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Proposal for  
**Actuarial Audit Services**

June 12, 2014

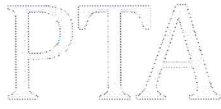
Submitted to:

Minnesota  
Legislative Commission  
on  
Pensions  
and  
Retirement



LCPR JUN 16 2014

Postmarked 6/12/14 *ljd*



**William B. Fornia, FSA | President**

June 12, 2014

Mr. Lawrence A. Martin  
Executive Director  
Legislative Commission on Pensions  
and Retirement  
55 State Office Building  
100 Rev. Dr. Martin Luther King Jr. Blvd.  
St. Paul, MN 55155

Dear Mr. Martin:

Pension Trustee Advisors (PTA) and KMS Actuaries (KMS) are pleased to submit our proposal to provide actuarial audit services for the Minnesota Legislative Commission on Pensions and Retirement (Commission).

Our proposal provides details of our public plan experience in Section 1. Individual biographies for our proposed actuarial team are presented in Section 2, along with references you can contact and learn more about our strength in providing actuarial services.

Section 3 contains a detailed work plan and timeline for providing the actuarial services you seek and our fees are contained in Section 4.

A notarized statement for Compliance with Affirmative Action is provided in Section 5 and we further detail our firms' capabilities in Section 6.

In the Appendices, you will find samples of actuarial work products that are representative of special and recurring services we provide to our clients like the Commission.

Many of the most discerning clients in the country have chosen to work with PTA and KMS in the past four years. We hope that Minnesota's Commission chooses to also, and look forward to meeting with you.



Mr. Lawrence A. Martin

June 12, 2014

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As you read through our proposal, please do not hesitate to contact us should you need additional information. We encourage you to contact our references, and hope to meet with you in person to present our qualifications.

Sincerely,



**William B. Fornia, FSA, EA, MAAA  
President**

Pension Trustee Advisors, Inc.  
7600 E Arapahoe Road, Suite 125  
Centennial, CO 80112

Tel: 303.263.2765

e-mail:

[flick@pensiontrusteeadvisors.com](mailto:flick@pensiontrusteeadvisors.com)

Sincerely,



**Linda L. Bournival, FSA, EA, MAAA  
Consulting Actuary**

KMS Actuaries, LLC  
814 Elm Street, Suite 204  
Manchester, NH 03101

Tel: 603.792.9494

e-mail: [lindab@kmsactuaries.com](mailto:lindab@kmsactuaries.com)

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Pension Trustee Advisors (PTA) and KMS Actuaries (KMS) are pleased to submit our proposal to provide actuarial audit services for the Minnesota Legislative Commission on Pensions and Retirement (Commission). William "Flick" Forna of PTA and Linda Bournival of KMS have combined their actuarial expertise and experience to provide actuarial consulting services to the public sector, particularly special projects such as these retirement system audits.

But PTA and KMS are not your typical actuarial consulting firms. We specialize in the specific kinds of studies of large public pension systems that the Commission seeks. As you will see in Section 2, we are extremely experienced and at the national forefront of thought pertaining to actuarial funding of large public pension systems.

#### Importance of the Minnesota Legislative Commission on Pensions and Retirement

Because we are a smaller firm than most that we anticipate you will be considering, you would be an extremely high priority client to us. You would be one of our 2-3 most important clients and get the complete attention, quality and service that you deserve. We will meet the agreed-upon deadlines that you impose as well as be extremely responsive to your other needs.

But don't think that because we are small that we have no depth or limited capacity. We do have the availability to perform these audits within the timeframe you require, and we have several other subcontractors that we can call upon for further assistance should the need arise. In particular, we have worked with Paul Schrader, a seasoned pension actuary with 45 years of experience with retirement and other employee benefit programs with major employers in both the private and public sectors. Linda has deep expertise with actuarial valuations as well as a strong understanding of public pensions. And Flick has unsurpassed knowledge of US public pension funding as well as the strength to review actuarial valuations. All are skilled communicators of this complex information.

#### Our specialty

Although we have extensive experience performing ongoing actuarial services, since 2010 we have carved out a niche with important high visibility unique actuarial consulting pertaining to public retirement systems. Our largest client has been the Ohio Retirement Study Council, an oversight board much like your Commission. We conducted a massive review of pension reform for ORSC in 2011-2012 and have recently completed an actuarial audit of the 192,000 member School Employees Retirement System of Ohio.

We have consulted on high visibility lawsuits including the Detroit and Stockton, California bankruptcies, and defended COLA adjustments similar to those enacted in Minnesota. We work not only for pension systems, but for government bodies, labor groups, and third parties. Our philosophy is to get the facts on the table and well understood so that decision-makers can make the right decisions.

Flick wrote software and conducted Boeing's first experience study in 1981. Since then, we have conducted experience studies for:

- Teachers' Retirement System of Oklahoma
- Colorado Fire and Police Pension Association
- Wyoming Retirement System
- North Dakota Teachers' Fund for Retirement
- Utah Retirement System
- New Mexico Educational Retirement Board
- Public School Retirement System of Missouri

In addition, we have audited numerous experience studies, including:

- CalSTRS
- Alaska Retirement System
- School Employees' Retirement System of Ohio

#### National expertise

Both Flick and Linda are fully credentialed Fellows of the Society of Actuaries as well as Enrolled Actuaries under ERISA. There is no higher US qualification for pension actuaries. Flick has served on the American Academy of Actuaries Public Pension Committee and currently serves on the Conference of Consulting Actuaries (CCA) Public Plans Community Steering Committee. His CCA role included as a major author of a recent draft report on public pension funding policy. He is considered a thought leader on public pension funding policy and has spoken on the subject to the AARP, National Conference of State Legislators, GASB, as well as numerous actuarial organizations and other organizations specializing in public pensions throughout the world.

We have been exposed to dozens of different public plans and their actuarial software and methods from Alaska to Puerto Rico and Maine to California. PTA/KMS has a well-established process for conducting actuarial audits, developed based on years of conducting audits and actuarial valuations. We have reviewed the actuarial work from numerous actuarial firms, and understand many of the nuances of various actuarial methods and techniques. We know the actuarial software used by Cavanaugh MacDonald and Gabriel Roeder Smith & Co.

The Minnesota pension plan audits will be our top priority.

The vast majority of the work would be conducted by Flick and Linda. We do have capacity in the timeframe anticipated. We will not take on significant additional projects which might interfere. Should Linda or Flick somehow not be available due to emergency, we will use one of a number of other qualified actuaries with whom we have teamed on other projects.

Finally, neither PTA nor KMS will seek a contractual limit on liability with respect to errors in its actuarial work, nor require a disclaimer on reliance on actuarial results by third parties.



## SECTION 2 – FIRM INFORMATION

### **Firm's Structure, Operational Method and Communication Capability**

Pension Trustee Advisors was incorporated in Colorado in 2010 by its sole owner, William Forna. KMS Actuaries, formed in 2011 by its sole owners, Linda Bournival (99%) and Gerald Collins (1%), is a limited liability company. Our firms provide actuarial, retirement, benefit and technology services. PTA's and KMS' actuarial consulting services to the public sector, particularly special projects such as this audit, represent the vast majority of all the combined services our firms provide. There is currently no plan for retirement of key executives or for any changes to our ownerships or organization structures.

Flick and Linda provide actuarial consulting services out of PTA's and KMS' home offices, which are located in metropolitan Denver and Boston, respectively. Flick serves as the lead actuary and consultant and is responsible for management of client relationships and projects. Linda performs all the data processing, calculations and modeling using the ProVal actuarial valuation system, widely used by many national firms. Both Flick and Linda deal directly with clients. Paul Schrader is called upon to assist Flick and Linda and provide the necessary consulting and peer review of final client communications.

Flick is well known for his ability to teach complex concepts to lay audiences. He is an author and frequent speaker at organizations such as the Pension Research Council, the National Conference of State Legislators (NCSL), National Association of State Retirement Administrators (NASRA), the National Council on Teacher Retirement (NCTR), the National Association of Public Pension Attorneys (NAPPA), the National Conference on Public Employee Retirement Systems (NCPERS), the Conference of Consulting Actuaries, the Western Pension and Benefits Conference, the International Foundation of Employee Benefit Plans, The Conference Board, the Government Finance Officers Association (GFOA), and the Brazilian Association of Pension Plans (ABRAPP).

Linda has been complimented by many of her clients in that she can patiently explain actuarial concepts to a diverse, and in many cases, non-technical, audience, including boards of selectman, school committees, retirement boards and other local boards and committees. KMS' focus is to work with sponsors of retirement systems and retiree medical programs, provide analysis of complex calculations and communicate the results so that they can be easily understood by lay persons.

We have provided examples of an actuarial valuation report and communication regarding benefit cost estimates in Appendix C and Appendix D, respectively.

### **Firm's and Personnel's Prior Public Pension Experience**

Our key strength for Minnesota in this engagement is that we specialize in these types of second actuary arrangements: The majority of our combined work involves other actuaries, either through audits, special studies, litigation, or negotiations.

Flick, the proposed lead actuary and consultant for the Commission, has conducted thirteen audits for large defined benefit public retirement systems. We believe that he has more experience with actuarial audits for statewide systems than anyone.

## SECTION 2 – FIRM INFORMATION

Some of Flick's audit and actuarial consulting clients include:

### ***Retirement System Audits***

- Alaska Public Employees' Retirement System and Teachers' Retirement System (reviewed Buck)
- California State Teachers' Retirement System (reviewed Milliman)
- Colorado Public Employees' Retirement Association (reviewed Watson Wyatt)
- Public School Retirement System of Kansas City (reviewed Hays)
- Teachers' Retirement System of Louisiana (reviewed Hall)
- North Dakota Public Employees' Retirement System (reviewed Segal)
- North Dakota Teachers' Fund For Retirement (reviewed GRS)
- Ohio School Employees Retirement System (reviewed Cavanaugh Macdonald)
- Oklahoma Police Pension and Retirement System (reviewed Mercer)
- Oklahoma Public Employees' Retirement System (reviewed Mercer)
- Omaha School Employees' Retirement System (reviewed Milliman)
- Seattle City Employees Retirement System (reviewed Milliman)
- Tacoma City Employees Retirement System (reviewed Milliman)
- Vermont Retirement Systems (reviewed Buck)

### ***Select Retirement Systems' Ongoing Actuarial Services (pre-PTA)***

- Colorado Fire and Police Pension Association
- Colorado Public Employees Retirement Association
- Houston Firefighters Relief and Retirement System
- Public School Retirement System of Missouri
- New Mexico Educational Retirement Board
- North Dakota Teachers Fund for Retirement
- Oklahoma Firefighters Pension and Retirement System
- Oklahoma Police Pension and Retirement System
- Teachers Retirement System of Oklahoma
- Seattle City Employees Retirement System
- Utah Retirement Systems
- Wyoming Retirement System

### ***Select 2010-2014 Pension Trustee Advisor Clients***

- Ohio Retirement Study Council
- Municipal Employees Retirement System of Michigan
- City of Baltimore, MD
- Colorado Fire and Police Pension Association
- Puerto Rico Employees Retirement System
- Puerto Rico Teachers Retirement System



## SECTION 2 – FIRM INFORMATION

### *Select 2010-2014 Pension Trustee Advisor Clients*

- University of California Union Coalition
- San Diego City Employees Retirement System
- Alaska Public Pension Coalition
- New York City Office of the Comptroller
- Texas Association of Public Employee Retirement Systems
- New Hampshire Office of the Attorney General

Linda has provided actuarial consulting and retirement system valuation services for several municipalities and governmental entities over the past 25 years. In addition, she provides Governmental Accounting Standards Board Statement Number 45 (GASB 45) valuation and retiree health care consulting services to many large, medium and small public sector clients. Some of Linda's clients include:

### *Select 2011-2014 KMS Actuaries Clients*

- Ohio Retirement Study Council
- Municipal Employees Retirement System of Michigan
- Worcester Regional Retirement System, MA
- Town of Hingham, MA
- City of Lowell, MA
- Town of Weston, MA

Linda recently peer reviewed the Experience Study report developed by the Massachusetts Public Employee Retirement Administration Commission for the Massachusetts State Retirement System.

Paul has 45 years of experience with retirement and other employee benefit programs with major employers in both the private and public sectors. Paul retired from Buck Consultants and since retirement, has consulted with several public retirement systems in areas of strategic planning and policy setting, including the South Dakota Retirement System.

We provide a summary of Flick, Linda and Paul's professional qualifications and experience on the following pages.

## SECTION 2 – FIRM INFORMATION

### William B. (Flick) Fornia

Flick, the proposed lead actuary and consultant for the Commission, has conducted thirteen audits for large defined benefit public retirement systems. We believe that he has more experience with actuarial audits for statewide systems than anyone.

He is founder and President of Pension Trustee Advisors (PTA). PTA provides consulting services on public pensions with focus on pension advice.

### Previous Work History

He was senior vice president at Aon Consulting, leading their public sector pension actuarial consulting practice from 2006 to 2010. Flick has more than 30 years of consulting and actuarial experience, primarily in the areas of retiree pension and healthcare benefits. Prior to Aon, he managed the Denver Retirement Practice of Buck Consultants and has served nationally as a Senior Consultant for Gabriel, Roeder, Smith & Co., both specializing in public pensions.

### Work Experience

Flick Fornia has expertise in all retirement-related areas, including financing, plan design, bond analysis, asset-liability studies, retiree healthcare and legislative testimony. His career includes serving as corporate actuary for The Boeing Company and as consultant for numerous multinational corporations in Brazil and Argentina during his ten years at Towers Perrin. Previously, he was corporate actuary for Boeing.

He has performed consulting services for 22 statewide retirement systems in Alaska, California, Colorado, Louisiana, Missouri, New Mexico, North Dakota, Oklahoma, Puerto Rico, Utah, Vermont, Wyoming and others. He conducted the first actuarial audits of Oklahoma Police Pension and Retirement System and Oklahoma Public Employees' Retirement System. Other clients have included the US Department of State, Cities of Baltimore, Oakland and Philadelphia, IBM, US WEST and Ford Motor Company.

### Articles and Speech Presentations

Flick is well known for his ability to teach complex concepts to lay audiences. He is an author and frequent speaker at organizations such as the Pension Research Council, the National Conference of State Legislators (NCSL), National Association of State Retirement Administrators (NASRA), the National Council on Teacher Retirement (NCTR), the National Association of Public Pension Attorneys (NAPPA), the National Conference on Public Employee Retirement Systems (NCPERS), the Conference of Consulting Actuaries, the Western Pension and Benefits Conference, the International Foundation of Employee Benefit Plans, The Conference Board, the Government Finance Officers Association (GFOA), and the Brazilian Association of Pension Plans (ABRAPP).



## SECTION 2 – FIRM INFORMATION

Articles and speeches have addressed all aspects of retirement programs including retiree healthcare plans, and the challenges of public sector defined contribution plans. He co-authored "*A Better Bang for the Buck – The Economic Efficiencies of Defined Benefit Plans*" with the National Institute of Retirement Security in 2008.

### Professional Organizations and Education

He is a Fellow of the Society of Actuaries, Enrolled Actuary, Member of the American Academy of Actuaries, and Fellow of the Conference of Consulting Actuaries. He currently serves on the steering committee of the Conference of Consulting Actuaries Public Pensions Subcommittee, and is on the faculty of the Society of Actuaries Fellowship Admissions Course. Flick earned a Bachelor of Arts in Mathematics at Whitman College.

## SECTION 2 – FIRM INFORMATION

### Linda L. Bournival

Linda L. Bournival formed KMS Actuaries, LLC, after nearly 25 years of actuarial consulting experience with a wide-range of retirement plan and postemployment benefit assignments and issues. A significant portion of her experience includes consulting and actuarial services for pension plans and postemployment benefit programs for governmental entities, including states, cities, towns, school districts and authorities.

### Previous Work History

Prior to forming KMS Actuaries, Linda was a Director and Consulting Actuary at Buck Consultants and most recently Executive Vice President at Ricci Consultants. Linda has over 25 years of consulting and actuarial experience and includes services for pension plans and postemployment benefit programs for private and public sector entities. She has worked with clients regarding qualified and non-qualified defined benefit and defined contribution plans.

### Work Experience

She has provided a variety of services with respect to retirement plans, including the design and preparation of comprehensive employee benefit statements for the Vermont State Retirement Systems, the design and development of a complex automated benefit calculation system for the Massachusetts Bay Transportation Retirement Fund (MBTA), the administration and establishment of qualification procedures for domestic relations orders for Florida Progress Corporation and pension valuations of retirement benefits in divorce situations.

Since the implementation of Statement Numbers 43 and 45 issued by the Governmental Accounting Standards Board, Linda has been retained by a growing number of municipalities in New England, including the City of Manchester NH, the Manchester NH School District, Dukes County OPEB Trust, the University of Maine, the Towns of Belmont, Littleton and Weston, Massachusetts, Wachusett Regional School Districts and others.

Since 1988, she has provided pension valuation and consulting services to several public retirement systems in Massachusetts, including most recently Worcester Regional, Braintree, Hingham, Lowell and Reading. She also has provided actuarial consulting services to private sector clients, including Florida Progress Corporation, High Voltage Engineering Corporation, Massachusetts Hospital Association and MediaNews Group.

She recently presented on "Pension Reform and Plan Design: Around the Country" at Massachusetts Public Employees Retirement Administration Commission's Emerging Issues Forum.

## SECTION 2 – FIRM INFORMATION

### Professional Organizations and Education

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She is a Fellow of the Society of Actuaries, an Enrolled Actuary, a Member of the American Academy of Actuaries, and a Fellow of the Conference of Consulting Actuaries. Linda graduated magna cum laude from Providence College earning a Bachelor of Arts in Mathematics.



## SECTION 2 – FIRM INFORMATION

### R. Paul Schrader

Paul Schrader has 45 years of experience with retirement and other employee benefit programs with major employers in both the private and public sectors.

#### Previous Work History

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Paul spent most of his career with A. S. Hansen, Inc. in Denver as a consulting actuary with responsibility for the firm's activities in the Rocky Mountain region. He served as a Vice President, member of the Board of Directors and Executive Committee of Hansen, and later as a Managing Director of William M. Mercer, Inc. after their acquisition of Hansen. Paul retired from Buck Consultants as a consulting actuary with responsibility for Buck's activities in this region.

#### Work Experience

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Paul has assisted in the consolidation of several independent statewide public employee retirement systems into one unified system with common benefits and practices. He served as consulting actuary and principal consultant to a statewide public employee retirement system for over 35 years, and continues to serve as a strategic planning and policy consultant. He has designed a consolidated, total benefit plan for a multi-bank holding company after merger and consulted with a Fortune 500 employer on adoption of investment policy and funding actuarial assumptions and methods to match corporate objectives of minimizing future contributions to plan due to substantial over-funded status. Paul has conducted numerous asset/liability forecast studies to test long-term and most likely effects of alternative investment policies, actuarial assumptions and methods, and benefit changes. Additional work experience includes the development of a strategic plan including benefit and funding policies for a retirement system covering over 50,000 members. Paul has also led numerous retirement plan reviews for public sector retirement systems considering the conversion of a defined benefit plan to a defined contribution or hybrid plan.

#### Professional Organizations and Education

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Paul graduated from the University of Texas with a degree in Actuarial Science. He is an Associate of the Society of Actuaries, Member of the American Academy of Actuaries, Member of the Western Pension & Benefits Conference and an Enrolled Actuary.

Paul is a frequent speaker at professional and industry organizations, an author of several benefits articles, and has provided expert testimony in the development of public retirement policies.

## SECTION 2 – FIRM INFORMATION

**Function of Assigned Personnel**

Flick Forna will serve as the lead actuary and consultant and will be responsible for management of the overall relationship and project. For the review audits, the replication audits and the experience study reviews, Flick and Linda Bournival will review the actuarial valuation reports for conformity with the Commission's Standards for Actuarial Work and the Actuarial Standards of Practice (ASOPs). For the replication audits, Linda will perform all the data processing, calculations and modeling using the ProVal actuarial valuation system, widely used by many national firms. Flick and Linda will both provide services required for the Commission's requests throughout the term of the contract. Both Flick and Linda will have direct contact with the Commission and the Commission staff. Paul Schrader will assist Flick and Linda and provide the necessary consulting and peer review of the final audit reports.

**References**

Below, we provide references that you can contact to references you can contact and learn more about our strength in providing actuarial services.

**Ohio Retirement Study Council**

Contact: Bethany Rhodes, Director and General Counsel  
Address: 88 East Broad Street, Suite 1175  
Columbus, Ohio 43215

Phone: (614) 228-3574  
Email: Bethany.Rhodes@orsc.org

In 2011, PTA and KMS were hired to complete a pension reform study for the Ohio Retirement Study Council that involved review of Ohio's five public pension systems' reform proposals. Our review led to one of the most comprehensive and balanced pension reforms in the country. The comprehensive report can be found at [www.orsc.org/rfps/PTA\\_Final.pdf](http://www.orsc.org/rfps/PTA_Final.pdf).

**Municipal Employees' Retirement System of Michigan**

Contact: Kristin Bellar, Senior Deputy General Counsel  
Address: 1134 Municipal Way  
Lansing, Michigan 48917

Phone: (517) 703-9030  
Email: kbellar@mersofmich.com

In 2013, PTA and KMS were hired to complete a specific actuarial review study for MERS.

## SECTION 2 – FIRM INFORMATION

### Colorado Police and Fire

Contact: Dan Slack  
Address: 5290 DTC Parkway, Suite 100, Greenwood Village, Colorado 80111

Phone: (720) 479-2308  
Email: DSlack@FPPAco.org

Flick served FPPA as ongoing actuary from 1997 to 2006. He conducted actuarial valuations, experience studies and an asset liability study. In 2012 at PTA he conducted the strategic planning module at their annual board retreat.

### Alaska Retirement Management Board and Alaska Public Pension Coalition

Contact: Sam Trivette  
Address: Glacier Hwy, Juneau, AK

Phone: (907) 723-3220  
Email: samtriv@gci.net

Flick provided actuarial review and services to ARMB from 2005 to 2006 and 2008 to 2009. Since 2010, he has worked with the APPC to support legislation returning a defined benefit program to certain employees. Sam is an ARMB trustee and member of APPC.

### Worcester Regional Retirement System

Contact: Kevin Blanchette, Chairperson  
Address: 23 Midstate Drive  
Auburn, MA 01501

Phone: 508.832.6314  
Email: kpblanchette@worcesterregionalretirement.com

KMS performs actuarial valuations of the Retirement System pursuant to Chapter 32 of the Massachusetts General Laws. Other services we have provided include a cost-of-living study to value the cost of increasing the COLA base, presentation of the valuation results to the 95 member units and a pension forum presenting the cost of disability retirements. Linda has provided services to Worcester Regional since 2010, and previously while with Buck Consultants, from 1992 – 2000.



## SECTION 2 – FIRM INFORMATION

### Client Additions and Subtractions

PTA and KMS have together provided actuarial consulting services to the following:

#### *PTA/KMS Clients*

- Ohio Retirement Study Council
- Ingham County, Michigan
- Municipal Employees Retirement System of Michigan

PTA, founded in 2010, is the leading provider of specialized non-routine actuarial services pertaining to state and local government retirement systems. Following is a list of all PTA clients since inception in 2010.

#### *PTA Clients – Governments*

- Ohio Retirement Study Council
- City of Philadelphia
- City of Baltimore
- City of Colorado Springs
- San Antonio Water System
- New York City Office of the Comptroller
- City of Oakland, California
- State of New Hampshire
- City of Fort Worth
- City of Boulder, Colorado
- CollegeInvest [Colorado 529 College Savings Plan]
- Ingham County, Michigan

#### *PTA Clients – Retirement Systems*

- Puerto Rico General Employees Retirement System
- Puerto Rico Teachers Retirement System
- Municipal Employees Retirement System of Michigan
- Colorado Fire and Police Pension Association
- Fort Worth Employees Retirement System
- San Diego City Employees Retirement System

## SECTION 2 – FIRM INFORMATION

***PTA Clients – Labor Organizations***

- International Association of Firefighters' Locals of:
  - Arizona
  - Atlanta
  - Fairfield, CT
  - Maine
  - Memphis
  - New Jersey
  - Stamford, CT
  - Stratford, CT
- Alaska Public Pension Coalition
- Rhode Island Retirement Income Security Coalition
- Washington State Patrol Troopers Association
- AFT New Mexico
- Providence RI Retirees
- University of California Union Coalition

***PTA Clients – Other Parties***

- National Conference of Public Employee Retirement Systems
- Texas Association of Public Employee Retirement Systems
- Assured Guaranty Corporation
- Alvarez and Marsal [Advisor to Detroit COPs holders in Bankruptcy]

KMS, founded in 2011, already has a significant presence in the public sector, providing services to over sixty entities, including state and local retirement systems, cities, towns, counties, school districts and enterprise units. Following is a list of all KMS clients since inception in 2011.

***KMS Clients – Governments***

- |   |  |
|---|--|
| • Ashburnham, MA                        | • Manchester, NH                                 |
| • Assabet Valley Collaborative          | • Manchester, NH School District                 |
| • Ayer Shirley Regional School District | • Massachusetts Water Resources Authority (MWRA) |
| • Bedford, MA                           | • North Reading, MA                              |
| • Belknap County, NH                    | • North Attleboro Electric Department            |
| • Belmont, MA                           | • Plymouth, MA                                   |
| • Berlin, NH                            | • Raymond, NH School District                    |
| • Blackstone, MA                        | • Salem, NH                                      |
| • Boylston, MA                          | • Salem-Beverly Water Supply                     |
| • Canterbury, CT                        |  |
| • Clinton, MA                           |  |
| • Cohasset, MA                          |  |
| • Dukes County Pooled OPEB Trust        |  |

## SECTION 2 – FIRM INFORMATION

### *KMS Clients – Governments*

- Franklin, NH
- Gardner, MA
- Georgetown Municipal Light Department
- Greater Lawrence Technical School
- Hampshire Regional School District
- Hanover, NH
- Harvard, MA
- Hillsborough County, NH
- Hingham, MA
- Kingston, MA
- Lincoln-Sudbury Regional School District
- Littleton, MA
- Littleton Electric Light Department
- Lynnfield Center Water District
- Lynnfield Water District
- S.A.U. #6, Claremont, NH
- S.A.U. #21, Hampton, NH
- S.A.U. #41, Hollis, NH
- Shirley, MA
- Southbridge, MA
- Spencer-East Brookfield, MA Regional School District
- Sterling, MA
- Stratford Housing Authority, CT
- Sudbury, MA
- Sullivan County, NH
- Swampscott, MA
- Townsend, MA
- University of Maine System
- Wachusett Regional School District
- Weston, MA
- Winthrop, MA

### *KMS Clients - Retirement Systems*

- Braintree
- Franklin Regional
- Dukes County
- Hingham
- Lowell
- (Massachusetts) Public Employee Retirement Administration Commission
- Reading
- Worcester Regional

Neither PTA nor KMS has lost any clients since inception.



## SECTION 2 – FIRM INFORMATION

### Firm's Valuation System

KMS has a lease arrangement with Winklevoss Technologies (WinTech) for their software called ProVal, used for pension and OPEB valuations. ProVal can perform the following tasks:

- Built-in tools for database management
- Funding valuations under any assumption set
- GASB 25, 27, 43 and 45 accounting valuations, and recently updated for GASB 67 and 68
- Client-ready valuation report
- Deterministic and stochastic modeling of assets and liabilities for assessing future costs
- Detailed gain/loss analysis: This module produces a detailed gain/loss analysis by source
- Experience analysis: This produces experience results by decrement
- Multi-cycle valuations
- Data Base development and maintenance
- Data modeling
- Online help and WinTech actuarial support

The WinTech software, which is supported nationally and widely used by actuarial firms, provides us with extensive valuation flexibility including the support to value plan and assumption changes and the ease in conducting plan design studies. Proval is equipped to handle large valuations - we used Proval to perform a replication audit of the School Employees Retirement System of Ohio, which has 122,000 active members and almost 70,000 benefit recipients. Flick and Linda also use the Microsoft Office suite of software applications including Word, Access, PowerPoint, and Excel. Flick and Linda's involvement in every aspect of the audit allows for a more streamlined consulting approach and in the end, better service to our clients.

PTA and KMS recognize the need for stringent guidelines, practices and procedures to ensure the protection and security of our clients' information. To that end, we have established data security policies and have a disaster recovery plan in place.

### Data Storage and Security

We require that data containing personal information be submitted to us through Leapfile, a reliable, secure and compliant data transfer solution. Our data is retained on a password-protected drive and is archived nightly to a HIPAA compliant online storage facility.

## SECTION 2 – FIRM INFORMATION

### Data Security Policies

PTA and KMS maintain computer security systems that provide at a minimum:

1. Secure user authentication protocols including
  - Control of user IDs and other identifiers
  - A reasonably secure method of assigning and selecting passwords
  - Control of data security passwords
  - Restricting access to authorized users
2. Secure access control measures that
  - Restrict access to files containing confidential information to authorized users
  - Assign unique identifications plus passwords to each person with computer access that are reasonably designed to maintain the integrity of the security
3. Encryption of all transmitted files containing personal information that will travel across public networks
4. Reasonable monitoring of systems for unauthorized use or access
5. Encryption of all personal information stored on laptops and other portable devices
6. Reasonably up-to-date firewall protection
7. Reasonably up-to-date versions of system security agent software, including malware protection and reasonably up-to-date patches and virus definitions

### Firm's Potential Conflicts of Interest

Neither PTA nor KMS has been retained by a statewide or local Minnesota public pension plan, a Minnesota governmental employing unit, a Minnesota public employee labor union, or a comparable party interested in Minnesota public pension policy development.

### Audited Annual Financial Report

Neither PTA nor KMS are public companies. However, we could provide specific financial information if needed by the Commission.

## SECTION 3 – WORK PLAN

Based on our understanding of the requested services in the RFP, we will perform audits of the actuarial work performed for Minnesota pension plans by the various actuarial firms to assure the Commission that the methodologies are appropriate and the valuation results are accurate in accordance with all applicable statutes, policies and Actuarial Standards of Practice. Further, as a key component of our review, we will identify any procedures where improvements could be made in order to achieve greater value and understanding from the actuarial services performed.

### **Requested Actuarial Services and Methodology**

Specifically, we will perform the following services:

- Review Standards for Actuarial Work
- Replicate annual actuarial valuations as follows:
  - July 1, 2014: MSRS – General
  - July 1, 2015: PERA – General
  - July 1, 2016: Teachers Retirement Association
  - July 1, 2017: St. Paul Teachers Retirement Fund Association
  - July 1, 2018: Public Employees Police and Fire Retirement Plan
- Review 11 annual actuarial valuations\*
- Review quadrennial experience studies\*
- Review actuarial cost estimates of proposed legislation
- Review optional annuity form table and annuity reserve factors
- Review prior service credit purchase payment amount
- Present information and reports on assigned topics to the Commission
- Provide general and specific advice to the Commission and Commission staff
- Prepare special studies or research

Services marked with an asterisk are annual or quadrennial; all others are provided upon the request of the Commission or Commission staff.

There are essentially three phases to the review – (1) Matching the numbers from the actuarial valuation software in a replication audit, (2) Matching calculations performed on the software-generated numbers to calculate costs and liabilities in every audit, and (3) Opining on the appropriateness of the actuarial assumptions and methods.



## SECTION 3 – WORK PLAN

### Reviewing valuations

Our process consists of the following basic steps:

1. Review actuarial report and statutes to understand plan provisions
2. Build an excel workbook to replicate all calculations in actuarial valuation report
3. Based on the specific plan provisions, request test-cases from incumbent actuary
4. Program our actuarial software ProVal for plan provisions and assumptions
5. Run our programs to match incumbent actuarial valuation reports
6. Use test cases to resolve discrepancies
7. Document discrepancies which are due to an issue of concern

The key component of this phase of an actuarial replication audit is matching the numbers. By matching, we know precisely the techniques and methods used by the fund actuaries. And we use our software to confirm that the numbers were calculated accurately and not erroneously.

### Appropriateness of techniques

Once we confirm that the numbers were calculated accurately, the next step is to opine on whether the calculation techniques were appropriate. We use Generally Accepted Actuarial Practices and our own experience to opine on the appropriateness of the calculations. As mentioned above, we have extensive experience with techniques used by most of the major actuarial firms, and vast knowledge of actuarial standards of practice.

### Ensuring that no material items are overlooked

Generally Accepted Actuarial Practice for a full valuation replication is that materiality is 5%. This has been an established practice under ERISA, and is often used in public pension audits. We try to match liabilities and costs much closer than 5%. We even replicate the incumbent actuary's numbers using their techniques if inappropriate, just to confirm that we match. We then report on the inappropriate calculations and recalculate them using our appropriate techniques. We always find some problems, but fortunately, they are usually not material.

We ensure that no material items are overlooked through several practices:

1. We always look at the statute for plan provisions, not merely at the actuarial report's description of plan provisions
2. We run our model first without looking at the test cases, then use test cases only to resolve discrepancies
3. We compare the actuarial report with:
  - a. GFOA model report
  - b. Statutory reporting requirements
  - c. GASB requirements
  - d. Other actuarial reports of other statewide retirement systems

### Reasonable methods

Due to our extensive audit experience, we have tremendous exposure to various actuarial methods and have given a great deal of thought into the methods. Flick Forna was a key author in the recent Conference of Consulting Actuaries Draft of Actuarial Funding Policies. In the process of developing this, we spent dozens of hours with leading public sector actuaries from all of the major firms discussing various funding methods and policies. We discussed nuances of various methods and ramifications of the methods. We will use this draft funding policy as a benchmark of reasonable methods and opine on the Minnesota state methods. We will discuss both the statutorily required methods and the interpretations made by the fund actuaries.

### Quality Control

We ensure quality through several means:

1. Review - Every number and every conclusion will be reviewed by both Linda and Flick. In addition, we will utilize a third highly qualified experienced actuary for peer review of our final work products.
2. Credentials and Qualifications - Both Linda and Flick are Fellows of the Society of Actuaries and Enrolled Actuaries - the highest certifications for US pension actuaries. We are active in the public pension actuarial community and strive to keep our knowledge base honed.
3. Specialization - Actuarial audits and similar reviews are our specialty. We do not perform work for which we are less qualified than this highly specialized practice area. We have exposure to many other large statewide retirement systems and use our experience from other systems to help meet our clients' needs.
4. Clarity - Actuarial reports can be dense. We work hard to ensure that our reports are clear and well understood. We facilitate this by having multiple readers review our reports for readability and clarity. These reviewers include fully credentialed actuaries as well as less knowledgeable readers. Linda and Flick often gives speeches to non-actuarial audiences; this practice helps keep our reports and presentations clear.
5. Additional considerations for actuarial audits - Because a substantial portion of actuarial audits is the duplication of numbers, accuracy is often confirmed when we match the numbers. But we do not stop with merely matching; we analyze the appropriateness of the assumptions, methods and techniques.
6. References - We encourage you to contact our references to confirm that our work quality has been strong.

## SECTION 3 – WORK PLAN

### Reviewing Experience Studies

Our experience study review will consist of three phases:

1. Review the data which is used in the experience study. We will check counts of individuals impacted by decrement, as well as totals. This will be done by year in detail.
2. Review all calculations in the experience study: The study is chock full of calculations made from the raw data. We will duplicate such calculations.
3. Compare experience study results with actuarial valuation results: Each years' actuarial valuation produces an actuarial gain or loss. These should be consistent with the findings from the experience study. We will compare the experience study findings with the historical actuarial valuation findings to make sure that they are consistent.
4. Check for anomalies: Experience studies are complex, and sometimes the findings can be inconsistent if one is not careful. For example, a common mistake is to fail to properly reflect actual inflation when analyzing past salary growth rates. Another common mistake is to double count those who terminate without vested benefits with those who die prior to vesting. Our vast experience with actuarial audits help us identify potential problem areas.
5. Review decisions made in the experience study: The end result of an experience study is the recommendation of new actuarial assumptions. These are often somewhat subjective decisions. We will review the experience study reports and comment on whether we believe the conclusions drawn are appropriate.



## SECTION 3 – WORK PLAN

**Proposed Work Plan and Timeline**

Our proposed work plan and timeline for completion of the scope of services follow. Activities noted with an asterisk will be provided for the replication audits only. Responsible party is designated in *italics*.

Flick and Linda will provide services out of PTA's and KMS' home offices, which are located in metropolitan Denver and Boston, respectively. Flick will serve as the lead actuary and consultant to the Commission and is responsible for management of client relationships and projects. Linda performs all the data processing, calculations and modeling using the ProVal actuarial valuation system. Both Flick and Linda will correspond directly with the Commission staff as well as present results and reports to the Commission.

PTA/KMS will attend a meeting with *Commission staff* in St. Paul to discuss project specifics, deliverables, timeline, etc. This meeting will be a critical kickoff and will define the work to be completed, the staff support and fund actuary requirements, deliverables and timeline.

**A. *Review Commission's Standards for Actuarial Work***

1. Present recommended changes Timeframe: by January 30, 2015  
PTA/KMS will review and prepare appropriate updates and revisions in the Standards for Actuarial Work and present to the Commission for its consideration.

**B. *Review Annual Actuarial Valuations for 11 Plans and Replicate Annual Actuarial Valuation for 1 Plan***

Specifically, the major tasks associated with the audits and their related timeframes are as follows:

1. Collect data Timeframe: by September 15  
PTA/KMS will submit a data request to the *Commission staff*. *Commission staff* will provide the following:
  - Member data submitted by the plan to the fund actuary\*
  - Actuarial data prepared by the fund actuary\*
  - Individual actuarial valuation results from a sampling of member lives\*
  - Financial data\*
  - July 1, 2014 and July 1, 2013 actuarial valuation report
  - Current plan provisions as contained in various sections of the statutes
  - All communications and reports pertaining to actuarial calculations

## SECTION 3 – WORK PLAN

2. Review & verify data\* Timeframe: by September 30  
PTA/KMS will verify that the data used by the fund actuary is consistent with the data provided by the *Commission staff*. PTA/KMS will also review the data for conformity with the Commission's Standards for Actuarial Work and Actuarial Standard of Practice No. 23, Data Quality.
3. Review Plan Provisions Timeframe: by October 15  
PTA/KMS will review the provisions of each plan as written in the Minnesota statutes and as summarized in the Actuarial Reports.
4. Review Actuarial Assumptions and Methods Timeframe: by October 15  
The valuation results are only as good as the methods and assumptions upon which they are developed. Our review would test the appropriateness of these building blocks.

PTA/KMS will review the demographic and economic assumptions used by the fund actuaries in the July 1, 2014 actuarial valuations. Demographic assumptions to be analyzed include the rates of mortality, retirement and separation rates. Economic assumptions to be analyzed include the investment return rate, inflation rate, individual salary increases and payroll growth and medical inflation rate.

- Review past experience based on information contained in the most recent experience study, comparing that experience with peers and standard benchmarks.
- Review demographic assumptions for consistency with plan provisions. Just as with the economic assumptions, demographic assumptions have a significant impact on funding.
- Compare current assumptions with prevailing actuarial practice utilizing the Public Fund Survey.
- Prepare forward looking assumptions using empirical methods. These methods look at the asset allocation used of the particular client and anticipated real and nominal returns of each asset class. The methodology is consistent from client to client, but the outcomes may be quite different.
- If we find that the economic or demographic assumptions are inappropriate, we will recast the costs and such using better assumptions.\*
- Review for conformity with the Commission's Standards for Actuarial Work, Actuarial Standard of Practice No. 27, Selection of Economic Assumptions for Measuring Pension Obligations and Actuarial Standard of Practice No. 35, Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations.
- We will first understand the Commission's funding objectives and review any statutory requirements relative to the selection of the funding methods. We will review the funding methods and determine if the methods are technically sound and conform to the Standards for Actuarial Work and the Actuarial Standard of Practice. If we find that the funding methods are inappropriate, we will recast the costs and such using more appropriate methods\*. We will present in our report a detailed rationale for the recommendations. We will review for conformity with the



## SECTION 3 – WORK PLAN

Commission's Standards for Actuarial Work and Actuarial Standard of Practice No. 4, Measuring Pension Obligations.

5. Verify the calculation of the actuarial asset values                      Timeframe: by November 15  
*PTA/KMS* will review any statutory requirements relative to the selection of the asset method. We will review the asset methods and determine if the methods are technically sound and conform to the Actuarial Standard of Practice. If we find that the asset methods are inappropriate, we will recast the costs and such using more appropriate methods. We will present in our report a detailed rationale for the recommendations. We will review for conformity with the Commission's Standards for Actuarial Work and Actuarial Standard of Practice No. 44, Selection and Use of Asset Valuation Methods for Pension Valuations. Finally, we will verify the calculations of the actuarial asset values for each plan.
6. Code ProVal and Develop Plan Liabilities\*                                      Timeframe: by November 30  
*PTA/KMS* will perform all the data processing, calculations and modeling using an actuarial valuation system used by many national firms. KMS has a lease arrangement with Winklevoss Technologies (WinTech) for their software called ProVal, used for pension and OPEB valuations.
7. Verify the accuracy of the benefits valued\*                                      Timeframe: by December 15  
*PTA/KMS* will verify that all appropriate benefits provided under the replicated audit plans have been valued accurately. We will further test the validity of the liabilities by reviewing a number of sample test lives. We request that complete sample test life output be provided by the fund actuaries.
8. Reconcile Discrepancies\*    Timeframe: by December 31  
*PTA/KMS* will work with the fund actuaries to reconcile any discrepancies that resulted from our in depth analysis of the valuation calculations.
9. Review Actuarial Reports    Timeframe: by January 15  
*PTA/KMS* will review the July 1, 2014 valuation reports prepared by the fund actuaries for conformity with the Commission's Standards for Actuarial Work and Actuarial Standard of Practice No. 41, Actuarial Communications and present any recommendations for improvement to the report.
10. Verify the contribution rates    Timeframe: by January 15  
*PTA/KMS* will review the methodology to calculate the unfunded actuarial accrued liability and the amortization period used under the various cost methods used for reasonableness. We will make recommendations, if necessary, for changes to the methodology. We will review for conformity with the Commission's Standards for Actuarial Work and Actuarial Standard of Practice No. 4, Measuring Pension Obligations.



## SECTION 3 – WORK PLAN

11. Prepare draft audit reports Timeframe: by January 31  
*PTA/KMS* will prepare two written reports (one for the replication audit, one for the review audits) in a format similar to that included in Appendix A. We will submit our reports to the *Commission staff* for their review and input.
1. During the course of the reviews, *PTA/KMS* will provide progress reports to the *Commission staff* as needed.
  2. We will develop written reports containing details of the process of the audit, cost analyses, findings, detailed recommendations and conclusions where appropriate.
  3. Our reports will be in language clearly understood by lay readers.
  4. Our reports will contain a glossary of terms essential to an understanding of retirement system funding and actuarial valuations.
12. Prepare final audit reports Timeframe: by March 1  
*PTA/KMS* will incorporate recommended changes and prepare the final reports.
13. Present reports to the Commission Timeframe: by April 1  
*PTA/KMS* will present the final reports to the Commission to discuss our findings and recommendations contained in our reports. The contents of our presentation will be in a format similar to that included in Appendix B.

**C. *Review Quadrennial Experience Studies***

1. Review Demographic Experience Study Timeframe: See below  
*PTA/KMS* will review the data used in the experience study for reasonableness and consistency as well as the mathematical calculations for completeness and accuracy. Further, we will review the assumptions produced as a result of the experience study and verify that they are reasonable. Finally, we will review the June 30, 2014 experience study reports prepared by the fund actuaries for conformity with the Commission's Standards for Actuarial Work and Actuarial Standard of Practice No. 41, Actuarial Communications and present any recommendations for improvement to the report.
2. Prepare draft experience study audit reports Timeframe: See below  
*PTA/KMS* will prepare written reports for each experience study audit in a format similar to that included in Appendix A. We will submit our reports to the *Commission staff* for their review and input.

The review of the experience study reports will be completed within 60 days following the date on which the last of the three experience studies is filed with the Commission.

## SECTION 4 – COMPENSATION

Fees are determined based on our estimate of the time required to perform the actuarial audit and other services. Our fees for the five contract years for the fixed fee services are as follows:

<b>Description of Fixed Fee Services</b>	<b>Proposed Fees</b>				
	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>
Review of the annual actuarial valuation reports for 11 plans annually	\$56,300	\$58,000	\$59,700	\$61,500	\$63,300
Replication of the annual actuarial valuation report for 1 plan annually	54,300	55,900	57,600	59,300	61,100
Review of the quadrennial experience studies for MSRS-General, PERA-General and TRA		20,800			
<b>Total Fixed Fee Services</b>	<b>\$110,600</b>	<b>\$134,700</b>	<b>\$117,300</b>	<b>\$120,800</b>	<b>\$124,400</b>

- Rates for additional services beyond the scope presented above are as follows:
  - William Fornia - \$465 per hour
  - Linda Bournival - \$375 per hour
  
- Rates currently charged to other PTA and KMS clients fall within the ranges specified, and generally vary depending on the type of consulting assignment:
  - William Fornia - \$395 - \$650
  - Linda Bournival - \$350 - \$395
  
- Out-of-pocket expenses, including travel and lodging, will be charged at cost.
  
- Computer expenses are included in the fixed fee and hourly fees outlined above.

## SECTION 4 – COMPENSATION

- Development costs, including
  - Necessary changes to our current computer systems;
  - Necessary changes for data entry;
  - Gaining familiarization with the Minnesota pension plans and systems; and
  - Obtaining other data and information necessary to perform actuarial services task

are included in the fixed fees outlined above.

- We propose that invoices, which will include the hourly rate and number of hours worked on the audit by specific personnel, will be submitted on a monthly basis. We request invoices be paid upon receipt. A late charge of 1% will accrue on unpaid invoices after 45 days.



SECTION 5 – AFFIRMATIVE ACTION COMPLIANCE

In accordance with the provisions of Minnesota Statutes, Section 363A.36, no bid for a contract in excess of \$100,000 may be accepted from an employer having more than 20 full-time employees at any time during the previous 12 months unless the employer has an affirmative action plan approved by the Minnesota Commissioner of Human Rights. The Commission will not accept a proposal unless it includes one of the following:

- 1) A copy of the actuarial firm's current certificate of compliance issued by the Minnesota Commissioner of Human Rights; or
- 2) A notarized statement certifying that the actuarial firm has a current certificate of compliance issued by the Minnesota Commissioner of Human Rights; or
- 3) A notarized statement certifying that the actuarial firm has not had more than 20 full-time employees located in the State of Minnesota at any time during the 12 months prior to submission of the proposal.

I, Linda Bournival, certify that neither Pension Trustee Advisors nor KMS Actuaries, LLC have more than 20 full-time employees located in the State of Minnesota at any time during the 12 months prior to submission of the proposal.

SUBSCRIBED AND SWORN to before me this 12<sup>th</sup> day of June, 2014 by Linda Bournival.



My commission expires \_\_\_\_\_

Notary Public Regina Hull

## SECTION 6 – FIRMS’ CAPABILITIES

We have demonstrated throughout this proposal that PTA/KMS have the knowledge, expertise and experience to produce actuarial valuations and experience study reports as specified in Minnesota Statutes, Section 356.215 and the current Commission Standards for Actuarial Work.

We encourage you to review our public plan experience details that we list in Section 2 and to contact our references also provided in Section 2 to learn more about our strength in providing actuarial services.

APPENDIX A

**SAMPLE  
ACTUARIAL AUDIT  
REPORT**



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**FINAL  
REPORT  
TO ORSC**



**ACTUARIAL AUDIT  
FOR THE  
SCHOOL EMPLOYEES  
RETIREMENT SYSTEM OF OHIO**

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**William B. Fornia, FSA  
Linda L. Bournival, FSA**

February 2014



**PENSION  
TRUSTEE  
ADVISORS**



**ACTUARIES**

February 21, 2014

Ohio Retirement Study Council

**Re:** SERS Actuarial Audit

Dear Councilmembers:

We have completed our actuarial audit of the School Employees Retirement System pursuant to R.C. §171.04(E). As shown in the attached findings, we have matched actuarial calculations quite closely, and have several related comments. None of the comments reflects a critical concern. Our audit finds that actuarial calculations were reasonable, consistent and accurate.

The undersigned are members of the American Academy of Actuaries and meet the Qualification Standards to provide this statement of actuarial opinion.

We look forward to presenting these findings to you in April.

Sincerely,



William B. Forna, FSA  
President  
Pension Trustee Advisors



Linda L. Bournival, FSA  
Consulting Actuary  
KMS Actuaries, LLC

cc: School Employees Retirement System

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## Section 1 – General Findings

The Ohio Statutes require that the Ohio Retirement Study Council (ORSC) contract for an independent audit of the state retirement systems' actuaries not less than once every ten years. ORSC elaborated that the firm conducting the audit is to express an opinion regarding:

- An overall opinion as to the validity, completeness, and appropriateness of the demographic and financial information used by the consulting actuary to meet SERS' financial objectives,
- An overall opinion as to the reasonableness of the consulting actuary's conclusions and the conformance of the consulting actuary's work with generally accepted actuarial standards and practices, and
- A detailed description of each audit exception and the estimated effects of each exception on SERS, and
- Detailed recommendations for improvement.

Our opinion is that these standards were met, as will be discussed in the following pages.

We have duplicated the actuarial valuations and actuarial experience studies conducted by Cavanaugh Macdonald Consulting (CMC) and the results match quite closely. The primary purpose of an actuarial audit is to confirm that there are no significant errors in the actuarial calculations. Based on our replication, we report that we have found no significant discrepancies and conclude that there are no significant errors.

We make the following recommendations:

- Address health care assumptions more rigorously in the next actuarial experience study
- Correct minor calculations as discussed in the following pages
- Reconsider certain actuarial assumptions in the next experience study, including:
  - Pre-retirement mortality
  - Merit pay increases for those with more than ten years of service
  - Early retirement for those retiring after August 1, 2017
  - Dependent children for those at normal parenting ages

The following table summarizes the actuarial liabilities and normal costs produced by CMC and PTA/KMS actuarial valuations.

Annual Basic Benefits and Retiree Health Care Valuations as of June 30, 2013						
	Actuarial Liability			Normal Cost		
	CMC	PTA/KMS	% Diff.	CMC	PTA/KMS	% Diff.
<b>Retirement</b>						
Basic Benefits	16,826,360	16,864,671	0.23%	304,074	305,327	0.41%
Medicare Part B	386,773	392,159	1.39%	5,768	6,334	9.81%
Death after Retirement	34,029	34,070	0.12%	549	540	-1.77%
Total	17,247,161	17,290,900	0.25%	310,392	312,201	0.58%
<b>Health Care</b>						
Actives	1,761,722	1,760,677	-0.06%	89,482	89,178	-0.34%
Inactives	1,156,578	1,156,295	-0.02%			
Total	2,918,299	2,916,972	-0.05%	89,482	89,178	-0.34%
Grand Total	20,165,461	20,207,872	0.21%	399,873	401,379	0.38%
*All numbers in thousands						

As mentioned above, the grand total actuarial liability calculated by PTA/KMS was within 0.21% of the same calculated by CMC. The grand total normal cost calculated by PTA/KMS was within 0.38% of that calculated by CMC.

## Section 2 – Audit of Actuarial Method, Factors and Assumptions Used in Actuarial Valuations

The first step in the actuarial audit process is to review the actuarial method, actuarial factors and actuarial assumptions used in the actuarial valuations.

### ACTUARIAL METHOD

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CMC uses several actuarial methods in determining costs and liabilities for the School Employees Retirement System of Ohio.

- The actuarial funding method is the Entry Age actuarial cost method
- The actuarial asset valuation method is a four year smoothed market value
- The amortization method is a level payroll, closed period method
- The method of developing the health care claims cost assumptions is not clearly described in the reports.

#### Actuarial Funding Method

The Entry Age Normal actuarial cost method is used for actuarial valuations. This method is designed to maintain constant plan costs throughout each employee's career as a portion of pay. We believe this is a reasonable and appropriate method. It is the most common method used by large public pension systems such as the SERS. CMC is applying the method reasonably, consistently and accurately.

#### Actuarial Asset Valuation Method

CMC employs a four year smoothed market value actuarial asset valuation method. Unlike actuarial funding methods, actuarial asset valuation methods are not precisely defined. Most actuaries use what could be categorized as a "five [or four] year smoothed market value actuarial asset valuation method" as does CMC, but might use quite different methods. We have reviewed the precise provisions of the method that CMC employs and find it to be reasonable, consistently applied, and accurate.

The CMC method is a very conventional and appropriate application of a four year smoothed method. They spread any investment gains or losses (relative to the actuarial assumption) over four years and apply a 20% maximum disparity from true market value. Health care assets are not smoothed, and subtracted from the total smoothed assets to determine the pension actuarial value of assets. This is a reasonable and appropriate method.

#### Amortization Method for Determining Funding Amounts

In addition to the Entry Age Normal actuarial cost method, CMC and SERS use a conventional method for amortizing components of unfunded liability. The method was a



closed period, decreased from thirty years as of 6/30/2012 to 29 years as of 6/30/2013. As this period gets shorter in future decades, CMC and SERS may wish to consider a layered method, meaning that each year's unplanned increase or decrease in the actuarial unfunded liability is amortized over a new period. This would still be considered a closed period.

Many if not most statewide pension systems continue to use an open period. The closed period approach tends to be more conservative than the open period approach. As discussed in our 2011 Pension Reform Solutions report, we believe that the closed period is appropriate.

The other amortization feature being used is to amortize the costs as an increasing percentage of payroll. We believe this is an appropriate approach for funding, despite the changes in the GASB rules which will not permit this method for GASB determinations.

In conclusion, we find the amortization method reasonable, consistent and accurate.

### **Amortization Method for GASB Determinations**

The Government Accounting Standards Board (GASB) has very specific requirements for its amortization method. These requirements will be changing with the next actuarial valuation. CMC and SERS are using the same amortization method for GASB determinations as for calculating the pension funding requirement. This will change with next year's actuarial valuation. We find this current practice reasonable and appropriate.

### **Amortization Factors**

CMC developed the 29 year amortization factor for allocating the cost of funding the unfunded liability. We confirmed that these calculations are correct. This is calculated based on the investment return assumption of 7.75% and payroll growth rate of 4.00%.

### **Cost Factors**

CMC uses the Entry Age Normal actuarial cost method to determine actuarial cost factors which assign the liability to appropriate years. These "cost factors" are a natural byproduct of the actuarial valuation process and we confirm that they are being calculated correctly.

## **ACTUARIAL ASSUMPTIONS**

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We have reviewed the actuarial assumptions used by the actuary and find them to be reasonable, consistent, and accurate.

The actuary uses a large number of actuarial assumptions, including:

- Demographic Assumptions
  - Mortality During Active Service
  - Mortality After Retirement
  - Mortality After Disability Retirement
  - Withdrawal From Service Before Retirement
  - Retirement
  - Disability Retirement
  - Withdrawal of Contributions at Termination
  - Other Demographic Assumptions
- Economic Assumptions
  - Investment Return Rate
  - Inflation
  - Individual Salary Increases
  - Payroll Growth
- Post-employment Healthcare Assumptions
  - Base Claim Rate Derivation
  - Health Care Cost Trend Rate
  - Morbidity
  - Retiree – Paid Premiums
  - Health Plan Participation Rates and Elections
  - Spouse Coverage Rates
  - Medicare Coverage Rates

Brief comments on each assumption are included below and will be discussed in more detail in Section 4 of this report which focuses on the experience study.

## **DEMOGRAPHIC ASSUMPTIONS**

---

### **Rates of Post-Retirement Mortality**

CMC uses a static post-retirement mortality table which incorporated a margin of 12% to 15% to anticipate future increases in longevity. We find this approach reasonable. Although the table in use is the 1994 Group Annuity Mortality table (with one year adjustment) – a table that is twenty years old – the experience shows that this table as adjusted is appropriate.

Actuaries are getting more sophisticated in their techniques for anticipating future mortality improvements. CMC is using the traditional method of building in a margin in their static mortality table. This would tend to require that the table be changed every few years to continue to anticipate improved mortality. This approach is very reasonable. The more sophisticated method would be to use a “generational” mortality



table which assigns different mortality probabilities based not only on age but on generation. For example, an 80 year old retiree in 2014 (born 1934) would have higher mortality rates than a future 80 year old retiree born in 1984. At some point, CMC may wish to change methodologies, but because this adds complexities, many actuaries continue to use the “static” mortality table method that CMC now uses.

We also compared the CMC table with a commonly used current table known as “RP-2000” using a projection for improvement to 2013. We found that CMC’s assumptions are more conservative than this 2013 table for females for all ages from 55 up through age 95 and for males age 72 to 104. This is a useful comparison that shows that the table being used by CMC is probably still on track in 2013 and still with some margin for future improvement. We expect that CMC will continue to monitor SERS actual mortality experience carefully in each experience study and gradually modify the tables as the margin for mortality improvement erodes.

### **Rates of Disabled Post-Retirement Mortality**

CMC’s mortality assumption for those disables appears reasonable, although this data is fairly sparse, with only 1,222 deaths in the five year period.

### **Rates of Pre-Retirement Mortality**

CMC’s experience study found an extraordinary low number of pre-retirement deaths. Only 458 were observed, with 733 expected under the prior mortality table. Consequently, they recommended changing the mortality table to one which would produce 419 expected deaths.

The problem we see with this approach is that this would be based on a mortality table which is only 25% of the standard 1994 GAM table. This means that the standard table would predict 1,674 deaths, but only 458 were observed in the experience study. We find this almost impossible to believe that SERS members have four times better pre-retirement mortality than what would be predicted by a standard mortality table. This is even more astonishing because they actually have slightly worse mortality experience once they retire.

We suspect that rather than nearly immortal active SERS members, what is happening is that there is some kind of reporting discrepancy in counting the number of SERS members who die in active service. Perhaps some deaths are simply being reported as individuals quitting.

Although we recommend that CMC reconsider this assumption in the next experience study, and this is an interesting phenomenon, it is important to note that any error is trivial. Many more active members quit than die, so if there is an error in reporting or



setting actuarial assumptions in the pre-retirement mortality, it is likely more than compensated for in the withdrawal assumptions.

### **Withdrawal from Service before Retirement**

We concur that the withdrawal tables used by CMC are reasonable, consistent and accurate. CMC uses a table based on service rather than one based on age. We find that this is a sound methodology because individuals do have higher likelihood of termination during their first few years of employment than later in their career.

### **Retirement**

We concur that the retirement tables used by CMC are reasonable, consistent and accurate. CMC uses different retirement tables based on whether they are eligible for an unreduced retirement benefit. This is a sound method because individuals often are reluctant to retire if the benefit is subject to a reduction for early retirement.

One minor concern is that CMC does not assume that any individuals will retire under an early (reduced) retirement after August 1, 2017 under the new eligibility requirements. While this is not a critical assumption for pensions because the value of such early retirement subsidy is small, the value of early retirements under health care can be significant. Therefore, we would recommend that some future retirees are assumed to retire early. Of course, there is no experience to measure this assumption, as 2017 has not yet arrived. But we would anticipate that indeed some individuals will choose to retire early. Because current actuarial valuations measure liabilities for individuals who will retire later, it is important to predict future retirement incidence as accurately as practical.

### **Disability Retirement**

We concur that the disability tables used by CMC are reasonable, consistent and accurate.

### **Withdrawal of Contributions at Termination**

CMC does not have an explicit assumption for the likelihood of individuals withdrawing contributions at retirement. They use a more robust method of comparing the discounted value of the available annuity with the value of contributions on an individual-by-individual and year-by-year method. This is a sophisticated actuarial valuation method which we support. We did discover that discount rates had not been changed in this calculation, but find the discrepancy virtually immaterial. CMC would probably wish to correct this oversight.

### **Other Demographic Assumptions**

We reviewed the other demographic assumptions which could be analyzed by CMC. We find their study reasonable, consistent and accurate. These assumptions include:

*Marriage Rates* – CMC assumes 80% of future retirees would be married. Current retirees use actual marriage data at the time of valuation. We support this approach.

*Spouse Coverage Rates* – CMC assumes 50% of future male retirees would have a covered spouse and 40% of future female retirees would have a covered spouse. Current retirees use actual spouse coverage data at the time of valuation. We support this approach.

*Age Difference between Husbands and Wives* – CMC assumes husbands are 3 years older than wives. We find CMC's analysis reasonable.

*Number of Dependent Children* – CMC did not disclose an assumption of dependent children in the actuarial valuation report or the experience study. Based on our analysis of test cases, we learned that CMC assumes that no members have dependent children (for pension and health care purposes). Because the pre-retirement survivor benefit is greater when there are dependent children, we recommend that this assumption be analyzed in the experience study, and that some assumption be made. For example, CMC could assume that members have two dependent children from when they are ages 25 to 47, then one from 47 to 50, then none once they become age 50. Keep in mind, however, that very few members die prior to retirement and collect these benefits. So although we believe some consideration should be made for dependent children, the financial implication is small. Further, no assumption for dependent children is made in the health care valuation, but there are 494 dependent children of retired members receiving health benefits as of the most recent valuation. Many of these dependent children receive health benefits until age 26, but there are a number of them, presumably disabled, who receive health benefits for life. We recommend that a small liability load or explicit assumption be considered for the value of these benefits.

## **ECONOMIC ASSUMPTIONS**

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### **Investment Return Rate**

CMC uses a 7.75% investment return rate. This assumption is consistent with that used by most systems. According to the Public Funds Survey as of January 30, 2013, the median assumption for 126 large primarily state systems is 7.90%. In particular:

- 42 of the 126 (33%) use assumptions lower than 7.75%,
- 17 (13%) use a 7.75% assumption, and
- 77 (61%) use an assumption greater than 7.75%, the most common being 8.00%, which is used by 49 (39% of the total).



A 7.75% rate is also used by one other statewide system in Ohio. The other systems' expected rates are:

- Ohio Public Employees Retirement System – 8.00%
- State Teachers Retirement System of Ohio – 7.75%
- Ohio Police and Fire Retirement System – 8.25%
- Ohio Highway Patrol Retirement System – 8.00%

Of course, a simple comparison of what other systems are using is helpful, but not a sufficient criteria for establishing an assumed rate of investment return.

CMC used a very robust forward-looking “building block” method, where they developed an inflation assumption, a real return assumption and an assumption for expenses. Each of these components were calculated independently, then summed (subtracted for expenses) to develop the net investment return assumption. CMC went further and used the standard deviation of returns developed by SERS investment consultants to estimate the 25<sup>th</sup>, 50<sup>th</sup> and 75<sup>th</sup> percentile real return distribution.

Their 7.75% net return assumption is comprised of 3.25% inflation plus 5.25% real return minus 0.75% administrative expenses. Inflation is discussed in the section below, so we will focus on the real return component and the administrative expense component.

To calculate the assumed real rate of return, CMC used the SERS asset allocation along with the capital market assumptions developed by SERS' investment consultant (Summit Strategies Group). This can be illustrated by the following table:

**CMC Development of Expected Real Return**

Asset Class	Asset Allocation (Weight)	Expected Real Return
Cash	1.0%	0.0%
US Stocks	22.5%	5.0%
Non-US Stocks	22.5%	5.5%
Fixed Income	19.0%	1.5%
Private Equity	10.0%	10.0%
Real Assets	10.0%	5.0%
Hedge Funds / Multi-Asset Strategies	15.0%	7.5%
Total (Weighted Average)	100.0%	5.27%

We have three concerns with this calculation. The first is very minor. SERS reports that it has a 45% allocation to global equities. The analysis above assumed that the global equities were split half US and half non-US. Although we had not reviewed SERS actual



investment allocations, we would have expected that more would be invested in the US than outside of the US. SERS has advised us that they indeed have a 50/50 split of global equity investments between US and non-US. Although this is not material, we recommend that the next experience study explicitly confirm the global equity allocation between US and non-US.

Our second concern is that Summit in June 2010 reported an expected nominal return for private equity of 11.0%, which when combined with an expected inflation rate of 2.5% yields an expected real return for private equity of 8.5%. But instead of 8.5%, 10.0% was used in the experience study development. This was based on a later email from Summit to CMC. This may have been an oversight by Summit. This concern has a somewhat larger effect, reducing the 5.27% calculated weighted average to 5.12%. At this point it is important to point out that these return assumptions are just that – assumptions. Will private equity generate average 8.5% annual real returns or 10.0% average annual real returns? No one knows, of course. Other investment consultants may have more optimistic outlooks for private equity. So while the math suggests 5.12% instead of 5.27%, one should not put undue weight on these calculations.

Our third concern is that SERS appears to have modified its asset allocation between 2010 and 2014. The real estate allocation has been increased from 10% to 15% while the hedge fund (multi-asset strategies) allocation has dropped from 15% to 10%. In addition to this, according to its December 31, 2013 “Economic & Capital Market Review”, Summit has decreased its capital market assumptions substantially. For example, it’s expectation for US large capitalization stocks has dropped from 7.5% in 2010 to 5.5% in 2013. This is only partially explained by its drop in anticipated inflation from 2.50% to 2.25%. This drop might suggest that the next experience study might recommend much lower assumptions. These three factors might be represented by the following table (changed numbers are **bolded** and *italicized*):

**Possible Development of Expected Real Return – Next Experience Study**

Asset Class	Asset Allocation (Weight)	Expected Real Return
Cash	1.0%	<b>0.75%</b>
US Stocks	<b>25.0%</b>	<b>3.25%</b>
Non-US Stocks	<b>20.0%</b>	<b>4.75%</b>
Fixed Income	19.0%	<b>1.25%</b>
Private Equity	10.0%	<b>7.00%</b>
Real Assets	<b>15.0%</b>	5.00%
Hedge Funds / Multi-Asset Strategies	<b>10.0%</b>	<b>3.75%</b>
Total (Weighted Average)	100.0%	<b>3.83%</b>

This suggests that the next experience study might suggest a more than 1% drop in investment return, all other things being equal. Many other factors may change this conclusion, such as changes in underlying capital market assumptions or asset allocations. We would encourage CMC in its next experience study to look at capital market assumptions of other advisors in addition to Summit.

According to the Public Funds Survey as of January 30, 2013, the median real rate of return assumption for 126 large primarily state systems is 4.50%. Although not specifically asked, this is presumably after reduction for administrative expenses in most responses. In particular:

- 30 of the 126 (24%) use assumptions lower than 4.50%,
- 35 (28%) use a 4.50% assumption, the most common assumption,
- 61 (48%) use an assumption greater than 4.50%, and
- a 5.00% real rate of return is assumed by all four other Ohio statewide systems.

CMC assumed that SERS administrative expenses would be 0.75%, based on the following history of expenses:

**History of Administrative and Investment Expenses**

Fiscal Year Ending June 30:	Total Expenses (\$000)	Expense Ratio (to assets)
2006	68,071	0.66%
2007	76,754	0.63%
2008	95,995	0.86%
2009	86,203	1.01%
2010	95,458	1.02%
Average	84,496	0.84%

We recommend continuing to monitor the expenses and expense ratios. The trend had been that expenses were increasing. With the recent run-up in the market, hopefully the expense ratio has returned to the 0.75% range that CMC assumes. We understand that changes in asset allocation have also recently reduced these administrative and investment expenses since 2010. CMC may wish to incorporate expenses in its table of experience gains and losses by risk area.

In addition to the building block assumption development, CMC analyzed recent SERS historical returns and long term national equity and fixed income returns. We believe a three pronged approach (forward looking, historical, and peer comparison) is appropriate, and that despite our minor concerns, the CMC 7.75% return assumption is reasonable.

CMC uses a 5.25% investment return assumption for the healthcare plan. In order to develop this return assumption, CMC reported in the experience study that it was



based on the short term return of employer assets. We recommend that CMC develop this assumption more rigorously in the next experience study report. Notwithstanding our recommendation for more robust development, we find the assumption to be reasonable, consistent and accurate.

## **Inflation**

We reviewed the confirmation of the 3.25% inflation developed by CMC. We find that the methodology used by CMC is reasonable, consistent and accurate. CMC's use of forward looking data such as the yields on inflation-indexed treasury bonds is particularly robust. The data supported the reduction from 3.50% to 3.25%, and may support an even further reduction in the next experience study.

According to the Public Funds Survey as of January 30, 2013, the median assumption for 126 large primarily state systems is 3.00%. In particular:

- 76 of the 126 (60%) use assumptions lower than 3.25%, the most common being 3.00%, which is used by 52 (41% of the total).
- 11 (9%) use a 3.25% assumption, and
- 39 (31%) use an assumption greater than 3.25%.

A 3.25% rate is also used by one other statewide system in Ohio. The other systems' expected rates are:

- Ohio Public Employees Retirement System – 3.00%
- State Teachers Retirement System of Ohio – 2.75%
- Ohio Police and Fire Retirement System – 3.25%
- Ohio Highway Patrol Retirement System – 3.00%

## **Payroll Growth**

CMC proposes a real payroll growth rate of 0.75%, based substantially on the Social Security Administration's data over the last fifty years. When added to 3.25% inflation, this results in a total payroll growth assumption of 4.00%. We find this to be reasonable, consistent and accurate.

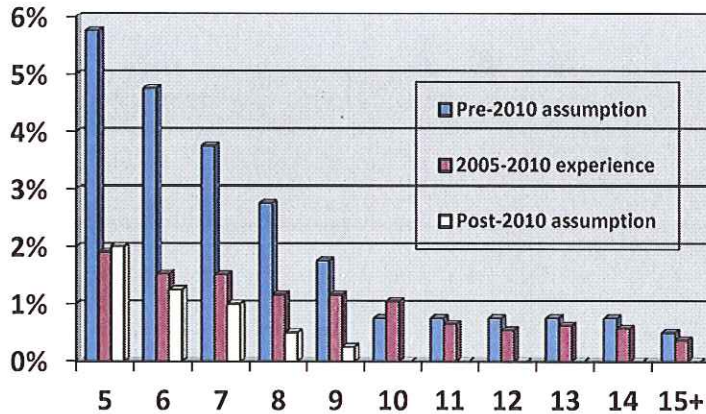
## **Individual Salary Increases**

CMC analyzed individual salary increase rates, and appropriately considered the impact of inflation on the increases. It is a common mistake to improperly attribute low salary increases between inflation and other components. CMC handled this correctly. For example, as CMC mentioned in their experience study, inflation during the experience study period was only 2.3%, while the assumed rate of inflation was 3.5%.



We do have some concerns with CMC’s development of merit increase assumptions for individuals with more than ten years of service. This can be illustrated by the following chart.

**Merit Increase Assumptions by Years of Service**



This shows that merit increase experience was lower than expected across most of the spectrum. While CMC’s new reduced assumption for up to five years of service seems appropriate, we question whether it is appropriate to assume no merit increase for anyone with ten or more years of service.

Three considerations mitigate our concern, however. First, there have been actuarial gains due to salary in at least the last ten actuarial valuations. This means that while our observation may be appropriate based on the data as of 2010, their assumptions appear to have predicted recent experience more accurately. Second, as mentioned previously, the inflation assumption might be higher than need be. Since salary growth is the sum of payroll growth and merit, and since payroll growth is the sum of inflation plus real wage growth, if merit is slightly understated but inflation is slightly overstated, the total may be right. Third is an even more arcane point. When CMC developed their 2005-2010 experience (red bars above), they subtracted out the prior real payroll growth assumption of 0.50% from the total real salary growth. One could make a case that they could have subtracted out the new real payroll growth assumption of 0.75% instead. This would make each of the red bars lower by 0.25%, which significantly diminishes the disparity between what we might have recommended and what CMC actually did recommend.

The bottom line is that we recommend that CMC study this very carefully in their next experience study. The allocation of salary growth between merit and payroll growth is actually an important distinction in the cost development. This is because higher total

salary growth increases actuarially calculated costs, but higher payroll growth can decrease the current period amortization costs.

## **POST-EMPLOYMENT HEALTHCARE ASSUMPTIONS**

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### **Base Claim Rate Derivation**

It is common practice for actuaries to project future claim costs by measuring past experience and adjusting it to reflect the effects of inflation and plan design. It is not well documented in the actuarial report how CMC set the expected claims costs.

Because retiree health care actuarial valuations are a more recent development than pension actuarial valuations, common actuarial practice is less robust in terms of disclosure of methods and assumptions. The CMC disclosure of health assumptions is consistent with general practice, but not as strong as their disclosure of pension assumptions or ideal practice.

Based on discussions with CMC and review of certain calculations, we find that the health care claim cost assumption is reasonable. However we recommend that this be more rigorously documented either in an actuarial experience study for healthcare or through expanded disclosure in the actuarial reports or both.

In order to develop the core health care claims cost assumption, CMC took the following steps.

- Identify the medical cost, or vendor rates, for each plan type and tier (Medicare Mutual PPO, Kaiser HMO, etc.)
- Develop a factor to adjust medical trend by one-half year
- Calculate Aging Factors based on the average of the aging factors of the entire age distribution of the applicable groups
- Utilize assumed participation factors for each plan type
- Calculate weighted average based on all of these factors to arrive at assumed age 65 core health care claims cost

We have reviewed these factors and find them reasonable, appropriately calculated and accurate.

During our initial review, we had a concern with the under-65 spouses of currently retired members. When CMC developed the base claim cost for this group, they averaged expected claims (based on the vendor rates) for this group. But approximately 30% of these under-65 spouses were indicated as subscribed in lower-cost Medicare plans. This was unexpected that a significant number of pre-65 spouses would be on Medicare, so we recommended that SERS review the data for this group. SERS finance staff and healthcare



staff verified that all of the spouses under age 65 were indeed subscribed in the lower-cost Medicare plans as indicated in the data.

### Health Care Cost Trend Rate

To properly measure future liabilities, actuaries apply trend rates (health inflation) to the base claim costs described above. Standard practice is to use prevailing national trend rates and grade down to an ultimate trend rate that is slightly higher than prevailing CPI rates. It is reasonable to alter these national rates by applying population-based credibility factors to the Plan's experience and using a blended set of trend rates. CMC did not disclose the process which they used to develop their health care cost trend rates in either the experience study or the actuarial valuation reports. When asked, they replied:

*"The Actuarial Standards Board has issued Actuarial Standard of Practice (ASOP) No. 6, "Measuring Retiree Group Benefit Obligations", which provides guidance to actuaries in selecting economic assumptions for measuring obligations of postretirement plans other than pensions. As noted in ASOP No. 6, the actuary should consider the following key components in setting the health care cost trend rate: inflation, medical inflation, definition of covered charges, frequency of services, leveraging caused by plan design features not explicitly modeled, and plan participation. The actuary should not consider aging of the covered population when selecting the trend assumption for projecting future costs.*

*In projecting medical and prescription drug costs, we assume the health benefit plan cost trend rates will decrease from an initial rate to an ultimate level. For the initial trend rate, our methodology includes the use of published annual health care inflation surveys in conjunction with actual plan experience, where credible. Given the volatile nature of medical and prescription drug costs, the initial trend rate assumption is subject to continued update and review with each valuation performed.*

*As for the decrease to the ultimate trend rate, there are various approaches used to determine the timing and level of the decreases (e.g., multi-year grading period, SOA-Getzen Model). The assumed decrease in medical and prescription drug trend rates reflects the belief that health care inflation cannot indefinitely outstrip the growth rate of employer budgets and the overall economy. As a standard of practice, we typically assume a grading period of five to ten years, depending on the level of change (i.e., larger differences between the initial trend rate and the ultimate trend rate are assumed to require a longer reduction period).*

*For the ultimate trend rate assumption, we believe the use of an assumption of price inflation plus 1.0% to 2.0% is reasonable for an ultimate rate of medical trend as healthcare costs have historically risen at higher rates than general price inflation.*



*We typically assume an ultimate trend rate of 5.0%. Although in our last experience study we lowered the Ohio SERS price inflation assumption from 3.50% to 3.25%, we decided to keep the ultimate trend assumption at 5.0% since it still fell in the range of 1.0% to 2.0% above price inflation. As with any standard of practice, the specifics of each plan are reviewed to ensure there is nothing unusual that would necessitate a long-term trend rate that is either higher or lower than what is typical. It appears to be reasonable to use an ultimate rate of 5.0% as there appears to be nothing unusual about Ohio SERS's medical plans that would necessitate a long-term trend that is either higher or lower than what is typically used for this type of calculation."*

We find this approach reasonable, and the trend rates which it produces reasonable. It is possible that the ultimate trend rate will be closer to the price inflation assumption of 3.25%, but CMC's conservative assumption of 5.00% provides some cushion for higher than anticipated health care costs. As mentioned previously, we recommend that this process be documented more rigorously in the next experience study report, the actuarial valuation report or both

### **Morbidity**

In a health insurance valuation, morbidity is sometimes defined as the difference in claims costs at different ages. Morbidity rates are also known as aging factors. They are used to transform average health cost assumptions to health care cost assumptions which vary by age. CMC did not disclose what data was used for development of aging factors in the reports. Upon request, they did disclose to us that:

*"Our first OPEB valuation for Ohio SERS was as of June 30, 2008. The prior actuary had completed an OPEB valuation as of 1/1/2008 and had adjusted the age related morbidity factors, using them for the 1st time as of 1/1/2008. Since the factors had been recently analyzed and updated, we retained them for our 6/30/2008 valuation. We have since that time closely monitored all publications and research projects undertaken by the SOA regarding age related morbidity and have seen no indication that these factors are no longer appropriate."*

We encourage CMS to review these factors in the next experience investigation to the extent data is available. At the very least, we would recommend that the experience study report disclose the process used for choice of these aging factors. We reviewed the aging factors developed by CMC and found them appropriate.

### **Retiree – Paid Premiums**

The true measure of a plan's liability is the difference between total claims costs and the amount that retirees contribute to offset those total costs. For Retiree-Paid Premiums, CMC used actual retiree contribution percentages by class under the current provisions of the plan. CMC does not assume any increases to the share of the costs

covered by premiums. This means that they would increase by the same health care trend factors as underlying health costs. These are beginning at 8.50% (6.75% for Medicare) and grading down to 5.0%. This is a reasonable approach.

### **Health Plan Participation Rates**

The actuary assumes that 94.4% of future retirees elect coverage under the PPO versus HMO. No supporting documentation is provided for this assumption, although it appears to be consistent with the actual coverage selection for the current retiree population. Upon further questions to CMC as to the elections, they responded:

*“The basis for the participation assumptions include: consideration of the prior actuary’s assumptions, general rules of thumb for anticipating participation based on employer subsidy levels, and actual plan experience. Our general rule of thumb for anticipating participation based on subsidy levels is 1.0 minus the square of the retiree’s (or spouse’s) percentage contribution. At some contribution levels, the assumed “rule of thumb” participation percentages were higher than the prior actuary’s assumptions and, after analyzing actual plan experience, we found the prior actuary’s assumptions to be more appropriate. We plan to do a more robust analysis of plan participation in our next experience study now that we have creditable experience on the post 8/1/2008 service retirees, keeping in mind that it will have to be closely monitored, particularly for pre-Medicare eligible retirees due to the ACA (subsidized coverage on the Exchanges and the expansion of Medicaid).”*

We find this to be a reasonable and appropriate approach, and agree with their intention of performing a more robust analysis.



### Section 3 – Audit of Compilation of Actuarial Valuations

The cornerstone of an actuarial audit is a replication of the actuarial valuation. As mentioned above, we matched quite closely the costs and liabilities developed by CMC for the retirement system. Consequently, we conclude that the valuation results are reasonable, accurate and consistent.

The following table summarizes the actuarial liability and normal cost for the Annual Basic Benefits produced by CMC and PTA/KMS actuarial valuations.

Annual Basic Benefits Valuation as of June 30, 2013						
	Actuarial Liability			Normal Cost		
	CMC	PTA/KMS	% Diff.	CMC	PTA/KMS	% Diff.
<b>Active Members</b>						
Retirement	6,870,958	6,938,189	0.98%	184,037	207,876	12.95%
Death	93,779	99,480	6.08%	4,395	4,734	7.72%
Disability	270,826	267,066	-1.39%	21,151	20,490	-3.12%
Termination	-204,730	-220,735	7.82%	94,491	72,227	-23.56%
Medicare Part B	131,656	136,417	3.62%	5,768	6,334	9.81%
Death after Retirement	7,512	7,553	0.54%	549	540	-1.77%
<b>Total</b>	<b>7,170,002</b>	<b>7,227,969</b>	<b>0.81%</b>	<b>310,392</b>	<b>312,201</b>	<b>0.58%</b>
<b>Retirees</b>						
Retirement	7,752,714	7,738,283	-0.19%			
Disability	822,617	822,617	0.00%			
Beneficiaries	654,406	653,983	-0.06%			
Medicare Part B	243,515	244,140	0.26%			
Death after Retirement	25,246	25,246	0.00%			
<b>Total</b>	<b>9,498,497</b>	<b>9,484,268</b>	<b>-0.15%</b>			
<b>Deferred Vested</b>						
Retirement	281,639	281,639	0.00%			
Medicare Part B	11,602	11,602	0.00%			
Death after Retirement	1,272	1,272	0.00%			
<b>Total</b>	<b>294,512</b>	<b>294,512</b>	<b>0.00%</b>			
<b>Inactive Members</b>						
	284,150	284,150	0.00%			
<b>Total</b>	<b>17,247,161</b>	<b>17,290,900</b>	<b>0.25%</b>	<b>310,392</b>	<b>312,201</b>	<b>0.58%</b>

\*All numbers in thousands



The following table summarizes the actuarial liability and normal cost for the Retiree Health Care Benefits produced by CMC and PTA/KMS actuarial valuations.

Retiree Health Care Valuation as of June 30, 2013						
	Actuarial Liability			Normal Cost		
	CMC	PTA/KMS	% Diff.	CMC	PTA/KMS	% Diff.
<b>Active Members</b>						
Service Retirements	1,573,760	1,572,362	-0.09%			
Disability	121,019	121,071	0.04%			
Termination	65,651	66,030	0.58%			
Death	1,293	1,215	-6.00%			
<b>Total</b>	<b>1,761,722</b>	<b>1,760,677</b>	<b>-0.06%</b>	<b>89,482</b>	<b>89,178</b>	<b>-0.34%</b>
<b>Retirees</b>						
Service Retirements	943,175	943,099	-0.01%			
Disability	177,343	177,343	0.00%			
Spouses	15,155	15,178	0.15%			
Children	6,570	6,346	-3.41%			
<b>Total</b>	<b>1,142,243</b>	<b>1,141,965</b>	<b>-0.02%</b>			
Deferred Vested	14,335	14,330	-0.04%			
<b>Total</b>	<b>2,918,299</b>	<b>2,916,972</b>	<b>-0.05%</b>	<b>89,482</b>	<b>89,178</b>	<b>-0.34%</b>

\*All numbers in thousands

Summary of Deviation of Results

	Basic Benefits Valuation Results	Retiree Health Care Valuation Results
Accrued Liability	0.25%	0.05%
Normal Cost	0.58%	0.34%

Actuaries generally use a 5% deviation as an acceptable range of error. As the total actuarial liabilities and normal costs deviations calculated by PTA/KMS were well within this “margin of error”, we are quite satisfied that numbers are appropriate.

Although we did match quite closely, there are several areas which we would encourage CMC to explore further:

- In valuing the Pension benefits, the following are a few items we uncovered that could be corrected, but overall would be immaterial to the valuation results:
  - Value deferred vested Post-Retirement Death Benefit coverage at retirement. The death benefit is available to each recipient of a service or disability benefit. While the benefit is correctly valued for retirees and disabled members, the benefit is not correctly valued for deferred vested members.
  - Make minor correction to the early retirement factors table. CMC provided us with the table of early retirement factors. For retirements before August 1, 2017, there are two entries at age 65 of “0” (at 23 and 24 years of service) which should be “1”.
  - Develop the lump sum annuity conversion factors using a 7.75% discount rate. We asked CMC to provide the parameters used to develop these factors, and they replied,  
  
*“The lump sum factors are developed using ProVal. These are internal calculations used to compare the value of the member contributions vs. the accrued benefit to select the benefit of greater value. We looked at what the basis that is loaded for these and note that the interest rate used was 8.0% rather than 7.75%. This item did not get updated after the last experience study which changed the discount rate. We have looked at the impact of correcting this and find it would be immaterial to the valuation results.”*
  - The Medicare Part B benefit is valued as a Joint & Survivor payment form when the retired member turns 65. This benefit could be valued separately for the member and the spouse so that the benefit is payable at age 65 for each.
- We recommend that CMC incorporate the following in the Pension Valuation Report:
  - Include the chart or comment about the health care fund expected solvency period, which had been included in prior valuation reports.
  - The breakout of liabilities and employer contribution rates provided in “Required Contribution Rates” on page 9 and Appendix A should be consistent.
  - Indicate that the Medicare Part B reimbursement continues to the spouse upon the death of the retiree only if the retiree elects a Joint & Survivor payment form.

- We recommend that CMC incorporate the following in the Health Care Valuation Report:
  - Include in Schedule C information regarding the \$35 monthly surcharge.
  - Provide greater detail on the determination of the Monthly Expected Medical/Prescription Drug Premiums and Claims.
  - Include blended claims costs for Children.
  - Describe the blended claims costs as “Annual”.
  - Service Retirement eligibility requirements should be described the same as Pension report.
  - An assumption regarding the Health Care Premium Discount Program should be stated regarding future eligible retirees.
  - Include an assumption regarding valuation of future children’s benefits.



## Section 4 – Review of Retiree Health Care Premium Rates

We performed an assessment of whether SERS/CMC appropriately, consistently, and evenly determines retiree contributions to health care and whether the implementation of the system's health care policies differ from those determinations.

For our review, we relied on the Board's funding policy, Board meeting minutes, Health Care Actuarial reports, Health Care Enrollment Guides, Comprehensive Annual Financial Reports (CAFR) and other documents as provided by SERS staff. We compared the total vendor costs, and in the case of self-funded plans, the actuarial costs, to the actual premiums charged. Our analysis took into account changes to plan design, reimbursements, and employer contributions available to fund health care and the projected health care trust solvency period.

The Board's funding policy (most recently reviewed January, 2013) describes the funding philosophy and objectives regarding pension and health care benefits. The funding policy states as its purpose the following:

"The purpose of this Statement of Funding Policy is to describe the funding philosophy and objectives of the Retirement Board of the School Employees Retirement System of Ohio (Board). This Statement sets forth policy and describes the organization and division of responsibilities to prudently implement the Board philosophy and objectives in accordance with sections 3309.21 and 3309.211 of the Ohio Revised Code. It also establishes the framework and specific objectives to monitor the System's funded status and to promote effective communication between the Board and SERS staff."

The funding policy includes the following statement regarding access to health care:

"Access to health care is provided in accordance with section 3309.69 of the Ohio Revised Code, and is financed through a combination of employer contributions and retiree premiums, copays and deductibles on covered health care expenses, investment returns, and any funds received as a result of SERS' participation in Medicare programs. The System's goal is to maintain a health care reserve account with a twenty-year solvency period in order to ensure that fluctuations in the cost of health care do not cause an interruption in the program. However, during any period in which the twenty-year solvency period is not achieved, the System shall manage the Health Care Fund on a pay-as-you-go basis.

The Ohio Revised Code permits SERS to offer access to health care to eligible individuals receiving retirement, disability, and survivor benefits and to their eligible dependents. Health care coverage may be changed at any time, resulting in adjustments in the required funding of the health care program.

Included within the aforementioned employer contribution is a surcharge determined in accordance with Ohio Revised Code section 3309.491. The surcharge is levied against employers whose employees earn less than a specified minimum salary. In order to avoid shifting an onerous financial burden to our members and retirees, the employer surcharge will continue to be an important source of health care revenues.”

SERS staff provided Board policies that relate to health care, however none of the policies provided dictate a precise method or specific guidelines on setting premium rates. These would be consistent with the SERS funding policy for health care which is Pay-As-You-Go. We believe the Board has discretion in setting premium rates and is not bound by any formal policy.

Actuarial calculations are performed each year to determine the annual cost to pre-fund retirement, disability and survivor benefits. The Board then determines how much of the total contribution will be allocated for these benefits, and how much is allocated for health care benefits. Based on the amount allocated for health care, the Board also determines the amount of health care benefits that are currently provided, balancing long-term solvency of the health care program with the desire to provide current health care benefits.

Currently, resources available to provide health care benefits to SERS retirees include:

- Dedicated employer funding of health care benefits (after retirement benefits are funded)
- Additional 1.5% of payroll premium surcharge for lower-paid employees
- Health care trust fund investment earnings
- Retiree premiums
- Federal subsidies and reimbursements

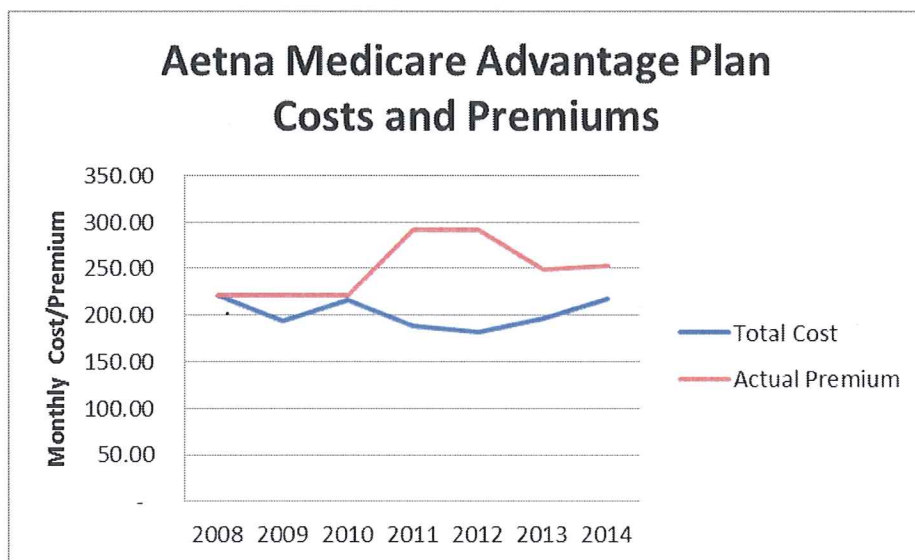
Section 3309.49 of the Ohio Revised Code limits the total employer contribution rate for retirement benefits and health care to 14% of pay. Employer contributions in excess of those required to support the basic retirement system benefits are allocated to the retiree health care fund. The following table shows a five-year history of the employer contribution rates allocated to health care.

Valuation as of June 30	Employer Contribution
2013	1.64%
2012	1.66%
2011	2.05%
2010	2.93%
2009	1.96%

The employer contribution rates shown above include the 1.5% payroll surcharge that is levied against employers whose employees earn less than a specified minimum salary.

The following analysis focuses on the most common medical and prescription drug plan available to Medicare-eligible retirees – the Aetna Medicare Advantage Plan and the self-insured prescription drug program - for years 2008 through 2014. The following table and chart show the actual costs and premiums for the Aetna Medicare Advantage plan and prescription drug program for years 2008 through 2014.

Calendar Year	Medical Cost	Rx Cost	Total Cost	Actual Premium
2014	\$86.52	\$131.00	\$217.52	\$253.00
2013	65.07	131.00	196.07	248.00
2012	74.43	107.00	181.43	291.00
2011	87.61	100.00	187.61	291.00
2010	87.61	128.00	215.61	221.00
2009	71.00	122.00	193.00	221.00
2008	57.00	164.00	221.00	221.00





A summary of the major Board actions with respect to Health Care as well as our observations for years 2009 through 2014 follows:

### **2009 Health Care Premiums**

#### *SERS Actions*

- Move Medicare recipients enrolled in Medical Mutual Medicare Advantage Plan to the Aetna Medicare Advantage Plan creating a single vendor model and an additional savings of \$2 PMPM
- Apply the savings from Medicare Part D Retiree Drug Subsidy (RDS) to the Medicare rates as was done in prior years
- Maintain 2008 premium rates for 2009

#### *PTA/KMS Observations*

- 2008 CAFR reports Health Care Fund solvency extends to fiscal year 2019
- Prescription drug costs reduced by 26% Medicare (with RDS credit) and 10% for non-Medicare
- Prescription drug costs increased by 2% Medicare (without RDS credit)
- Although cost for Aetna Medicare Advantage Plan increased \$14 and prescription drug cost decreased \$42, SERS Board elected to maintain the 2008 premium rates for this plan
- Given concerns with solvency, we believe this was a prudent and reasonable approach

### **2010 Health Care Premiums**

#### *SERS Actions*

- Apply the savings from Medicare Part D Retiree Drug Subsidy (RDS) to the Medicare rates as was done in prior years
- Maintain 2009 premium rates for 2010

#### *PTA/KMS Observations*

- 2009 CAFR reports Health Care Fund solvency extends to fiscal year 2014
- Prescription drug costs increased by 5% (Medicare with RDS credit) and 17% (non-Medicare)
- Although cost for Aetna Medicare Advantage Plan increased over \$16 and prescription drug cost increased \$6, SERS Board elected to maintain the 2008 premium rates for this plan
- Given concerns with solvency, we believe this was a prudent and reasonable approach

## 2011 Health Care Premiums

### *SERS Actions*

- Apply the savings from Medicare Part D Retiree Drug Subsidy (RDS) to the Medicare rates as was done in prior years
- Offer additional wellness program incentives
- Approve plan changes, including increased deductibles for non-Medicare plans
- Approve subsidy changes
- Implement Prescription Drug Plan (PDP)
- Assess a \$35 PMPM premium surcharge designed to balance health care expenses with annual resources
- Retain savings from plan changes to further balance health care expenses with annual resources
- Set premium rates to include cost plus savings from plan changes plus premium surcharge

### *PTA/KMS Observations*

- 2010 CAFR reports Health Care Fund solvency extends to fiscal year 2018
- Prescription drug costs increased by 13% (Medicare with RDS credit) and 21% (non-Medicare - prior to plan changes)
- CMS reimbursements decreased by 1.7% from 2010 rates
- Total cost for Aetna Medicare Advantage Plan remained the same while prescription drug costs decreased \$28
- Premium rates increased 16%, but now includes \$35 premium surcharge
- Given concerns with solvency, we believe this was a prudent and reasonable approach

## 2012 Health Care Premiums

### *SERS Actions*

- Apply the savings from Medicare Part D Retiree Drug Subsidy (RDS) to the Medicare rates as was done in prior years
- Maintain 2011 premium rates for 2012

### *PTA/KMS Observations*

- 2011 CAFR reports Health Care Fund solvency extends to fiscal year 2023
- SERS received federal reimbursement for Early Retiree Reimbursement Program (ERRP)
- Prescription drug costs increased by 7% (Medicare with RDS credit) and 22% (non-Medicare)
- Implemented discount program on brand name prescription drugs, generating estimated savings of \$15 million to \$17 million a year
- No employer contributions available in 2012 for health care beyond the 1.5% health care payroll surcharge

- Total cost for Aetna Medicare Advantage Plan decreased \$13 and prescription drug costs increased \$7
- Premium rates remained level from prior year
- Given concerns with solvency, we believe this was a prudent and reasonable approach

## 2013 Health Care Premiums

### *SERS Actions*

- Apply the savings from Medicare Part D Retiree Drug Subsidy (RDS) to the Medicare rates as was done in prior years
- ERRP funds have been exhausted
- Utilized Aetna and Medicare reimbursement to offer premium support to Aetna Medicare enrollees

### *PTA/KMS Observations*

- 2012 CAFR reports Health Care Fund solvency extends to fiscal year 2020
- Minimal employer contributions available in 2013 for health care beyond the 1.5% health care payroll surcharge
- No further funds from ERRP
- About 50% of new retirees in 2011 did not enroll in SERS
- Total cost for Aetna Medicare Advantage Plan decreased \$9 and prescription drug costs increased \$24
- Premium rates decreased 16%; rate includes \$35 premium surcharge
- Given concerns with solvency, we believe this was a prudent and reasonable approach

## 2014 Health Care Premiums

### *SERS Actions*

- Apply the savings from Medicare Part D Retiree Drug Subsidy (RDS) to the Medicare rates as was done in prior years
- Remove \$300 deductible from Medicare Advantage plan
- Implement Silver Sneakers benefit
- Change Medicare co-pays
- Renegotiated Express Scripts contract resulting in 8% savings

### *PTA/KMS Observations*

- Prescription drug costs did not change (Medicare) and decreased 3.6% (non-Medicare)
- PDP savings passed on to Medicare-eligible retirees only
- Total cost for Aetna Medicare Advantage Plan increased \$21 and prescription drug costs remained the same as 2013
- Premium rates increased 2%; rate includes \$35 premium surcharge



- Given concerns with solvency, we believe this was a prudent and reasonable approach

Overall, we believe that the premium rates established for the years 2009 through 2014 are reasonable and align with the costs of the underlying benefits offered. As stated in the Board's funding policy, health care coverage may change at any time, resulting in adjustments in resources of the required funding of the health care program. Premiums should not only be based on current costs, but also take into account the many factors discussed above, including maintaining the health care trust fund with a twenty year solvency period, changes to plan design, reimbursements, future enrollment of younger, healthy retirees and available employer contributions to fund health care.

To summarize, we find that the rates were accurate, consistent and reasonable.

## Section 5 – Other Considerations

We found CMC's work to be strong. It was reasonable, consistent and accurate. We do not believe that any methods, assumptions, or calculations are erroneous to the level of necessary recalculations.

As indicated above, our primary recommendations are:

- Document the development of health care claim costs more rigorously either in the actuarial reports or in the experience study or both
- Examine several minor actuarial assumptions (discussed above) more rigorously in the next experience study
- Correct minor discrepancies in the next actuarial valuation

For the most part, we found the CMC actuarial valuation reports and experience study reports to be very well written, and focusing on important issues. Actuarial Standard of Practice (ASOP) No. 41 provides extensive guidance to actuaries regarding actuarial communications. We find that the CMC reports complied with the guidance of ASOP 41.

Additionally, the reports generally are consistent with Government Finance Officers' guidelines for reporting. The CMC signers of the reports are qualified actuaries.

Cavanaugh Macdonald, the Ohio Retirement Study Council and particularly the School Employees Retirement System of Ohio staff were fully cooperative and responsive, which assisted in the process. Finally, we wish to reaffirm that the work done by CMC was reasonable, consistent and accurate.

**SAMPLE  
ACTUARIAL AUDIT  
PRESENTATION**



PTA

PENSION  
TRUSTEE  
ADVISORS



ACTUARIAL  
SERVICES  
LLC

Presentation on the Actuarial Audit of  
School Employees Retirement System of Ohio  
for Ohio Retirement Study Council

William B. Fornia, FSA

Linda L. Bournival, FSA

To SERS March 20, 2014

To ORSC April 10, 2014

# Agenda

- Major Findings of Actuarial Review
- Actuarial Assumptions
  - Demographic
  - Economic
  - Healthcare
- Actuarial Methods
- Actuarial Liability
- Healthcare Premium Rate Review
- Audit Conclusions



# Findings of Actuarial Review - Recap

## Actuarial Assumptions

- Reasonable and consistent
- Some minor concerns

## Actuarial Methods

- Reasonable and consistent
- Some minor concerns with disclosure

## Actuarial Valuation Replication

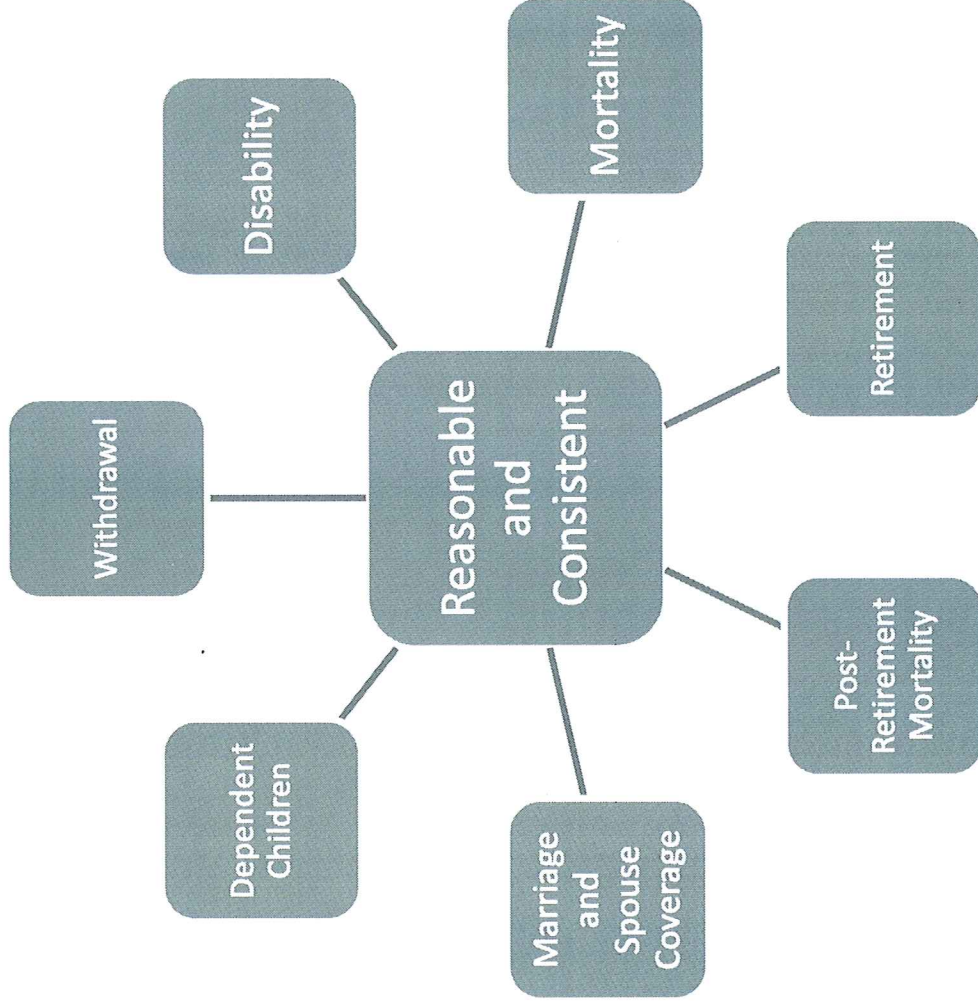
- Very close match (0.21% on total liability)
- Reasonable, consistent and accurate

## Premium Rate Analysis

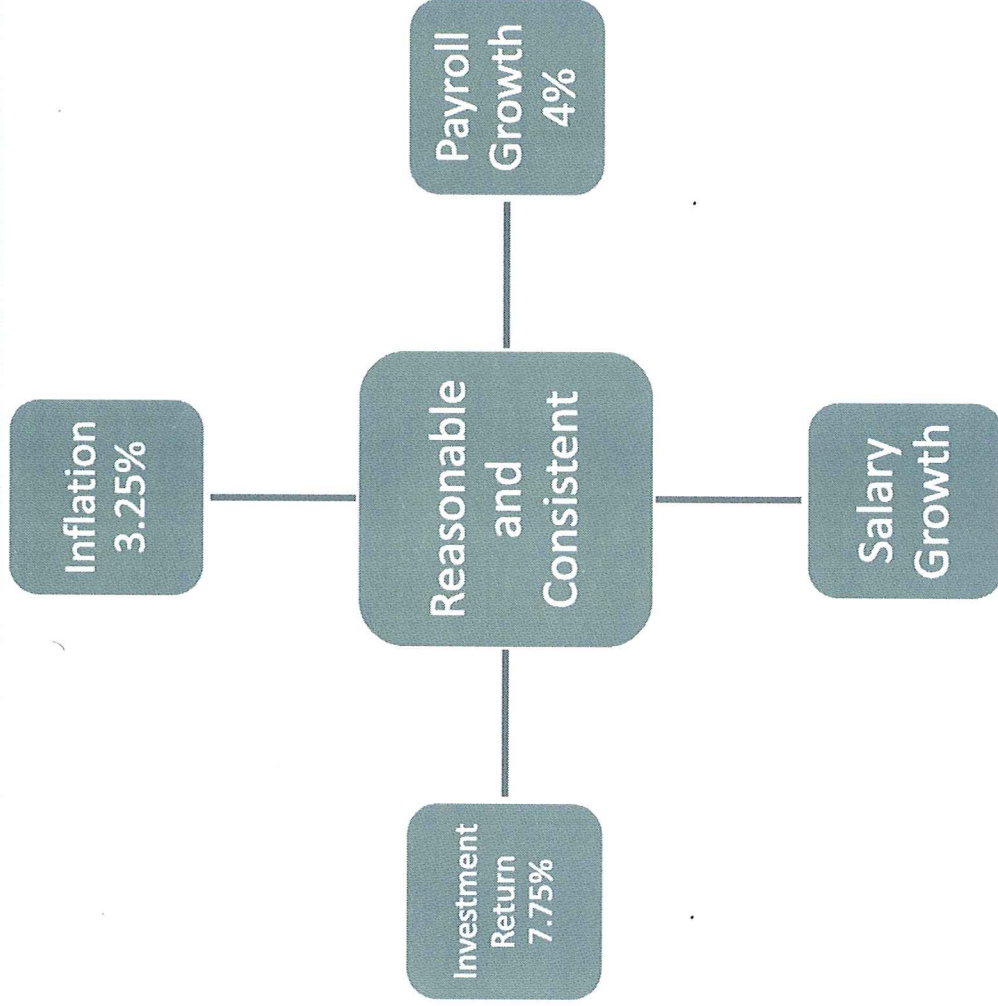
- Reasonable, consistent and accurate
- Some minor concerns with disclosure



# Demographic Assumptions



# Economic Assumptions



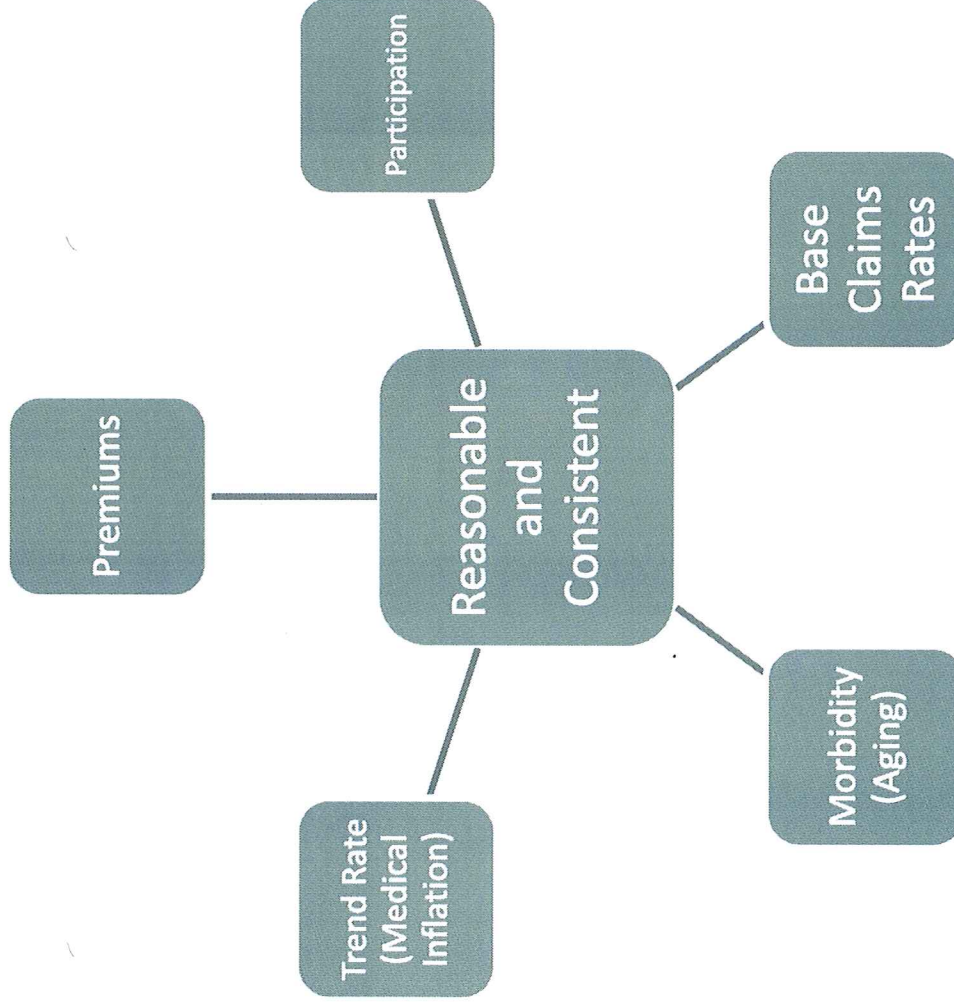


# Economic Assumptions

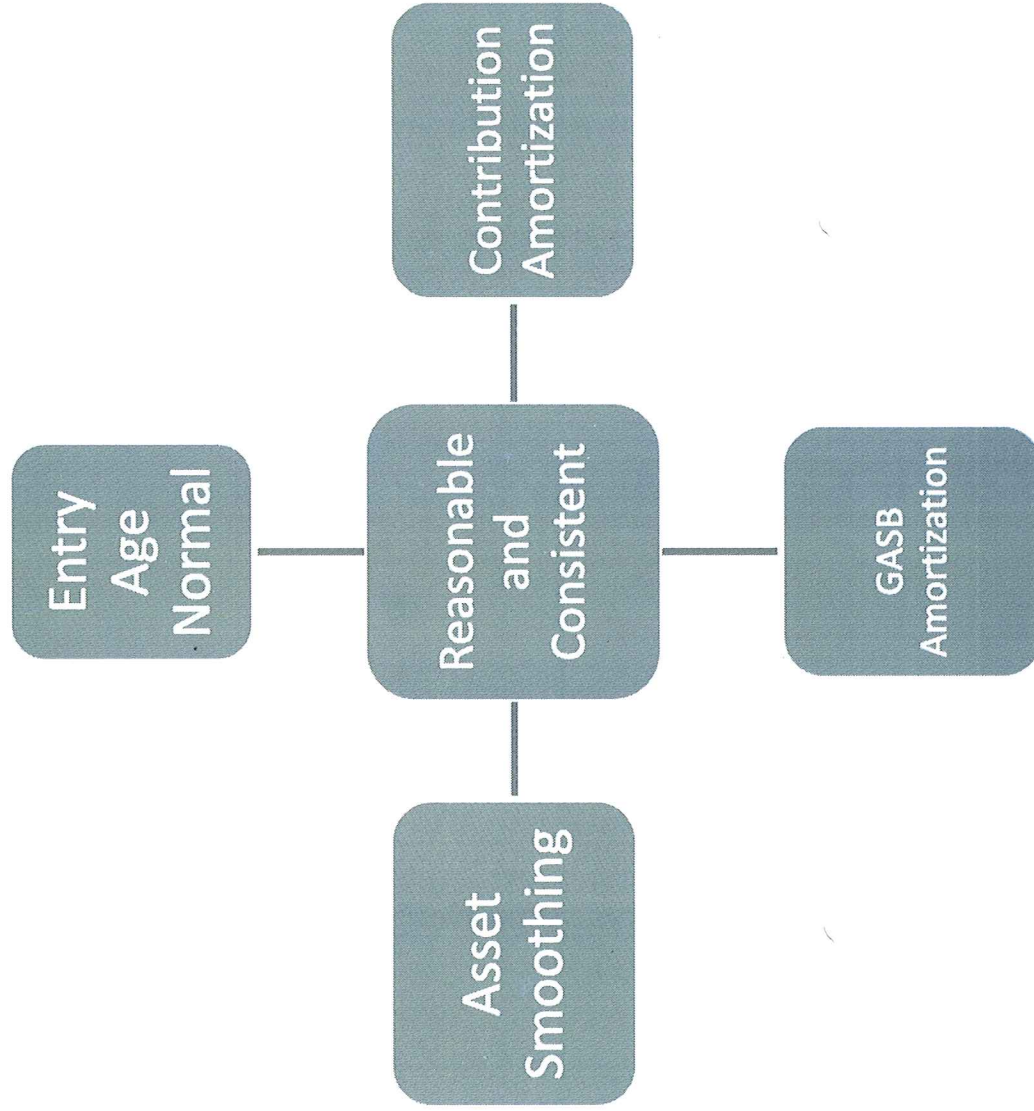
- Investment Return Rate of 7.75%
  - Consistent with other systems
- Inflation Rate of 3.25%
  - Consistent with other systems
  - Current market rate is much lower
- Payroll Growth of 4%
  - Reasonable
- Salary Growth Rate
  - Reasonable
  - Recommend analysis of merit increases in next experience study



# Healthcare Assumptions



# Actuarial Methods





# Amortization Methods

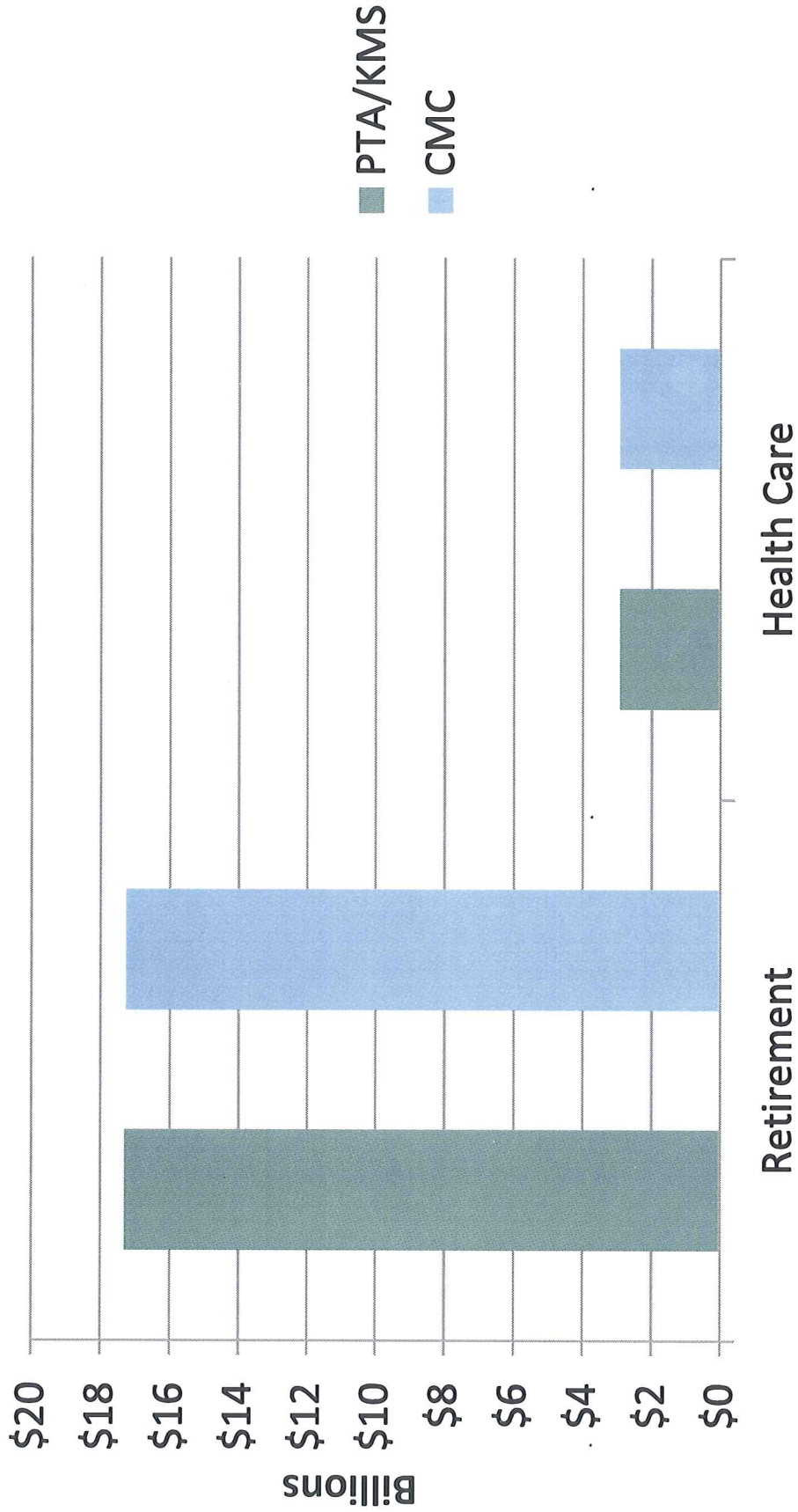
- For determination of contribution requirements
  - Based on increasing payroll (4% of total payroll)
  - Closed 30-year amortization period from 6/30/2012
  - Each year's activity currently amortized over 29 years
  - As period gets shorter, may consider a layered method
  - Healthcare premium allocation based on remaining contributions net of pension contribution
- For determination of GASB "Annual Required Contribution"
  - CMC tests that amortization policy satisfies GASB
  - GASB new rules will not permit 4% increase
  - GASB now permits 30 years
  - Currently satisfies GASB, but not for next and future valuations under new rules



# Actuarial Valuation Replication

- Strong match
- Actuarial liabilities match within 0.21% in total
- Thorough, complete work by Cavanaugh Macdonald Consulting (CMC)

# Actuarial Liability





# Health Care Premium Rate Review

- Premium rates are reasonable
- Align with costs of underlying benefits
- Considerations for setting premium rates
  - Health care trust solvency
  - Plan design
  - Reimbursements
  - Future enrollments
  - Employer contributions



# Audit Conclusions

- Excellent match in valuation replication
- Assumptions, Methods and Factors
  - Reasonable
  - Consistent
  - Accurate
- Premium rates are reasonable
- CMC reports well written
- Recommend that CMC review a handful of minor issues mentioned in report

# Minor Concerns and Areas for Improvement

- Actuarial Assumptions
  - Pre-Retirement Mortality
  - Merit Pay for those with more than ten years
  - Early Retirement for future retirees
  - Dependent Children
- Health Care assumption and method disclosures
- Some minor calculation errors



# Pre-Retirement Mortality Assumption

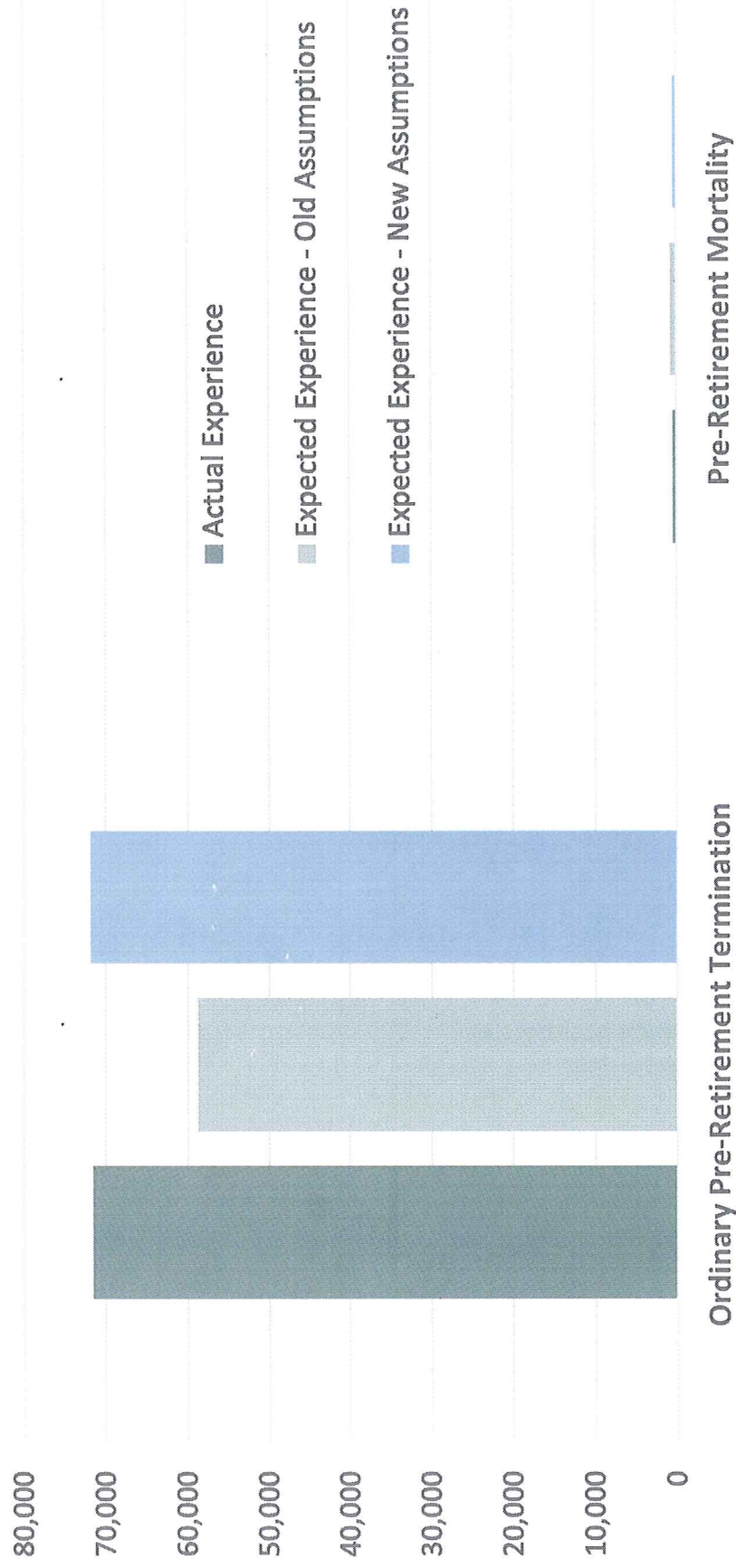
## Concern

- Based on extremely low SERS pre-retirement mortality experience, CMC recommended actuarial table with 75% less than normal mortality
  - This experience seems extremely unlikely
    - Only 458 deaths occurred, when 1,678 would have been expected by standard table
  - Might be some kind of coding error
- But this difference is insignificant when considering that 71,570 terminated



# Pre-Retirement Mortality Assumption Concern is Insignificant

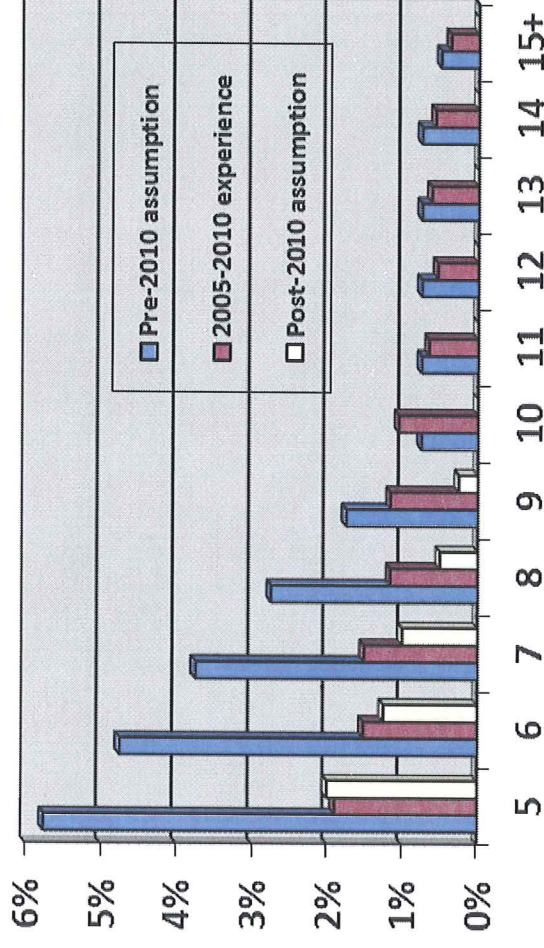
Pre-Retirement Terminations: 2005-2010



# Actuarial Assumption Concern with Merit Pay for those with More than Ten Years

- CMC assumes no merit increases after ten years
- These individuals did experience merit increases of about 0.5%

Merit Increase Assumptions by Years of Service



- Impact of assumption could be modest, when considering inflation



# Other Minor Actuarial Assumption Concerns

- **Early Retirement for future retirees**
  - Those retiring early after August 1, 2017 will have new benefit schedule
  - Will need to develop some assumption for this
  - No data yet, but assumption is necessary
- **Dependent Children**
  - None are assumed, although benefits are provided to dependent children of certain deceased members
  - Explicit assumption could be considered for those of normal parenting age
  - Alternatively, a load on pre-retirement survivor normal costs and liabilities could be implemented



# Actuarial Audit Replication – In a Perfect World

- Auditing actuary receives:
  - From pension system:
    - Plan provisions,
    - Member data, and
    - Asset information
  - From system actuary:
    - Actuarial valuation reports, and
    - Experience study reports
- Auditing actuary is able to:
  - Match calculations of system actuary, and
  - Opine that system actuary’s assumptions and methods are reasonable and appropriate

# Actuarial Audit Replication – In the Real World

- Actuarial valuation report is not 100% complete in its description of plan benefits, actuarial assumptions, and actuarial methods
- Actuaries and retirement system have ongoing conversations clarifying ambiguities
- System actuary provides test cases illustrating precise calculations



# Actuarial Audit Replication – In SERS World

- SERS was extremely helpful and responsive in clarifying plan provisions
- CMC test cases were extremely helpful in illustrating actuarial methods
- We recommend that CMC expand documentation of health care assumptions and methodologies
  - In the actuarial reports, and/or
  - In the next experience study report



# Findings of Actuarial Review - Recap

## Actuarial Assumptions

- Reasonable and consistent
- Some minor concerns

## Actuarial Methods

- Reasonable and consistent
- Some minor concerns with disclosure

## Actuarial Valuation Replication

- Very close match (0.21% on total liability)
- Reasonable, consistent and accurate

## Premium Rate Analysis

- Reasonable, consistent and accurate
- Some minor concerns with disclosure

**SAMPLE  
ACTUARIAL VALUATION  
REPORT**



**WORCESTER REGIONAL RETIREMENT SYSTEM**

**ACTUARIAL VALUATION**

**as of**

**January 1, 2012**

Prepared by:

Linda L. Bournival, FSA  
KMS Actuarial, LLC  
Fellow, Society of Actuaries  
Enrolled Actuary  
Member, American Academy of Actuaries





September 17, 2012

Worcester Regional Retirement Board  
Midstate Office Park  
23 Midstate Drive, Suite 106  
Auburn, MA 01501

Dear Board Members:

We are pleased to present the enclosed report summarizing the results of our actuarial valuation of the Worcester Regional Retirement System as of January 1, 2012.

Our valuation was performed in accordance with the provisions contained in Chapter 32 of the Massachusetts General Laws, "M.G.L.", as of January 1, 2012 and GASB Statement No. 25, Financial Reporting for Defined Benefit Pension Plans and Note Disclosures for Defined Contribution Plans (GASB 25) and GASB Statement No. 27, Accounting for Pensions by State and Local Governmental Employers (GASB 27).

The principal results of our valuation are summarized in Section 2. The summary of Plan provisions and actuarial methods and assumptions are shown in Sections 5 and 6, respectively. Section 7 summarizes the demographic profile of active members and retired plan participants. Asset information and actuarial liabilities are presented in Section 2. The development of the required appropriations pursuant to Chapter 32 of the M.G.L. is shown in Section 3. The required disclosures under GASB 25, GASB 27 and PERAC are presented in Section 4.

We also provide a 30-year forecast of the required appropriations and cash flows in Section 3.

Our actuarial valuation is based on a discount rate of 8.00%, compounded annually. Our calculations were based on participant census and asset data and other information provided by the Worcester Regional Retirement System and the benefit provisions of Chapter 32 of the M.G.L. as of January 1, 2012.

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K M S A C T U A R I E S

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Worcester Regional Retirement Board

September 17, 2012

Page 2

Our valuation follows generally accepted actuarial methods and we perform such tests as we consider necessary to assure the accuracy of the results. The amounts presented in this report have been appropriately determined according to the actuarial assumptions and methods stated herein.

We appreciate this opportunity to be of service to the Worcester Regional Retirement Board. We are available to answer any questions with respect to our valuation.

Respectfully submitted,



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Linda L. Bournival, FSA

Member, American Academy of Actuaries

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Worcester Regional Retirement System  
Actuarial Valuation as of January 1, 2012



## ACTUARIAL CERTIFICATION

This report presents the results of the Actuarial Valuation for the Worcester Regional Retirement System as of January 1, 2012. The report presents the funding schedule contribution amounts for the fiscal years beginning 2013 and accounting and financial reporting information in accordance with Statement Numbers 25 and 27 of the Governmental Accounting Standards Board.

This valuation is based upon member data provided by the Retirement Board and asset information reported to the Public Employee Administration Commission (PERAC) by the Worcester Regional Contributory Retirement System. Although we did not audit the data used in the valuation, we believe that the information is complete and reliable.

This report was completed in accordance with generally accepted actuarial standards and procedures, and conforms to the Code of Professional Conduct of the American Academy of Actuaries. The actuarial assumptions used in the determination of costs are reasonably related to the experience of the System and to reasonable expectations, and represent our best estimate of anticipated long-term experience under the System.

This report is intended for the sole use of the Worcester Regional Retirement System and is intended to provide information to comply with the stated purpose of the report. It may not be appropriate for other purposes.

The undersigned credentialed actuaries are Members of the American Academy of Actuaries and meet the Qualification Standards of the American Academy of Actuaries necessary to render the actuarial opinion contained herein. They are available to answer any questions with regard to this report.

Respectfully submitted,

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Linda L. Bournival, FSA  
Member, American Academy of Actuaries  
(603) 792-9494

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David M. Mirabito, FSA  
Member, American Academy of Actuaries  
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## SECTION 1 - SUMMARY

### Background

We have completed the Actuarial Valuation of the Worcester Regional Retirement System as of January 1, 2012. This valuation is based upon census data provided by the Retirement Board and asset information reported to the Public Employee Retirement Administration Commission (PERAC) by the Worcester Regional Retirement Board. Information for the prior valuation completed as of January 1, 2010 was obtained from the valuation report prepared by Ricci Consultants.

### Massachusetts General Laws

The valuation was prepared in accordance with Chapter 32 of the Massachusetts General Laws ("M.G.L.").

The valuation does not take into consideration:

- Changes in the law after the valuation date,
- Transfers between retirement systems pursuant to Section 3(8)(c) of Chapter 32,
- State-mandated benefits and
- Cost-of-living increases granted to members in pay status between 1982 and 1997.

### GASB Statement Numbers 25 and 27

The Governmental Accounting Standards Board (**GASB**) is responsible for establishing accounting standards for governmental entities. Calculations developed in accordance with GASB standards are required when providing financial statements.

GASB Statement Number 25 (**GASB 25**) establishes financial reporting standards for defined benefit pension plans of state and local governmental entities. The Statement establishes a framework that distinguishes between two categories of information: current financial information about plan assets and financial activities and actuarially determined information about the funded status of the plan and the progress being made in accumulating sufficient assets to pay benefits when due.

GASB Statement Number 27 (**GASB 27**) establishes standards for the measurement, recognition, and display of pension expense and related liabilities, assets, note disclosures, and, if applicable, required supplementary information in the financial reports of state and local governmental employers. Employers are required to measure and disclose an amount for annual pension cost on the accrual basis of accounting, regardless of the amount recognized as pension expense on the accrual basis. Annual pension cost should be equal to the employer's Annual Required Contribution (ARC) to the plan.

The required disclosures under the GASB Statements are presented in Section 4.

## SECTION 1 - SUMMARY

### Actuarial Valuation

During the two years since the last valuation, the total unfunded actuarial accrued liability of the System was expected to increase from \$449,025,282 as of January 1, 2010 to \$463,793,848 as of January 1, 2012. The actual unfunded actuarial accrued liability was \$546,124,800. The greater than expected increase was due to the asset loss and the assumption change. In addition, we note that the increase in the annual and average pensions payable to retired members and beneficiaries over the two-year period was 13.7% and 11.4%, respectively. The details of the gain and loss analysis are provided in Exhibit 2.6.

### Appropriations

The funding appropriation for each year is computed as the sum of the Normal Cost and an amortization payment to pay off the Unfunded Actuarial Liability, adjusted for semi-annual payments of the appropriation made during the fiscal year. The appropriation as of January 1, 2012 is \$39,424,045. The development of the appropriation as of January 1, 2012 is presented in Exhibit 3.1. The unfunded actuarial liability attributable to the Early Retirement Incentive is still scheduled to reduce to zero by 2028.

For fiscal year 2013, we show the actual appropriation developed under the previous funding schedule and reported on the PERAC "Required Fiscal Year 2013 Appropriation" letter dated December 15, 2011 of \$35,056,320. The Board has adopted a funding policy that provides for a 7% increase in the appropriation for fiscal years 2014 and 2015 and an 8% increase in the appropriation for fiscal years 2016 and 2017. The amortization payments toward the unfunded actuarial accrued liability for 2018 and subsequent years are adjusted to reflect this. The current funding schedule is shown in Exhibit 3.2.



## SECTION 1 - SUMMARY

A summary of principal valuation results from the current valuation and the prior valuation follows. Changes in actuarial methods and assumptions and Plan provisions are discussed below, as well as changes in census data and asset information.

Valuation Date	<u>1/1/2012</u>	<u>1/1/2010</u>	<u>Increase/ (Decrease)</u>
<b>Summary of Member Data</b>			
Active Members	6,377	6,236	2.3%
Average Age	47.8	47.1	1.5%
Average Service	10.4	9.6	8.3%
Salary	\$223,912,713	\$220,750,318	1.4%
Average Salary	\$35,113	\$35,399	(0.8%)
Valuation Salary	\$238,952,079	\$241,992,607	(1.3%)
Retired Members and Beneficiaries	2,742	2,686	2.1%
Average Age	74.1	74.3	(0.3%)
Total Annual Pension	\$43,108,572	\$37,900,202	13.7%
Average Annual Pension	\$15,722	\$14,110	11.4%
Disabled Members	233	215	8.4%
Average Age	63.1	63.0	0.2%
Total Annual Pension	\$6,335,254	\$5,583,375	13.5%
Average Annual Pension	\$27,190	\$25,969	4.7%
Inactive Members	1,874	2,324	(19.4%)
Annuity Savings Fund	10,996,041	\$12,337,781	(10.9%)
<b>Actuarial Accrued Liability (AAL)</b>	<b>\$982,796,782</b>	<b>\$863,002,067</b>	<b>13.9%</b>
<b>Assets</b>			
Market Value of Assets	\$396,103,870	\$344,980,654	14.8%
Actuarial Value of Assets	436,671,982	413,976,785	5.5%
<b>Unfunded Accrued Liability (Surplus)</b>	<b>\$546,124,800</b>	<b>\$449,025,282</b>	<b>21.6%</b>
<b>Funded Status</b>	<b>44.4%</b>	<b>48.0%</b>	<b>(7.5%)</b>
<b>Normal Cost</b>			
Employer	\$8,067,437	\$8,379,107	(3.7%)
Employee	20,400,686	20,001,488	2.0%
Administrative Expenses	0	0	
Total Normal Cost	\$28,468,123	\$28,380,595	0.3%

Worcester Regional Retirement System  
Actuarial Valuation as of January 1, 2012

## SECTION 1 - SUMMARY

Valuation Date	<u>1/1/2012</u>	<u>1/1/2010</u>	<u>Increase/ (Decrease)</u>
<b>Appropriations</b>			
Fiscal Year 2013	\$35,056,320	\$35,056,320	0.0%
Fiscal Year 2014	\$37,510,266	\$37,510,262	0.0%
Fiscal Year 2015	\$40,135,980	\$40,135,980	0.0%

### Actuarial Assumptions and Methods

All Actuarial Assumptions and Methods used in this valuation are the same as those used in the prior valuation, except the mortality improvement applied to the RP-2000 Mortality Table was changed to project to 2012 (previously 2010). Changing these assumptions resulted in a net increase in the unfunded actuarial accrued liability of \$4,768,291 and an increase in the employer normal cost of \$78,438. The Actuarial Assumptions and Methods utilized in this valuation are detailed in Section 6, Actuarial Assumptions and Methods.

### Plan Provisions

All Plan provisions used in this valuation are the same as those used in the prior valuation. The Plan provisions utilized in this valuation are detailed in Section 5, Summary of Plan Provisions.

### Census Data

As of January 1, 2012, there are 6,377 active members who may be eligible for benefits in the future, 2,742 retirees and beneficiaries, 1,874 inactives and 233 disabled retirees. Summaries of the active, retired and disabled employees are included in Section 7, Demographic Information.

### Assets

This valuation is based upon asset information reported to the Public Employee Retirement Administration Commission (PERAC) by the Worcester Regional Retirement Board. The market value of assets increased from \$344,980,654 as of January 1, 2010 to \$396,103,870 as of January 1, 2012. During the plan years ended 2010 and 2011, the market value rates of return were 12.94% and -0.19%, respectively.

The actuarial value of assets increased from \$413,976,785 as of January 1, 2010 to \$436,671,982 as of January 1, 2012. During the plan years ended 2010 and 2011, the actuarial rates of return were 3.77% and 0.00%, respectively.

## SECTION 2 - PRINCIPAL VALUATION RESULTS

### Exhibit 2.1 - Plan Assets

Asset information is reported annually to the Public Employee Retirement Administration Commission by the Worcester Regional Contributory Retirement System. The Market Value of Assets for the two most recent calendar years are as follows:

Calendar Year	2011	2010
<b>Trust Fund Composition at Year-End</b>		
Cash	\$2,333,329	\$2,666,464
Short-Term Investments	0	0
Fixed Income Securities	0	0
Pooled Short Term Funds	0	0
Equities	0	0
Pooled Domestic Equity Funds	0	0
Pooled International Equity Funds	0	0
Pooled Global Equity Funds	0	0
Pooled Domestic Fixed Income Funds	0	0
Pooled International Fixed Income Funds	0	0
Pooled Global Fixed Income Funds	0	0
Pooled Alternative Investments	11,643,665	12,288,337
Pooled Real Estate Funds	16,908,053	15,809,529
Pooled Domestic Balanced Funds	0	0
Pooled International Balanced Funds	0	0
Hedge Funds	0	0
PRIT Cash	0	0
PRIT Fund	364,086,610	363,964,801
Prepaid Expenses	0	0
Accounts Receivable	1,149,111	1,730,880
Interest Due & Accrued	0	0
Accounts Payable	(16,898)	(3,182,855)
<b>Total Market Value of Assets</b>	<b>\$396,103,870</b>	<b>\$393,277,156</b>



## SECTION 2 - PRINCIPAL VALUATION RESULTS

### Exhibit 2.1 - Plan Assets

Calendar Year	2011	2010
<b>Funds</b>		
Annuity Savings Fund	\$205,821,738	\$197,802,806
Annuity Reserve Fund	47,957,568	45,237,026
Special Military Service Cr Fund	73,956	68,874
Pension Fund	11,303,798	10,618,699
Expense Fund	0	0
Pension Reserve Fund	130,946,810	139,549,751
Total Market Value of Assets	\$396,103,870	\$393,277,156
<b>Asset Activity</b>		
Market value as of Beginning of Year	\$393,277,156	\$344,980,654
Contributions and Receipts	58,806,923	56,556,162
Benefit Payments and Expenses	(55,224,151)	(53,130,828)
Investment Return	(756,058)	44,871,168
Market Value as of End of Year	\$396,103,870	\$393,277,156
<b>Computed Rate of Return</b>	-0.19%	12.94%

Returns and annualized past returns developed by PERAC are shown below. Information is obtained from the Investment Report published by PERAC for the years shown.

Year	1-Year Return	5-Year Return	Return (Since 1985)
2011	-0.18%	0.21%	7.91%
2010	12.20%	2.74%	8.23%
2009	13.15%	1.47%	8.08%

## SECTION 2 - PRINCIPAL VALUATION RESULTS

### Exhibit 2.1 - Plan Assets

Valuation Date	1/1/2012	1/1/2011	1/1/2010
<b>1. Market Value of Assets as of prior January 1</b>	\$393,277,156	\$344,980,654	\$298,227,726
a. Prior Year Contributions and Receipts	58,806,923	56,556,162	55,129,451
b. Prior Year Benefit Payments and Expenses	(55,224,151)	(53,130,828)	(48,737,944)
c. Expected Investment Return Rate	8.00%	8.00%	8.50%
d. Expected Investment Return	31,617,426	27,746,883	25,643,632
e. Expected Market Value of Assets as of Valuation Date	\$428,477,354	\$376,152,871	\$330,262,865
<b>2. Prior Year Gain / (Loss)</b>			
a. Market Value of Assets as of January 1	\$396,103,870	\$393,277,156	\$344,980,654
b. Expected Market Value of Assets	428,477,354	376,152,871	330,262,865
c. Prior Year Gain / (Loss)	(32,373,484)	17,124,285	14,717,789
<b>3. Phase-In of Asset Gains and Losses</b>			
Plan Year	Gain / (Loss)	Unrecognized Gain / (Loss)	Unrecognized Gain / (Loss)
a. 2011	(\$32,373,484)	(\$25,898,787)	-
b. 2010	17,124,285	10,274,571	13,699,428
c. 2009	14,717,789	5,887,116	8,830,673
d. 2008	(154,155,062)	(30,831,012)	(61,662,025)
e. 2007	(3,370,284)	-	(674,057)
f. 2006	12,678,214	-	-
g. 2005	(12,473,953)	-	-
h. Total		(40,568,112)	(39,805,981)
Unrecognized Gain / (Loss)		-	-
Unrecognized Gain / (Loss)		11,774,231	(92,493,037)
Unrecognized Gain / (Loss)		(1,348,114)	2,535,643
Unrecognized Gain / (Loss)		-	-
Unrecognized Gain / (Loss)		(79,531,277)	
<b>4. Actuarial Value of Assets</b>			
a. Market Value of Assets Less Unrecognized Gain / (Loss)	\$436,671,982	\$433,083,137	\$424,511,931
b. 80% of Market Value of Assets	316,883,096	314,621,725	275,984,523
c. 120% of Market Value of Assets	475,324,644	471,932,587	413,976,785
d. Actuarial Value of Assets, a., but not less than b. and not greater than c.	\$436,671,982	\$433,083,137	\$413,976,785
e. Ratio of Actuarial Value of Assets to Market Value of Assets	110.24%	110.12%	120.00%
<b>5. Rate of Return on Actuarial Value of Assets for Prior     Calendar Year</b>	0.00%	3.77%	13.76%

Worcester Regional Retirement System  
Actuarial Valuation as of January 1, 2012

## SECTION 2 - PRINCIPAL VALUATION RESULTS

The **Actuarial Present Value of Future Benefits** is the present value of the cost to finance all benefits payable in the future, discounted to reflect the probability of payment and the time value of money. Below is the Actuarial Present Value of Future Benefits from the current valuation and the prior valuation:

### Exhibit 2.2 - Actuarial Present Value of Future Benefits

Valuation Date	<u>1/1/2012</u>	<u>1/1/2010</u>
<b>Actives</b>		
Superannuation	\$594,342,118	\$534,720,587
Termination	26,934,251	30,386,995
Death	35,388,014	34,665,023
Disability	54,557,371	53,072,297
Total Active	\$711,221,754	\$652,844,902
<b>Retired Members and Inactives</b>		
Retired Members and Beneficiaries	\$395,637,470	\$345,279,655
Disabled Members	67,158,647	58,146,968
Inactive Members	10,996,041	12,337,781
Total Retired Members and Inactives	\$473,792,158	\$415,764,404
<b>Total Present Value of Future Benefits</b>	<b>\$1,185,013,912</b>	<b>\$1,068,609,306</b>

The **Actuarial Accrued Liability** is the portion of the Actuarial Present Value of Future Benefits which is allocated to all periods prior to a valuation year and therefore is not provided for by future Normal Costs. Below is the Actuarial Accrued Liability from the current valuation and the prior valuation:

### Exhibit 2.3 - Actuarial Accrued Liability

Valuation Date	<u>1/1/2012</u>	<u>1/1/2010</u>
<b>Actives</b>		
Superannuation	\$451,199,487	\$391,016,715
Termination	13,606,639	14,678,631
Death	18,132,908	16,795,347
Disability	26,065,590	24,746,970
Total Active	\$509,004,624	\$447,237,663
<b>Retired Members and Inactives</b>		
Retired Members and Beneficiaries	\$395,637,470	\$345,279,655
Disabled Members	67,158,647	58,146,968
Inactive Members	10,996,041	12,337,781
Total Retired Members and Inactives	\$473,792,158	\$415,764,404
<b>Total Actuarial Accrued Liability</b>	<b>\$982,796,782</b>	<b>\$863,002,067</b>

Worcester Regional Retirement System  
Actuarial Valuation as of January 1, 2012



## SECTION 2 - PRINCIPAL VALUATION RESULTS

The **Normal Cost** is the portion of the Actuarial Present Value of Future Benefits which is allocated to a valuation year. Only active employees who have not reached Normal Retirement Age incur a Normal Cost. Below is the Normal Cost from the current valuation and the prior valuation:

### Exhibit 2.4 - Normal Cost

Valuation Date	<u>1/1/2012</u>	<u>1/1/2010</u>
<b>Actives</b>		
Superannuation	\$19,333,118	\$18,754,851
Termination	3,431,701	4,057,338
Death	2,385,287	2,395,321
Disability	3,318,017	3,173,085
Total Active	\$28,468,123	\$28,380,595
<b>Administrative Expenses</b>	\$0	\$0
<b>Total Normal Cost</b>		
Normal Cost	\$28,468,123	\$28,380,595
As a Percentage of Salary	11.9%	11.7%
<b>Employee Normal Cost</b>		
Employee Contributions	\$20,400,686	\$20,001,488
As a Percentage of Salary	8.5%	8.3%
<b>Employer Normal Cost</b>		
Employer Normal Cost	\$8,067,437	\$8,379,107
As a Percentage of Salary	3.4%	3.5%

### Exhibit 2.5 - Unfunded Actuarial Accrued Liability

Valuation Date	<u>1/1/2012</u>	<u>1/1/2010</u>
<b>Unfunded Actuarial Accrued Liability</b>		
a. Actuarial Accrued Liability, before changes	\$982,796,782	\$863,002,067
b. Actuarial Value of Assets	436,671,982	413,976,785
c. Unfunded Actuarial Accrued Liability (a. - b.)	\$546,124,800	\$449,025,282
d. Funded Ratio (b. divided by a.)	44.4%	48.0%

## SECTION 2 - PRINCIPAL VALUATION RESULTS

### Exhibit 2.6 - Actuarial Experience

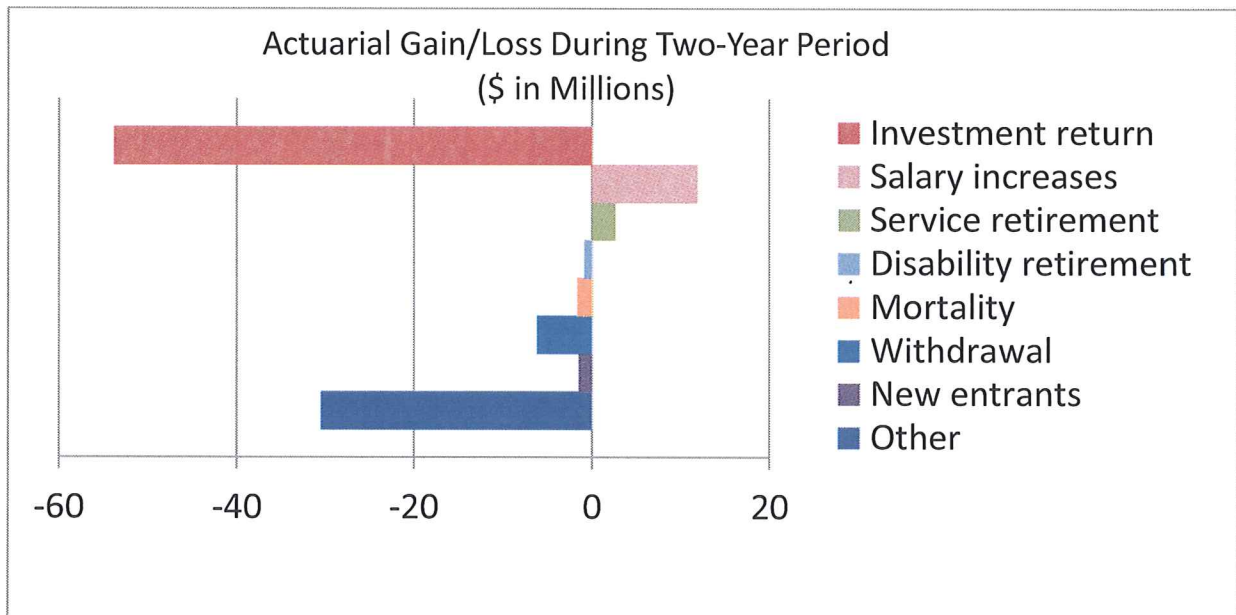
In performing the actuarial valuation, various assumptions are made regarding mortality, retirement, disability and withdrawal rates as well as salary increases and investment returns. A comparison of the results of the current valuation and the prior valuation is made to determine how closely actual experience relates to expected. During the two years since the last valuation, the total unfunded actuarial accrued liability of the System was expected to increase by \$14,768,566. Below is the development of the Actuarial Gain or Loss for the current 2-year period:

Calendar Year Ending	<u>12/31/2011</u>	<u>12/31/2010</u>
<b>Expected Unfunded Actuarial Accrued Liability</b>		
a. Unfunded Actuarial Accrued Liability, beginning of year	\$456,591,418	\$449,025,282
b. Normal cost, beginning of year	\$29,657,722	28,380,595
c. Total contributions	58,806,923	56,556,162
d. Interest (full year on a. and b., half year on c.)	36,351,631	35,741,703
e. Expected Unfunded Actuarial Accrued Liability	\$463,793,848	\$456,591,418
f. Unfunded Actuarial Accrued Liability (before changes)	\$541,356,508	
g. (Gain)/Loss	\$77,562,660	
<b>Asset (gain)/loss</b>		
a. Actuarial value of assets, beginning of year	\$433,083,137	\$413,976,785
b. Contributions and Receipts	58,806,923	56,556,162
c. Benefit Payments and Expenses	(55,224,151)	(53,130,828)
d. Assumed rate of return	8.00%	8.00%
e. Expected return	34,801,904	33,266,574
f. Actuarial value of assets, end of year	436,671,982	433,083,137
g. Actual return	6,073	15,681,018
h. Actual rate of return	0.00%	3.77%
i. Asset (gain)/loss	\$34,795,831	\$17,585,556
j. Asset (gain)/loss over two-year period	\$53,788,232	
<b>Actual Unfunded Actuarial Accrued Liability</b>		
a. Changes due to:		
a) Asset (gain)/loss	\$53,788,232	
b) Net (gain)/loss from demographic experience	23,774,429	
c) Assumption changes	4,768,291	
d) Plan changes	-	
e) Total changes	\$82,330,952	
b. Unfunded Actuarial Accrued Liability, end of year	\$546,124,800	

## SECTION 2 - PRINCIPAL VALUATION RESULTS

### Exhibit 2.6 - Actuarial Experience

The loss over the two-year period is made up of the following:





## SECTION 3 - CHAPTER 32 OF M.G.L. APPROPRIATIONS

### Exhibit 3.1 - Annual Appropriations

The **Annual Appropriation** is determined in accordance with the requirements set forth in Section 22D of Chapter 32 of the Massachusetts General Laws ("M.G.L."). The appropriation is comprised of the annual employer normal cost and amortization payments to pay the unfunded actuarial accrued liability. Below are the details of the annual appropriation for the current valuation and the prior valuation.

Amortization Payment	<u>Outstanding Balance at 1/1/2012</u>	<u>Period (in years)</u>	<u>Payment Increase Rate</u>	<u>Total Appropriation at 1/1/2012</u>
a. Early Retirement Incentive (2002)	\$13,226,403	16	4.50%	\$1,046,240
b. Early Retirement Incentive (2003)	\$2,593,206	16	4.50%	\$205,129
c. Assumption Change	\$4,768,292	28	4.00%	\$270,694
d. Plan Change	\$0	28	4.00%	\$0
e. Remaining Unfunded Liability	\$525,536,899	28	4.00%	\$29,834,545
f. Total	\$546,124,800			\$31,356,608
<b>Normal Cost</b>				\$8,067,437
<b>Total Appropriation at Valuation Date</b>				\$39,424,045

## SECTION 3 - CHAPTER 32 OF M.G.L. APPROPRIATIONS

Exhibits 3.2 and 3.3, are based on the assumptions below:

- Payroll and Total Normal Cost are both expected to increase 4.50% per year.
- The Employee Contribution rate will increase linearly from the 2012 percentage to 10.50% by 2028 as members contributing at the lower rates are replaced by new members contributing over 9%.
- Employer Normal Cost is the difference between Total Normal Cost and Employee Contributions.
- The Unfunded Actuarial Accrued Liability ("UAL") is computed as of January 1 of each year assuming no future gains or losses.
- The Amortization Payment of UAL is an increasing amortization of the UAL, excluding the UAL attributable to the Early Retirement Incentive ("ERI") program, over 28 years through 2040 with payments increasing 4.00% per year.
- The Amortization Payment of ERI is an increasing amortization of the UAL attributable to the ERI program over 16 years with payments increasing by 4.50% per year, consistent with the prior valuation.
- Total Employer Cost is the sum of the Employer Normal Cost, the Amortization of the UAL and the Amortization of the ERI, all computed as of January 1 of each year and adjusted for semi-annual equal payments made July 1 and January 1.
- For fiscal year 2013, we show the actual appropriation developed under the previous funding schedule of \$35,056,320. The Board has adopted a funding policy that provides for a 7% increase in the appropriation for fiscal years 2014 and 2015 and an 8% increase in the appropriation for fiscal years 2016 and 2017. The amortization payments toward the unfunded actuarial accrued liability for 2018 and subsequent years are adjusted to reflect this.
- Benefit payments exclude cost-of-living increases granted to members in pay status between 1982 and 1997. In addition, benefit payments are as expected for the first ten years of the forecast, then increase by the greater of 4.50% per year thereafter or the expected future payments for the current population projected by our computer model.

## SECTION 3 - CHAPTER 32 OF M.G.L. APPROPRIATIONS

### Exhibit 3.2 - 30-Year Forecast of Annual Appropriations

Fiscal Year Ending	Employer Normal Cost	Amortization Payment of UAL	Amortization Payment of ERI 2002	Amortization Payment of ERI 2003	Total Employer Cost	Increase over Prior Appropriation
2013	\$8,545,215	\$25,185,626	\$1,108,202	\$217,277	\$35,056,320	
2014	8,605,345	27,519,795	1,158,071	227,055	37,510,266	7.00%
2015	8,653,579	30,034,945	1,210,184	237,272	40,135,980	7.00%
2016	8,688,731	33,145,537	1,264,641	247,949	43,346,858	8.00%
2017	8,709,521	36,524,429	1,321,550	259,107	46,814,607	8.00%
2018	8,714,589	40,056,770	1,381,020	270,767	50,423,146	7.71%
2019	8,702,477	41,659,040	1,443,167	282,951	52,087,635	3.30%
2020	8,671,625	43,325,402	1,508,109	295,684	53,800,820	3.29%
2021	8,620,375	45,058,418	1,575,974	308,989	55,563,756	3.28%
2022	8,546,953	46,860,755	1,646,893	322,895	57,377,496	3.26%
2023	8,449,465	48,735,185	1,721,003	337,425	59,243,078	3.25%
2024	8,325,898	50,684,592	1,798,447	352,608	61,161,545	3.24%
2025	8,174,097	52,711,976	1,879,378	368,476	63,133,927	3.22%
2026	7,991,777	54,820,455	1,963,950	385,057	65,161,239	3.21%
2027	7,776,493	57,013,273	2,052,327	402,385	67,244,478	3.20%
2028	7,525,652	59,293,804	2,144,683	420,492	69,384,631	3.18%
2029	7,236,488	61,665,556	-	-	68,902,044	-0.70%
2030	7,562,129	64,132,178	-	-	71,694,307	4.05%
2031	7,902,425	66,697,465	-	-	74,599,890	4.05%
2032	8,258,033	69,365,364	-	-	77,623,397	4.05%
2033	8,629,645	72,139,978	-	-	80,769,623	4.05%
2034	9,017,978	75,025,577	-	-	84,043,555	4.05%
2035	9,423,788	78,026,601	-	-	87,450,389	4.05%
2036	9,847,859	81,147,665	-	-	90,995,524	4.05%
2037	10,291,012	84,393,572	-	-	94,684,584	4.05%
2038	10,754,108	87,769,314	-	-	98,523,422	4.05%
2039	11,238,043	91,280,087	-	-	102,518,130	4.05%
2040	11,743,755	94,931,289	-	-	106,675,044	4.05%
2041	12,272,225	-	-	-	12,272,225	-88.50%
2042	12,824,474	-	-	-	12,824,474	4.50%



## SECTION 3 - CHAPTER 32 OF M.G.L. APPROPRIATIONS

### Exhibit 3.3 - 30-Year Forecast of Cash Flow

Calendar Year	Assets, BOY	Benefit Payments	Employee Contributions	Employer Contributions	Investment Return	Assets, EOY
2012	\$396,103,870	\$67,406,100	\$20,400,686	\$33,096,258	\$33,047,134	\$415,241,848
2013	415,241,848	59,902,359	21,624,986	35,412,997	35,186,618	447,564,090
2014	447,564,090	63,519,541	22,918,161	37,891,905	37,917,419	482,772,033
2015	482,772,033	67,141,931	24,283,931	40,923,257	40,928,854	521,766,144
2016	521,766,144	70,999,184	25,726,212	44,197,118	44,258,527	564,948,817
2017	564,948,817	75,087,667	27,249,122	47,603,897	47,930,348	612,644,517
2018	612,644,517	79,284,339	28,856,999	49,175,321	51,818,492	663,210,990
2019	663,210,990	83,508,850	30,554,406	50,792,719	55,945,932	716,995,197
2020	716,995,197	88,118,502	32,346,144	52,457,085	60,325,406	774,005,330
2021	774,005,330	92,683,647	34,237,265	54,169,415	64,976,669	834,705,032
2022	834,705,032	97,299,072	36,233,087	55,930,690	69,933,212	899,502,949
2023	899,502,949	101,976,597	38,339,201	57,741,893	75,227,738	968,835,184
2024	968,835,184	106,565,544	40,561,495	59,603,996	80,902,214	1,043,337,345
2025	1,043,337,345	111,360,993	42,906,157	61,517,956	86,995,274	1,123,395,739
2026	1,123,395,739	116,372,238	45,379,703	63,484,718	93,538,016	1,209,425,938
2027	1,209,425,938	121,608,989	47,988,982	65,505,211	100,563,888	1,301,875,030
2028	1,301,875,030	127,081,394	50,741,203	65,049,605	107,906,407	1,398,490,851
2029	1,398,490,851	132,800,057	53,024,557	67,685,749	115,781,423	1,502,182,523
2030	1,502,182,523	138,776,060	55,410,662	70,428,875	124,228,136	1,613,474,136
2031	1,613,474,136	145,020,983	57,904,142	73,283,333	133,288,686	1,732,929,314
2032	1,732,929,314	151,546,927	60,509,828	76,253,647	143,008,390	1,861,154,252
2033	1,861,154,252	158,366,539	63,232,771	79,344,528	153,435,974	1,998,800,986
2034	1,998,800,986	165,493,033	66,078,245	82,560,879	164,623,844	2,146,570,921
2035	2,146,570,921	172,940,219	69,051,766	85,907,799	176,628,363	2,305,218,630
2036	2,305,218,630	180,722,529	72,159,096	89,390,597	189,510,156	2,475,555,950
2037	2,475,555,950	188,855,043	75,406,255	93,014,799	203,334,442	2,658,456,403
2038	2,658,456,403	197,353,520	78,799,537	96,786,155	218,171,382	2,854,859,957
2039	2,854,859,957	206,234,428	82,345,516	100,710,649	234,096,465	3,065,778,159
2040	3,065,778,159	215,514,977	86,051,064	11,586,062	243,734,240	3,191,634,548
2041	3,191,634,548	225,213,151	89,923,362	12,107,435	253,733,991	3,322,186,185

## SECTION 4 - REQUIRED DISCLOSURES

The Governmental Accounting Standards Board (GASB) requires certain disclosures of pension liabilities for public employer financial statements in accordance with Statement Numbers 25 and 27. Footnote disclosures required by GASB Statement Numbers 25 and 27 include a description of the Plan, a summary of significant accounting policies and information about contributions, legally required reserves and investment concentrations. The Annual Required Contribution (ARC) shown is for the fiscal year beginning the following July 1.

Below is the required disclosure information:

<u>Valuation Date</u>	<u>1/1/2012</u>	<u>1/1/2010</u>
1. Actuarial Accrued Liability	\$982,796,782	\$863,002,067
2. Actuarial Value of Assets	436,671,982	413,976,785
3. Unfunded Actuarial Accrued Liability (UAAL)	\$546,124,800	\$449,025,282
4. Funded Ratio = 2. ÷ 1.	44.4%	48.0%
5. Covered Payroll	\$238,952,079	\$241,992,607
6. UAAL as a Percentage of Covered Payroll = 3. ÷ 5.	228.5%	185.6%
7. Annual Required Contribution (ARC)	\$35,056,320	\$31,200,000
8. Net Pension Obligation	\$0	\$0

### Schedule of Funding Progress

Actuarial Valuation Date	Actuarial Value of Assets (a)	Actuarial Accrued Liability (b)	Unfunded AAL (UAAL) (b-a)	Funded Ratio (a/b)	Covered Payroll (c)	UAAL as a Percentage of Covered Payroll ((b-a) / c)
1/1/2012	436,671,982	982,796,782	546,124,800	44.4%	238,952,079	228.5%
1/1/2010	413,976,785	863,002,067	449,025,282	48.0%	241,992,607	185.6%
1/1/2007	389,758,785	692,768,325	303,009,540	56.3%	211,518,755	143.3%
1/1/2004	350,879,900	552,773,549	201,893,649	63.5%	170,669,442	118.0%
1/1/2001	316,389,108	426,280,953	109,891,845	74.2%	145,000,347	76.0%
1/1/1999	248,967,040	374,455,997	125,488,957	66.5%	119,857,640	105.0%
1/1/1998	240,982,371	394,330,873	153,348,502	61.1%	134,803,954	114.0%
1/1/1997	174,065,213	291,956,757	117,891,544	59.6%	111,270,545	106.0%

Worcester Regional Retirement System  
Actuarial Valuation as of January 1, 2012

## SECTION 4 - REQUIRED DISCLOSURES

The most recent actuarial valuation of the System was prepared by KMS Actuaries, LLC as of January 1, 2012.

The normal cost for employees on that date was:	\$20,400,686	8.5% of payroll
The normal cost for the employer was:	\$8,067,437	3.4% of payroll

The actuarial liability for active members was:	\$509,004,624
The actuarial liability for retired and inactive members was:	473,792,158
Total actuarial liability:	\$982,796,782
System assets as of that date:	\$436,671,982
Unfunded actuarial accrued liability:	\$546,124,800

The ratio of System assets to total actuarial accrued liability was: 44.4%

The principal actuarial assumptions used in the valuation are as follows:

Investment Return:	8.00%
Rate of Salary Increase:	3.00% (all years)

### Schedule of Funding Progress

Actuarial Valuation Date	Actuarial Value of Assets (a)	Actuarial Accrued Liability (b)	Unfunded AAL (UAAL) (b- a)	Funded Ratio (a/b)	Covered Payroll (c)	UAAL as a Percentage of Covered Payroll ((b-a) / c)
1/1/2012	436,671,982	982,796,782	546,124,800	44.4%	238,952,079	228.5%
1/1/2010	413,976,785	863,002,067	449,025,282	48.0%	241,992,607	185.6%
1/1/2007	389,758,785	692,768,325	303,009,540	56.3%	211,518,755	143.3%
1/1/2004	350,879,900	552,773,549	201,893,649	63.5%	170,669,442	118.0%
1/1/2001	316,389,108	426,280,953	109,891,845	74.2%	145,000,347	76.0%
1/1/1999	248,967,040	374,455,997	125,488,957	66.5%	119,857,640	105.0%
1/1/1998	240,982,371	394,330,873	153,348,502	61.1%	134,803,954	114.0%
1/1/1997	174,065,213	291,956,757	117,891,544	59.6%	111,270,545	106.0%

Worcester Regional Retirement System  
Actuarial Valuation as of January 1, 2012



## SECTION 5 - SUMMARY OF PLAN PROVISIONS

### Administration

There are 106 contributory retirement systems for public employees in Massachusetts. Each system is governed by a retirement board and all boards, although operating independently, are governed by Chapter 32 of the Massachusetts General Laws and other applicable statutes. This law in general provides uniform benefits, uniform contribution requirements and a uniform accounting and funds structure for all systems.

### Participation

Participation is mandatory for all full-time employees. Eligibility with respect to part-time, provisional, temporary, seasonal or intermittent employment is governed by regulations promulgated by the local retirement board, and approved by PERAC. Membership is optional for certain elected officials.

There are four classes of membership in the Retirement System:

- |          |  |
|----------|--|
| Group 1: | General employees, including clerical, administrative, technical and all other employees not otherwise classified. |
| Group 2: | Certain specified hazardous duty positions.  |
| Group 3: | State police officers and inspectors.  |
| Group 4: | Local police officers, firefighters and other specified hazardous positions.                                       |

For members in more than one group, participation will be proportional.

### Member Contributions

Member contributions vary depending on the most recent date of membership:

- |                         |   |
|-------------------------|---|
| Prior to 1975:          | 5% of Salary                                      |
| 1975 - 1983:            | 7% of Salary                                      |
| 1984 - June 30, 1996:   | 8% of Salary                                      |
| July 1, 1996 - present: | 9% of Salary                                      |
| 1979 - present:         | An additional 2% of Salary in excess of \$30,000. |

### Rate of Interest

Interest on regular deductions made after January 1, 1984 is a rate established by PERAC in consultation with the Commissioner of Banks. The rate is obtained from the average rates paid on individual savings accounts by a representative sample of at least ten financial institutions.

### Retirement Age

The mandatory retirement age for some Group 2 and Group 4 members is age 65. Most Group 2 and Group 4 members may remain in service after reaching age 65. Group 4 members who are employed in certain public safety positions are required to retire at age 65. There is no mandatory retirement age for members in Group 1.

## SECTION 5 - SUMMARY OF PLAN PROVISIONS

**Salary** Gross regular compensation. This does not include bonuses, overtime, severance pay, unused sick leave credit or other similar compensation.

**Average Salary** Average annual rate of regular compensation received during the three consecutive years that produce the highest average, or, if greater, during the last three years (whether or not consecutive) preceding retirement.

**Creditable Service** The period during which a member contributes to the retirement system plus certain periods of military service and "purchased" service.

**Benefit Rate** Varies with the member's retirement age, but the highest rate of 2.5% applies to Group 1 members who retire at or after age 65, Group 2 members who retire at or after age 60 and to Group 4 members who retire at or after age 55.

A .1% reduction is applied to each year of age under the maximum age for the member's group.

The benefit rate for Group 1 is used for Group 2 members who terminate from service prior to age 55.

Rate	Group 1	Age Group 2	Group 4
2.50%	65+	60+	55+
2.40%	64	59	54
2.30%	63	58	53
2.20%	62	57	52
2.10%	61	56	51
2.00%	60	55	50
1.90%	59	--	49
1.80%	58	--	48
1.70%	57	--	47
1.60%	56	--	46
1.50%	55	--	45

## SECTION 5 - SUMMARY OF PLAN PROVISIONS

<b>Superannuation Retirement</b>	Eligibility	<ul style="list-style-type: none"><li>• completion of 20 years of Creditable Service, or</li><li>• attainment of age 55 if hired prior to 1978, or if classified in Group 4, or</li><li>• attainment of age 55 with 10 years of Creditable Service, if hired after 1978, and if classified in Group 1 or 2</li></ul>
	Benefit Amount	Product of the member's Benefit Rate, Average Salary and Creditable Service.
	Maximum Benefit	80% of the member's Average Salary.
	Veteran's Benefit	Additional benefit of \$15 per year of Creditable Service, up to a maximum of \$300.
<b>Deferred Vested</b>	Eligibility	<ul style="list-style-type: none"><li>• completion of ten or more years of Creditable Service.</li><li>• elected officials hired prior to 1978, completion of six years of Creditable Service.</li></ul>
	Benefit Amount	Accrued benefit payable commencing at age 55, or the completion of 20 years of Creditable Service, or may be deferred until later at the participant's option.
<b>Withdrawal of Contributions</b>		<p>Contributions may be withdrawn upon termination of employment.</p> <ul style="list-style-type: none"><li>• Members hired prior to 1984 receive contributions plus 100% of interest credited.</li><li>• Members hired after 1983 with less than five years of Creditable Service receive contributions only.</li><li>• Members hired after 1983 with more than five years of Creditable Service but less than ten years receive contributions plus 50% of interest credited.</li><li>• Members hired after 1983 with more than ten years of Creditable Service receive contributions plus 100% of interest credited.</li></ul>



## SECTION 5 - SUMMARY OF PLAN PROVISIONS

<b>Ordinary Disability Retirement</b>	Eligibility	Non-job related disability after completion of ten years of Creditable Service.
	Benefit Amount	Superannuation benefit determined if the member is age 55, up to a maximum of 80% of Average Salary over three years. If the member is a veteran, 50% of final rate of salary (final year) plus an annuity based on the accumulated member contributions plus credited interest, up to a maximum of 80% of Average Salary over five years.
<b>Accidental Disability Retirement</b>	Eligibility	Disabled as a result of an accident in the performance of duties. There is no minimum age or service requirement.
	Benefit Amount	72% of Salary plus an annuity based on accumulated member contributions plus credited interest.
	Maximum Benefit	100% of Salary if hired before January 1, 1988, otherwise 75% of Salary.
	Veteran's Benefit	Additional allowance of \$15 per year of Creditable Service, up to a maximum of \$300.
	Supplemental Dependent Allowance	Additional allowance of \$415 per year for each child.
<b>Non-Occupational Death</b>	Eligibility	For members with at least two years of creditable service who die while in active service, but not due to occupational injury.
	Benefit Amount	Benefit as if Option C had been elected. Minimum benefit of \$250 per month for surviving spouse, \$120 per month for first child and \$90 per month for each additional child.
<b>Accidental Death</b>	Eligibility	For members who die as a result of an occupational injury.
	Benefit Amount	72% of Salary plus an annuity based on accumulated member contributions plus credited interest.
	Maximum Benefit	100% of Salary if hired before January 1, 1988, otherwise 75% of Salary.

## SECTION 5 - SUMMARY OF PLAN PROVISIONS

Veteran's Benefit Additional allowance of \$15 per year of creditable service, up to a maximum of \$300.

Supplemental Dependent Allowance Additional allowance of \$708.60 per year for each child until age 18 (or age 22 if a full-time student).

**Cost-of-Living Adjustment (COLA)** In accordance with the adoption of Chapter 17 of the Acts of 1997, the granting of a Cost-of-Living Adjustment will be determined by an annual vote by the Retirement Board. The amount of increase will be based upon the Consumer Price Index, limited to a maximum of 3.0%, beginning on July 1. All retirees, disabled retirees and beneficiaries who have been receiving benefit payments for at least one year as of July 1 are eligible for the adjustment. The maximum amount of pension benefit subject to a COLA is \$14,000. All COLAs granted to members after 1981 and prior to July 1, 1998 are deemed to be an obligation of the Commonwealth of Massachusetts and are not the liability of the Retirement System.

**Optional Forms of Payment** A member may elect to receive his or her retirement allowance in one of three forms of payment:

- Option A – Life annuity.
- Option B – Life annuity with death benefit equal to excess of member contributions plus credited interest to retirement over annuity benefit paid to member.
- Option C – Life annuity with 66 $\frac{2}{3}$ % of benefit continued to designated joint annuitant upon death of member.

## SECTION 6 - ACTUARIAL ASSUMPTIONS AND METHODS

**Valuation Date:** January 1, 2012

**Investment Return:** 8.00% per year.

**Annuity Savings Fund Interest Rate:** 3.00% per year

**Amortization Method:** *Remaining Unfunded Actuarial Accrued Liability (UAL):*  
Increasing dollar amount at 4.00% to reduce the Unfunded Actuarial Accrued Liability, excluding any Unfunded Actuarial Accrued Liability attributable to the Early Retirement Incentive program (ERI), to zero on or before June 30, 2040.

*Early Retirement Incentive Program:*  
Increasing dollar amount at 4.50% to reduce the Unfunded Actuarial Accrued Liability attributable to the Early Retirement Incentive Program (ERI) to zero on or before June 30, 2028. No change from prior valuation.

**Salary Scale:** The assumed annual rates for salary increases including longevity are illustrated by the following rates:

<u>Year</u>	<u>General Employees</u>	<u>Police and Fire</u>
All years	3.00%	3.00%

**Cost-of-Living Allowance:** Cost-of-Living Allowances (COLA) are assumed to be 3% of the pension amount, capped at \$420 per year.

**Mortality Table:** RP-2000 Mortality Table Projected to 2012 with Scale AA. RP-2000 Mortality Table set forward two years for disabled Public Safety members.

*General Employees:* 55% of deaths are job-related.

*Police and Fire:* 90% of deaths are job-related.



## SECTION 6 - ACTUARIAL ASSUMPTIONS AND METHODS

**Turnover Rates:** Illustrative turnover rates are shown below:

<u>Creditable Service</u>	<u>General Employees</u>	<u>Police and Fire</u>
0	0.1500	0.0150
10	0.0540	0.0150
20	0.0200	0.0000
30	0.0000	0.0000

**Disability Rates:** Illustrative disability rates are shown below:

<u>Attained Age</u>	<u>General Employees</u>	<u>Police and Fire</u>
20	0.0001	0.0010
30	0.0003	0.0030
40	0.0010	0.0030
50	0.0019	0.0125

*General Employees:* 55% of disabilities are accidental and 45% are ordinary.

*Police and Fire:* 90% of disabilities are accidental and 10% are ordinary.

**Retirement Rates:** Illustrative retirement rates are shown below:

<u>Age</u>	<u>General Employees</u>		<u>Police and Fire</u>
	<u>Male</u>	<u>Female</u>	<u>Male &amp; Female</u>
50	0.0100	0.0150	0.0200
51	0.0100	0.0150	0.0200
52	0.0100	0.0200	0.0200
53	0.0100	0.0250	0.0500
54	0.0200	0.0250	0.0750
55	0.0200	0.0550	0.1500
56	0.0250	0.0650	0.1000
57	0.0250	0.0650	0.1000
58	0.0500	0.0650	0.1000
59	0.0650	0.0650	0.1500
60	0.1200	0.0500	0.2000
61	0.2000	0.1300	0.2000
62	0.3000	0.1500	0.2500
63	0.2500	0.1250	0.2500
64	0.2200	0.1800	0.3000
65	0.4000	0.1500	1.0000

## SECTION 6 - ACTUARIAL ASSUMPTIONS AND METHODS

**Retirement Rates (continued):**

<u>Age</u>	<u>General Employees</u>		<u>Police and Fire</u>
	<u>Male</u>	<u>Female</u>	<u>Male &amp; Female</u>
66	0.2500	0.2000	1.0000
67	0.2500	0.2000	1.0000
68	0.3000	0.2500	1.0000
69	0.3000	0.2000	1.0000
70	1.0000	1.0000	1.0000

**Actuarial Cost Method:** Individual Entry Age Normal.

**Actuarial Asset Method:** The Actuarial Value of Assets is the market value of assets as of the valuation date reduced by the sum of:

- a) 80% of gains and losses of the prior year,
- b) 60% of gains and losses of the second prior year,
- c) 40% of gains and losses of the third prior year and
- d) 20% of gains and losses of the fourth prior year.

Investment gains and losses are determined by the excess or deficiency of the expected return over the actual return on the market value. The actuarial valuation of assets is further constrained to be not less than 80% or more than 120% of market value.

**Census Data:** Census data as of the valuation date were submitted by the Retirement Board.

**Asset Data:** Asset information is reported annually to the Public Employee Retirement Administration Commission by the Worcester Regional Contributory Retirement System.

**Dependents:** 80% of all members will be survived by a spouse. Age assumption for spouses is that males are assumed to be three years older than females.

**Administrative Expenses:** The anticipated administrative expenses for the fiscal year. For Fiscal Year 2013 and later, the administrative expenses were assumed to be \$0.





## SECTION 7 - PLAN MEMBER INFORMATION

### Exhibit 7.2 - Retired Plan Members and Beneficiaries Annual Pensions as of January 1, 2012

Attained Age	Male		Female		Total	
	Count	Total Payments	Count	Total Payments	Count	Total Payments
<20	0	0	0	0	0	0
20-24	0	0	0	0	0	0
25-29	0	0	0	0	0	0
30-34	0	0	1	17,895	1	17,895
35-39	0	0	1	10,532	1	10,532
40-44	0	0	3	22,234	3	22,234
45-49	5	88,096	4	92,694	9	180,790
50-54	20	559,780	26	578,806	46	1,138,586
55-59	56	1,765,262	67	806,386	123	2,571,648
60-64	165	4,933,999	225	3,016,793	390	7,950,792
65-69	188	5,066,396	299	4,308,304	487	9,374,700
70-74	168	3,888,647	269	3,827,204	437	7,715,851
75-79	135	2,398,739	261	3,111,375	396	5,510,114
80-84	123	2,072,189	240	2,393,232	363	4,465,422
85-89	89	1,085,746	237	1,884,863	326	2,970,609
90-94	21	249,891	110	738,726	131	988,617
95+	5	33,463	24	157,321	29	190,783
<b>Total</b>	<b>975</b>	<b>22,142,208</b>	<b>1,767</b>	<b>20,966,364</b>	<b>2,742</b>	<b>43,108,572</b>
Average Age	72.4		75.0		74.1	
Average Payment		22,710		11,866		15,722
	35.6%	51.4%	64.4%	48.6%	100.0%	100.0%

Worcester Regional Retirement System  
Actuarial Valuation as of January 1, 2012

## SECTION 7 - PLAN MEMBER INFORMATION

**Exhibit 7.3 - Disabled Plan Members Annual Pensions as of January 1, 2012**

Attained Age	Male		Female		Total	
	Count	Total Payments	Count	Total Payments	Count	Total Payments
<20	0	0	0	0	0	0
20-24	0	0	0	0	0	0
25-29	0	0	0	0	0	0
30-34	0	0	1	20,501	1	20,501
35-39	5	192,428	1	36,878	6	229,306
40-44	9	275,743	0	0	9	275,743
45-49	14	489,939	3	128,764	17	618,703
50-54	15	489,283	9	202,554	24	691,837
55-59	35	1,152,664	7	98,231	42	1,250,895
60-64	34	987,911	3	15,369	37	1,003,280
65-69	29	788,118	4	96,573	33	884,691
70-74	16	390,695	3	50,319	19	441,014
75-79	20	426,052	5	115,025	25	541,077
80-84	11	232,417	2	28,807	13	261,224
85-89	3	68,410	1	7,580	4	75,989
90-94	3	40,993	0	0	3	40,993
95+	0	0	0	0	0	0
Total	194	5,534,651	39	800,603	233	6,335,254
Average Age	63.3		61.9		63.1	
Average Payment	83.3%	28,529	16.7%	20,528	100.0%	27,190
		87.4%	12.6%			100.0%

## SECTION 8 - GLOSSARY OF TERMS

**Actuarial Accrued Liability** – That portion of the Actuarial Present Value of pension plan benefits which is not provided by future Normal Costs or employee contributions. It is the portion of the Actuarial Present Value attributable to service rendered as of the Valuation Date.

**Actuarial Assumptions** – Assumptions, based upon past experience or standard tables, used to predict the occurrence of future events affecting the commencement, amount and duration of pension benefits, such as: changes in compensation, mortality, withdrawal, disablement and retirement; rates of investment earnings and asset appreciation or depreciation; and any other relevant items.

**Actuarial Cost Method (or Funding Method)** – A procedure for allocating the Actuarial Present Value of all past and future pension plan benefits to the current year (Normal Cost) and the past (Actuarial Accrued Liability).

**Actuarial Gain or Loss (or Experience Gain or Loss)** – A measure of the difference between actual experience and that expected based upon the set of Actuarial Assumptions, during the period between the valuation date and the most recent immediately preceding valuation date.

**Note:** The effect on the Accrued Liability and/or the Normal Cost resulting from changes in the Actuarial Assumptions, the Actuarial Cost Method or Plan provisions would be described as such, not as an Actuarial Gain (Loss).

**Actuarial Present Value** – The dollar value on the valuation date of all benefits expected to be paid to current members based upon the Actuarial Assumptions and the terms of the Plan.

**Amortization Payment** – That portion of the pension plan appropriation which represents payments made to pay interest on and the reduction of the Unfunded Accrued Liability.

**Annual Required Contribution (ARC)** – The employer's periodic required contributions to a defined benefit pension plan, calculated in accordance with the rules required by the Governmental Accounting Standards Board (GASB).

**Annual Statement** – The statement submitted by the local retirement board to PERAC each year that describes the asset holdings and Fund balances as of December 31 and the transactions during the calendar year that affected the financial condition of the retirement system.

**Annuity Reserve Fund** – The fund into which total accumulated Member Contributions, including interest, is transferred at the time a member retires, and from which annuity payments are made.

**Annuity Savings Fund** – The fund in which Member Contributions plus interest credited are held for active members and for former members who have not withdrawn their contributions and are not yet receiving a benefit (inactive members).



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## SECTION 8 - GLOSSARY OF TERMS

**Assets** – The total value of the investments held by the Plan trust that are for the payment of promised benefits.

**Cost of Benefits** – The estimated payment from the pension system for benefits for the fiscal year.

**Expense Fund** – The fund into which the appropriation for administrative expenses is paid and from which all such expenses are paid.

**Funded Ratio** – The Actuarial Value of Assets expressed as a percentage of the Actuarial Accrued Liability.

**Funding Schedule** – The schedule based upon the most recently approved actuarial valuation which sets forth the amount which would be appropriated to the pension system in accordance with Section 22D of M.G.L. Chapter 32.

**GASB** – Governmental Accounting Standards Board.

**Normal Cost** – Total Normal Cost is that portion of the Actuarial Present Value of pension plan benefits which is expected to accrue in the current fiscal year. The Employee Normal Cost is the amount of the expected Member Contributions for the current fiscal year. The Employer Normal Cost is the difference between the Total Normal Cost and the Employee Normal Cost.

**Pension Benefit Obligation** – The portion of the Actuarial Present Value attributable to past service in accordance with the Projected Unit Credit cost method as stipulated by GASB Statement Number 5 (GASB 5). GASB 5 has been superseded by GASB Statements Number 25 and 27.

**Pension Fund** – The fund into which appropriation amounts as determined by PERAC are paid and from which pension benefits are paid.

**Pension Reserve Fund** – The fund which shall be credited with all amounts set aside by a system for the purpose of establishing a reserve to meet future pension liabilities. These amounts would include excess interest earnings.

**Present Value of Future Benefits** – The actuarial present value of the cost to finance benefits payable in the future, discounted to reflect the expected effects of the time value of money and the probabilities of payment.

**Special Fund for Military Service Credit** – The fund which is credited with amounts paid by the retirement board equal to the amount which would have been contributed by a member during a military leave of absence as if the member had remained in active service of the retirement board. In the event of retirement or a non-job related death, such amount is transferred to the Annuity Reserve Fund. In the event of termination prior to retirement or death, such amount shall be transferred to the Pension Fund.

**Unfunded Actuarial Accrued Liability** – The excess of the Actuarial Accrued Liability over the Actuarial Value of Assets.

**SAMPLE  
BENEFIT COST ESTIMATE  
RESULTS**



November 8, 2012

Mr. Ted C. Alexiades  
Chairman  
Hingham Contributory  
Retirement Board  
210 Central Street  
Hingham, MA 02043

Dear Ted:

As requested, we have analyzed the impact on the Hingham Retirement System's liabilities and funding schedule as a result of adoption of certain local options. We used the data and results of the most recently completed January 1, 2012 valuation to develop the change in the accrued liability and normal cost and the resulting impact on the funding schedule. The results of our analysis follows:

1. Increase Benefits Payable to Widows and Widowers of Disabled Public Employees under §101 of Chapter 32

A local option is available to raise the minimum benefits payable to surviving spouses of disabled employees from \$9,000 to \$12,000. The accrued liability as a result of this benefit change is expected to increase by \$78,000.

The impact in the appropriation for fiscal year 2013 is an increase of \$4,600.

2. Increase Minimum Allowance in §12 of Chapter 32 from \$250 per month to \$500 per month.

A local option is available to raise the minimum allowance payable to Option C surviving spouses of members who die in active service but not due to occupational injury from \$250 per month to \$500 per month. The normal cost and accrued liability as a result of this benefit change are expected to increase by \$10,200 and \$185,000, respectively.

The impact in the appropriation for fiscal year 2013 is an increase of \$21,500.

K M S A C T U A R I E S



3. Increase the COLA Base from \$12,000 to \$13,000

A local option is available to raise the maximum base amount on which the annual cost-of-living adjustment (COLA) is calculated. Currently, the COLA percentage is applied to a retiree's retirement allowance up to \$12,000. The Board may increase the maximum base amount in multiples of \$1,000. The normal cost and accrued liability as a result of increasing the maximum base amount to \$13,000 are expected to increase by \$25,100 and \$533,500, respectively.

The impact in the appropriation for fiscal year 2013 is an increase of \$57,600.

4. Increase Board Member stipend from \$3,000 up to \$4,500

A local option is available to increase the Board Member stipend from \$3,000 up to \$4,500. We understand that Board Members do not currently receive a stipend.

Providing a \$3,000 or \$4,500 stipend to five Board Members will increase the System's administrative expenses and thus the appropriation for fiscal year 2013 by \$15,600 and \$23,400, respectively, increasing by 4½% per year.

5. Establish a \$15,000 minimum retirement allowance for retirees with 25 or more years of credited service at retirement

A local option is available to establish a \$15,000 minimum retirement allowance for retirees with 25 or more years of credited service at retirement. The normal cost is expected to decrease by \$57,000 and the accrued liability is expected to increase by \$1,305,700.

The impact in the appropriation for fiscal year 2013 is an increase of \$17,800.

We have provided a summary of these proposed changes below:

Option	Increase/(Decrease)		
	Accrued Liability	Normal Cost	2013 Appropriation
1 - §101 Minimum Allowance	\$78,000	\$0	\$4,600
2 - §12 Minimum Allowance	185,000	10,200	21,500
3 - Increase to COLA Base	533,500	25,100	57,600
4a - Board Stipend - \$3,000		15,000	15,600
4b - Board Stipend - \$4,500		22,500	23,400
5 - Establish Minimum with 25 Years of Service	1,305,700	(57,000)	17,800

Mr. Ted C. Alexiades

November 8, 2012

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In closing, we are happy to answer any questions you may have regarding the material we have provided in this supplemental report.

Sincerely,

A handwritten signature in black ink that reads "Linda Bournival". The signature is written in a cursive style with a large, looped "L" and "B".

Linda L. Bournival, FSA, EA  
Consulting Actuary