and (d.) 2.00% after December 31, 2011 until the annuity begins. Amount is payable at normal or early retirement. If a member terminated employment prior to July 1, 1997 but was not eligible to commence their pension before July 1, 1997, an actuarial increase shall be made for the change in the post-retirement interest rates from 5.00% to 6.00%.
Optional Form Conversion Factors	Actuarially equivalent factors based on RP-2000 for healthy annuitants, white collar adjustment, projected to 2027 using scale AA, set back two years for males and set forward one year for females, blended 95% males, and 7.0% interest.

Summary of Plan Provisions (concluded)

Combined Service Annuity	Members are eligible for combined service benefits if they: (a.) Have sufficient allowable service in total that equals or exceeds the applicable service credit vesting requirement of the retirement plan with the longest applicable service credit vesting requirement; and (b.) Have at least six months of allowable service credit in each plan worked under; and (c.) Are not in receipt of a benefit from another plan, or have applied for benefits with an effective date within one year. Members who meet the above requirements must have their benefit based on the following: (a.) Allowable service in all covered plans are combined in order to determine eligibility for early retirement. (b.) Average salary is based on the high five consecutive years during their entire service in all covered plans.
Changes in Plan Provisions	Member contributions as a percent of pay will increase from 12.4% to 13.4% beginning July 1, 2014 and to 14.4% beginning July 1, 2016. Employer contributions will increase from 18.6% to 20.1% beginning July 1, 2014 and to 21.6% beginning July 1, 2016. State contributions of $1 million will be made annually on October 1 beginning in 2013. Contributions continue until both PERA P&F and MSRS State Patrol reach 90% funding (on a Market Value of Assets basis). Vesting for retirement benefits is ten years for members hired after June 30, 2013 (was five years for members hired after June 30, 2010). Vesting for survivor benefits is five years for members hired after June 30, 2013 (was five years for members hired after June 30, 2010). Allowable service used to determine benefits is limited to 33 years, with a refund of employee contributions for excess years of service. Members with at least 28 years of service as of July 1, 2013 are not subject to this service limit. For retirements after June 30, 2015, reduction for early retirement is 0.34% for each month that the member is under age 55 at the time of retirement. Post-retirement increases were reduced from 1.5% per year to 1.0% per year until an 85% funding ratio is reached. Increases revert to 2.5% when a 90% funding ratio is reached (funding ratio calculated using Market Value of Assets).

State Patrol Retirement Fund

Active Members as of June 30, 2013

	Years of Service								
Age	<1	1-4	5-9	10-14	15-19	20-24	25-29	30+	ALL
<25	11	0	0	0	0	0	0	0	11
25-29	23	41	7	0	0	0	0	0	71
30-34	11	37	40	7	0	0	0	0	95
35-39	6	17	66	52	12	0	0	0	153
40-44	2	10	55	63	48	2	0	0	180
45-49	1	3	13	35	41	43	11	0	147
50-54	1	3	14	13	33	24	43	9	140
55-59	0	2	11	6	6	7	6	9	47
60-64	0	0	0	0	0	0	0	1	1
65+	0	0	0	0	0	0	0	0	0
ALL	55	113	206	176	140	76	60	19	845

Average Annual Earnings

	Years of Service								
Age	<1	1-4	5-9	10-14	15-19	20-24	25-29	30+	ALL
<25	19,999	0	0	0	0	0	0	0	19,999
25-29	25,705	58,937	66,278	0	0	0	0	0	48,895
30-34	28,453	58,513	71,042	74,302	0	0	0	0	61,471
35-39	31,984	60,868	72,420	77,669	82,451	0	0	0	72,121
40-44	55,505	64,535	75,521	76,566	78,936	84,289	0	0	76,062
45-49	51,087	58,988	75,455	74,870	78,409	81,213	82,122	0	77,820
50-54	46,559	68,928	80,467	79,069	78,805	81,835	84,305	83,865	81,087
55-59	0	85,282	77,424	81,904	76,590	84,361	84,606	87,574	82,117
60-64	0	0	0	0	0	0	0	75,806	75,806
65+	0	0	0	0	0	0	0	0	0
ALL	27,722	60,316	73,777	76,831	78,951	81,780	83,934	85,197	72,170

State Patrol Retirement Fund

Service Retirements as of June 30, 2013

	Years Retired							
Age	<1	1-4	5-9	10-14	15-19	20-24	25+	ALL
<50	0	0	0	0	0	0	0	0
50-54	12	11	0	0	0	0	0	23
55-59	32	62	29	0	0	0	0	123
60-64	4	12	99	25	0	0	0	140
65-69	0	0	15	121	15	0	0	151
70-74	0	0	2	13	103	2	0	120
75-79	0	0	0	2	19	51	0	72
80-84	0	0	0	0	1	14	46	61
85+	0	0	0	0	0	2	56	58
ALL	48	85	145	161	138	69	102	748

Average Annual Benefit

	Years Retired							
Age	<1	1-4	5-9	10-14	15-19	20-24	25+	ALL
<50	0	0	0	0	0	0	0	0
50-54	48,089	44,615	0	0	0	0	0	46,427
55-59	60,902	61,238	46,310	0	0	0	0	57,630
60-64	23,562	60,700	54,796	51,280	0	0	0	53,781
65-69	0	0	46,330	56,291	57,994	0	0	55,470
70-74	0	0	48,494	50,386	65,051	60,196	0	63,105
75-79	0	0	0	55,031	74,167	67,591	0	68,977
80-84	0	0	0	0	80,203	74,753	65,006	67,492
85+	0	0	0	0	0	67,089	65,596	65,647
ALL	54,587	59,010	52,136	55,020	65,648	68,815	65,329	59,525

State Patrol Retirement Fund

Survivors as of June 30, 2013

	Years Since Death							
Age	<1	1-4	5-9	10-14	15-19	20-24	25+	ALL
<50	6	2	4	2	0	0	0	14
50-54	0	3	1	1	1	0	0	6
55-59	4	2	3	2	0	0	0	11
60-64	0	2	8	1	2	0	1	14
65-69	4	0	10	7	3	0	1	25
70-74	2	2	7	3	5	0	0	19
75-79	3	2	1	2	1	5	1	15
80-84	2	3	9	8	1	3	7	33
85+	0	7	12	10	4	8	7	48
ALL	21	23	55	36	17	16	17	185

Average Annual Benefit

	Years Since Death							
Age	<1	1-4	5-9	10-14	15-19	20-24	25+	ALL
<50	7,489	8,658	21,213	30,397	0	0	0	14,849
50-54	0	9,098	15,758	13,844	60,517	0	0	19,568
55-59	24,640	16,077	43,944	26,877	0	0	0	28,754
60-64	0	26,052	22,115	26,389	50,400	0	12,412	26,330
65-69	32,779	0	24,314	34,837	27,076	0	31,796	29,245
70-74	44,451	24,551	44,527	48,252	39,245	0	0	41,614
75-79	33,891	61,786	16,937	27,697	64,648	18,018	40,283	32,839
80-84	37,782	32,504	40,322	42,033	33,763	21,207	33,174	36,419
85+	0	29,431	34,706	35,083	33,892	33,158	50,252	35,956
ALL	25,749	26,307	32,009	35,719	39,573	26,185	39,321	32,174

State Patrol Retirement Fund

Disability Retirements as of June 30, 2013

	Years Disabled							
Age	<1	1-4	5-9	10-14	15-19	20-24	25+	ALL
<50	1	1	6	1	0	0	0	9
50-54	2	3	2	0	0	0	0	7
55-59	1	1	1	2	3	0	0	8
60-64	0	0	2	4	1	1	0	8
65-69	0	0	1	6	1	1	0	9
70-74	0	0	0	0	0	2	2	4
75-79	0	0	0	0	0	2	0	2
80-84	0	0	0	0	0	0	2	2
85+	0	0	0	0	0	0	1	1
ALL	4	5	12	13	5	6	5	50

Average Annual Benefit

	Years Disabled							
Age	<1	1-4	5-9	10-14	15-19	20-24	25+	ALL
<50	38,160	40,726	40,571	30,054	0	0	0	39,151
50-54	61,410	49,745	50,563	0	0	0	0	53,311
55-59	40,141	52,033	62,322	34,754	30,409	0	0	39,403
60-64	0	0	44,868	33,418	46,801	41,938	0	39,018
65-69	0	0	47,532	39,130	60,583	51,335	0	43,803
70-74	0	0	0	0	0	45,518	43,868	44,693
75-79	0	0	0	0	0	61,996	0	61,996
80-84	0	0	0	0	0	0	44,866	44,866
85+	0	0	0	0	0	0	50,598	50,598
ALL	50,280	48,398	45,345	36,001	39,722	51,383	45,613	43,804

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July 1, 2013 Actuarial Review
of the Retirement Systems under the

Minnesota Legislative Commission on Pensions and Retirement

January 31, 2014

Prepared by:

Milliman, Inc.

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February 18, 2014

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February 18, 2014

Minnesota Legislative Commission
on Pensions and Retirement
State Office Building, Room 55
100 Rev. Dr. Martin Luther King Jr. Blvd.
St. Paul, Minnesota 55155

ATTN: Mr. Lawrence A. Martin, Executive Director

RE: Actuarial Review of the July 1, 2013 Actuarial Valuation Reports

Ladies and Gentlemen:

The enclosed report presents the findings and comments resulting from a review of the July 1, 2013 actuarial valuations for selected funds of the retirement systems administered by the Duluth Teachers Retirement Fund Association (DTRFA), the Minnesota Public Employees Retirement Association (PERA), the Minnesota State Retirement System (MSRS), the Minnesota Teachers Retirement Association (TRA), and the St. Paul Teachers Retirement Association (StPTRFA). The funds included in the Actuarial Review are detailed below. An overview of our major findings is included in the Executive Summary section of the report. More detailed commentary is provided in the sections devoted to each fund individually.

We pursued this review with a constructive mindset. We looked to identify any possible suggestions that might improve understanding of or confidence in the actuarial services being provided. Naturally, some of the comments may be viewed as personal preference or nit-picky in nature. While we are not trying to impose our own preferences or biases on the Fund or the Fund Actuary, neither did we hesitate to make such comments if we believed that some change, however minor, would improve the actuarial functions.

This report is prepared for use by the Minnesota Legislative Commission on Pensions and Retirement (LCPR) in their oversight role with regard to the above mentioned retirement systems. It has been prepared using multi-faceted review techniques. These techniques include specific validation of a sampling of calculations.

Actuarial Review of July 1, 2013 Actuarial Valuation Reports

Funds Included in Review *	
MSRS General	PERA Police and Fire
MSRS State Patrol	PERA Local Correctional
MSRS Correctional	PERA MERF
MSRS Judges	TRA
MSRS Elective State Officers/Legislators	DTRFA
PERA General	St. PTRFA

* *A complete replication of the July 1, 2013 Actuarial Valuation has been performed for MSRS State Patrol, MSRS Correctional, PERA Police and Fire, and PERA Local Correctional. Please see the Milliman client report dated January 31, 2014 for the MSRS State Patrol report, January 31, 2014 for the MSRS Correctional report, January 31, 2014 for the Police and Fire report, and January 31, 2014 for the PERA Local Correctional report for the details of the replication valuations. For all of the other funds included in the Actuarial Review, a complete replication of the July 1, 2013 actuarial valuation has not been performed.*

In preparing this report, we relied, without audit, on information (some oral and some in writing) supplied by both the relevant actuarial firms who prepare the formal valuations and the relevant staff at each of the administrative systems. This information includes, but is not limited to, statutory provisions, employee data and financial information. It should be noted that if any data or other information provided to us is inaccurate or incomplete, our calculations and recommendations may need to be revised.

Actuarial assumptions, including discount rates, mortality tables, and others identified in this report, and actuarial cost methods are those used by the Fund Actuary and as prescribed by statute or adopted by the applicable Board and approved by the LCPR. These parties are responsible for selecting the plan's funding policy, actuarial valuation methods, asset valuation methods, and assumptions. The policies, methods, and assumptions used in this valuation are those that have been so prescribed and are described in the Actuarial Basis of this report.

A valuation report is only an estimate of the System's financial condition as of a single date. It can neither predict the System's future condition nor guarantee future financial soundness. Actuarial valuations do not affect the ultimate cost of System benefits, only the timing of System contributions. While the valuation is based on an array of individually reasonable assumptions, other assumption sets may also be reasonable and valuation results based on those assumptions would be different. No one set of assumptions is uniquely correct. Determining results using alternative assumptions is outside the scope of our engagement.

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

On the basis of the foregoing, we hereby certify that, to the best of our knowledge and belief, this report is complete and accurate and has been prepared in accordance with generally recognized and accepted actuarial principles and practices which are consistent with the principles prescribed by the Actuarial Standards Board (ASB) and the Code of Professional Conduct and Qualification Standards for Public Statements of Actuarial Opinion of the American Academy of Actuaries.

Milliman's work is prepared solely for the use and benefit of the LCPR. To the extent that Milliman's work is not subject to disclosure under applicable public records laws, Milliman's work may not be provided to third parties without Milliman's prior written consent unless allowed under the Legislative Commission on Pensions and Retirement Contract for Actuarial Review and Auditing Consulting Services dated July 18, 2013. Milliman does not intend to benefit or create a legal duty to any third party recipient of its work product. No third party recipient of Milliman's work product should rely upon Milliman's work product. Such recipients should engage qualified professionals for advice appropriate to their own specific needs.

Any distribution of the enclosed report must be in its entirety including this cover letter, unless prior written consent is obtained from Milliman, Inc. This report has been prepared in accordance with the terms and provisions of the Legislative Commission on Pensions and Retirement Contract for Actuarial Review and Auditing Consulting Services effective July 18, 2013.

We, William V. Hogan, FSA, and Timothy J. Herman, FSA, are actuaries for Milliman, Inc. We are members of the American Academy of Actuaries and a Fellow of the Society of Actuaries, and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein.

We look forward to making a personal presentation of our findings in briefings to the Minnesota Legislative Commission on Pensions and Retirement and to relevant staff members.

Respectfully submitted,

Milliman, Inc.

William V. Hogan

William V. Hogan, FSA, MAAA
Principal and Consulting Actuary

Timothy J. Herman

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WVH/TJH/kf

July 1, 2013 Actuarial Review
of the Retirement Systems under the

Minnesota Legislative Commission on Pensions and Retirement

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Purpose and Scope of the Actuarial Audit Review

In accordance with Minnesota Statutes, Section 356.214, Subdivision 4, the Minnesota Legislative Commission on Pensions and Retirement (LCPR) has engaged Milliman, Inc. to perform an actuarial review of the July 1, 2013 actuarial valuations prepared for selected statewide and major local Minnesota public employee pension funds. Except as indicated below, our reviews have been limited in scope and do not reflect a full replication of any individual retirement system. The table below details the selected funds included in our review.

Funds Included in Review *	
MSRS General	PERA Police and Fire
MSRS State Patrol	PERA Local Correctional
MSRS Correctional	PERA MERF
MSRS Judges	TRA
MSRS Elective State Officers/Legislators	DTRFA
PERA General	St. PTRFA

* *A complete replication of the July 1, 2013 Actuarial Valuation has been performed for MSRS State Patrol, MSRS Correctional, PERA Police and Fire, and PERA Local Correctional. Please see the Milliman client report dated January 31, 2014 for the MSRS State Patrol report, January 31, 2014 for the MSRS Correctional report, January 31, 2014 for the Police and Fire report, and January 31, 2014 for the PERA Local Correctional report for the details of the replication valuations. For all of the other funds included in the Actuarial Review, a complete replication of the July 1, 2013 actuarial valuation has not been performed.*

The actuarial review of each of the remaining valuations was performed using a methodology known as a **"limited scope"** or **"peer review"** audit. Such a review is intended to provide assurance that the liabilities and costs of the system are reasonable. The review is not a full replication of the actuarial valuation results, but is a review of the key components in the valuation process that encompass the derivation of the liabilities and costs for the system. These key components are the data, the benefits valued, application of the actuarial assumptions, application of the asset valuation method and the actuarial cost method employed. The receipt of detailed valuation output for a select group of test lives provides the detail necessary to validate each of these key components. The test lives reviewed are not randomly selected, but rather are specifically chosen to include members that will cover the various benefit provisions and actuarial assumptions used in the valuation process. For example, test lives generally will include:

- Members in various status categories such as active, terminated vested, retired, and survivors.
- Retiree test lives are selected with different forms of payment to ensure all payment forms are accurately valued.
- Active members who are covered by different benefit structures are included to make sure the benefits valued for all benefit structures are appropriate.
- Members of different gender and age/service combinations to test the application of different actuarial assumptions.
- Active members are selected that will test differences within one set of actuarial assumptions, e.g. Rule of 90, early retirement and normal retirement.

We reviewed all of the information provided to us from the fund administrators and the fund actuaries. We also requested and reviewed additional information provided by the fund actuaries. With respect to the actuarial assumptions, we generally focused our review on the application of the assumptions in the valuation process. In some limited instances, we have commented about the appropriateness of some assumptions.

A limited scope audit may identify areas of concern, but it generally cannot quantify the impact of any issues identified, other than in general terms. In our report, we comment on several findings where we feel the issue identified is immaterial or within a reasonable degree of tolerance. For the most part, these comments are couched in terms of an expected percentage impact on the actuarial liability and normal cost rate. Given that the actuarial accrued liability of some of the plans is a very large number, a small percent change may result in a dollar amount judged to be "large" depending upon your point of view (0.50% of $23 billion is $115 million). However, as a percentage, the difference may be considered small and within acceptable levels of variance.

It is important to recognize that the actuarial valuation process, while very sophisticated in its calculation methodology, is still an estimate of the financial value of benefits payable on contingent events, most of which occur many years into the future. As such, a considerable amount of uncertainty and variability surrounds those estimates. As actuaries we recognize this fact and are comfortable that small differences (in percentages) in the results do not change the overall financial results portrayed in the valuation. Furthermore, the actuarial software used by different firms has implicit differences that create differences in the valuation numbers. A good example of differences in actuarial software is the decrement timing (mid-year vs. beginning of year). In this case both approaches fall within acceptable actuarial practices and both approaches produce reasonable results even though they may vary by several percentage points. For this reason, we believe the comparison of valuation results should be evaluated in terms of percentage differences. To provide some context for our comments, in a replication audit, where the differences that are identified can also be quantified, we generally expect to be within 1-2% on the calculation of the present value of future benefits and within 4-5% on the calculation of the actuarial accrued liability and normal cost. The wider range on the latter items is because there tends to be more variability in how different actuarial software programs allocate the total liability (present value of future benefits) to past and future years of service.

Statement of Key Findings

Our conclusions concerning the primary issues of the audit are as follows:

In general, we have found the actuarial calculations to be accurate, appropriate, and consistent with the standards of work issued by the LCPR. While there are some exceptions noted throughout this report, we do not believe that any of these would substantively alter the results presented by the various fund actuaries. However, in our conclusions, we present some longer term considerations where we have some concerns.

There are several issues identified for one or more systems in the report. We have summarized some of them as follows:

1. The 2013 Omnibus Retirement Bill included changes to benefit provisions and financing sources including member and employer contribution increases as well as State Aid. Specific changes by fund are noted elsewhere in this report. In general, significant improvements in the long-term health of the affected funds are expected as a result of these changes. Nevertheless, there are some funds with significant financial challenges.

2. The table below compares the July 1, 2012 and July 1, 2013 Contribution Sufficiency/(Deficiency) measures as calculated by the Fund Actuaries.

Contribution Sufficiency/(Deficiency) Measure
Reported by Fund Actuary

Fund*	July 1, 2012	July 1, 2013
MSRS General	-2.32%	-2.45%
MSRS Correctional	-4.58%	-5.41%
MSRS State Patrol	-11.52%	-8.68%
MSRS Judges	-13.50%	-11.46%
PERA General	-0.96%	-1.65%
PERA Correctional	0.13%	0.26%
PERA P&F	-7.94%	-2.64%
TRA	-5.04%	-4.74%
DTRFA	-8.49%	-2.88%
SPTRFA	-6.40%	-2.80%

* *The table above shows the results for Funds that use a level percentage of pay methodology to determine the Contribution Sufficiency/(Deficiency) measure. Consequently, the results for MSRS Elective State Officials/Legislators, and the MERF Division of PERA are not included.*

3. Market value returns for the last fiscal year were generally favorable. However, due to mixed investment experience for the last four fiscal years, most (but not all) of the funds using an asset smoothing mechanism reported an investment loss on an actuarial value basis as prior unrecognized losses became recognized. Many of these funds now have actuarial value of assets that are less than the market value of assets. These funds are now well positioned to report investment gains on an actuarial basis next year even if market returns are only average.

4. Each Fund Actuary has reported the Contribution Sufficiency/(Deficiency) measure on both an actuarial value and a market value basis. Reviewing this measure on a market value basis illustrates the impact the asset smoothing has on deferred asset gains. In addition to reviewing the Contribution Sufficiency/(Deficiency) measure on a market value basis, it is also instructive to consider the effects after the increases in member and employer contribution rates are fully phased in and after the temporary State Aid to the St. Paul and Duluth Teachers Funds expire. The table below illustrates the Contribution Sufficiency/(Deficiency) measure on a market value basis and on a market value basis with long-term funding sources.

July 1, 2013 Contribution Sufficiency/(Deficiency) Measure			
Fund* **	**Actuarial Value Basis Reported by Fund Actuary**	**Market Value Basis Reported by Fund Actuary**	**Market Value Basis with Long-Term Funding Sources Calculated by Milliman***
MSRS General	-2.45%	-0.80%	-0.80%
MSRS Correctional	-5.41%	-3.97%	-3.97%
MSRS State Patrol	-8.68%	-4.33%	0.67%
MSRS Judges	-11.46%	-9.64%	-9.64%
PERA General	-1.65%	-0.15%	-0.15%
PERA Correctional	0.26%	1.19%	1.19%
PERA P&F	-2.64%	0.65%	2.90%
TRA	-4.74%	-2.73%	-1.73%
DTRFA	-2.88%	-0.85%	-10.77%
SPTRFA	-2.80%	-1.67%	-1.42%

* *Milliman calculations use the values reported by the Fund Actuary.*

*** *The table above shows the results for Funds that use a level percentage of pay methodology to determine the Contribution Sufficiency/(Deficiency) measure. Consequently, the results for MSRS Elective State Officials, MSRS Legislators, and the MERF Division of PERA are not included.*

5. As noted in the detailed commentary, the Actuarial Required Contribution rate results in "negative amortization" for a period of time. This means that amortization payments on the unfunded actuarial liability are not large enough to cover interest on the unfunded actuarial liability in the short term. Consequently, the unfunded actuarial liability is expected to increase in the next year for most funds. Because the amortization payments are expected to increase over time under this method, eventually the payments will be enough to cover both interest and principal until the unfunded liability is fully amortized at the statutory amortization date.

   However, we note that for the St. Paul Teachers Retirement Fund Association, a "rolling" 25 year amortization period is used. This means that the amortization schedule never diminishes and the method will never get out of the negative territory. We believe that this funding methodology should be reviewed and modified if deemed appropriate.

6. For the Duluth Teachers Retirement Fund Association, there is an inherent upward bias in the calculation of the Actuarial Required Contribution rate due to the combined impact of the Fund Actuary's application of the Entry Age normal actuarial cost method and the amortization of the Unfunded Actuarial Accrued Liability as a level percentage of payroll for this fund. This issue is further discussed in Section 3 of this report. The Entry Age Normal methodology which is applied for Duluth Teachers lowers the Normal Cost and moves a portion of it to the unfunded actuarial liability. This increases the pressure on funding a mature fund such as Duluth Teachers during periods of declining payroll because the funding of the Unfunded Actuarial Accrued Liability is predicated on payments from future payrolls that will be higher than the current payroll. The increased amortization period as a

result of plan and assumption changes has further aggravated this issue. Further, it is not clear to us that this method follows the Actuarial Standards of Practice as adopted by the LCPR. Under Minnesota Statutes, the Actuarial Required Contribution rate is not required to be contributed to the Fund. Instead, this measure is compared to the Statutorily Required Contributions to assess the adequacy of the current contributions. Using Milliman's July 1, 2012 replication results, the table below illustrates the differences in the calculation of the Contribution Sufficiency/Deficiency measure in dollar terms:

Duluth Teachers' Retirement Fund Association
Illustrative Contribution Sufficiency/(Deficiency) Measure Using Milliman July 1, 2012 Results

(dollars in thousands)

Entry Age Normal Method	Newly Hired Member's Benefit Structure	Each Member's Benefit Structure	Each Member's Benefit Structure
Amortization Method	**Level Percent of Payroll**	**Level Percent of Payroll**	**Level Dollar**
1. Statutory Contributions	$7,348	$7,348	$7,348
2. Required Contributions			
a. Normal Cost	3,591	3,844	3,844
b. Amortization of the Unfunded Actuarial Accrued Liability	7,652	7,607	10,034
c. Expense	587	587	587
d. Total [2.a.+ 2.b.+ 2.c.]	11,830	12,038	14,465
Sufficiency/(Deficiency) [1.- 2.d.]	$(4,482)	$(4,690)	$(7,117)

7. Legislation passed in both 2010 and 2011 modified the cost of living adjustments (COLA) applied to annual pension payments. These modifications lowered the COLA until a specified funding level is achieved. For the 2013 valuations, we have reviewed the methodology used by the Fund Actuary for determining the level of COLA to value in these situations. We believe the methodology used is reasonable for the 2013 valuations.

   The 2013 Omnibus Pension Legislation changed the COLA mechanism for PERA General, Police & Fire, Local Correctional, and MERF Division of PERA as described below:

   > The funding ratio threshold that must be attained to pay a 2.5% postretirement benefit increase to benefit recipients was changed from 90% for one year to 90% for two consecutive years. The funding ratio threshold that determines when a 2.5% postretirement benefit increase must decrease to 1.0% was changed from less than 90% for one year to less than 80% for one year or less than 85% for two consecutive years.

   The PERA Local Correctional Plan's accrued liability funded ratio on a market value basis was 88.99% on July 1, 2012 and 96.21% on July 1, 2013. Under the new COLA mechanism, the COLA was 1.0% on January 1, 2014. The January 1, 2015 COLA will depend on the July 1, 2014 accrued liability funded ratio on a market value basis. If the July 1, 2014 funded ratio reaches 90% or more, the COLA will increase to 2.5%. Otherwise, the COLA will remain at 1.0%. The 2013 Omnibus Pension Legislation will reduce changes to the COLA but not eliminate them.

8. An important aspect of the actuarial reports is to provide a consistent "picture" of the funded status and funding requirements for each of the funds year after year. The current funded status as of the valuation date is extremely important but it is also important to understand the direction of the change in funded status. This understanding is enhanced when prior years can be compared in a consistent fashion. The following comments concerning report content are aimed in this direction.
   - We note that some of the reports do not show all of the decrement costs related to active member benefits even though the numbers accurately reflect those amounts in the totals. Specifically, in some cases, the expected refund payments have been aggregated with deferred retirement benefits for benefits expected to be paid to active members upon withdrawal.
   - Also, we note that the projected benefit ratio anticipates future increases in contributions which are already in statute for some funds, but not others. We recommend that all fund actuaries adopt a consistent methodology on this calculation.
9. An actuarial valuation is a snapshot of the current funded status as of the valuation date. It is important to understand the changes in funded status over time - both historical changes and expected future changes. We believe the valuation projections which are required by the actuarial standards will provide useful information to the LCPR to more fully understand the funding challenges the retirement systems face.

There are other relatively minor items that we note in the individual report sections later on.

Conclusions and Recommendations

While the actuarial results presented in the reports are generally correct, we believe that there are some key issues facing most of these systems.

Actuarial Value of Assets

From the 7/1/2009 to the 7/1/2013 actuarial valuations, there have been significant changes to the benefit structure, updates to the actuarial assumptions, and modifications to the actuarial standards of practice adopted by the LCPR. In addition, when measured on a market value basis, the funds have experienced unfavorable asset return for the fiscal year ending June 30, 2012 and favorable asset returns for the fiscal years ending June 30, 2010, June 30, 2011, and June 30, 2013 when compared to the 8.5% (8.0% for the fiscal year ending June 30, 2013) actuarial rate of asset return assumption specified by Minnesota statutes:

- The rates of return on a market value of assets basis were typically between 15-16% for the year ending June 30, 2010 with the MSRS Legislator's fund posting the lowest return at 12.2% and the Duluth Teachers Retirement Fund Association netting a return of 17.6%.
- The rates of return on a market value of assets basis were between 21-24% for the year ending June 30, 2011 with the Duluth Teachers Retirement Fund Association posting the lowest return at 21.6% and the St. Paul Teachers Retirement Fund Association netting a return of 24.8%.
- The rates of return on a market value of assets basis ranged from a loss of 0.5% to positive return of 2.7% for the year ending June 30, 2012 with the St. Paul Teachers Retirement Fund Association posting the lowest return at (0.4%) and the PERA Police and Fire Fund Association netting a return of 2.9%.
- The rates of return on a market value of assets basis were typically between 13-16% for the year ending June 30, 2013 with Duluth Teachers Retirement Fund Association earning 16.6% and St. Paul Teachers Retirement Fund Association netting 13.5%.

The favorable market value returns for the year ending June 30, 2013 were offset by the recognition of prior investment losses under the asset smoothing method. Consequently, the July 1, 2013 actuarial valuation results indicate investment losses when measured on an actuarial value of assets.

COLA

One of the significant changes in the benefit structure made by the 2010 Omnibus Pension Legislation is the temporary reduction in the post-retirement Cost of Living Adjustment (COLA). This change requires a fund to pay a lower annual COLA until “financial stability” is restored for the fund. For most funds (but not all), the COLA is reduced from 2.5% to 2.0% per year. Minnesota statutes define “financial stability” to occur when the ratio of the market value of the fund’s assets to the fund’s actuarial accrued liabilities is 90% or more. If and when “financial stability” is reached as of an actuarial valuation date, the fund may pay a COLA of 2.5% as of the following January 1.

In setting the actuarial assumption with respect to “financial stability”, some of the fund actuaries have prepared projections to determine if, and when, the fund is projected to reach the 90% funding level on a market value basis. For these funds, most of the projections indicate the fund will not reach the 90% funding level within the next 15 years in order to pay a higher COLA. Consequently, the actuarial valuations for these funds assume that the lower COLA required under the 2010 Omnibus Pension Legislation will continue to be paid for the actuarial valuation period (typically over the next 75-100 years for most actuarial valuation systems). This implies that additional actions may be necessary if the goal is to achieve a 90% funding level. One issue that needs to be addressed relates to when a fund is projected to achieve 90% funding level only in later years. How should an actuarial valuation model the plan fund liabilities and costs of the COLA in such a situation? For example, a small deficiency in a fund does not necessarily mean that full funding will not be achieved. It only means full funding will not be achieved by the scheduled amortization date. Consequently, these funds are expected to reach 90% funded status at some future date.

Additionally, the current statutes provide for the full 2.5% COLA to be paid when a fund reaches the 90% funding level (on a market value of assets basis). There is the possibility that a fund may be in the position to satisfy the 90% funding criteria before a higher COLA is paid and be less than 90% funded after paying the higher COLA. This suggests administrative issues that may need to be addressed by the Funds or via law changes.

The 2013 Omnibus Pension Legislation changed the COLA mechanism for some funds. These changes that are described above will reduce but not eliminate these issues. We stand ready to assist the Commission with this issue.

Finally, we would prefer that all of the actuary reports document the analysis for assuming the COLA assumption being used.

Amortization of Unfunded Actuarial Liability

Earlier, we noted a concern about the funding for Duluth Teachers Retirement Fund Association. However, we note that most of the Funds that we have reviewed share a similar issue to a lesser degree. Most of the Funds amortize their unfunded actuarial liability as a level percentage of future payroll. Since future payroll is projected to increase each year, a significant portion of the amortization is pushed back to the later years. In fact, the early years of amortization payments do not even cover the interest on the unfunded actuarial liability. This is sometimes referred to as “negative amortization”. The problem arises when payrolls do not increase as projected. When this happens, the unfunded actuarial liability goes up (not down) since the payments do not cover the interest. A corollary to that problem occurs when using a rolling 25 year amortization such as St. Paul Teachers Retirement Fund. Even if the payroll projection is met, you never cover the interest on the unfunded actuarial liability because you are always in the first year of the amortization.

We have provided the following table in an effort to demonstrate our concern. The question is whether the data is an aberration or a trend for the future. The data in this table was taken from the 2013 actuarial valuation reports.

Geometric Mean Over Select Time Periods

	Payroll Growth Assumption	1-Year	5-Year	10-Year	20-Year
PERA General	3.75%	2.0%	2.1%	1.8%	4.0%
PERA P&F	3.75%	0.2%	2.5%	3.6%	5.9%
MSRS General	3.75%	4.9%	1.9%	2.1%	2.6%
MSRS State Patrol	3.75%	-0.6%	0.7%	1.4%	2.8%
TRA	3.75%	1.2%	1.5%	2.9%	3.3%
DTRFA	3.50%	-3.0%	-3.0%	-1.3%	0.1%
StPTRFA	4.00%	3.5%	1.0%	1.9%	3.6%

American Academy of Actuaries Actuarial Standards of Practice

The Actuarial Standards Board of the Academy of Actuaries establishes and improves standards of actuarial practice. These Actuarial Standards of Practice (ASOPs) identify what the actuary should consider, document, and disclose when performing an actuarial assignment. Standards of practice are in place to assure the public that actuaries are professionally accountable. At the same time, the standards provide practicing actuaries with a basis for assuring that their work will conform to appropriate practices. Written standards of practice, coupled with written provisions for disciplining members, show that the profession governs itself and takes an active interest in protecting the public.

There are ASOPs for each area of specialty (Casualty, Health, Life, Pension) and also general standards that apply to all practice areas. The specific pension ASOPs that apply to the actuarial work reviewed by Milliman include:

- ASOP 4: Measuring Pension Obligations
- ASOP 27: Selection of Economic Assumptions for Measuring Pension Obligations
- ASOP 35: Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations
- ASOP 44: Selection and Use of Asset Valuation Methods for Pension Valuations

<u>ASOP 4</u>

ASOP 4 governs the calculation of pension obligations and the communication of those results. In general, the report should contain sufficient information such that:

- It would be properly interpreted and applied by the person to whom the communication is directed, and
- Another actuary in the pension practice could form an opinion about the reasonableness of the conclusion.

Standard of Practice No. 4 also indicates specific requirements for content of actuarial reports including:

- The name of the person or firm retaining the actuary and the purpose of the report,
- An outline of the benefits being valued,
- The effective date of the calculation,
- A summary of the participant data,
- A summary of asset information,
- A description of the actuarial methods and assumptions, and
- A statement of the findings, conclusions or recommendations necessary to satisfy the purpose of the communication.

<u>ASOP 27</u>

ASOP 27 governs the selection of economic assumptions for measuring pension obligations. The guidance with respect to the investment return assumption included in the current version of this standard of practice calls for the actuary to construct a “best estimate range” and recommend a specific point within this range. The standard defines the best estimate range as “…the narrowest range within which the actuary reasonably anticipates that the actual results, compounded over the measurement period, are more likely than not to fall”. (ASOP 27, § 2.1)

We believe that the current 8.0% for 4 years, 8.5% thereafter select and ultimate interest rate assumption generally can fit within the guidance provided by the current standard. As we reported in our review of the experience studies during 2010, we believe it falls on the upper end of the “best estimate range” when looking at standard Milliman economic models.* This means the 8.0/8.5% assumption is somewhat more likely to generate investment losses in the future as opposed to investment gains relative to the 8.0/8.5% long-term return assumption according to the output from Milliman's standard model.

Changes to ASOP 27

The Actuarial Standards Board has adopted a revised edition of ASOP 27. This revised edition will be first effective for the July 1, 2015 actuarial valuation of the funds. The revised edition of ASOP 27 no longer includes the concept of a "best estimate range." Instead, the revised edition of the standard calls for the actuary to select a "reasonable" assumption. An assumption is "reasonable" if it has no significant bias (i.e. it is neither significantly optimistic or pessimistic). The revised edition goes on to describe a "Range of Reasonable Assumptions." In part, this definition states, "The actuary should also recognize that different actuaries will apply different professional judgment and may choose different reasonable assumptions. As a result, a range of reasonable assumption may develop both for an individual actuary and across actuarial practice." (Revised edition of ASOP 27, Section 3.6.2).

The general trend that we have seen over the last decade is a reduction in the capital market assumptions by both actuarial firms and investment consultants. In addition, we have also seen the trend of lower interest rate assumption used by public pension funds. As a reference point, the 50th percentile return based on Milliman's capital market model is significantly less than 8.5%. In our view, we might feel that the current 8.5% assumption does have a bias toward optimism.

ASOP 35

ASOP 35 governs the selection of demographic and other noneconomic assumptions for measuring pension obligations. A revised edition of this standard was adopted by the Actuarial Standards Board of the American Academy of Actuaries in September 2010. This standard is applicable to Members of the American Academy of Actuaries and is effective for any actuarial valuation with a measurement date on or after June 30, 2011. Consequently, the July 1, 2011 actuarial valuation was the first time the revised ASOP 35 standard applies to Members of the American Academy of Actuaries who prepare work for the Minnesota retirement funds. We believe the current mortality assumption used for the July 1, 2013 actuarial valuations satisfy the requirements in the revised ASOP 35 standard.

ASOP 44

ASOP 44, Selection and Use of Asset Valuation Methods for Pension Valuations, governs the asset valuation method. This ASOP provides that the asset valuation method, which is used to develop the actuarial value of assets, should bear a reasonable relationship to the market value. It further provides that the asset valuation method should be likely to satisfy both of the following:

- Produce values within a reasonable range around market value AND
- Recognize differences from market value in a reasonable amount of time.

In lieu of both of the above, the standard will be met if either of the following requirements is satisfied:

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* Milliman's investment consultants develop long-term capital market expected returns based on current yields and valuation levels, published surveys of expert forecasts of real GDP growth and inflation, and historical risk measures of asset class return volatility and covariance. These capital market assumptions underlie the "building block" method used in our expected return model based on the guidance in Actuarial Standard of Practice No. 27 (ASOP27), *Selection of Economic Assumptions for Measuring Pension Obligations.* The building block method in our model considers asset allocation, expected return and variance of each class, and correlation and covariance between asset classes. We then analyze the output ranges and adjust for expected investment expenses in order to arrive at our recommended investment return assumption.

- There is a sufficiently narrow range around the market value OR
- The method recognizes differences from market value in a sufficiently short period.

We believe the methodology in statute meets the requirements of ASOP 44 because it recognizes the difference between market value and actuarial value in a sufficiently short period.

The purpose of an asset valuation method is to reduce volatility in the value of assets that is used in the valuation process thereby creating more stable contribution rates. However, it is important to recognize the difference between the actuarial and market value of assets and the impact the deferred investment experience will have on future valuations. As required by the LCPR actuarial standards of practice, the valuation reports include the difference between actuarial and market value of assets, and provide the funded ratio and actuarial contribution rate on a market value basis.

We believe that all of the reports meet these requirements.

Standards for Actuarial Work (Legislative Commission on Pensions and Retirement)

The Legislative Commission on Pensions and Retirement (LCPR) has adopted standards for actuarial work. The purposes of the standards are:

1. To ensure that sound actuarial procedures are utilized in developing actuarial assumptions, actuarial valuations, and cost estimates for proposed legislation for each retirement plan.
2. To establish sufficient uniformity of actuarial procedures that financial comparability of the retirement plans of the State of Minnesota is maximized.
3. To facilitate the development of sound public policy decision making in the pension area by the Legislature and the Legislative Commission on Pension and Retirement.

These standards are updated periodically, most recently as of August 11, 2010. All actuarial work for retirement plans subject to Minnesota Statutes, Section 356.215 and not subject to Minnesota Statutes, Section 356.216 must be prepared in accordance with the appropriate standards in effect as of the date of the valuation. Specific comments regarding the Commission's Standards are included in our discussion of each Plan.

Audit Conclusion

The Duluth Teachers Retirement Fund Association (DTRFA) is made up of one fund. The fund covers the public school teachers employed by Duluth public schools (except charter school teachers).

In general, the fund experienced a decrease in the accrued liability funded ratio and a decrease in the contribution rate deficiency. The decrease in the deficiency measure is primarily due to the temporary addition of $6,000,000 in State Aid. In addition, the DTRFA is a mature fund with about 43% of its membership in pay status representing more than 70% of the Actuarial Accrued Liability.

The following changes affected the July 1, 2013 actuarial valuation of the Fund:

- Benefit provisions and contribution sources were changed as a result of the 2013 Omnibus Retirement Bill
  - Scheduled increases in member and employer contribution rates of 1.71% of pay fully phased in at July 1, 2014.
  - State Contributions of $6,000,000 on October 1, 2013 and October 1, 2014 were added.
  - Increase in the formula multiplier of 0.2% for New Plan members that applies to service after June 30, 2013.
  - Change in actuarial early retirement reduction factors for New Plan Tier II members to a table of stated reductions.
  - A 1% annual post-retirement COLA was reinstated on January 1, 2014. The post-retirement COLA will change to a CPI-based COLA up to 5% if the funded ratio is 90% or higher on an actuarial value basis.

Following Minnesota Statute 356.215 Subdivision 11, the statutory amortization date was extended from June 30, 2039 to June 30, 2040 due to the increase in the accrued liability from the changes in actuarial assumptions and plan benefits.

As noted in our July 1, 2012 replication review, there appears to be a difference in the application of the entry age normal actuarial cost method between the Milliman results and the results prepared by the fund actuary. The Milliman results employ a method which bases the normal cost rate on the benefits to be earned by current members based on each member's benefit structure. In determining the normal cost rate, we assumed the current plan design has been in effect since date of hire. This approach will result in a normal cost rate that is level over a member's career. Subject to changes in the demographic composition of the active member group, the normal cost rate for the fund as a whole will decrease over time under the current benefit structure as new members with lower benefits replace current members with higher benefits.

We believe the fund actuary's results are based on the normal cost rate using the same benefit structure for new hires on all current members. Under this application of the entry age normal actuarial cost method, the part of the current members' future accruals that will no longer be funded via normal cost rate are essentially capitalized as the actuarial accrued liability and therefore funded via amortization of the unfunded actuarial accrued liability. This approach will result in a normal cost rate that is level over time, subject to changes in the demographic composition of the active member group.

In practice, we have seen both applications of the entry age normal actuarial cost method used for governmental employer pension plans. However, there is a concern about consistency between the results produced by different Fund Actuaries. Based on other replication valuations we have prepared, we believe that all of the other Fund Actuaries use the method we have employed. It is also questionable whether the method used for DTRFA satisfies the requirements of Section III of the Standards For Actuarial Work as updated by the Legislative Commission on August 11, 2010. Furthermore, with the extension of the amortization period and the declining covered payroll discussed in the Executive Summary, we believe the use of this variation of the EAN method used for the DTRFA valuation to be increasingly inappropriate. We have provided more discussion on this below.

As required by Minnesota Statutes, the Unfunded Actuarial Accrued Liability (UAAL) is amortized as a level percent of payroll from the valuation date to the statutory amortization date to determine the Actuarial Required Contribution Rate. Currently, the actuary applies an assumed payroll growth assumption of 3.50% as set in statute to determine the amortization rate to pay off the UAAL. A review of the data set forth in Section 4, Exhibit III of the fund actuary's report provides a clear downward trend in payroll from June 30, 2008 to June 30, 2011 with a slight increase in the June 30, 2012 fiscal year, and another decrease on the June 30, 2013 fiscal year. Looking further back, the annual payroll growth from June 30, 1993 through June 30, 2013 is slightly over 0.1%. The implication of future payroll lower than what was projected by the actuarial assumptions is that the calculated amortization payment is not sufficient to pay off the Unfunded Actuarial Accrued Liability by the statutory amortization date. For example, the fund actuary's report calls for a supplemental contribution amortization of $10.7 million; whereas, interest alone on the unfunded liability is almost $13.0 million. This situation is sometimes referred to as "negative amortization". For a growing payroll situation, this lower contribution is offset by higher contributions in the future. However, if payroll is not growing, the lower contributions are not offset and the deficit grows instead of shrinks. Given the mature state of this Fund, we believe this assumption should be addressed with consideration given to a level dollar amortization method.

There is an inherent upward bias in the calculation of the Actuarial Required Contribution rate due to the combined impact of the fund actuary's application of the Entry Age normal actuarial cost method and the amortization of the Unfunded Actuarial Accrued Liability as a level percentage of payroll for this fund. Under Minnesota Statutes, the Actuarial Contribution rate is not required to be contributed to the Fund. Instead, this measure is compared to the Statutorily Required Contributions to assess the adequacy of the current contributions. Using Milliman's July 1, 2012 replication results, the table below illustrates the differences in the calculation of the Contribution Sufficiency/Deficiency measure in dollar terms:

Duluth Teachers' Retirement Fund Association
Illustrative Contribution Sufficiency/(Deficiency) Measure Using Milliman July 1, 2012 Results

(dollars in thousands)

Entry Age Normal Method	Newly Hired Member's Benefit Structure	Each Member's Benefit Structure	Each Member's Benefit Structure
Amortization Method	**Level Percent of Payroll**	**Level Percent of Payroll**	**Level Dollar**
1. Statutory Contributions	$7,348	$7,348	$7,348
2. Required Contributions			
a. Normal Cost	3,591	3,844	3,844
b. Amortization of the Unfunded Actuarial Accrued Liability	7,652	7,607	10,034
c. Expense	587	587	587
d. Total [2.a.+ 2.b.+ 2.c.]	11,830	12,038	14,465
Sufficiency/(Deficiency) [1.- 2.d.]	$(4,482)	$(4,690)	$(7,117)

The combined effect of (1) negative amortization by using level percent of pay amortization, (2) declining covered payroll, (3) the Fund Actuary's continued application of the Entry Age Normal Cost Method, and (4) the extension of the amortization date as required by Minnesota Statutes is likely to result in higher funding deficiencies in future years.

For the July 1, 2013 Actuarial Valuation of the DTRFA, we have prepared a limited scope sample life review of the Fund Actuary's results as provided in our contract. A full replication review was last prepared for the July 1, 2012 Actuarial Valuation. Our comments below reflect the results of our sample life review.

Comments

Membership Data

We received the original data file prepared by the Fund and supplied to the actuary. We found that the data elements were being used in a consistent manner by the fund actuary. We also noted that the number of records and other summary values listed in the report were reasonable. Based upon this, we believe the data used by the actuary to prepare the actuarial valuation is appropriate and reasonably accurate.

Actuarial Value of Assets

We have reviewed the application of the asset smoothing method. It is the method defined in statute and we believe that this method has been applied correctly.

Actuarial Valuation

We reviewed 12 sample life calculations (6 active, 4 in-pay, 2 deferred vested). We reviewed calculated values and matched the present value of future benefits provided by the actuary to within a reasonable degree of tolerance in the sample lives.

Funding Method

As noted above, we believe that the actuary should consider revising their application of the Entry Age Normal funding method to be consistent with the other funds and as provided in the statutes.

Actuarial Assumptions

We have reviewed the actuarial assumptions as summarized in the actuarial valuation. We have confirmed that the fund actuary has applied these assumptions as summarized in the report, and we have also confirmed the appropriate use of assumptions required by Chapter 356.215, except as noted below.

We have determined that the Fund Actuary has applied a salary increase assumption for the initial years of employment (select period) that is not consistent with the increase assumption contained in Chapter 356.215 of the Minnesota statutes. We have confirmed in the sample lives that the Fund Actuary is applying the rates as stated in their report. Since the rates only apply in the early years of employment and the liabilities in DTRFA are heavily skewed to retirees and longer service employees, we believe the impact of these rates is not likely to be significant in total present value of benefits. It is possible that this could affect the calculation of Entry Age Normal Cost by a larger percentage than the present value of benefits.

We note there appears to be a substantial difference between the fund actuary's results and our results for active Member benefits for deferred retirement and refund of contributions. This apparent difference is due to the approaches used in the valuation system when an active Member is assumed to leave the System by withdrawal. In the actuarial assumptions, Members who withdraw from the System after becoming eligible for a deferred benefit are assumed to take the larger of their return of contributions, or their deferred annuity benefit. In the fund actuary's results, the benefits are included in the deferred retirement component if the member is projected to be vested at the time of withdrawal. Otherwise, the benefits are included in the refund of contributions component. In the Milliman results, the deferred retirement component includes the value of annuity benefits for vested Members who withdraw from the System. The refund of contributions component includes both the refund of contributions for members who are not vested at the date of assumed withdrawal plus the value of the return of contributions for Members who are assumed to elect a refund of contributions in lieu of future annuity benefits.

We further note there is a substantial difference between the Fund Actuary's results and our results for terminated members. For deferred retirements with future augmentation, we believe this difference is due to different application of the actuarial standards for terminations that are expected following the member's vesting date. According to the actuarial standards, the proper technique is to assume that the member selects the benefit with the greater value. Thus, for each year after the member's vesting date, the actuarial present value of Projected Benefits is based on the larger of the member's contributions accumulated with interest or the present value of the member's vested deferred benefit (augmented, if appropriate). In our valuation, we determine the greater value as of the former member's assumed retirement date, and then discounting the greater value from the member's assumed retirement date to the valuation date. In the Fund Actuary's valuation, it is our understanding that the greater value is determined by comparing the present value of the deferred benefit as of the valuation date to the member's contributions accumulated with interest at the valuation date. Because the interest on accumulated contributions is 4% and the interest discount factor is 8% for the first 4 years and 8.5% thereafter, the Fund Actuary's method produces a higher present value.

As part of legislation enacted in 2013, the annual Cost of Living Adjustment (COLA) applied to the pensions of retired Members was changed to 1.0%. However, if the Fund achieves at least 90% funded ratio on the actuarial value of assets to actuarial liability, the COLA will provide benefit increases based on the change in CPI-U up to a maximum of 5%. The valuation by the Fund Actuary assumes that the 1.0% COLA will remain in place for all years. As stated in the Fund Actuary's report, this assumption is based on the projections that indicate a steadily declining funding level in the future given the current statutory contribution schedule. We believe this assumption is reasonable.

In addition, the actuarial assumptions description regarding the treatment of unknown data is somewhat vague. We recommend a more detailed description of this assumption.

<u>Plan Provisions</u>

We have reviewed the sample life calculations for compliance with Chapter 354A of the Minnesota statutes. We believe that these calculations reasonably reflect the benefits provided under the statute. In addition, the Actuarial Valuation Report contains a summary of the plan provisions. We believe this summary reasonably reflects the benefits provided under the statute.

<u>Actuarial Report</u>

The information provided in the Actuarial Valuation Report appears to meet all of the requirements of the Standards for Actuarial Work established by the State of Minnesota Legislative Commission on Pensions and Retirement with one exception. The Actuarial Standards require the disclosure of certain funding measurements based upon the market value of assets.

There are some other items worthy of note with respect to the report. First, we are pleased that the report contains a ten year projection of cash flows. Second, the report does not separately provide costs related to expected refunds by active members who terminate employment. Third, we believe it would be a good enhancement to the report if the assumptions section reflected the date of the last experience analysis on which the assumptions are based (although we note that the body of the report does discuss this information).

Audit Conclusion

The Minnesota Public Employees Retirement Association (PERA) is made up of four funds. The funds cover the general membership (General), police and fire members (P&F), local correctional members (Correctional), and the Minneapolis Employees' Retirement Fund (MERF Division of PERA), reflecting the distinct benefit provisions and contribution rate requirements of each group.

For the July 1, 2013 Actuarial Valuations of the PERA Funds, Milliman prepared a replication audit of the Police and Fire Fund and the Local Correctional Fund and sample life audits of the other two funds. Detailed information regarding the replication audit of the Police and Fire Fund and the PERA Correctional Fund is provided in separate reports; however, we have provided some general comments regarding the result of the replication audit in this report. Commentary and results on the sample life audits for the other two funds are provided below.

The following changes from the 2013 Omnibus Pension Legislation were reflected in the July 1, 2013 actuarial valuations:

- COLA mechanism for PERA General, Police & Fire, Local Correctional, and MERF Division of PERA:
    - The funding ratio threshold that must be attained to pay a 2.5% postretirement benefit increase to benefit recipients was changed from 90% for one year to 90% for two consecutive years. The funding ratio threshold that determines when a 2.5% postretirement benefit increase must decrease to 1.0% was changed from less than 90% for one year to less than 80% for one year or less than 85% for two consecutive years.
- Police & Fire Fund changes in addition to the COLA mechanism changes:
    - Post-retirement increases were reduced from 1.5% to 1.0% per year.
    - Member and employer contribution rates increased 3.0% of pay fully phased in by January 1, 2015.
    - State contributions of $9,000,000 paid annually on October 1. These contributions continue until both PERA Police & Fire and MSRS State Patrol reach 90% funded ratio on a market value basis.
    - For retirements after May 31, 2014, the first post-retirement increase will be delayed two years. In addition, the reduction for early retirement is 5% per year that the member is under age 55 at the time of retirement. This change in the early retirement reduction is phased in over a 5-year period ending June 30, 2019.
    - For members hired after June 30, 2014, the vesting requirement was changed to 50% vested after 10 years grading to 100% vested after 20 years. In addition, allowable service to determine benefits is limited to 33 years (the pro-rata share of employee contributions for service in excess of 33 years is refunded).

The reader should note that the Fund Actuary determined the Supplemental Contribution Amortization of the Unfunded Actuarial Accrued Liability using the Statutory Amortization Date as described in Minnesota Statutes Section 356.215 Subd. 11(j). Thus, the actuarially required contribution rate includes a component for the amortization of the unfunded actuarial liability (UAL). For a given level of UAL, annual amortization payments are calculated as increasing by 3.75% per year ("level percent amortization"). If future experience follows the actuarial assumptions, this should result in amortization payments that keep pace with the assumed growth in overall compensation. Please note that with the current amortization period, amortization payments in the short term will not be large enough to cover interest on the UAL, which means that as a dollar amount the UAL is expected to grow. This situation is sometimes referred to as “negative amortization”. The negative amortization will continue until the amortization period becomes short enough, and the amortization payments become large enough, such that the amortization payments will be enough to cover both interest and principal, and from that point forward the UAL as a dollar amount is expected to decline progressively until ultimately reaching zero by the end of the amortization period.

PERA General showed modest declines while the other three funds showed modest gains in all of the funded ratios and in the contribution rate sufficiency/deficiency measure as reported by the Fund Actuary. With the exception of PERA General, the primary reason for the improvement in the contribution rate sufficiency/deficiency measure is the recognition of deferred investment gains in the actuarial value of assets for PERA P&F and PERA Correctional while MERF improved due to sizeable market returns during the past year. In addition, PERA P&F showed a larger improvement due to changes in plan provisions.

General

The contribution rate deficiency increased from (0.96%) to (1.65%) of pay on an actuarial value basis. On a market value basis, the deficiency decreased to (0.15%). The funding ratios have also decreased on an actuarial basis and the Fund Actuary has determined that a 90% ratio will not be reached within a 15 year period so that the 2.5% COLA has not been applied in this valuation.

Police & Fire

There is a 2.64% of pay deficiency using the actuarial value of assets. This is a significant improvement from the previous year. The primary reason is the significant changes in the plan provisions. With scheduled increases in the contribution rate, the plan’s funded status is expected to improve. More detailed information is available in our replication report.

MERF Division of PERA

Both the funded ratios and contribution rate deficiency measure increased for the MERF Division of PERA. This increase is primarily due to investment gains from the prior fiscal year and the actual contributions in excess of the required contributions. As of July 1, 2013, the Accrued Liability Funded Ratio is 74.44%. When this ratio reaches 80%, the MERF Division will be merged with the PERA General Fund (based upon the Fund Actuary’s report, potentially three to five years at current contribution levels and ignoring gains or losses). Upon the merger, the remaining liability will be amortized as a level dollar amount through June 30, 2031. The payment will be based on the assumptions of the PERA General Fund.

Local Correctional

Based on the actuarial value of assets, the Plan is 91% funded and the statutory contribution exceeds the required contribution by 0.26%. As noted by the Fund Actuary, the COLA has changed as shown in the table below:

Effective Date of Change	COLA Change
January 1, 2011	2.5% to 1.0%
January 1, 2012	1.0% to 2.5%
January 1, 2013	2.5% to 1.0%

The Plan’s accrued liability funded ratio on a market value basis was 88.99% on July 1, 2012 and 96.21% on July 1, 2013. Under the new COLA mechanism, the COLA was 1.0% on January 1, 2014. The January 1, 2015 COLA will depend on the July 1, 2014 accrued liability funded ratio on a market value basis. If the

July 1, 2014 funded ratio reaches 90% or more, the COLA will increase to 2.5%. Otherwise, the COLA will remain at 1.0%. For the July 1, 2013 actuarial valuation, the Fund Actuary assumed a 2.5% COLA for all future years.

Unless otherwise noted, the following comments apply to all four funds.

Comments

Membership Data	We received the original data file prepared by the Fund and supplied to the actuary. We found that the data elements were being used in a consistent manner by the Fund Actuary. We also noted that the number of records and other summary values listed in the report were within a reasonable tolerance to our own totals. Based upon this, we believe the data used by the actuary to prepare the actuarial valuation is appropriate and reasonably accurate.
Actuarial Value of Assets	We have reviewed the application of the asset smoothing method for PERA General, PERA P&F, and PERA Correctional. It is the method defined in statute and we believe that this method has been applied correctly. For the MERF Division of PERA, the Market Value of Assets is used. It is the method defined in Statute.
Actuarial Valuation	We reviewed 47 sample life calculations (16 active, 20 in-pay and 11 deferred vested). We reviewed calculated values by decrement and matched the values provided by the actuary to within a reasonable degree of tolerance. Based upon this limited review, we believe the actuarial calculations summarized in the actuary's report are reasonably accurate.
Funding Method	We believe that the actuary has correctly applied the Entry Age Normal funding method as provided in the statutes. This has been verified on a limited basis by the sample life calculations reviewed in the Actuarial Valuation section. In addition, the total required contribution follows the methodology provided in Minnesota Statutes 356.215.
Actuarial Assumptions	We have reviewed the actuarial assumptions as summarized in the actuarial valuation. We have confirmed that the sample life calculations from the Actuarial Valuation section have applied these assumptions as summarized in the report. We have also confirmed the appropriate use of assumptions required by Chapter 356.215. All other assumptions were selected by the Fund and the actuary. In general, we believe that the assumptions employed by the Fund Actuary for the MERF Division of PERA are reasonable and consistent with statutes and the Standards for Actuarial Work with one possible exception. The retirement rate assumption for this fund is that 100% of active members retire at age 61. The valuation results prepared by the Fund Actuary are consistent with the assumptions approved by the LCPR. We note Section II.D(4) of the Standards for Actuarial Work states: "*Members Remaining Active Beyond the Age at Which the Retirement Rate becomes 100% - Each remaining active member must be assumed to retire one year following the valuation date unless a different timing assumption is approved by the Commission. Remaining active members must be included in the valuation for all purposes.*"

Because the assumptions were approved by the LCPR, we concluded that the valuation results were consistent with the Standards for Actuarial Work.

Because the Fund is closed and there is a relatively small number of active members who are close to retirement age, there is not a significant impact on the valuation results.

Plan Provisions

We have reviewed the sample life calculations for compliance with Chapter 353 of the Minnesota statutes. We believe that these calculations reasonably reflect the benefits provided under the statute. In addition, the Actuarial Valuation Report contains a summary of the plan provisions. We believe this summary reasonably reflects the benefits provided under the statute.

Actuarial Report

The information provided in the Actuarial Valuation Report appears to meet the requirements of the Standards for Actuarial Work established by the State of Minnesota Legislative Commission on Pensions and Retirement. The information contained in the report appears to be accurate and provides the information in a logical progression.

In all reports, the Fund Actuary has provided the expected impact on the valuation results if the COLA provision reverted back to a 2.5% level upon reaching a 90% funding level. We find this to be useful information in understanding this issue. We agree with the Fund Actuary's assessment that the 2.5% COLA is not expected to apply for PERA General, Police & Fire, and MERF Division of PERA. However, the Local Correctional fund is at 96.21% as of July 1, 2013 and we find the Fund Actuary's assumption of the 2.5% COLA to be reasonable.

Audit Conclusion

The Minnesota State Retirement System (MSRS) is made up of five funds. The funds cover the state employees (General), state patrol, correctional members (Correctional), judges, and certain grandfathered elected State officers. Each fund reflects the distinct benefit provisions and contribution rate requirements of each group.

For the July 1, 2013 Actuarial Valuations of the MSRS Funds, Milliman prepared a replication audit of the MSRS State Patrol Fund and the MSRS Correctional Fund and sample life audits of the other three funds. Detailed information regarding the replication audit of the MSRS State Patrol Fund and the MSRS Correctional Fund is provided in separate reports; however, we have provided some general comments regarding the result of the replication audit in this report. Commentary and results on the sample life audits for the other two funds are provided below.

The following changes from the 2013 Omnibus Pension Legislation were reflected in the July 1, 2013 actuarial valuations:

- State Patrol
  - Post-retirement increases were reduced from 1.5% to 1.0% per year until an 85% funded ratio is reached on a market value basis. The post-retirement increases revert to 2.5% when a 90% funded ratio is reached.
  - Member and employer contribution rates increased 5.0% of pay fully phased in by July 1, 2016.
  - State contributions of $1,000,000 paid annually on October 1. These contributions continue until both PERA Police & Fire and MSRS State Patrol reach 90% funded ratio on a market value basis.
  - For retirements after June 30, 2015, the reduction for early retirement is 4% per year that the member is under age 55 at the time of retirement.
  - For members hired after June 30, 2013, the vesting requirement for retirement and survivor benefits was changed from 5 to 10 years.
  - Allowable service to determine benefits is limited to 33 years (the pro-rata share of employee contributions for service in excess of 33 years is refunded). Members with at least 28 years of service as of July 1, 2013 are not subject to this service limit.
- Judges
  - Post-retirement increases were reduced from 2.0% per year to 1.75% per year. Increases revert to 2.0% when a 70% funding ratio is reached (on a market value of assets basis). Increases revert to 2.5% when a 90% funding ratio is reached (on a market value of assets basis).
  - A new benefit program (Tier 2) was created for judges first appointed or elected after June 30, 2013. Judges first appointed or elected before July 1, 2013 with less than five years of service as of December 31, 2013 may make a one-time irrevocable election for Tier 2 benefits.
    - Tier 2 member contributions are 7.00% of pay.
    - The Normal Retirement Age for Tier 2 members is 66.

- The retirement benefit formula for Tier 2 members is 2.5% of Average Salary multiplied by the number of years of service. There is no maximum benefit percentage for Tier 2 members.

− Tier 1 member contributions were increased from 8.00% of payroll to 9.00% of payroll effective July 1, 2013. Employer contributions for both Tier 1 and Tier 2 members were increased from 20.50% of payroll to 22.50% of payroll as of July 1, 2013.

The reader should note that the Fund Actuary determined the Supplemental Contribution Amortization of the Unfunded Actuarial Accrued Liability using the Statutory Amortization Date as described in Minnesota Statutes Section 356.215 Subd. 11(j). Thus, the actuarially required contribution rate includes a component for the amortization of the unfunded actuarial liability (UAL). For a given level of UAL, annual amortization payments are calculated as increasing by 3.75% per year ("level percent amortization"). If future experience follows the actuarial assumptions, this should result in amortization payments that keep pace with the assumed growth in overall compensation. Please note that with the current amortization period, amortization payments in the short term will not be large enough to cover interest on the UAL, which means that as a dollar amount the UAL is expected to grow. This situation is sometimes referred to as "negative amortization". The negative amortization will continue until the amortization period becomes short enough, and the amortization payments become large enough, such that the amortization payments will be enough to cover both interest and principal, and from that point forward the UAL as a dollar amount is expected to decline progressively until ultimately reaching zero by the end of the amortization period.

In general, the four on-going funds showed modest gains in most of the funded ratios and a decrease in the contribution rate deficiency as reported by the Fund actuary. The primary reason for the decrease in the contribution rate deficiency measure is the changes in plan provisions. We note the 5% contribution rate increase scheduled to be fully phased in at July 1, 2016 for the State Patrol fund is expected to significantly improve the deficiency measure in this fund. Nevertheless, a significant contribution rate deficiency exists for all of these funds.

Additional discussion of the four on-going funds follows:

General

A contribution rate deficiency remains. This measure is likely to show a larger deficiency for the next year as statutory contributions are less than actuarially required. Without increases in the contribution rate or favorable actuarial experience, the plan's funded status is expected to deteriorate. The Fund Actuary has noted that the UAL will never get paid down based upon the current actuarial measurement. This conclusion seems reasonable to us.

Correctional

The contribution rate deficiency increased. The primary reason is the recognition of investment losses from prior years. The percent of pay deficiency is 5.41% using the actuarial value of assets. This is a significant deficiency in the contribution rates. Without increases in the contribution rate or favorable actuarial experience, the plan's funded status is expected to deteriorate.

State Patrol

The contribution rate deficiency improved slightly. The primary reason is the significant changes in the plan provisions. We note that the normal cost rate plus expenses is 21.07%. Almost two-thirds of the contributions are needed to cover the ongoing cost of benefits in the current year (normal cost plus expenses). The excess of the statutory contributions over the normal cost rate plus expenses is a payment to amortize the unfunded accrued liability. With scheduled increases in the contribution rates, addition of State Aid, reduction in post-retirement benefit increases, and using a market value basis, it appears this fund may be heading towards a modest contribution sufficiency.

Judges

The Judges plan has a statutory contribution rate that is almost 13 percentage points higher than the normal cost rate. However, its funded status is very weak (51% on an actuarial value basis) so the UAAL contribution is higher than the normal cost rate. Because the Fund has a contribution deficiency of more than 11% of pay, the funded status is expected to decrease.

Unless otherwise noted, the following comments apply to all five funds.

Legislators/Constitutional Officers Consolidated Fund

Beginning for the July 1, 2013 to June 30, 2014 fiscal period, the Legislators Retirement Fund and the Elective State Officers Retirement Fund will be administratively consolidated. For reporting purposes, the Fund Actuary has prepared separate valuations of these two groups for this fiscal year but will provide a combined report in future years. Both funds are effectively administered on a "pay as you go" basis. The Fund Actuary has reported the required funding information in accordance with Minnesota statutes however funding ratios have very little meaning for these two groups. Nevertheless, (gain)/loss analysis can provide useful information with respect to directional changes in the costs for these two groups.

Comments

Membership Data	We received the original data file prepared by the Fund and supplied to the actuary. Generally, we found that the data elements were being used in a consistent manner by the Fund Actuary. There are some instances when the Fund Actuary has made assumptions about missing data. We also noted that the number of records and other summary values listed in the report were within a reasonable tolerance to our own totals. Based upon this, we believe the data used by the actuary to prepare the actuarial valuation is appropriate and reasonably accurate.
Actuarial Value of Assets	We have reviewed the application of the asset smoothing method. It is the method defined in statute and we believe that this method has been applied correctly.
Actuarial Valuation	We reviewed 53 sample life calculations (22 active, 20 in-pay and 11 deferred vested). We reviewed calculated values by decrement and matched the values provided by the actuary to within a reasonable degree of tolerance. Based upon this limited review, we believe the actuarial calculations summarized in the actuary's report are reasonably accurate.
Funding Method	We believe that the actuary has correctly applied the Entry Age Normal funding method as provided in the statutes. This has been verified on a limited basis by the sample life calculations reviewed in the Actuarial Valuation section. In addition, the total required contribution follows the methodology provided in Minnesota Statutes 356.215.
Actuarial Assumptions	We have reviewed the actuarial assumptions as summarized in the actuarial valuation. We have confirmed that the sample life calculations from the Actuarial Valuation section have applied these assumptions as summarized in the report. We have also confirmed the appropriate use of assumptions required by Chapter 356.215. All other assumptions were

selected by the Fund and the actuary.

We note that the Fund Actuary has assumed that former Members with deferred vested benefits will elect a single life annuity. Our valuation assumes that percentages of these Members will elect optional forms the same as for regular retirements. We believe that either assumption is reasonable; however, our preference is to use the "blended" assumption.

Plan Provisions

We have reviewed the sample life calculations for compliance with Chapter 352 of the Minnesota statutes. We believe that these calculations reasonably reflect the benefits provided under the statute. In addition, the Actuarial Valuation Report contains a summary of the plan provisions. We believe this summary reasonably reflects the benefits provided under the statute.

Actuarial Report

The information provided in the Actuarial Valuation Report appears to meet the requirements of the Standards for Actuarial Work established by the State of Minnesota Legislative Commission on Pensions and Retirement. The information contained in the report appears to be accurate and provides the information in a logical progression.

We do note that the "Other Gain" for the Legislators exceeds the normal 1% of Actuarial Accrued Liability threshold. The Fund Actuary does provide some footnoted information on causes. However, we feel that quantification of some of the larger reasons could be useful to the reader.

In all reports, the Fund Actuary has provided the expected impact on the valuation results if the COLA provision reverted back to a 2.5% level upon reaching a 90% funding level. We find this to be useful information in understanding this issue. We agree with the Fund Actuary's assessment that the 2.5% COLA is not expected to apply.

Audit Conclusion

The St. Paul Teachers Retirement Fund Association (StPTRFA) is made up of one fund. The fund covers the public school teachers employed by St. Paul public schools (except charter school teachers).

In general, the fund showed a decrease in the accrued liability funded ratio and an increase in the projected benefit funded ratio. The fund also showed a decrease in the contribution rate deficiency. As noted below, the Fund Actuary has included the scheduled contribution rate increases of 2.5% phased in over the next four years in the projected benefit funded ratio. While including these known contribution rate increases seems logical, this methodology has not been consistently applied in this manner by the other Funds. More consistency between the funds concerning this measure would be desirable.

The following changes affected the July 1, 2013 actuarial valuation of the Fund:

- Benefit provisions and contribution sources were changed as a result of the 2013 Omnibus Retirement Bill
  - Scheduled increases in member and employer contribution rates of 2.50% of pay over the next four years.
  - State Contributions of $7,000,000 on October 1, 2013 and October 1, 2014 were added.
  - Increase in the formula multiplier of 0.2% for Coordinated members that applies to service after June 30, 2015.
  - Change in actuarial early retirement reduction factors to a table of stated reductions.
  - The salary scale assumption was decreased by 1%.

The reader should note that the Fund Actuary determined the Supplemental Contribution Amortization of the Unfunded Actuarial Accrued Liability using a 25-year rolling amortization period as prescribed in Minnesota Statutes Section 356.215 Subd. 11(j). Thus, the actuarially required contribution rate includes a component for the amortization of the unfunded actuarial liability (UAL). For a given level of UAL, annual amortization payments are calculated as increasing by 3.75% per year ("level percent amortization"). Please note that with the current amortization period of 25 years, amortization payments in the short term will not be large enough to cover interest on the UAL, which means that as a dollar amount the UAL is expected to increase during the next year. This situation is sometimes referred to as "negative amortization". Because the amortization period used to calculate the contribution rate is reset at 25 each year for the entire UAL, the negative amortization will continue each year into the future unless the amortization period is set to a shorter period so that the amortization payments will be large enough to cover both interest and principal. This means that the actuarially required contribution rate would not lead to a 100% funded ratio in any future year unless the System has experience more favorable than assumed.

For the July 1, 2013 Actuarial Valuation of the StPTRFA, we have prepared a limited scope sample life review of the Fund Actuary's results as provided in our contract. A full replication review was last prepared for the July 1, 2012 Actuarial Valuation. Our comments below reflect the results of our sample life review.

Comments

Membership Data — We received the original data file prepared by the Fund and supplied to the actuary. We found that most of the data elements were being used in a consistent manner by the Fund Actuary. We also noted that the number of records and other summary values listed in the report were reasonable.

We note that the Fund Actuary changed the processing of valuation payroll for active members with less than 1 year of service as a result of last year's replication review. It is our understanding that the Fund Actuary used the reported payroll for active members with less than 1 year of service in the prior year's valuation. As stated in the Fund Actuary's report, the processing methodology was changed this year to annualize reported pay for these individuals.

For terminated members, it is our understanding that the Fund Actuary supplements the data reported by the fund with salary history information that the Fund Actuary maintains. As noted in the July 1, 2012 replication report, when we used this supplemental information, our aggregate valuation results are more than 5% different from the Fund Actuary's results. Our valuation systems appear to produce a similar difference for the sample life we reviewed.

Our conclusion is that overall the Fund Actuary is reasonably reflecting the data received from SPTRFA to within a reasonable degree of tolerance with our own determinations.

Actuarial Value of Assets

We have reviewed the application of the asset smoothing method. It is the method defined in statute, and we believe that this method has been applied correctly.

Actuarial Valuation

We reviewed 12 sample life calculations (6 active, 4 in-pay, 2 deferred vested). We reviewed calculated values by decrement and matched the values provided by the actuary to within a reasonable degree of tolerance.

Based upon our review, we believe the actuarial calculations summarized in the actuary's report are reasonably accurate.

Funding Method

We believe that the actuary has correctly applied the Entry Age Normal funding method as provided in the statutes. This has been verified on a limited basis by the sample life calculations reviewed in the Actuarial Valuation section. In addition, the total required contribution follows the methodology provided in Minnesota Statutes 356.215.

Actuarial Assumptions

We have reviewed the actuarial assumptions as summarized in the actuarial valuation. We have confirmed that the sample life calculations from the Actuarial Valuation have applied these assumptions as summarized in the report. We have also confirmed the appropriate use of assumptions required by Chapter 356.215. All other assumptions were selected by the Fund and the Fund Actuary.

Similar to our July 1, 2012 replication review, our 2013 sample life review continues to show a substantial difference between the Fund Actuary's results and our results for active Member benefits for deferred retirement and refund of contributions. This apparent difference is due to the approaches used in the valuation system when an active Member is assumed to leave the System by withdrawal. In the actuarial assumptions, Members who withdraw from the System after becoming eligible for a deferred benefit are assumed to take the larger of their return of contributions, or their deferred annuity benefit. In the Fund Actuary's results, the benefits are included in the deferred retirement component if the member is projected to be vested at the time of withdrawal. Otherwise, the benefits are included in the refund of contributions component. In the Milliman results, the deferred retirement component includes the value of annuity benefits for vested Members who withdraw from the System. The refund of contributions component includes both the refund of contributions for members who are not vested at the date of assumed withdrawal plus the value of the return of contributions for Members who are assumed to elect a refund of contributions in lieu of future annuity benefits. We believe that both methodologies are reasonable and that the present value of benefits in total for the two categories reasonably reflect the expected costs.

We further note there is a substantial difference between the Fund Actuary's results and our results for terminated members. For deferred retirements with future augmentation, we believe this difference is due to different interpretation and application of the actuarial standards for terminations that are expected following the member's vesting date. According to the actuarial standards, the proper technique is to assume that the member selects the benefit with the greater value. Thus, for each year after the member's vesting date, the actuarial present value of Projected Benefits is based on the larger of the member's contributions accumulated with interest or the present value of the member's vested deferred benefit (augmented, if appropriate). In our valuation, we determine the greater value as of the former member's assumed retirement date, and then discounting the greater value from the member's assumed retirement date to the valuation date. In the Fund Actuary's valuation, it is our understanding that the greater value is determined by comparing the present value of the deferred benefit as of the valuation date to the member's contributions accumulated with interest at the valuation date. Because the interest on accumulated contributions is 4% and the interest discount factor is 8% for the first 4 years and 8.5% thereafter, the Fund Actuary's method produces a higher present value.

As part of legislation enacted in 2011, the annual Cost of Living Adjustment (COLA) applied to the pensions of retired Members was changed to 1.0% if the Accrued Liability Funded Ratio is less than 80%. However, if the Fund achieves at least 80%, but less than 90% funded ratio on the actuarial value of assets to actuarial liability, the COLA will increase to 2.0%. The valuation by the Fund Actuary assumes that the lower 1.0% COLA will remain in place for all years. As stated in the Fund Actuary's report, this assumption is based on the current market value funded ratio of 60% and projections that indicate a steadily declining funding level in the future given the current statutory contribution schedule. We believe this assumption is reasonable.

Plan Provisions

We have reviewed the sample life calculations for compliance with Chapter 354A of the Minnesota statutes. We believe that these calculations reasonably reflect the benefits provided under the statute. In addition, the Actuarial Valuation Report contains a summary of the plan provisions. We believe this summary reasonably reflects the benefits provided under the statute.

Actuarial Report

The information provided in the Actuarial Valuation Report appears to meet most of the requirements of the Standards for Actuarial Work established by the State of Minnesota Legislative Commission on Pensions and Retirement.

The projected benefit funded ratio reported by the Fund Actuary includes the scheduled contribution rate increases of 2.5% phased in over the next four years in this measure.

The information contained in the report appears to be accurate and provides the information in a logical progression.

Audit Conclusion

The Minnesota Teachers Retirement Association (TRA) is made up of one fund. The fund covers the state public school teachers except for those teachers employed by St. Paul or Duluth public schools (except charter school teachers) or the University of Minnesota. Effective July 1, 2006, the Minneapolis Teachers Retirement Fund was merged into this fund.

The fund experienced a decrease in the accrued liability funding ratio and in the contribution rate deficiency. The decrease in the contribution rate deficiency measure is mainly due to the increase in the employee and employer contribution rates offset by the recognition of previously deferred asset losses. We note the contribution rate increases scheduled to be fully phased in by July 1, 2014 are expected to continue to improve the deficiency measure in this fund.

The following plan change was reflected in the July 1, 2013 actuarial valuation of the Fund:

- The early retirement reduction factors were changed with the 2013 Pension Omnibus Legislation. The revised factors are phased in over a 5-year period.

The reader should note that the Fund Actuary determined the Supplemental Contribution Amortization of the Unfunded Actuarial Accrued Liability using the Statutory Amortization Date as prescribed in Minnesota Statutes Section 356.215 Subd. 11(j). Thus, the actuarially required contribution rate includes a component for the amortization of the unfunded actuarial liability (UAL). For a given level of UAL, annual amortization payments are calculated as increasing by 3.75% per year ("level percent amortization"). If future experience follows the actuarial assumptions, this should result in amortization payments that keep pace with the assumed growth in overall compensation. Please note that with the current amortization period, amortization payments in the short term will not be large enough to cover interest on the UAL, which means that as a dollar amount the UAL is expected to increase during the next year. This situation is sometimes referred to as "negative amortization". The negative amortization will continue until the amortization period becomes short enough, and the amortization payments become large enough, such that the amortization payments will be enough to cover both interest and principal, and from that point forward the UAL as a dollar amount is expected to decline progressively until ultimately reaching zero by the end of the amortization period.

For the July 1, 2013 Actuarial Valuation, we have prepared a limited scope sample life review of the Fund Actuary's results as provided in our contract. A full replication review was last prepared for the July 1, 2011 Actuarial Valuation. Our comments below reflect the results of our sample life review.

Comments

Membership Data	We received the original data file prepared by the Fund and supplied to the actuary. We found that the data elements were being used in a consistent manner by the Fund Actuary. We also noted that the number of records and other summary values listed in the report were within a reasonable tolerance to our own totals. Based upon this, we believe the data used by the actuary to prepare the actuarial valuation is appropriate and reasonably accurate.
Actuarial Value of Assets	We have reviewed the application of the asset smoothing method. It is the method defined in statute and we believe that this method has been applied correctly.
Actuarial Valuation	We reviewed 14 sample life calculations (8 active, 4 in-pay and 2 deferred vested). We reviewed calculated values by decrement and matched the

values provided by the actuary to within a reasonable degree of tolerance. Based upon this review, we believe the actuarial calculations summarized in the actuary's report are reasonably accurate with two items noted below.

For one sample life of an active Coordinated member hired before July 1, 1989, we note there appears to be a difference in the valuation systems with respect to the determination of eligibility for future retirement benefits. It is our understanding that the Fund Actuary's valuation system determines the eligibility for retirement benefits based on a member's age and service at the valuation date. In this sample, the age was 55 and service was 34 under the Fund Actuary's valuation system. The Fund Actuary then correctly determined that this sample life was not eligible for Rule-of-90 (age plus service is 89) benefits, calculated the applicable Early Retirement Benefits, and correctly used the early retirement decrement rate of 7%. In the Milliman valuation system, the eligibility for retirement benefits is determined based on a member's age and service at the assumed decrement date. Because mid-year decrements are assumed, the Milliman valuation system calculates the age and service at decrement to be 55.5 and 34.5, respectively. Consequently, the Milliman valuation system determines that this sample life is eligible for Rule-of-90 (age plus service is 90), calculates the applicable Rule-of-90 benefits (which are higher than the Early Retirement Benefits) and uses the Rule-of-90 retirement decrement of 50%. Consequently, Milliman's calculated present value of future benefits for this sample life is higher than the Fund Actuary's calculated present value of future benefits. While our July 1, 2011 replication results were within 1.7% of the active members present value of future benefits calculated by the Fund Actuary, we cannot say with certainty what the magnitude of this difference is for the July 1, 2013 valuation.

For one sample life for a disabled in-pay Member. It appears the member was valued as receiving a Joint & 100% Survivor Annuity even though the retiree data file does not contain any spousal information or form of benefit payment information. This approach covers the death benefit payable to a married disabled member. However, this approach implicitly assumes 100% marriage rate for disabled members and ignores the conversion from disability to regular retirement when the member reaches Normal Retirement Age. We recommend the Fund Actuary review the implications of the conversion from disability to regular retirement at Normal Retirement Age to determine what, if any, modifications to the actuarial assumptions and/or valuation methodology may be appropriate for future valuations. We recognize that the accrued liability for disabled members is less than 0.61% of the total fund accrued liability and this issue is probably less than 10% of the accrued liability for disabled members. Consequently, this issue is not likely to significantly impact the actuarial valuation results.

<u>Funding Method</u>

We believe that the actuary has correctly applied the Entry Age Normal funding method as provided in the statutes. This has been verified on a limited basis by the sample life calculations reviewed in the Actuarial Valuation section. In addition, the total required contribution follows the methodology provided in Minnesota Statutes 356.215.

Actuarial Assumptions

We have reviewed the actuarial assumptions as summarized in the actuarial valuation. We have confirmed that the sample life calculations from the Actuarial Valuation section have applied these assumptions as summarized in the report. We have also confirmed the appropriate use of assumptions required by Chapter 356.215. All other assumptions were selected by the Fund and the Fund Actuary.

As noted in our July 1, 2011 replication valuation, there appears to be a substantial difference between the Fund Actuary's results and our replication valuation results for active Member benefits for deferred retirement and refund of contributions. This apparent difference is due to the approaches used in the valuation system when an active Member is assumed to leave the System by withdrawal. In the actuarial assumptions, Members who withdraw from the System after becoming eligible for a deferred benefit are assumed to take the larger of their return of contributions, or their deferred annuity benefit. In the Fund Actuary's results, the benefits are included in the deferred retirement component if the member is projected to be vested at the time of withdrawal. Otherwise, the benefits are included in the refund of contributions component. In the Milliman results, the deferred retirement component includes the value of annuity benefits for vested Members who withdraw from the System. The refund of contributions component includes both the refund of contributions for members who are not vested at the date of assumed withdrawal plus the value of the return of contributions for Members who are assumed to elect a refund of contributions in lieu of future annuity benefits. As noted in our July 1, 2011 replication valuation, we believe the Fund Actuary is reasonably reflecting the withdrawal decrement because the Fund Actuary's present value of future benefits for the withdrawal decrement (sum of deferred retirement component plus refund of contributions component) is within 1.4% of the Milliman results included in our July 1, 2011 replication valuation.

Plan Provisions

We have reviewed the sample life calculations for compliance with Chapter 354 of the Minnesota statutes. We believe that these calculations reasonably reflect the benefits provided under the statute. In addition, the Actuarial Valuation Report contains a summary of the plan provisions. We believe this summary reasonably reflects the benefits provided under the statute.

Actuarial Report

The information provided in the Actuarial Valuation Report appears to meet all of the requirements of the Standards for Actuarial Work established by the State of Minnesota Legislative Commission on Pensions and Retirement with one exception.

In the summary of plan provisions section, the report refers to new early retirement reduction factors that begin to apply July 1, 2015. However, there are no details on what the level of rates are, how they are phased in over a 5-year period, and the differences that apply to members retiring at age 62 or later with at least 30 years of service. As a technical reader of the report, we believe the inclusion of the additional detail would be beneficial.

With respect to the valuation of the post-retirement COLA, we agree that the lower 2.0% COLA is appropriate for the July 1, 2013 actuarial valuation based upon the 2013-2014 contribution rates. According to the Fund Actuary's report, this assumption is based on projections that indicate the Fund is not expected to reach a 90% funded ratio for over 30 years.

Finally, the information contained in the report appears to be accurate and provides the information in a logical progression.

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FISCAL YEAR 2014
ACTUARIAL REVIEW AND AUDITING SERVICES CONTRACT EXTENSION

LEGISLATIVE COMMISSION ON PENSIONS AND RETIREMENT
CONTRACT FOR ACTUARIAL REVIEW AND AUDITING CONSULTING SERVICES

SECTION 1. PURPOSE

Minnesota Statutes, Section 356.214, Subdivision 4, authorizes the Legislative Commission on Pensions and Retirement ("Commission"), 55 State Office Building, Saint Paul, Minnesota 55155, to contract with an established actuarial consulting firm to audit or review the actuarial valuations, periodic experience studies, and actuarial cost analyses of the various statewide and major local Minnesota public employee pension plans. The Commission enters into this contract with Milliman, Inc., with its home office located at 1301 Fifth Avenue, Suite 3800, Seattle, Washington 98101, and its primary service office located at 15800 Bluemound Road, Suite 400, Brookfield, Wisconsin 53005, in order to obtain the actuarial review and auditing services necessary to implement its authority under Minnesota Statutes, Section 356.214, Subdivision 4.

SECTION 2. ACTUARIAL REVIEW AND AUDITING SERVICES TO BE PROVIDED

(a) Review of Annual Actuarial Valuations for Compliance and Reasonableness Fiscal Year 2014. Milliman, Inc. shall review for compliance with Minnesota Statutes, Section 356.215, with the Standards for Actuarial Work of the Legislative Commission on Pensions and Retirement, and with the applicable actuarial standards of practice issued by the Actuarial Standards Board and for the reasonableness and accuracy the results of the July 1, 2013, actuarial valuations, in the indicated timing priority, of the following statewide and major local Minnesota public retirement plans:

(A) the General State Employees Retirement Plan of the Minnesota State Retirement System;

(B) the General Employee Retirement Plan of the Public Employees Retirement Association;

(C) the MERF Division of PERA;

(D) the Teachers Retirement Association;

(E) the Judges Retirement Plan;

(F) the Duluth Teachers Retirement Fund Association;

(G) the St. Paul Teachers Retirement Fund Association; and

(H) the Legislators/Constitutional Officers Consolidated Retirement Plan.

The results of the review shall consist of a written report of the review of each valuation before February 1, 2014, and a presentation to the Legislative Commission on Pensions and Retirement by a senior Milliman, Inc. team member identified in Appendix A at a scheduled meeting of the Commission during the 2014 Legislative Session summarizing the review of all valuations.

(b) Replication of Annual Actuarial Valuations

Fiscal Year 2014. Milliman, Inc. shall prepare an actuarial valuation on a closed group basis under Minnesota Statutes, Section 356.215, the Standards for Actuarial Work established by the Legislative Commission on Pensions and Retirement, and with the applicable actuarial standards of practice issued by the Actuarial Standards Board, based on the same June 30, 2013, participant data and the same June 30, 2013, financial data that the applicable retirement plan provided to its consulting actuary, for the following Minnesota public retirement plans:

(A) the State Patrol Retirement Plan;

(B) the Public Employees Police and Fire Retirement Plan;

(C) the Correctional State Employees Retirement Plan of the Minnesota State Retirement System; and

(D) the Local Government Correctional Service Retirement Plan.

The results of the actuarial valuation shall consist of a written actuarial valuation report for each retirement plan before November 15, 2013, or 3 weeks after receipt of the final report by the Actuary of the fund or plan, whichever is later, and a presentation to the Legislative Commission on Pensions and Retirement by a senior Milliman, Inc. team member identified in Appendix A at a scheduled meeting of the Commission during the 2014 Legislative Session summarizing all valuations.

(c) Review of Actuarial Cost Estimates of Proposed Pension Legislation. Milliman, Inc. shall review, as assigned by the Commission Executive Director, the actuarial cost estimate of proposed pending legislation prepared by the consulting actuary retained by a statewide or major local Minnesota public employee retirement plan. The review must be for conformity with Minnesota Statutes, Section 356.215, the Standards for Actuarial Work established by the Legislative Commission on Pensions and Retirement, and with the applicable actuarial standards of practice issued by the Actuarial Standards Board, and for reasonableness of the results. The review results shall consist of a written report of its findings by the date for the report specified by the Commission Executive Director after consultation and, if requested by the Commission Executive Director, a presentation of a summary of its review to the Legislative Commission on Pensions and Retirement by a senior Milliman, Inc. team member identified in Appendix A at a Commission hearing on the proposed legislation.

(d) Review of Optional Annuity Form or Annuity Reserve Factor Changes. Milliman, Inc. shall review, as assigned by the Commission Executive Director, changes approved by the governing board of a statewide or major local Minnesota public employee retirement plan. The review must be for conformity with Minnesota Statutes, Section 356.215, and any other relevant provisions of Minnesota Statutes, the Standards for Actuarial Work established by the Legislative Commission on Pensions and Retirement, and with the applicable actuarial standards of practice issued by the Actuarial Standards Board, and for reasonableness of the results. The review results shall consist of a written report of its findings by the date for the report specified by the Commission Executive Director after consultation.

(e) Review of Prior Service Credit Purchase Payment Amount Determinations. Milliman, Inc. shall review, as assigned by the Commission Executive Director, a determination by the consulting actuary of a statewide or major local Minnesota public employee retirement plan of the purchase payment amount for a prior service credit purchase. The review must be for conformity with Minnesota Statutes, Sections 356.215 and 356.551, with the

Standards for Actuarial Work established by the Legislative Commission on Pensions and Retirement, and with the applicable actuarial standards of practice issued by the Actuarial Standards Board, and for reasonableness of the results. The review results shall consist of a written report of its findings by the date for the report specified by the Commission Executive Director after consultation.

(f) Review of Public Employer Privatization Gain and Loss Determinations. Milliman, Inc. shall review, as assigned by the Commission Executive Director, a determination by the consulting actuary of a statewide or major local Minnesota public employee retirement plan of the retirement plan actuarial gain from a public employer privatization and of the retirement plan actuarial loss from an extension of the benefit enhancements under Minnesota Statutes, Chapter 352F or 353F, to the privatized public employee group. The review must be for conformity with Minnesota Statutes, Section 356.215, the Standards for Actuarial Work established by the Legislative Commission on Pensions and Retirement, and with the applicable actuarial standards of practice issued by the Actuarial Standards Board, and for reasonableness of the results. The review results shall consist of a written report of its findings by the date for the report specified by the Commission Executive Director after consultation.

(g) General Benefit Plan Design and Other Consulting. Milliman, Inc. shall provide, as requested by the Commission Chair or by the Commission Executive Director, general consulting on benefit plan design, actuarial funding method, and related issues. The general consulting results shall consist of a written report of its information and recommendations by the date for the report specified by the Commission Chair or by the Commission Executive Director after consultation, and, if requested by the Commission Chair or Commission Executive Director, a presentation by a senior Milliman, Inc. team member identified in Appendix A of a summary of the information and recommendations to the Legislative Commission on Pensions and Retirement at a scheduled Commission meeting.

SECTION 3. MANNER OF AND CONDITIONS ON ACTUARIAL REVIEW AND AUDITING SERVICES PROVISION

(a) Service Provision Requests. Milliman, Inc. shall undertake the review and auditing actuarial consulting services set forth in Section 2, Paragraphs (a) and (b), without any further request or action by or on behalf of the Commission. Milliman, Inc. shall undertake the review and auditing or general actuarial consulting services set forth in Section 1, Paragraphs (c), (d), (e), (f), and (g), only upon request by the Commission Chair or by the Commission Executive Director, as applicable.

(b) Compensation Rates and Limits. Milliman, Inc. shall undertake the consulting services set forth in Section 2 subject to the hourly rates, specific consulting services compensation limit, and general consulting services compensation limit set forth in Section 4.

(c) Explanations and Clarifications. Without additional compensation, upon the request of the Commission Chair, another member of the Commission, the Executive Director of the Commission, or the Deputy Executive Director of the Commission, Milliman, Inc. shall provide an additional explanation to the Commission of any previously supplied valuation, report or other actuarial or consulting service, shall respond to relevant questions from the Commission related to prior consulting services performed by Milliman, and shall provide to the Commission any requested clarifications regarding the previously supplied valuations, reports and services.

(d) Data Acquisition, Retention and Practices. In undertaking its duties under this contract, Milliman, Inc. shall make reasonable and good faith efforts to obtain from the administrators of the pension plans the financial and demographic data necessary to review or replicate the annual actuarial valuations, the quadrennial experience studies, the actuarial cost estimates of proposed pension legislation, the optional annuity form or annuity reserve factor changes, the prior service credit purchase payment amount determination, and public employer privatization gain and loss determination. If a pension plan fails to supply Milliman, Inc. with the necessary data in a timely fashion, Milliman, Inc. shall notify the Executive Director and the executive committee of the Commission of that data supply failure.

In performing duties under this contract, Milliman, Inc. shall not destroy or otherwise dispose of any data obtained from the various pension plans or other data sources without the prior approval of the Commission Chair or of the Executive Director of the Commission.

Milliman, Inc., in handling demographic data obtained from the pension plans and in dealing with any person or party other than the Commission Executive Director or the authorized representatives of the applicable pension plan, must conform to the applicable requirements of the Minnesota Government Data Practices Act, Minnesota Statutes, Chapter 13.

Any information received by Milliman, Inc. from the Legislative Commission on Pensions and Retirement or from a statewide or major local Minnesota public employee retirement plan must be considered "confidential information." However, unless contrary to Minnesota Statutes, Chapter 13, information received from the Legislative Commission on Pensions and Retirement or a retirement plan will not be considered confidential information if (1) the information is or comes to be generally available to the public through no fault of Milliman, Inc., (2) the information was independently developed by Milliman, Inc. without resort to information provided to Milliman, Inc. by or on behalf of the Legislative Commission on Pensions and Retirement or a retirement plan, or (3) Milliman, Inc. appropriately receives the information from another source which is not under an obligation of confidentiality to the Legislative Commission on Pensions and Retirement. Milliman, Inc. agrees that confidential information shall not be disclosed to any third party without prior written consent by the Commission Executive Director, or as compelled by subpoena or similar judicial instrument. In the case of a subpoena or similar judicial instrument, Milliman, Inc. shall provide reasonable advance notice to the Commission Executive Director to allow the Legislative Commission on Pensions and Retirement to seek a protective order.

(e) Restrictions on Personnel Changes. Milliman, Inc. agrees that services under this contract will be provided by the professional personnel listed as senior team members in Appendix A, with assistance by internal Milliman, Inc. staff. Milliman, Inc. must obtain the approval of the Commission before substituting other professional personnel or assigning additional professional personnel as senior team members under this contract.

(f) Provision of Report Copies. Any written report by Milliman, Inc. under this contract shall be provided to the following recipients with the specified number of copies:

Number of Copies	Designated Recipient
Three (including one unbound copy)	the Commission staff
One	the chief administrative officer of the applicable Minnesota public pension plan
One	the Commissioner of Minnesota Management and Budget
One	the Legislative Reference Library
One	the Legislative Auditor.

(g) Copies of Relevant Correspondence. With respect to any consulting service provided by Milliman, Inc. under this contract, Milliman, Inc. shall provide the Commission Executive Director with a copy of any written or electronic correspondence it had with a third party in connection with the service.

SECTION 4. COMPENSATION

(a) Base Compensation Amounts, Rates, and Limits. The base compensation rates and limits to be used to determine the amounts to be paid to Milliman, Inc. by the Commission for services rendered for the Commission by Milliman, Inc. under this contract are as follows:

(1) For the satisfactory replication of the July 1, 2013, actuarial valuations of the Public Employees Police and Fire Retirement Plan, the State Patrol Retirement Plan, the Correctional State Employees Retirement Plan of the Minnesota State Retirement System, and the Local Government Correctional Service Retirement Plan, $33,000;

(2) For the satisfactory completion of the compliance and reasonableness review of the July 1, 2013, actuarial valuations of the General State Employees Retirement Plan of the Minnesota State Retirement System, the General Employee Retirement Plan of the Public Employees Retirement Association, the MERF Division of PERA, the

Teachers Retirement Association (TRA), the Duluth Teachers Retirement Fund Association, the St. Paul Teachers Retirement Fund Association, the Judges Retirement Plan, and the Legislators/Constitutional Officers Retirement Plan, $56,000;

(3) For the satisfactory completion of the requested review of an actuarial cost estimate of proposed pension legislation, not to exceed in total any specified compensation limit, the actual time charges for each member of the Milliman, Inc. team at the following hourly billing rates:

Team Member Category	Fiscal Year 2014 Hourly Billing Rate
Primary Actuary	$357-475
Secondary Actuary	$271-352
Other F.S.A.	$217-298
Other Professional Staff	$162-184
Actuarial Assistants	$130-162
Technical and Clerical	$86-108

(4) For the satisfactory completion of the requested review of a change in an optional annuity form or annuity reserve factors, not to exceed in total any specified compensation limit, the actual time charges for each member of the Milliman, Inc. team at the applicable hourly billing rates set forth in clause (3);

(5) For the satisfactory completion of the requested review of a prior service credit purchase payment amount determination, not to exceed in total any specified compensation limit, the actual time charges for each member of the Milliman, Inc. team at the applicable hourly billing rates set forth in clause(3);

(6) For the satisfactory completion of the requested review of a public employer privatization gain and lòss determination, not to exceed in total any specified compensation limit, the actual time charges for each member of the Milliman, Inc. team at the applicable hourly billing rates set forth in clause(3); and

(7) For the satisfactory completion of a requested general benefit plan design or other consulting project, not to exceed in total any specified compensation limit, the actual time charges for each member of the Milliman, Inc. team at the applicable hourly billing rates set forth in clause (3).

(b) Additional Limit For Certain Consulting Services. The total for the performance of the additional consulting services, electronic data processing, and for reasonable out-of-pocket expenses incurred in the performance of the consulting services under Section 2, Paragraphs (c), (d), (e), (f), and (g), for which the Commission is liable for payment during a fiscal year must not exceed $ 10,000 during Fiscal Year 2014. Milliman, Inc. must notify the Executive Director of the Commission when the accumulated amount paid or incurred by the Commission for actuarial consulting services under Section 2, Paragraphs (c), (d), (e), (f), and (g), equals 90 percent of the applicable maximum. Performance of the additional consulting services and related processing or incurring of expenses during any fiscal year must be discontinued by Milliman, Inc. when the fiscal year maximum has been attained. Compensation of Milliman, Inc. for the continued performance or the undertaking of additional consulting services requiring payment in excess of the applicable maximum may only be incurred by and shall only be paid for by the Commission if the Commission and Milliman, Inc. enter into an additional agreement for the provision of these consulting services and if this agreement is documented in writing.

(c) Billing and Payment Procedures. The Legislative Commission on Pensions and Retirement acknowledges the obligation to pay Milliman, Inc. for services rendered under this contract, whether arising from a Commission request or otherwise necessary as a result of this contract, at Milliman, Inc.'s standard hourly billing rates for the personnel utilized plus all out-of-pocket expenses incurred. Milliman, Inc. shall submit monthly invoices to the Commission for the services performed by Milliman, Inc. during the previous month. The invoice must detail the type of services that were performed and Milliman, Inc. shall provide any additional itemization or information regarding the invoice as requested by the Executive Director of the Commission or the Commission Chair. The amounts billed for the consulting services specified in Section 2, Paragraphs (a) and (b), may not exceed the maximum amounts specified for those services in paragraph (a), clauses (1) through (7) inclusive. No more than 90 percent of the maximum amount for any service specified in paragraph (a), clauses (1) through (2) inclusive, may be paid until the final document or report representing the work product for that service has been reviewed by the Executive Director of the Commission and the Executive Director of the Commission certifies that Milliman, Inc. has satisfactorily performed the applicable service requirements. The amounts billed for additional consulting services under Section 2, Paragraphs (c), (d), (e), (f), and (g), may not exceed the maximum amount specified for those services in paragraph (b) without compliance with the additional compensation agreement procedure set forth in that clause. No amount for a particular additional consulting service may be billed until the additional consulting service has been completed and any report or other work product document for that service has been provided to the Commission, if applicable. Payment for the additional consulting service may only be approved by the Executive Director of the Commission if the Executive Director of the Commission determines that Milliman, Inc. has satisfactorily performed that service and approval of that payment constitutes certification of satisfactory performance.

SECTION 5. TOOL DEVELOPMENT, LIABILITY LIMITATION, DISPUTE RESOLUTION, CHOICE OF LAW, AND THIRD PARTY RELIANCE

(a) Tool Development. Milliman, Inc. shall retain all rights, title and interest (including, without limitation, all copyrights, patents, service marks, trademarks, trade secret and other intellectual property rights) in and to all technical or internal designs, methods, ideas, concepts, know-how, techniques, generic documents and templates that have been developed by Milliman, Inc. prior to entering into this contract or developed during the course of the provision of services under this contract if those generic documents or templates do not contain any confidential information or proprietary data from the Legislative Commission on Pensions and Retirement or from a statewide or major local

Minnesota public employee retirement plan. Rights and ownership by Milliman, Inc. of original technical designs, methods, ideas, concepts, know-how, and techniques does not extend to or include all or any part of the proprietary data or confidential information provided to Milliman, Inc. by or on behalf of the Legislative Commission on Pensions and Retirement or from a statewide or major local Minnesota public employee retirement plan. To the extent that Milliman, Inc. may include in the materials any preexisting Milliman, Inc. proprietary information or other protected Milliman, Inc. materials, Milliman, Inc. agrees that the Legislative Commission on Pensions and Retirement is deemed to have a fully paid up license to make copies of the Milliman, Inc.-owned materials as part of this engagement for its internal business purposes, but such materials cannot be modified or distributed outside the Legislative Commission on Pensions and Retirement without the written permission of Milliman, Inc. or except as otherwise permitted in this contract.

(b) Limitation of Liability. Milliman, Inc. will perform all services under this contract in accordance with applicable professional standards. In the event of any claim arising from services provided by Milliman, Inc. under this contract at any time, the total liability of Milliman, Inc., its officers, directors, agents and employees to the Legislative Commission on Pensions and Retirement and the State of Minnesota shall not exceed $10 million. This limit applies regardless of the theory of law under which a claim is brought, including negligence, tort, contract or otherwise. In no event shall Milliman, Inc. be liable to the Commission or the State of Minnesota for any type of incidental or consequential damages. The foregoing limitations, however, do not apply in the event of the intentional fraud or willful misconduct of Milliman, Inc. Upon execution of this contract, Milliman, Inc. shall provide the Commission Executive Director with the name of the insurance carrier of any errors and omissions or comparable liability insurance held by the company, the insurance policy number, the address of the insurance carrier, and a certificate evidencing coverage in the amount of $10 million per claim. Upon any material change in that insurance coverage or upon the filing of any claim which materially affects Milliman, Inc.'s ability to provide the required insurance coverage, Milliman, Inc. shall provide prompt notification of the occurrence and shall provide periodic timely updates regarding any insurance claim.

(c) Dispute Resolution. In the event of any dispute arising out of or relating to the engagement of Milliman, Inc. by the Legislative Commission on Pensions and Retirement, the parties agree that the dispute will be resolved by final and binding arbitration under the Commercial Arbitration Rules of the American Arbitration Association except as otherwise provided for in Minnesota Statutes, Sections 572.08 to 572.30. The arbitration shall take place in Minnesota before a panel of three arbitrators selected from the roster of commercial arbitrators of the American Arbitration Association. Within 30 days of the commencement of the arbitration, each party shall designate in writing a single neutral and independent arbitrator. The two arbitrators designated by the parties shall then select a third arbitrator within 60 days of the commencement of the arbitration. The arbitrators shall have a background in either insurance, actuarial science or law. The arbitrators shall have the authority to permit limited discovery, including depositions, prior to the arbitration hearing, and such discovery shall be conducted consistent with the Federal Rules of Civil Procedure. If the third arbitrator provides notice of an intent to terminate arbitration service over the dispute, the arbitration process will continue if the initial two arbitrators agree that the arbitration process has not proceeded too far as to make a fair process with a substitute arbitrator unlikely and they select as a replacement a third arbitrator. The arbitrators will be compensated at an equal hourly rate, but the total compensation paid to all arbitrators shall not exceed two percent of the dollar value of the dispute for arbitration. The cost of the arbitration shall be paid by the losing party. The arbitrators shall have no power or authority to award punitive or exemplary damages. The arbitrators may, in their discretion, award the cost of the arbitration, including reasonable attorney fees, to the prevailing party. Any award made may be appealed to a court of competent jurisdiction. Any arbitration shall be confidential, and, except as provided in Minnesota Statutes, Chapter 13, or as required by law, neither party may disclose the content or results of any arbitration hereunder without the prior written consent of the other parties, except that disclosure is permitted to a party's auditors and legal advisors.

(d) Choice of Law. The construction, interpretation, and enforcement of this contract shall be governed by the substantive contract law of the State of Minnesota without regard to its conflict of laws provisions. In the event any provision of this contract is unenforceable as a matter of law, the remaining provisions will stay in full force and effect.

(e) No Third Party Reliance. Milliman, Inc.'s work is prepared solely for the use and benefit of the Legislative Commission on Pensions and Retirement and the State of Minnesota in accordance with its statutory and regulatory requirements. Milliman, Inc. recognizes that materials it delivers to the Legislative Commission on Pensions and Retirement are public records that are subject to disclosure to third parties. However, Milliman, Inc. does not intend to benefit and assumes no duty or liability to any third parties who receive Milliman, Inc.'s work in this fashion and Milliman, Inc. may include disclaimer language on its work product so stating. To the extent that Milliman, Inc.'s work is not subject to disclosure under applicable public records laws, the Legislative Commission on Pensions and Retirement agrees that it shall not disclose Milliman, Inc.'s work product to third parties without Milliman Inc.'s prior written consent; provided, however, that the Legislative Commission on Pensions and Retirement may distribute any Milliman, Inc. report in its entirety to the entities identified in Section 3(f) above, and to any other applicable regulatory or governmental agency, as necessary. In addition, the Legislative Commission on Pensions and Retirement may discuss and disclose any Milliman, Inc. report (provided that any disclosure of a report is in its entirety and contains all Milliman, Inc. provided disclaimers) in public hearings in the ordinary course of conducting its business.

SECTION 6. TERM OF CONTRACT; EXTENSION; CANCELLATION

(a) This contract is effective on the day following execution and, subject to the authority of the Commission in paragraph (b), remains in effect until June 30, 2014, or until all the obligations of Milliman, Inc. relating to the satisfactory completion of the reviews and replications of the actuarial valuations as of July 1, 2013, the completion of any related reports, and the completion of any other additional consulting projects assigned before June 30, 2014, are met, whichever is later.

(b) The Commission may unilaterally terminate this contract before the conclusion date specified in paragraph (a), with 30 days' notice and with the payment of just compensation to Milliman, Inc. if the Commission determines that further services under this contract by Milliman, Inc. would not serve the best interests of the State or of the Commission.

SECTION 7. ASSIGNMENT

Milliman, Inc. may not assign, transfer, or subcontract any rights or obligations under this contract without the prior written consent of the Commission.

SECTION 8. AMENDMENTS

Amendments or modifications of this contract must be made in writing and may be made only upon the agreement of Milliman, Inc. and of the Commission.

SECTION 9. STATE FINANCIAL AUDITS

The books, records, documents, and accounting procedures and practices of Milliman, Inc. relevant to this contract are subject to examination by the Commission, any auditor retained by the Legislative Coordinating Commission, and the Legislative Auditor. Any examination may be conducted at the offices of Milliman, Inc. in Omaha, Nebraska, and in Brookfield, Wisconsin. The availability of the books and records is limited to an examination for financial auditing purposes only. The examination does not extend to any program evaluation activities of the Legislative Auditor without the prior agreement of Milliman, Inc.

SECTION 10. OWNERSHIP OF DOCUMENTS; RESTRICTION ON CERTAIN USES

Subject to Milliman, Inc.'s reservation of rights in Section 5(a) and the limitations on distribution of Milliman, Inc. work product to third parties, any reports, studies, photographs, negatives, magnetic tapes, disks, or diskettes, or other documents or materials prepared by Milliman, Inc. in the performance of its obligations under this contract or any previous contract with the Commission and any data or related information provided by the applicable public pension plans to Milliman, Inc. to assist in that performance are the exclusive property of the Commission and must be provided to the Commission if requested by the Executive Director or upon termination of the contract. Milliman, Inc. may not use and may not willingly allow the materials to be used for any purpose other than for the performance of its obligations under this contract, unless it has obtained the prior written consent of the Commission. Milliman, Inc. may copyright any report, document, or other written work product item only in its capacity as an agent for the Commission for this purpose. Notwithstanding anything herein to the contrary and conditioned on Milliman, Inc.'s continued compliance with its confidentiality obligations hereunder, Milliman, Inc. shall be permitted to retain one (1) copy of all information received from the Legislative Commission on Pensions and Retirement for the purposes of meeting its work product documentation requirements.

BY

7/22/13 — Sandra L Pappas

Date

Senator Sandra L. Pappas, Chair
Legislative Commission on Pensions and Retirement

7/25/13 — William V. Hogan

Date

William V. Hogan, F.S.A., Consulting Actuary and Principal
Milliman, Inc.

Appendix A

Milliman, Inc.
Senior Team Members for the Minnesota
Legislative Commission on Pensions and Retirement Account

Name	Position
William V. Hogan	Primary Actuary and Lead Consultant
Timothy Herman	Primary Actuary and Consultant
Tim Bleick	Secondary Actuary
Allan Bittner	Secondary Actuary
Katherine Warren	Support Actuary

Milliman 2013 Public Pension Funding Study

29 plans lowered their interest rate assumptions,
which increased their accrued liabilities and lowered their funded ratios

Most plans are setting their interest rate assumptions in a realistic manner consistent with long-term market return expectations

Funded ratios are down slightly

Rebecca A. Sielman
FSA, MAAA, EA

Introduction

The Milliman Public Pension Funding Study uses an approach to measure the aggregate funded status of the 100 largest U.S. public pension plans that is unique among studies assessing the health of the country's public pension plans. Our study independently determines an actuarial interest rate assumption for each plan based on its unique asset allocation and Milliman's current outlook on future long-term investment returns, then uses the actuarially determined interest rates to recalibrate each plan's accrued liability. We found that the total recalibrated accrued liability for the plans in the study was just 2.6% larger than the total accrued liability reported by the plans. While the challenge of funding future pension promises remains considerable, our study results indicate that most plans have set their interest rate assumptions and measured their pension liabilities in a realistic, actuarial manner that is consistent with long-term market return expectations. There is more than one way to put a dollar figure on the value of future pension benefits; the focus of this study is the traditional budgeting approach of assessing liability based on the long-term returns expected to be earned by plan assets.

A notable finding of this year's study is that 29 of the 100 plans in the study have lowered their interest rate assumptions since the Milliman 2012 Public Pension Funding Study. The median interest rate used by the plans decreased from 8.00% in the 2012 study to 7.75% in the 2013 study. This drop is in line with a generally declining market consensus on expected long-term investment returns; our study's median actuarially determined interest rate similarly decreased from 7.65% in the 2012 study to 7.47% in the 2013 study. Note that lower interest rate assumptions cause accrued liabilities to increase and funded ratios to fall.

Plans report on the size of their assets in two ways: *market value*, which is well understood; and *actuarial value*, which reflects asset smoothing techniques designed to moderate year-to-year fluctuations in contribution amounts but which may deviate significantly from market value in periods of sizeable market gains or losses. The 100 plans in this study reported assets totaling $2.58 trillion on a market value basis and $2.73 trillion on an actuarial value basis. By comparison, reported assets in the Milliman 2012 Public Pension Funding Study stood at $2.51 trillion on a market value basis and $2.71 trillion on an actuarial value basis.

Funded ratios have fallen slightly in the Milliman 2013 Public Pension Funding Study relative to the 2012 study, reflecting changes in both

FIGURE 1: MILLIMAN 100, AGGREGATE FUNDED STATUS

	2012		2013	
$ TRILLIONS	**REPORTED FIGURES**	**RECALIBRATED FIGURES**	**REPORTED FIGURES**	**RECALIBRATED FIGURES**
Interest rate (median)	8.00%	7.65%	7.75%	7.47%
Interest rate (liability-weighted)	7.80%	7.55%	7.67%	7.44%
Accrued liability	$3.60	$3.71	$3.77	$3.86
Market value of assets	$2.51	$2.51	$2.58	$2.58
Actuarial value of assets	$2.71	$2.71	$2.73	$2.73
Funded ratio using market value of assets	69.8%	67.8%	68.5%	66.8%
Funded ratio using actuarial value of assets	75.1%	73.0%	72.4%	70.6%
Unfunded accrued liability using market value of assets	$1.09	$1.20	$1.19	$1.28
Unfunded accrued liability using actuarial value of assets	$0.89	$1.00	$1.04	$1.13

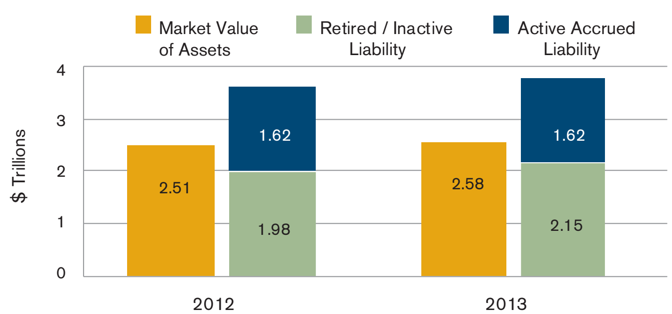
assets and liabilities. On the asset side, for more than half of the plans in this study the most recent valuation information available is as of July 1, 2012. The 12-month period from July 2011 to July 2012 generally saw disappointing investment results, with market returns hovering around 1% to 2%. On the liability side, 29 of the plans in this study lowered their interest rate assumptions and therefore increased their reported accrued liabilities.

The larger plans in the study tend to be somewhat better funded than the smaller plans in the study. The top quartile of plans by reported funded ratio accounts for 35% of the aggregate reported accrued liabilities, whereas the bottom quartile of plans accounts for just 18% of the aggregate reported accrued liabilities.

Liabilities

The plans reported aggregate accrued liabilities of $3.77 trillion. This total breaks down into $1.62 trillion for the 12.6 million plan members who are still working plus $2.15 trillion for the 11.8 million plan members who are retired and receiving benefits or who have stopped working but have not yet started collecting their pensions. The number of active members has declined by 200,000 relative to the Milliman 2012 Public Pension Funding Study, whereas the number of inactive members has grown by 900,000. In aggregate, the plans currently have assets sufficient to cover 100% of the reported accrued liability for retirees and inactive members but only 27% of the assets needed to cover the reported accrued liability for active plan members.

FIGURE 2: ACCRUED LIABILITY



Interest rate assumption

There are three sources of money to pay for public pension benefits: payroll deductions from active members, contributions from plan sponsors, and investment income generated by plan assets. When actuaries advise plan sponsors on contribution policy, they estimate what level of future investment income a plan's assets are likely to earn. Different types of investments carry different long-term expectations for investment earnings, so the actuary starts with return assumptions for each of the different asset classes. Collectively, these return assumptions, along with the associated variances and coefficients of correlation with other asset classes, are known as *capital market assumptions*. The actuary then takes into account each particular pension plan's allocation of investments across the different asset classes and arrives at the expected long-term average annual rate of return for the pension plan. This expected rate of return is used to discount projected future benefit payments back to the present time so that those future payments are expressed in today's dollars. Using this methodology to determine the plan's liabilities, if the plan sponsor always pays the amounts determined using actuarially sound methods and if the actual future investment results are equal to the interest rate assumption, then the plan should accumulate sufficient assets to pay benefits when due.

Capital market assumptions

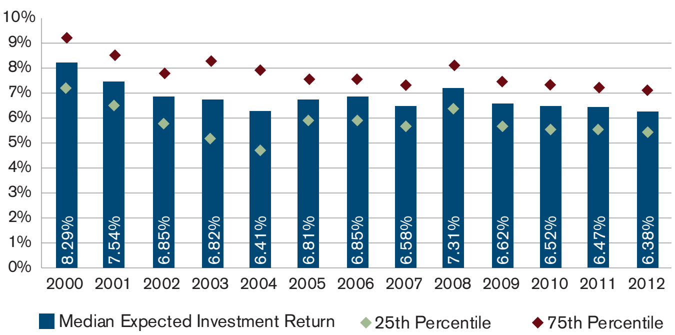
One of the most significant trends over the past decade is that the market's consensus views on long-term future investment returns have slid downward. Figure 3 illustrates this trend by showing the expected long-term return for a hypothetical asset allocation based on Milliman's capital market assumptions for each year since 2000. Over this period, expected returns on both equity and fixed-income investments have fallen by about 200 basis points. Pension plans have reflected this trend by lowering their interest rate assumptions, in some cases by making a single significant cut and in other cases by making gradual reductions. Where assumptions of 8.5% were once commonplace, over half of the plans in the study now have assumptions of 7.75% or below. With lower interest rate assumptions come higher reported accrued liabilities; for many public pension plans, a 100-basis-point reduction in the interest rate assumption causes an 11% to 15% increase in accrued liability, which in turn causes a reduction in the

Methodology

This study is based on the most recently available Comprehensive Annual Financial Reports and valuation reports, which reflect valuation dates ranging from June 30, 2010, to December 31, 2012; about two-thirds are from June 30, 2012, or later. For the purposes of this study, the reported asset allocation of each of the included plans has been analyzed to determine an independent measure of the expected long-term annual geometric average rate of return on plan assets. The reported accrued liability for each plan has then been recalibrated to reflect this actuarially determined interest rate. This study therefore adjusts for differences between each plan's assumed rate of investment return and a current market assessment of the expected return based on actual asset allocations. This study is not intended to estimate the plans' liabilities for settlement accounting purposes or to analyze the funding of individual plans.

reported funded ratio and an increase in the contributions needed to fund the plan over the long term. If market outlooks remain at current levels or continue to decline, it is likely that plans will continue to reduce their interest rate assumptions.

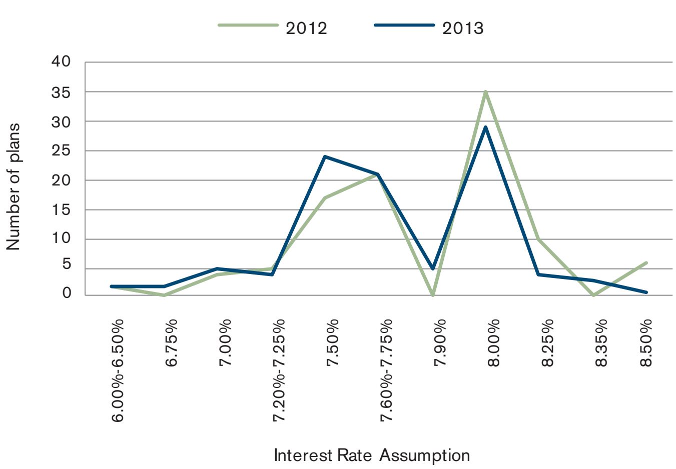
FIGURE 3: EXPECTED RETURN FOR A HYPOTHETICAL ASSET ALLOCATION BASED ON MILLIMAN'S CAPITAL MARKET ASSUMPTIONS



Asset allocation: 35% broad U.S. equities, 15% developed foreign equities, 25% core fixed income, 5% high yield bonds, 10% mortgages, 5% real estate, and 5% cash; inflation assumption is fixed at 2.5% for all years.

There is a wide diversity of investment allocations among the plans in this study, which in and of itself would naturally result in a diversity of interest rate assumptions. Expert opinion also varies regarding the expected long-term returns for different asset classes, and plans may have different attitudes about the appropriate level of conservatism to build into their interest rate assumptions. It is therefore not surprising that there is a wide spread of interest rate assumptions reported by the plans in this study, as shown in Figure 4.

FIGURE 4: INTEREST RATE ASSUMPTIONS REPORTED BY PLANS



The median of the interest rate assumptions reported by plans in this study is 7.75% (7.67% on a liability-weighted basis), down from a median of 8.00% (7.80% liability-weighted) in the Milliman 2012 Public Pension Funding Study. Since the 2012 study, 29 of the plans have lowered their interest rate assumption, most by 25 to 50 basis points. At an aggregate level, there were no significant changes in asset allocations during this period, so the drop in interest rate assumptions reflects the general consensus trend among investment professionals toward lower expected long-term returns on most asset classes.

Recalibrating the accrued liability

We independently applied a "building-block approach" to each plan's unique asset allocation, and determined the 50th percentile 30-year geometric rate of return based on Milliman's December 31, 2012, capital market assumptions. We then applied the plan's reported inflation assumption to arrive at our independent, actuarially determined interest rate. The median of the resulting interest rates is 7.47%, which is 28 basis points lower than the median interest rate assumption reported by the plans and 18 basis points lower than the 7.65% median rate from the Milliman 2012 Public Pension Funding

Interest rates and accrued liabilities: Asking the right question

How much are our pension promises worth? This is a question being asked with increasing urgency as plan sponsors grapple with how to cope with underfunded pension plans. But there is more than one way to determine the answer to this question, and the choice of calculation method depends on why the question is being asked.

To illustrate, consider a very different question: How much is New York City's Central Park worth? If the question is being asked in the context of gauging its aesthetic value, or its value as a recreational space, or its value as a green space converting carbon dioxide to oxygen, then the answer can be determined accordingly. But imagine how different the answer would be if the question is being asked in the context of developing Central Park's acreage and filling those green spaces with high-rise apartments and office buildings.

Similarly, putting a dollar figure on pension promises depends on the background for asking the question. If the context for the question is to determine what it would cost to shut down the pension plan today or to transfer responsibility for future pension benefits to an insurance company, then the answer is arrived at by discounting future pension payments using current market interest rates. But if the context for the question is to do long-range budgeting and to work out how much should be contributed to the plan this year and next year and 20 years from now, then the answer is arrived at by discounting future pension payments using the long-term expected return on the plan's investments. Neither answer to the question is more "right" than the other; they are just different answers to a question asked in different contexts.

Study. Figure 5 details how the actuarially determined interest rates compare to the interest rate assumptions reported by the plans; Figure 6 compares the 2013 actuarially determined interest rates to the 2012 actuarially determined interest rates.

FIGURE 5:

ACTUARIALLY DETERMINED INTEREST RATE VS. REPORTED INTEREST RATE

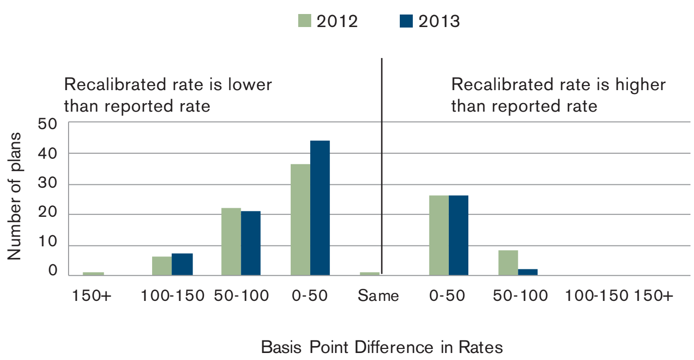
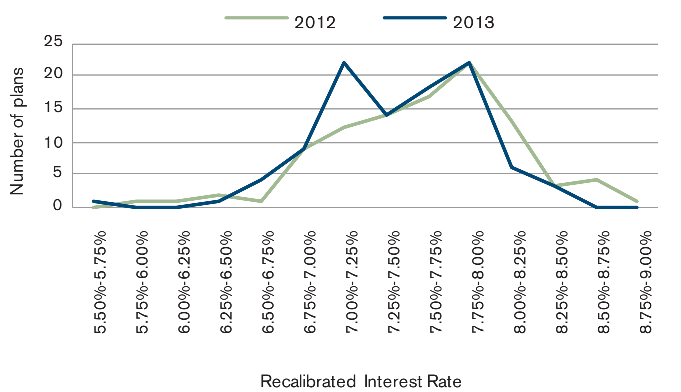


FIGURE 6: ACTUARIALLY DETERMINED INTEREST RATES IN 2013 VS. 2012

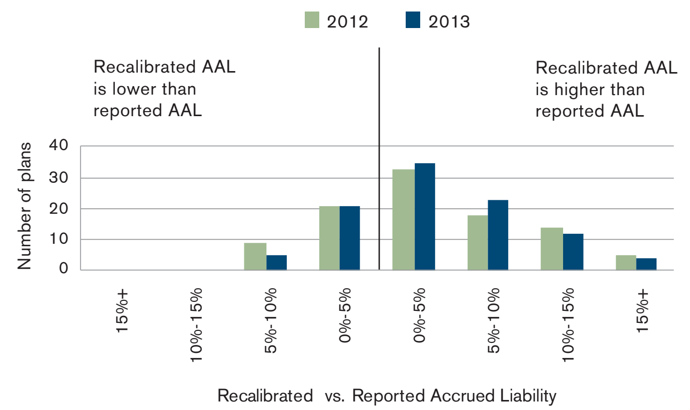


Note that for 28 of the 100 plans the actuarially determined interest rate is higher than the interest rate assumption reported by the plan; this suggests that those plans have included a margin for conservatism in their interest rate assumption.

Recalibrated accrued liabilities

Using each plan's actuarially determined interest rate to recalibrate the accrued liabilities, these plans have an aggregate accrued liability of $3.86 trillion. For most plans in the study, as was the case in 2012, the recalibrated accrued liability is not substantially different from the reported accrued liability, as shown in Figure 7.

FIGURE 7: RECALIBRATED VS. REPORTED ACCRUED LIABILITY



Sensitivity analysis

A relatively small change in the interest rate assumption can have a significant impact on the accrued liability. The magnitude of the accrued liability impact is a function of the makeup of the plan's membership: a less "mature" plan with more active members than retirees has a higher sensitivity to interest rate changes than a more mature plan with a bigger retiree population. Using an interest rate that is 100 basis points higher or lower than the actuarially determined interest rate moves the aggregate recalibrated accrued liability by 10.6% to 13.5% (see Figure 8), but can move accrued liability by as little as 9.2% for the most mature plans or as much as 15.1% for the least mature plans.

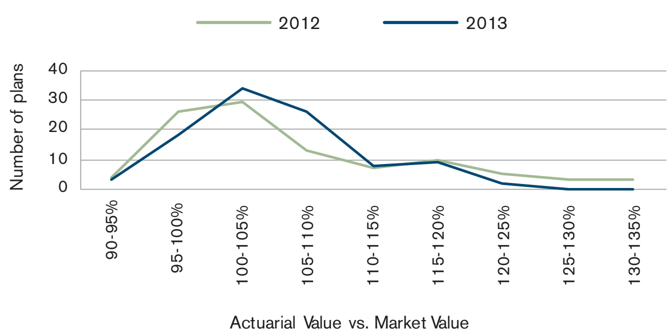
FIGURE 8: EFFECT OF CHANGING THE INTEREST RATE ASSUMPTION

RECALIBRATED ACCRUED LIABILITY ($ TRILLIONS)	- 100 BASIS POINTS	ACTUARIALLY DETERMINED INTEREST RATE	+ 100 BASIS POINTS
Most mature 25 plans	$0.75 (+11.6%)	$0.68	$0.61 (-9.2%)
Second most mature 25 plans	$1.68 (+13.1%)	$1.49	$1.33 (-10.4%)
Second least mature 25 plans	$0.91 (+14.1%)	$0.79	$0.71 (-11.1%)
Least mature 25 plans	$1.04 (+15.1%)	$0.90	$0.80 (-11.7%)
All 100 plans in aggregate	$4.38 (+13.5%)	$3.86	$3.45 (-10.6%)

Investments

The plans reported an aggregate market value of assets of $2.58 trillion and an aggregate actuarial value of assets of $2.73 trillion, compared with $2.51 trillion and $2.71 trillion, respectively, reported in the Milliman 2012 Public Pension Funding Study. Actuarial asset values are designed to reduce year-to-year contribution volatility by systematically recognizing market gains and losses over a multiyear period, typically three to five years. The advantage of asset smoothing techniques is that contribution levels are more consistent from year to year. After periods of large market losses, such as 2000 to 2002 and 2007 to 2009, actuarial asset values may be larger than market values. After periods of large market gains such as the late 1990s, the opposite is generally the case. Figure 9 shows the relationship of these two asset measures for the plans in this study. In both 2012 and 2013, the median ratio of actuarial value to market value was 104%, but the spread of values is somewhat narrower in 2013 than was the case in 2012; that is, fewer plans have a very large divergence between actuarial value and market value.

FIGURE 9: ACTUARIAL VALUE VS. MARKET VALUE



Most pension plans suffered significant asset losses in the timeframe of 2007 to 2009 and additional modest losses in 2011–2012. While there were sizeable gains experienced during 2009 to 2011, those gains were typically not as large as the losses, leading generally to plans with reported actuarial asset values larger than market values. Note that in the pension funding context, a "gain" or "loss" is based on the plan's actual investment performance relative to the interest rate assumption. While market indices have generally returned to pre-financial crisis levels, many pension plans have not fully recovered from the effects of the market meltdown. As the market gains and losses that were experienced over the past several years are gradually recognized, the relationship of actuarial value to market value will continue to shift. Most notably, much of the large losses suffered during the financial crisis have already been recognized, and many plans will have fully recognized those losses by 2013.

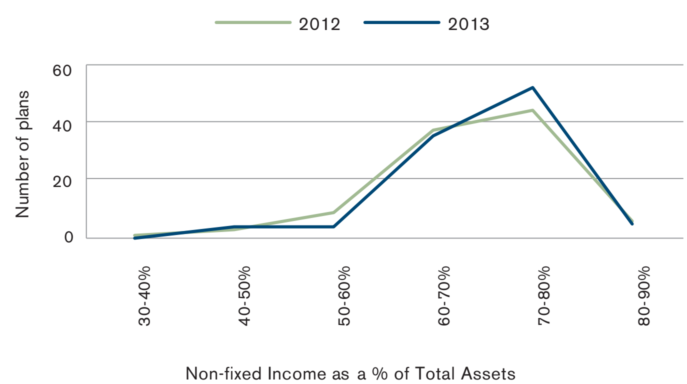
The plans included in this study are invested in a wide array of asset classes, as shown in Figure 10.

FIGURE 10: ASSET ALLOCATIONS

CLASS	2012	2013
Equities	51%	49%
Real estate	6%	8%
Private equity, etc.	13%	15%
Total non-fixed income	**70%**	**72%**
Fixed income	26%	25%
Cash	4%	3%
Total fixed income	**30%**	**28%**

While the aggregate 2013 investment allocation is 72% in non-fixed income classes and 28% in fixed income, there is considerable investment allocation variation from plan to plan. Figure 11 illustrates this variation, showing the percentage of plan assets invested in non-fixed income classes.

FIGURE 11:
PERCENTAGE ALLOCATION TO NON-FIXED INCOME ASSET CLASSES



Asset volatility ratio

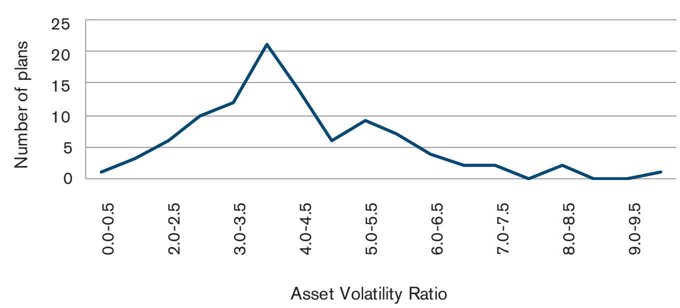
The *asset volatility ratio* is a metric that has been garnering attention lately for its ability to help plan sponsors anticipate the impact of investment volatility on contribution levels. The asset volatility ratio is simply the ratio of plan assets to the payroll for active members covered by the plan. A lower ratio means that plan assets are relatively small compared with payroll; this implies that a large single-year investment gain or loss will not move the contribution rate much. A higher ratio, on the other hand, signals that a fairly small deviation in asset performance could translate into a surprisingly large shift in the contribution rate. It is unsurprising that, as pension plans have accumulated assets and their member populations have matured over the past several decades, asset volatility ratios have risen. These higher ratios mean that contribution rates are now more sensitive than they once were to investment volatility, despite the use of asset-smoothing methods to help mitigate the impact of market movements. Figure 12 illustrates how changes in the asset volatility ratio over time can alter the relationship between investment volatility and contribution volatility.

FIGURE 12: ASSET VOLATILITY RATIO ILLUSTRATION FOR A HYPOTHETICAL PENSION PLAN

	1983	1993	2003	2013
Market value of assets	$30,000	$110,000	$260,000	$390,000
Covered payroll	20,000	40,000	70,000	80,000
Asset volatility ratio = assets ÷ payroll	1.50	2.75	3.71	4.88
Increase in contribution rate resulting from a 10% asset loss (using 15-year level dollar amortization)	1.58%	2.90%	3.91%	5.14%

The median asset volatility ratio for the plans included in this study is 3.9, and most plans fall within a range of 3.1 to 5.4. However, 18 of the plans have an asset volatility ratio of 5.5 or higher, indicating that their contributions will be more volatile in reaction to market swings.

FIGURE 13: ASSET VOLATILITY RATIOS



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Reported Data

PLAN NAME	VALUATION DATE	ACCRUED LIABILITY	MARKET VALUE: VALUE OF ASSETS	MARKET VALUE: SURPLUS / (UNFUNDED) ACCRUED LIABILITY	MARKET VALUE: FUNDED RATIO	ACTUARIAL VALUE: VALUE OF ASSETS	ACTUARIAL VALUE: SURPLUS / (UNFUNDED) ACCRUED LIABILITY	ACTUARIAL VALUE: FUNDED RATIO	COUNT OF ACTIVE MEMBERS	COUNT OF INACTIVE / RETIRED MEMBERS
Employees' Retirement System of Alabama	09/30/11	14,367	8,057	(6,310)	56%	9,456	(4,911)	66%	85,633	52,254
Teachers' Retirement System of Alabama	09/30/11	28,776	16,597	(12,179)	58%	19,430	(9,346)	68%	135,768	97,807
State of Alaska Public Employees' Retirement System	06/30/11	10,919	6,268	(4,651)	57%	6,762	(4,157)	62%	24,393	33,773
Arizona Public Safety Personnel Retirement System	06/30/12	10,326	5,075	(5,251)	49%	6,052	(4,274)	59%	18,542	12,562
Arizona State Retirement System	06/30/12	38,044	26,048	(11,996)	68%	28,549	(9,495)	75%	203,994	328,931
Arkansas Public Employees Retirement System	06/30/12	8,163	5,678	(2,485)	70%	5,625	(2,538)	69%	45,937	42,335
Arkansas Teacher's Retirement System	06/30/11	15,521	11,895	(3,626)	77%	11,146	(4,375)	72%	76,780	44,538
California Public Employees' Retirement System	06/30/11	328,600	241,740	(86,860)	74%	271,389	(57,211)	83%	779,481	851,014
California State Teachers' Retirement System	06/30/12	214,765	134,835	(79,930)	63%	144,232	(70,533)	67%	421,499	440,693
University of California Retirement Plan	07/01/12	54,620	41,806	(12,814)	77%	42,965	(11,655)	79%	116,888	126,252
Chicago Public Schools	06/30/12	17,376	9,437	(7,939)	54%	9,364	(8,012)	54%	30,366	30,171
Municipal Employees' Annuity and Benefit Fund of Chicago	12/31/12	13,475	5,183	(8,292)	38%	5,073	(8,402)	38%	31,326	38,115
Colorado Public Employees' Retirement Association	12/31/11	60,735	37,164	(23,571)	61%	37,185	(23,550)	61%	199,741	186,673
Connecticut State Employees Retirement System	06/30/12	23,019	8,468	(14,551)	37%	9,745	(13,274)	42%	47,868	45,448
Connecticut State Teachers' Retirement System	06/30/12	24,862	13,474	(11,388)	54%	13,735	(11,127)	55%	49,808	46,179
County Employees' Annuity and Benefit Fund of Cook County	12/31/12	13,418	8,060	(5,358)	60%	7,834	(5,584)	58%	21,447	28,030
Delaware State Employees' Pension Plan	06/30/12	7,950	6,915	(1,035)	87%	7,270	(680)	91%	35,427	26,393
Florida State Retirement System	07/01/12	148,050	122,921	(25,129)	83%	127,892	(20,158)	86%	517,287	475,399
Employees' Retirement System of Georgia	06/30/12	16,778	11,537	(5,241)	69%	12,261	(4,517)	73%	63,942	47,051
Teachers' Retirement System of Georgia	06/30/11	65,979	54,084	(11,895)	82%	55,428	(10,551)	84%	216,167	178,581
Employees' Retirement System of the State of Hawaii	06/30/12	20,683	11,286	(9,397)	55%	12,242	(8,441)	59%	65,599	47,683
Public Employee Retirement System of Idaho	07/01/12	13,397	11,330	(2,067)	85%	11,306	(2,091)	84%	65,270	47,973
Illinois Municipal Retirement Fund	12/31/11	30,963	24,834	(6,129)	80%	25,711	(5,252)	83%	175,233	234,182
State Employees' Retirement System of Illinois	06/30/12	33,091	10,961	(22,130)	33%	11,477	(21,614)	35%	62,729	85,602
State Universities Retirement System of Illinois	06/30/12	33,170	13,705	(19,465)	41%	13,950	(19,220)	42%	81,156	81,341
Teachers' Retirement System of the State of Illinois	06/30/12	90,025	36,517	(53,508)	41%	37,945	(52,080)	42%	162,217	204,499
Indiana Public Employees' Retirement Fund	06/30/12	15,784	12,244	(3,540)	78%	12,088	(3,696)	77%	145,519	142,066
Indiana State Teachers' Retirement Fund	06/30/12	20,860	9,077	(11,783)	44%	8,915	(11,945)	43%	70,573	56,338
Iowa Public Employees' Retirement System	06/30/12	29,446	23,025	(6,421)	78%	23,530	(5,916)	80%	164,200	171,454
Kansas Public Employee Retirement System	12/31/11	22,607	12,477	(10,130)	55%	13,379	(9,228)	59%	155,054	126,205
Kentucky Employees Retirement Systems	06/30/12	12,114	3,459	(8,655)	29%	3,599	(8,515)	30%	46,282	51,802
Kentucky Teachers' Retirement System	06/30/12	26,974	14,797	(12,177)	55%	14,691	(12,283)	54%	75,951	52,762
County Employees Retirement System of Kentucky	06/30/12	12,150	7,051	(5,099)	58%	7,295	(4,855)	60%	92,182	64,870
Los Angeles City Employees' Retirement System	06/30/12	14,394	9,059	(5,335)	63%	9,935	(4,459)	69%	24,917	23,031
Water and Power Employees' Retirement Plan of the City of Los Angeles	07/01/12	9,693	7,389	(2,304)	76%	7,574	(2,119)	78%	8,962	10,158
Los Angeles County Employees Retirement Association	06/30/12	50,809	38,307	(12,502)	75%	39,039	(11,770)	77%	91,952	68,859
Los Angeles Fire and Police Pension Plan	06/30/12	17,031	13,269	(3,762)	78%	14,252	(2,779)	84%	13,396	12,442
Louisiana State Employees' Retirement System	06/30/12	16,158	9,516	(6,642)	59%	9,026	(7,132)	56%	52,352	98,111
Teachers' Retirement System of Louisiana	06/30/12	24,540	14,189	(10,351)	58%	13,584	(10,956)	55%	84,513	94,802
Maine Public Employees Retirement System	06/30/12	11,553	8,454	(3,099)	73%	8,881	(2,672)	77%	39,360	30,485
Maryland State Employees' Combined System	06/30/12	20,284	12,631	(7,653)	62%	12,668	(7,616)	62%	85,174	92,511
Maryland Teachers	06/30/12	34,253	22,502	(11,751)	66%	22,524	(11,729)	66%	103,694	86,732
Massachusetts State Board of Retirement System	01/01/12	27,785	18,643	(9,142)	67%	20,508	(7,277)	74%	85,935	58,671
Massachusetts Teachers' Retirement System	01/01/12	36,483	20,129	(16,354)	55%	22,141	(14,342)	61%	86,860	57,406
Michigan Public School Employee's Retirement System	09/30/11	63,427	34,675	(28,752)	55%	41,038	(22,389)	65%	236,660	207,525
Michigan State Employees Retirement System	09/30/12	15,597	8,775	(6,822)	56%	10,212	(5,385)	65%	17,860	62,043
Municipal Employees' Retirement System of Michigan	12/31/11	9,844	5,933	(3,911)	60%	7,150	(2,694)	73%	35,111	35,362
Minnesota State Retirement System	07/01/12	11,083	9,098	(1,985)	82%	9,162	(1,921)	83%	48,207	47,677
Teachers Retirement Association of Minnesota	07/01/12	23,025	16,686	(6,339)	72%	16,805	(6,220)	73%	76,649	95,217
Public Employees Retirement Association of Minnesota	06/30/12	18,599	13,578	(5,021)	73%	13,662	(4,937)	73%	139,330	119,889
Public Employees' Retirement System of Mississippi	06/30/12	34,493	19,781	(14,712)	57%	19,993	(14,500)	58%	162,311	217,970
Missouri State Employees' Plan	06/30/12	10,794	7,582	(3,212)	70%	7,897	(2,897)	73%	51,332	55,342
Public School Retirement System of Missouri	06/30/12	35,588	27,817	(7,771)	78%	29,013	(6,575)	82%	77,529	50,207

PLAN NAME	VALUATION DATE	ACCRUED LIABILITY	MARKET VALUE: VALUE OF ASSETS	MARKET VALUE: SURPLUS / (UNFUNDED) ACCRUED LIABILITY	MARKET VALUE: FUNDED RATIO	ACTUARIAL VALUE: VALUE OF ASSETS	ACTUARIAL VALUE: SURPLUS / (UNFUNDED) ACCRUED LIABILITY	ACTUARIAL VALUE: FUNDED RATIO	COUNT OF ACTIVE MEMBERS	COUNT OF INACTIVE / RETIRED MEMBERS
Nebraska Public Employees Retirement Systems School Retirement System	06/30/12	9,609	7,246	(2,363)	75%	7,359	(2,250)	77%	39,477	40,068
Public Employees' Retirement System of the State of Nevada	06/30/10	35,078	20,906	(14,172)	60%	24,725	(10,353)	70%	102,594	55,726
New Hampshire Retirement System	06/30/12	10,362	5,774	(4,588)	56%	5,818	(4,544)	56%	48,625	29,826
Public Employees' Retirement System of New Jersey	07/01/12	45,393	25,176	(20,217)	55%	28,887	(16,506)	64%	280,158	153,625
Teachers' Pension and Annuity Fund of New Jersey	06/30/12	51,405	26,038	(25,367)	51%	31,079	(20,326)	60%	150,200	89,700
The Police and Firemen's Retirement System of New Jersey	07/01/12	31,732	21,126	(10,606)	67%	23,687	(8,045)	75%	40,819	39,767
Educational Retirement Board of New Mexico	06/30/12	15,837	9,489	(6,348)	60%	9,606	(6,231)	61%	60,855	71,368
Public Employees Retirement Association of New Mexico	06/30/12	17,788	11,600	(6,188)	65%	11,612	(6,176)	65%	48,483	36,623
New York City Employees' Retirement System	06/30/10	62,935	35,384	(27,551)	56%	40,433	(22,502)	64%	184,982	141,428
New York City Police Pension Fund	06/30/10	38,134	19,985	(18,149)	52%	22,909	(15,225)	60%	34,597	44,634
Teachers' Retirement System of the City of New York	06/30/10	55,138	26,398	(28,740)	48%	32,478	(22,660)	59%	111,647	80,526
New York State and Local Employees Retirement System	04/01/11	140,087	130,506	(9,581)	93%	126,395	(13,692)	90%	513,092	478,769
New York State Teachers' Retirement System	06/30/11	89,825	89,890	65	100%	86,892	(2,933)	97%	280,435	146,843
New York State and Local Police & Fire	03/31/12	24,169	22,357	(1,812)	93%	22,205	(1,964)	92%	31,024	34,799
North Carolina Local Governmental Employees' Retirement System	12/31/11	19,374	17,908	(1,466)	92%	19,326	(48)	100%	121,638	96,050
North Carolina Teachers and State Employees Retirement System	12/31/11	61,847	53,402	(8,445)	86%	58,125	(3,722)	94%	310,627	282,472
Ohio Police and Fire Pension Fund	01/01/12	16,347	9,688	(6,659)	59%	10,309	(6,038)	63%	27,463	30,029
Ohio Public Employees Retirement System	12/31/10	79,629	63,816	(15,813)	80%	60,599	(19,030)	76%	356,734	617,999
Schools Employees' Retirement System of Ohio	06/30/12	16,372	10,219	(6,153)	62%	10,284	(6,088)	63%	121,811	81,648
State Teachers Retirement System of Ohio	07/01/12	106,302	60,694	(45,608)	57%	59,490	(46,812)	56%	173,044	160,581
Oklahoma Public Employees Retirement System	07/01/12	8,335	6,821	(1,514)	82%	6,682	(1,653)	80%	42,569	35,760
Teachers' Retirement System of Oklahoma	06/30/12	18,588	10,195	(8,393)	55%	10,190	(8,398)	55%	87,778	61,403
Orange County Employees Retirement System	12/31/11	13,523	8,466	(5,057)	63%	9,064	(4,459)	67%	21,421	17,695
Oregon Public Employees Retirement System	12/31/11	61,198	51,389	(9,809)	84%	50,168	(11,030)	82%	170,972	158,915
Pennsylvania State Employees' Retirement System	12/31/11	42,282	24,371	(17,911)	58%	27,618	(14,664)	65%	107,021	121,531
Public School Employees' Retirement System of Pennsylvania	06/30/12	87,761	48,534	(39,227)	55%	58,228	(29,533)	66%	273,504	324,301
Puerto Rico Government Employees Retirement System	06/30/12	27,646	1,237	(26,409)	4%	1,237	(26,409)	4%	134,566	117,861
Puerto Rico Teachers Retirement System	06/30/11	11,449	2,386	(9,063)	21%	2,386	(9,063)	21%	43,402	36,129
Rhode Island Employees Retirement System	06/30/12	10,670	5,757	(4,913)	54%	6,167	(4,503)	58%	24,378	27,305
Sacramento County Employees' Retirement System	06/30/12	7,838	6,074	(1,764)	77%	6,530	(1,308)	83%	12,155	12,090
San Bernardino County Employees' Retirement Association	06/30/12	8,570	6,173	(2,397)	72%	6,789	(1,781)	79%	19,306	13,518
San Diego County Employees Retirement Association	06/30/12	10,943	8,437	(2,506)	77%	8,607	(2,336)	79%	16,457	20,205
City and County of San Francisco Employees' Retirement System	07/01/12	19,394	15,294	(4,100)	79%	16,028	(3,366)	83%	28,282	30,748
South Carolina Retirement System	07/01/11	40,016	22,395	(17,621)	56%	25,605	(14,411)	64%	192,865	268,382
South Dakota Retirement System	07/01/12	8,453	7,843	(610)	93%	7,828	(625)	93%	38,207	37,161
Tennessee Consolidated Retirement System	07/01/11	40,069	33,662	(6,407)	84%	36,681	(3,388)	92%	215,076	116,585
Texas County & District Retirement System	12/31/12	22,953	19,530	(3,423)	85%	20,250	(2,703)	88%	121,963	115,524
Texas Municipal Retirement System	12/31/12	22,683	20,491	(2,192)	90%	19,784	(2,899)	87%	101,827	87,958
Employees' Retirement System of Texas	08/31/12	29,377	21,826	(7,551)	74%	24,273	(5,104)	83%	132,669	177,989
Teacher Retirement System of Texas	08/31/12	144,427	111,450	(32,977)	77%	118,326	(26,101)	82%	815,155	404,166
Utah Retirement Systems	01/01/12	20,743	15,756	(4,987)	76%	16,615	(4,128)	80%	87,220	81,354
Virginia Employees Retirement System	06/30/11	75,185	50,267	(24,918)	67%	52,559	(22,626)	70%	326,357	186,423
Washington Public Employees' Retirement System	06/30/11	31,382	28,274	(3,108)	90%	29,880	(1,502)	95%	152,417	207,853
Washington State Law Enforcement Officer's and Fire Fighters' Plan 1 and 2	06/30/11	9,710	11,550	1,840	119%	12,186	2,476	125%	17,055	12,264
Washington State Teachers' Retirement System	06/30/11	15,557	13,741	(1,816)	88%	14,626	(931)	94%	66,203	50,913
West Virginia Teachers' Retirement System	06/30/11	9,445	5,075	(4,370)	54%	5,075	(4,370)	54%	35,855	34,291
Wisconsin Retirement System	12/31/11	76,565	71,455	(5,110)	93%	76,466	(99)	100%	256,232	353,525

Study Technical Appendix

Methodology: Expected rate of return on assets

For the purposes of this study, we recalibrated liabilities for included plans to reflect discounting at the expected rate of return on current plan assets. To develop the expected rate of return used in these calculations, we relied on the most recently available asset statements for each plan, particularly on Statements of Plan Net Assets as disclosed in published Comprehensive Annual Financial Reports (CAFRs). We did not make adjustments for potential differences between actual asset allocations and target policy asset allocations.

Our method for calculation of the expected rate of return was the "building-block method" as outlined in Actuarial Standard of Practice No. 27, using geometric averaging methodology. We used Milliman's December 31, 2012, capital market assumptions to calculate the 50th percentile 30-year geometric real rate of return, and then added the plan's inflation assumption to arrive at the total expected investment return on plan assets. Where the plan inflation assumption was not available, we used Milliman's December 31, 2012, capital market inflation assumption of 2.50%. We did not make any adjustment to the expected rate of return for plan expenses, nor did we include any assumption for investment alpha (i.e., we did not assume any excess return over market averages resulting from active versus passive management).

Methodology: Liability recalibration

We performed the recalibration of liabilities for pension plans included in the study using adjustment benchmarks based on detailed calculations for certain pension plans meeting broad categorization definitions. For these benchmark plans, we developed precise liability durations separately for active, terminated vested, and retired member populations. These calculated liability durations were modified durations, further adjusted for plan- and population-specific convexity. We applied a variety of cost of living adjustments (COLAs) to the various benchmark plans, resulting in a library of adjustment factors taking into account plan type, plan provisions, demographic group, and COLA.

We then selected liability adjustment factors for each plan in the study based on plan type, COLA provisions, and average demographic characteristics where available. For example, a teachers' plan was typically matched with a set of teachers' plan adjustment factors, with similar COLA provisions. If average ages, service levels, or expected working lifetimes were available, we also used these criteria to aid in choosing the adjustment factors. For each liability recalibration calculation, we then recalculated the selected benchmark durations to reflect the actual starting plan interest rate assumption. We performed separate liability adjustments for active, terminated vested, and retired liabilities, thereby adjusting for varying plan maturity levels.

The liability durations used for adjustment provide an estimate of the sensitivity of the present value of benefits (PVB) to changes in the interest rate assumption. We assumed that for active populations, the actuarial accrued liabilities (AAL) varied 85% as much as the PVB when liabilities were reported under the projected unit credit cost method, and 70% as much as the PVB when liabilities were reported under the entry age normal cost method. These assumptions for the relative change in AAL compared with PVB were based on the average results of a survey of actual changes in AAL versus PVB for selected Milliman clients. Although most plans in the study reported liability results under one of these two cost methods for Government Accounting Standards Board (GASB) reporting purposes, a handful of plans disclosed liabilities only under the frozen initial liability cost method. For those plans, we used the entry age normal assumption for the relative change of AAL to PVB.

Where any discrepancy occurred between liabilities disclosed for GASB reporting and liabilities disclosed elsewhere, the GASB reporting numbers were relied upon.