Request for Proposal

for the

Actuarial Audit of the Ohio State Highway Patrol Retirement System

for

The Ohio Retirement Study Council

June 18, 2021

Submitted by

William B. Fornia, FSA, EA, MAAA, President
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KMS Actuaries, LLC
52 Hunt Road
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June 18, 2021

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

Dear Bethany:

Pension Trustee Advisors (PTA), partnering with KMS Actuaries (KMS), is pleased to present this competitive offer in response to the Ohio Retirement Study Council's (ORSC) request for proposals (RFP) for actuarial audit services of the Ohio State Highway Patrol Retirement System (HPRS).

This type of assignment is our primary business. Unlike most actuarial firms, most of PTA's work involves a second actuary. We would be privileged to continue to serve as your auditing actuary and look forward to the opportunity to present our qualifications to you and in person and on the following pages.

We understand the work to be done and will make a commitment to perform the work as scheduled. PTA and KMS have the ability, willingness, knowledge, experience and resources to not only meet your needs, but exceed them, subject to the terms of the RFP. William (Flick) Fornia and Linda Bournival will be the primary consultants for ORSC and HPRS.

William B. Fornia, FSA, EA, MAAA	**Linda L. Bournival, FSA, EA, MAAA**
<u>**President**</u>	<u>**Consulting Actuary**</u>
Pension Trustee Advisors, Inc.	KMS Actuaries, LLC
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Public Pension Focus

The turmoil in public pensions is not unique to Ohio. Flick Fornia and Linda Bournival have been involved considerably in this arena both currently as well as through our prior employers. Our participation has ranged from actuarial valuations and audits of numerous pension systems to working outside the pension systems to help our clients' effect change. These engagements have been on all sides of the pension reform and often include state organizations such as ORSC. For example, PTA/KMS recently completed thorough actuarial reviews for the Colorado Office of the State Auditor and the Government of Guam. And of course, we are extremely proud of the role we played with ORSC in the review of Ohio's funding plans leading to one of the most comprehensive and balanced pension reforms in the country in addition to our audits of SERS, OP&F and OPERS.

We continue to have substantial involvement in the forefront of the public pension scene. Linda has a sound foundation of public pension and health actuarial valuations both large and small, through KMS and prior firms. Flick is a nationally recognized public plan actuary and advisor. He was reelected by the 30,000 worldwide membership of the Society of Actuaries to serve on the Board of Directors, recently completed a pension research project with the University of California and authored an often-cited paper for the National Institute on Retirement Security on the economic efficiencies of defined benefit pensions. He is well known throughout the public pension community for his ability to explain complex matters to a lay audience.

Our Philosophy

Our objective is to provide ORSC and HPRS with accurate, well-understood information so that they can make the right decisions. Pensions are controversial these days and difficult to understand. We analyze the facts and present them in a manner that will enable the best decisions to be made. We do this through (1) timely and responsive client service; (2) accurate, peer-reviewed, thorough actuarial analysis; and (3) effective oral and written communication of our findings. We encourage you to contact our clients (including ORSC Council members and OPERS, OP&F and SERS representatives) to confirm how we have accomplished our mission in the past.

We are happy to answer any questions on this proposal and look forward to discussing this with you further.

Sincerely,

William B. Fornia, FSA
President
Pension Trustee Advisors

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

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PTA | PENSION TRUSTEE ADVISORS

1.   Proposal Summary

In response to your Request for Proposal (RFP) for an Actuarial Audit, we are pleased to provide this proposal presenting our services for actuarial audit, advisory and related consulting to the Ohio Retirement Study Council (ORSC) and the Ohio State Highway Patrol Retirement System (HPRS).

The services requested will be for the performance of an actuarial audit for the primary purpose of independent verification and analysis of the assumptions, procedures, and methods used by HPRS' consulting actuary Foster & Foster for:

- HPRS annual pension actuarial valuation as of January 1, 2020;

- The five-year experience review for the period December 31, 2013 to December 31, 2018; and

- HPRS annual retiree health care actuarial valuation as of January 1, 2020, including GASB Statement 74 and 75 disclosures.

Below we present a summary of our understanding of the services that are sought by the ORSC and HPRS based on information provided in the RFP and our experience with ORSC and HPRS:

- HPRS is a statewide retirement system that was created in 1944 with the transfer of state troopers out of PERS and into an independent system, operating under the guidelines of Ohio Revised Code Chapter 5505.

- HPRS is funded through investments and contributions made by member employees and their employer. State troopers contribute 14% of their salary, while the State of Ohio contributes an amount equal to 26.50% of salary. Based on employee and employer data as of January 1, 2020, HPRS has 1,528 active members, 15 inactive members, and 1,738 benefit recipients. As of January 1, 2021, HPRS had assets totaling approximately $1 billion.

Specific Audit Requirements

The ORSC has issued an RFP requesting proposals from qualified actuarial consulting firms interested in performing an actuarial audit of HPRS. The RFP specifically is requesting the following services:

- Perform an actuarial audit for the primary purpose of independent verification and analysis of the assumptions, procedures and methods used by the consulting actuary (Foster & Foster) of HPRS for:
  - annual pension actuarial valuation as of January 1, 2020
  - the five-year experience review for the period December 31, 2013 to December 31, 2018
  - HPRS' retiree health care actuarial valuation as of January 1, 2020, including GASB 74 and 75 disclosures

As part of the independent verification analysis the actuarial audit shall include the following elements and activities:

- **Data Validity:**

  - Assess the validity, completeness, and appropriateness for HPRS' structure and funding objectives of the demographic and financial information used by the consulting actuary in the valuation of HPRS.

- **Actuarial Valuation Method and Procedures:**

  - Assess whether the consulting actuary's valuation method and procedures are reasonable and consistent with generally accepted actuarial standards and practices appropriate for HPRS' structure and funding objectives, and are applied as stated by the actuary.

  - Report the impact, if any, of deviations from accepted standards found during the audit, including the rationale for the deviations and determination of effects, including monetary impact.

- **Actuarial Valuation Assumptions:**

  - Determine whether the assumptions utilized in the actuarial valuations:
    - are technically sound,
    - conform to the appropriate Actuarial Standards of Practice,
    - are reasonable based on HPRS' experience, and
    - are appropriate for HPRS' structure and funding objectives
  - Include in the analysis demographic and economic assumptions such as mortality, retirement, separation rates, pay adjustments, rates of investment return and disability factors
  - Determine whether actual experience is appropriately evaluated in the experience study and whether recent changes in assumptions are appropriate, reasonable and supported by the experience study
  - Review the gain/loss analyses from the last four actuarial valuation reports

- **Parallel Valuation:**

  - Perform parallel valuations of pension benefits as of January 1, 2020, and of retiree health care benefits as of January 1, 2020, using the validated member census data and the same actuarial assumptions.

- **Recommendations:**

  - If adjustments to assumptions are recommended to more accurately reflect present and future assets, liabilities, and costs of HPRS:

    - Provide detailed rationale for such recommendations, and

    - Describe the general effect on HPRS' condition resulting from the proposed changes in assumptions.

- **Review of Health Care:**

  o Assess whether the system appropriately and consistently determines retiree contributions to health care and whether the implementation of the HPRS' health care policies differ from those determinations.

This proposal will demonstrate PTA's and KMS' ability to perform the audit and related consulting services that the ORSC requires. Flick Fornia and Linda Bournival can provide proactive, actuarial consulting advice based on years of experience with public sector plan sponsors. Not only should you review our qualifications and experience that we have detailed in Section 2 but we encourage you to contact the references we provide in Section 3 so you can gain confidence in our ability to provide these services. The fact that we have provided actuarial services during the last 30+ years to a large number of public sector clients speaks to our ability to provide satisfactory services.

Of course, our most important reference is the ORSC itself. From November 2011 through July 2012, we worked with ORSC and HPRS nearly every day reviewing plan details and actuarial calculations as a component of our pension reform study. We know ORSC and HPRS quite well and have a thorough understanding of its features and actuarial nuances. We recently conducted an audit of the School Employees Retirement System of Ohio (SERS), the Ohio Public Employees Retirement System (OPERS), and the Ohio Police and Fire Pension Fund (OP&F) for ORSC, so we have been through this process with you three times previously.

- **The firm's primary contact for ORSC staff use and, if different, for HPRS staff use during the audit, including the contact's address, telephone and e-mail address.**

  William (Flick) Fornia and Linda Bournival will be the primary consultants for ORSC and HPRS.

William B. Fornia, FSA, EA, MAAA	Linda L. Bournival, FSA, EA, MAAA
President	**Consulting Actuary**
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e-mail: flick@pensiontrusteeadvisors.com	e-mail: lindab@kmsactuaries.com

- **General ownership structure of the organization, including subsidiary and affiliated companies, and joint venture relationships.**

  Pension Trustee Advisors, a Colorado corporation, was formed in 2010. KMS Actuaries, formed in 2011, is a limited liability company and is solely owned by Linda Bournival.

- **Information regarding any material change in the firm's structure or ownership within the last eighteen months, or any material change in ownership, staff, or structure currently under**

review or being contemplated by the firm.

No material changes in either PTA's or KMS' structure or ownership is currently being contemplated.

- **If available, a third-party assessment or report concerning client satisfaction and measures of the firm's strengths and weaknesses.**

  No third-party assessment of PTA or KMS has been conducted to our knowledge. We encourage a discussion of our past performance with our references as well as knowledgeable ORSC councilmembers and staff.

- **Any material litigation which has been threatened against the firm or to which the firm is currently a party.**

  No litigation has been threatened against either PTA or KMS.

- **A list and brief description of litigation brought against the firm by existing or former clients over the last five years.**

  No litigation has been brought against either PTA or KMS by existing or former clients at any time.

- **A list of any professional relationships involving the ORSC, the five Ohio public retirement systems, the State of Ohio, or its political subdivisions for the past five years, together with a statement explaining why such relationships do not constitute a conflict of interest relative to performing the proposed review. In the event that the firm has had any professional relationships involving the ORSC, the five Ohio public retirement systems, the State of Ohio, or its political subdivisions for the past five years, the firm shall provide a statement explaining why such relationships do not constitute a conflict of interest relative to performing the proposed review, or, if necessary, an explanation of the actions that will be taken to ensure an independent review.**

  Other than previous work performed for ORSC, we have no professional relationships involving the ORSC, the five Ohio public retirement systems, the State of Ohio, or its political subdivisions.

2.   Capabilities and Experience

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

PTA/KMS Clients

- Ohio Retirement Study Council
- Government of Guam
- Ingham County, Michigan
- Materials Innovation and Recycling Authority of Connecticut
- Municipal Employees Retirement System of Michigan
- Confidential Multi-$Billion Public Retirement System
- Colorado Office of the State Auditor
- Kentucky Teachers' Retirement Funding Work Group
- Providence RI Retirees
- Cranston RI Retirees
- Edgewater CO Firemen's Pension Fund

Flick, the proposed lead actuary and consultant for ORSC, has conducted sixteen audits for large defined benefit public retirement systems. We believe that he has more recent experience with actuarial audits for statewide systems than anyone. Flick is well known for his ability to explain complex concepts to lay audiences. He is an author and frequent speaker at organizations such as the Pension Research Council, the 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).

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

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
- City of Austin
- Government of Guam
- State of Nevada
- University of Virgin Islands
- Massachusetts Bay Transportation Authority
- Materials Innovation and Recycling Authority of Connecticut
- CollegeInvest [Colorado 529 College Savings Plan]
- Ingham County, Michigan
- Valley Mental Health, UT
- South Carolina Judiciary
- Louisiana State University
- City of Albuquerque
- Colorado Office of the State Auditor

- Kentucky Teachers' Retirement Funding
  Work Group

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
- Kentucky Teachers' Retirement System

- San Diego City Employees Retirement
  System
- Missouri Public School Retirement System
- City of Edgewater, CO Volunteer
  Firefighters Pension Fund
- California State Teachers Retirement
  System
- Pennsylvania State Employees'
  Retirement System

PTA Clients – Labor Organizations

- International Association of Fire Fighters' Locals of:
  - Arizona
  - Atlanta
  - Dearborn, MI
  - Houston
  - Los Angeles
  - Maine
  - Memphis
  - Nebraska
  - New Jersey
  - Pennsylvania
  - Providence
  - Stamford, CT
  - Wayne County, MI
- Alaska Public Pension Coalition
- Rhode Island Retirement Income Security Coalition
- Washington State Patrol Troopers Association
- American Federation of Teachers
- AFSCME of Cook County, Illinois
- University of California Union Coalition
- City of Providence, RI Opt-out Retirees
- City of Cranston, RI Opt-out Retirees
- Association of Los Angeles Deputy Sheriff

PTA Clients – Other Parties

- National Conference of Public Employee Retirement Systems (includes Highway Patrol)
- Texas Association of Public Employee Retirement Systems
- Assured Guaranty Corporation
- Alvarez and Marsal [Advisor to Detroit COPs holders in Bankruptcy]
- Alpha Sites [Research organization]
- Federal Oversight Management Board of Puerto Rico

PTA ‖ PENSION TRUSTEE ADVISORS

Linda Bournival has provided actuarial consulting and retirement system valuation services for several municipalities and governmental entities over the past 30 years. In addition, she provides valuation services and retiree health care consulting services to many large, medium and small public sector clients. Linda provides recurring services to several public Retirement Systems, including services relating to GASB 67 and GASB 68 disclosure and reporting. She has recently partnered with PTA in providing actuarial audit services to three Ohio retirement systems – OPERS, SERS and OP&F. She has extensive ProVal experience for both pensions and OPEB valuations dating back more than 15 years.

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

Retirement System Clients

Massachusetts

- Andover
- Braintree
- Brockton
- Danvers
- Dukes County
- Franklin Regional
- Hampshire County
- Haverhill
- Hingham
- Lawrence
- Lowell
- New Bedford
- Plymouth
- Reading
- Worcester Regional
- PERAC (State Agency)

Other

- Colorado PERA*
- Edgewater, CO
- Government of Guam*
- Kentucky Teachers*
- Manchester, NH
- Ohio Retirement Study Council*
- Pennsylvania Municipal Retirement*
- Primex (NH)
- Puerto Rico*
- South Burlington (VT) School District
- University of Maine System

* Joint work with PTA

KMS Retiree Medical Clients

- Adams-Cheshire Regional School District
- Amherst, MA
- Amherst – Pelham Regional School District
- Androscoggin Valley Refuse District
- Ashburnham, MA
- Ashburnham Municipal Light, MA
- Assabet Valley Collaborative
- Lenox, MA
- Littleton, MA
- Littleton Electric Light Dept.
- Lynnfield Center Water District
- Lynnfield Water District
- Manchester, NH
- Manchester, NH School District

KMS Retiree Medical Clients

- Becket, MA
- Bedford, MA
- Berkshire Hills Regional School District
- Berlin, NH
- Berlin-Boylston Regional School District
- Beverly, MA
- Blackstone, MA
- Boylston, MA
- Boylston Municipal Light, MA
- Byfield Water District, MA
- Cape Cod Collaborative
- Charlton, MA
- Clinton, MA
- Cohasset, MA
- Coos County, NH
- Danvers, MA
- Dukes County Pooled OPEB Trust
- Epping, NH
- Gardner, MA
- Georgetown Municipal Light Department
- Government of Guam
- Grantham, NH
- Great Barrington, MA
- Greater Lawrence Technical School
- Hampton, NH
- Hanover, NH
- Hartford, VT School District
- Harvard, MA
- Hillsborough County, NH
- Hingham, MA
- Hollis, NH
- Jaffrey, NH
- Keene, NH
- Kingston, MA
- Lanesborough, MA
- Metro North Regional Emergency Communications Center
- Middlebury, VT
- Milford, NH
- Mount Greylock Regional School District
- North Reading, MA
- Northwood, NH
- Oxford, MA
- Plymouth, MA
- Raymond, NH School District
- Rockingham County, NH
- Salem, NH
- Salem-Beverly Water Supply
- S.A.U. #21, Hampton NH
- S.A.U. #41, Hollis, NH
- S.A.U. #53, Pembroke, NH
- S.A.U. #84, Littleton NH
- Shirley, MA
- Southern Berkshire Regional School District
- Southborough, MA
- Sudbury, MA
- Sudbury Water District
- Sullivan County, NH
- Sutton, MA
- Triton School District
- University of Maine System
- Upton, MA
- Wachusett Regional School District
- West Newbury, MA
- West Stockbridge, MA
- Weston, MA
- Williamstown, MA
- Windham, NH School District
- Wood's Hole Steamship Authority
- Woodsville Fire District

Flick Fornia has expertise in all retirement-related areas, including financing, plan design, bond analysis, asset-liability studies, retiree healthcare and legislative testimony. He has performed consulting services for 27 statewide retirement systems, including actuarial audits:

Retirement System Audits (audited actuarial firm noted)

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

3.   References

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

Alaska Legislature

Contact: Fate Putman, Legislative Staff to Representative Grier Hopkins
Address: State Capitol Room 434, Juneau AK, 99801
Phone: (907) 321-0773
Email: FatePutnam@gmail.com

Flick Fornia has performed actuarial analysis on the Alaska Public Employees Retirement System (PERS) and Alaska Teachers' Retirement System (TRS) since 2004. Mr. Putnam worked with Flick and PTA in 2020-2021 on behalf of the legislature related to development of a new hybrid retirement program. Putnam is also familiar with PTA work from 2012 to date on behalf of a labor coalition. Fornia also was ongoing review actuary for the Alaska Retirement Management Board (ARMB) 2004-2006, and conducted an extensive actuarial audit of the PERS and TRS on behalf of ARMB in 2009.

Government of Guam

Contact: Edward Birn, Director, Department of Administration
Address: ITC Building, Suite 224, 590 South Marine Corps Drive, Tamuning, Guam 96913
Phone: (671) 475-1250
Email: Edward.Birn@doa.guam.gov

PTA and KMS are ongoing actuary for the retiree healthcare program, including preparation of actuarial valuations and preparation of disclosures under GASB 75 for approximately 20 Guam governmental agencies. They also conducted a comprehensive study of potential changes to the retirement plan.

Worcester Regional Retirement System

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

Phone: 508.832.6314
Email: kpblanchette@wrrboard.org

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 100 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.

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4.   Staff Qualifications

Pension Trustee Advisors (Flick Fornia) is partnering with KMS Actuaries (Linda Bournival) to provide actuarial consulting services to ORSC and HPRS. Flick and Linda are both pension and retirement system actuaries with significant experience in providing actuarial consulting services to public sector clients. Flick and Linda are fully credentialed Fellows of the Society of Actuaries (FSA), the highest level of professional accreditation that an actuary can achieve. Both Flick and Linda are members of the American Academy of Actuaries and meet the Qualification Standards of the American Academy of Actuaries necessary to perform the services requested in this RFP and render actuarial opinions with respect to the calculations required.

Flick will serve as the lead actuary and consultant to the ORSC and HPRS. He will be responsible for management of the overall relationship and project. Linda and other KMS team members will perform all the data processing, calculations and modeling using an actuarial valuation system called ProVal, widely used by many national firms. We estimate the portion of the audit's time that will be spent by each for completion of the audit to be as follows:

- Flick Fornia   35%

- Linda Bournival   25%

- Other KMS Actuaries   40%
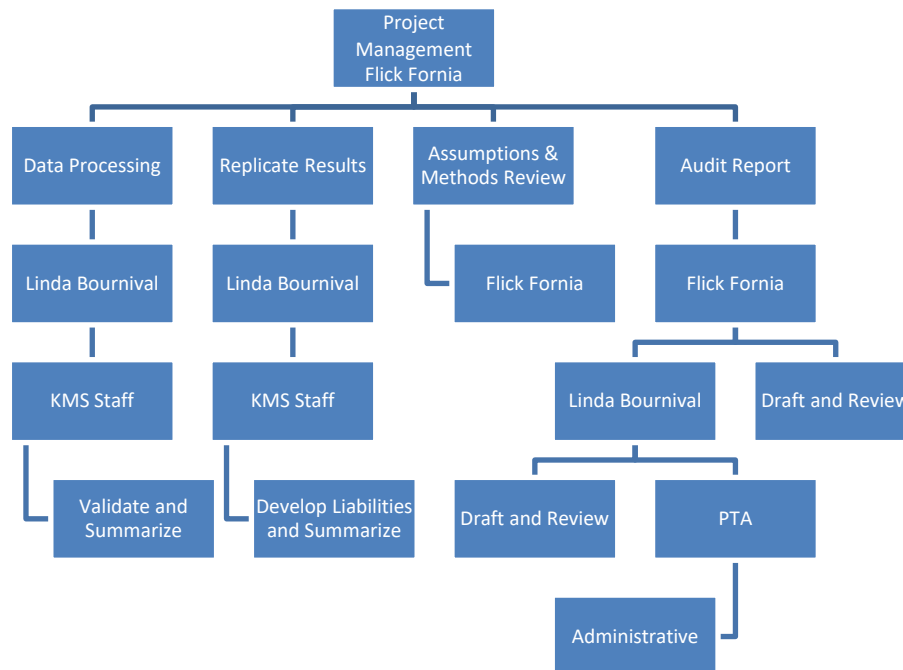
We provide a summary of Flick, Linda and other members of the team's professional qualifications and experience on the following pages.

William B. (Flick) Fornia

Flick, the proposed lead actuary and consultant for the ORSC, has conducted sixteen 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).

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 "Still a *Better Bang for the Buck – The Economic Efficiencies of Defined Benefit Plans"* with the National Institute of Retirement Security in 2014.

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 was reelected to the Board of Directors of the 30,000-member Society of Actuaries where he was elected by the Board to serve as Secretary/Treasurer. He 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.

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 implementation of GASB 67 and GASB 68 for several public retirement systems. She has recently performed two actuarial audits of large pension systems.

Since the implementation of Statement Numbers 43 and 45 issued by the Governmental Accounting Standards Board, and their successor statements 74 and 75, Linda has been retained by local entities in New England, including the City of Manchester NH, the Manchester NH School District, Dukes County OPEB Trust, the University of Maine System, the Towns of Littleton and Weston, Massachusetts, Wachusett Regional School Districts and others.

She has presented on "Pension Reform and Plan Design: Around the Country" and "Planning, Preparation and Collaboration for GASB 67/68 Implementation" at PERAC's Emerging Issues Forums. Most recently, she has presented on retiree medical actuarial issues as a panelist in a municipal round table series "Healthcare Cost Management at the Crossroads: What's Left in My Bag of Tricks?" and at the 2020 Conference of Consulting Actuaries Annual Meeting on "OPEB – Anything But GASB".

Professional Organizations and Education

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.

Amanda J. Makarevich

Amanda Makarevich joined KMS in 2017. She has seven years of experience working with governmental entities and private-sector clients providing a wide range of actuarial services, including preparation of valuations for funding purposes, GASB and FASB accounting disclosures and financial reporting, and projections for funding and plan termination purposes. Her background also includes the preparation and review of benefit calculations and employee benefit statements.

Work Experience

Amanda has been involved with the transition work for multiple new clients. Her responsibilities have included programming assumptions and plan provisions for valuations, reconciling results with those provided by the prior actuary, and developing templates for reports, benefit calculations, and statements.

Professional Organizations and Education

Amanda graduated with distinction from the University of North Carolina at Chapel Hill in 2012 earning a Bachelor of Arts in Mathematics with a second major in Music. She is an Associate of the Society of Actuaries and a Member of the American Academy of Actuaries and is currently working towards her Enrolled Actuary status.

Michael P. Collins

Michael Collins joined KMS full time in May of 2018 and previously worked as an intern during the summers since 2014.

Work Experience

He provides actuarial support to Linda and Amanda, including data analysis and editing, coding valuations in Proval for funding and GASB, setup of actuarial reports and preparation of benefit calculations and employee benefit statements.

Education

In May 2018, Michael graduated from the College of William & Mary with a Bachelor of Science in Computational & Applied Mathematics and Statistics and a minor in Music. Michael has successfully passed five actuarial exams and is working towards his Associateship in the Society of Actuaries.

Michael A. Bubulo

Michael A. Bubolo joined KMS in February of 2020.

Work Experience

He provides actuarial support to Linda and Amanda, including data analysis and editing, excel modeling, actuarial report setup and preparation of benefit calculations and employee benefit statements.

Education

Michael graduated from Sacred Heart University in May, 2019, with a Bachelor of Science in Mathematics and Finance and a minor in Actuarial Science. Michael has successfully passed four actuarial exams and is working towards his Associateship in the Society of Actuaries.

5.   Methodology, Work Product and Timeline

Based on our understanding of the requested services in the ORSC's RFP, the services requested will be for the performance of an actuarial audit for the primary purpose of independent verification and analysis of the assumptions, procedures, and methods used by the consulting actuary Foster & Foster of HPRS for:

- HPRS annual pension actuarial valuation as of January 1, 2020;
- The five-year experience review for the period December 31, 2013 to December 31, 2018; and
- HPRS annual retiree health care actuarial valuation as of January 1, 2020, including GASB Statement 74 and 75 disclosures.

In our review, we will make a determination as to whether the actuarial methods, considerations and analyses used by Foster & Foster in preparing the January 1, 2020 valuations are technically sound and conform to the appropriate Actuarial Standards of Practice as promulgated by the Actuarial Standards Board. Finally, we will prepare a written report summarizing our conclusions and recommendations, including appropriate documentation, and attend two meetings to present to the HPRS Board of Trustees and the ORSC Board.

Our proposed methodology for completion of the scope of review and other consulting services, along with the desired work products and estimated timeline[1] for completion of the reviews, follows:

1. **Hold initial meeting** with ORSC and HPRS by phone to discuss project specifics, deliverables, timeline, etc. (Week 1)

   This meeting will be a critical kickoff and will define the work to be completed, the staff support and consulting actuary requirements, deliverables and timeline.

2. **Collect data**, actuarial reports, actuarial calculations etc. used in the January 1, 2020 actuarial valuations of HPRS pension and retiree health care benefits as well as five-year experience review ending December 31, 2018 (Weeks 2-3)

   The following information would be required in order to complete the audit:

   To be provided by HPRS Staff:
   - January 1, 2020 Retirement System actuarial valuation report
   - January 1, 2020 Health actuarial valuation report
   - Member data submitted to Foster & Foster by HPRS
   - Financial data submitted to Foster & Foster by HPRS
   - Current plan provisions as contained in Ohio Revised Code Chapter 5505
   - All communications and reports pertaining to actuarial calculations

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[1] Week 1 of the timeline is the week following the execution of the contract.

To be provided by Foster & Foster:
- Member data used by Foster & Foster
- Complete tables of pre-retirement decrements and salary scales
- Present value annuity factors for sample ages
- Individual, detailed actuarial valuation results from a sampling of member lives (pensioners, active members and inactive members)
- Health claims cost calculations for retirees, disabled retirees, spouses and children

We anticipate approximately <u>five</u> hours of HPRS' staff time to provide the materials above and approximately <u>ten</u> hours of Foster & Foster time to provide the member data and sample life calculations. Additional hours may be required from Foster & Foster if we are unable to match Foster & Foster's sample life calculations immediately and need to confer further with them. We will work hard to minimize the time commitment by Foster & Foster and HPRS.

3. **Review System information**. We will thoroughly review all available information gathered (Weeks 3-5)

4. **Review the valuation calculation results** (Weeks 3-5)

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.

Methodology

- We will review the methodology and process used by Foster & Foster to check for adherence to actuarial standards and comment on the appropriateness of the method and procedures.
- We will quantify any issues in terms of actuarial impact.

5. **Hold meeting** with HPRS staff to review data layouts, plan provisions, etc. (Week 5)

After we thoroughly review the materials provided, we will meet by phone with HPRS staff to review the valuation data, plan provisions and other valuation methodology nuances. This is critical and will help us gain a better understanding of the valuation data elements, determination of plan benefits, etc.

6. **Verify the accuracy of the benefits valued and the data used by Foster & Foster** (Weeks 5-8)

We will verify that all appropriate benefits provided under HPRS have been valued accurately. We will also verify that the data provided by HPRS is consistent with the data used by Foster & Foster. Flick, Linda and the KMS team 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. ProVal can perform the following tasks:

- Funding valuations. The system can produce valuation results under any assumption set
- GASB 67, 68, 74 and 75 accounting valuations

- 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

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. We both 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 HPRS audit allows for a more streamlined consulting approach and in the end, better service to our clients.

Methodology
- Analyze member data submitted by HPRS to Foster & Foster
- Analyze member data used by Foster & Foster and compare aggregated data with that submitted by HPRS
- Program the benefits in ProVal and develop actuarial results
- Compare actuarial results to actuarial valuations
- Review for conformity with Actuarial Standard of Practice No. 23, Data Quality

7. **Evaluate the actuarial cost method and actuarial asset valuation method used by the System** (Weeks 3-8)

HPRS currently utilizes the entry age normal cost funding method. HPRS uses an actuarial asset valuation method which we have thoroughly modeled in our prior ORSC work.

Methodology
- We will first understand HPRS funding objectives and review any statutory requirements relative to the selection of the funding and/or asset method.
- We will review the funding and asset methods and determine if the methods are technically sound and conform to the Actuarial Standard of Practice.
- If we find that the funding and/or asset methods are inappropriate, we will recast the costs and such using better methods.   We will present in our report a detailed rationale for the recommendations.
- Review for conformity with Actuarial Standard of Practice No. 4, Measuring Pension Obligations and Actuarial Standard of Practice No. 44, Selection and Use of Asset Valuation Methods for Pension Valuations.

8. **Verify the reasonableness of the unfunded actuarial accrued liability calculation and the amortization period utilized** (Weeks 3-8)

    Methodology
    - Review the methodology to calculate the unfunded actuarial accrued liability and the amortization period used under the cost method for reasonableness.
    - We will show actual projections of contribution patterns under various amortization approaches.
    - Make recommendations, if necessary, for changes to the methodology.
    - Review for conformity with Actuarial Standard of Practice No. 4, Measuring Pension Obligations.

9. **Perform review of Demographic and Economic Assumptions** (Weeks 3-8)

    We will review the demographic and economic assumptions used by HPRS in the January 1, 2020 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, health care cost trend rates and morbidity factors.

    Methodology
    - 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 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.

10. **Perform review of January 1, 2020 valuation reports (Pension and Health)** (Weeks 8-10)

    - Review the January 1, 2020 valuation reports prepared by Foster & Foster for conformity with Actuarial Standard of Practice No. 41, Actuarial Communications.
    - Present any recommendations for improvement to the report.

11. **Deliver preliminary draft report** to ORSC and HPRS (Weeks 11-16)

    We will prepare a written report that is in language clearly understood by lay readers. Our audit report will be in a format similar to that included in Appendix A. Appendix B includes a sample actuarial audit presentation.

- During the course of the reviews, we will provide progress reports to ORSC and HPRS on a monthly basis.
- We will develop a written report containing a description of the work performed, and executive summary, findings, and detailed recommendations and conclusions where appropriate. The key findings and recommendations will be organized in a manner that clearly identifies to whom they are primarily directed (e.g., the Legislature, HPRS Board, and ORSC).
- Our report will be in language clearly understood by lay readers.
- Our report will contain a glossary of terms essential to an understanding of retirement system funding and actuarial valuations.

12. **Present preliminary report** to HPRS Executive Director by phone (after delivery of preliminary draft report)

- We will present the preliminary draft report to the HPRS Executive Director prior to the release of the final report.
- We will hold an exit conference with the HPRS staff and consulting actuary to discuss our findings and recommendations contained in our preliminary draft report.

13. **Present final report** (after meetings to present preliminary draft report)

- Make any required modifications to report and issue final report.
- We will present the final report to the HPRS Board of Trustees and the ORSC Board.
- We will provide a digital and 25 bound copies of the final report to HPRS and a digital and 25 bound copies of the final report to the ORSC not later than one week after completion of the final report.

6.   Glossary

Below, we provide a glossary of all abbreviations, acronyms and technical terms used to describe the services contained in our proposal.

Actuarial Accrued Liability – 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 by future Normal Costs.

Actuarial Assumptions – Assumptions as to the occurrence of future events affecting pension and OPEB costs, such as mortality, withdrawal, disablement and retirement; changes in compensation and Government provided pension benefits; rates of investment earnings and asset appreciation or depreciation; procedures used to determine the Actuarial Value of Assets; characteristics of future entrants for Open Group Actuarial Cost Methods; and other relevant items.

Actuarial Cost Method – A procedure for determining the Actuarial Present Value of pension plan benefits and expenses and for developing an actuarially equivalent allocation of such value to time periods, usually in the form of a Normal Cost and an Actuarial Accrued Liability.

Actuarial Present Value of Future Benefits – 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.

Actuarial Valuation – the determination, as of a valuation date, of the Normal Cost, Actuarial Accrued Liability, Actuarial Value of Assets and related Actuarial Present Values for a retirement plan or an OPEB plan.

Actuarial Value of Assets – The value of plan assets used in an actuarial valuation. The Actuarial Value of Assets may reflect smoothing techniques intended to dampen year-to-year fluctuations in the market value of assets.

Chapter 5505 of the Ohio Revised Code – The Ohio statutes governing HPRS.

Foster & Foster – HPRS' actuaries.

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

FSA – Fellow of the Society of Actuaries, the highest educational standard for actuaries.

GASB – Governmental Accounting Standards Board.

GASB 74 – Financial Reporting for Postemployment Benefit Plans Other Than Pension Plans

GASB 75 – Accounting and Financial Reporting for Postemployment Benefits Other Than Pensions

GASB 67 – Financial Reporting for Pension Plans

GASB 68 – Accounting and Financial Reporting for Pensions

HPRS – The Ohio State Highway Patrol Retirement System.

KMS – KMS Actuaries, LLC.

OPEB – Other Postemployment Benefits including medical, dental, vision, hearing and life insurance benefits.

OPERS – Ohio Public Employee Retirement System.

OP&F – Ohio Police and Fire Pension Fund.

ORSC – Ohio Retirement Study Council.

ProVal – Winkelvoss Technologies actuarial software used for funding and accounting valuations of retirement benefits and OPEB.

PTA – Pension Trustee Advisors, Inc.

SERS – School Employees' Retirement System of Ohio.

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

7. Cost Information

Fees are determined based on our estimate of the time required to perform the audit. 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 or quarterly basis.

Our cost proposal is presented below and includes hourly rates for the professional staff assigned to the actuarial audit and an estimate of the number of hours anticipated. In support of our commitment to the ORSC and HPRS and to demonstrate our sincere desire to continue working with you, we provide a discount on our fees and a "not to exceed fee" as shown below:

ORSC / HPRS Audit Fee Development

Task	Team Member Name	Hours	Average Hourly Billing Rate	Estimated Cost
• Initial Kick-off meeting • Data collection • Review Information	William Fornia	10	$473	$4,730
	Linda Bournival	10	330	3,300
	Other Actuarial Staff	5	220	1,100
	Total	25		$9,130
• Data Validity	Linda Bournival	2	$330	$660
	Other Actuarial Staff	8	203	1,624
	Total	10		$2,284
• Review of Methods and Procedures	William Fornia	8	$473	$3,784
	Linda Bournival	2	330	660
	Total	10		$4,444
• Review of Assumptions	William Fornia	15	$473	$7,095
	Linda Bournival	5	330	1,650
	Total	20		$8,745
• Perform Parallel Valuations	William Fornia	5	$473	$2,365
	Linda Bournival	15	330	4,950
	Other Actuarial Staff	65	203	13,195
	Total	85		$20,510

PENSION TRUSTEE ADVISORS

ORSC / HPRS Audit Fee Development (continued)

Task	Team Member Name	Hours	Average Hourly Billing Rate	Estimated Cost
• Review Health Care Premiums	William Fornia	2	$473	$946
	Linda Bournival	6	330	1,980
	Total	8		$2,926
• Prepare Written Report	William Fornia	15	$473	$7,095
	Linda Bournival	10	330	3,300
	Other Actuarial Staff	15	211	3,165
	Total	40		$13,560
• Briefings, Meetings and Exit Conference	William Fornia	25	$473	$11,825
	Linda Bournival	5	330	1,650
	Total	30		$13,475
Total Estimated Cost		228	$329	$75,074
Travel Costs				$3,000
Discount for ORSC				($10,000)
Total Estimated Fee (not to exceed)				**$68,074**

Appendix A – Sample Actuarial Audit Report

**REPORT
TO ORSC**

ACTUARIAL AUDIT
FOR THE
OHIO POLICE AND FIRE PENSION FUND

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

October 2017

October 6, 2017

Ohio Retirement Study Council
88 East Broad Street, Suite 1175
Columbus, OH 43215

Re: Ohio Police and Fire Pension Fund (OP&F) Actuarial Audit of the Pension and Health Benefits as of January 1, 2015

Dear Councilmembers:

We have completed our actuarial audit of the Ohio Police and Fire Pension Fund (OP&F) 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 are available to answer any questions you may have regarding our findings and recommendations of the actuarial audit.

Sincerely,

William B. Fornia, FSA
President
Pension Trustee Advisors

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

cc: Ohio Police and Fire Pension Fund

Table of Contents

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 OP&F's 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 OP&F, and

— Detailed recommendations for improvement.

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

Ohio Police and Fire Pension Fund (OP&F) provided retirement benefits and health care benefits. Actuarial values were reported through two actuarial reports:

- OP&F January 1, 2015 Actuarial Valuation of Pension Benefits, dated October 13, 2015
- OP&F January 1, 2015 Actuarial Valuation of Retiree Health Care Benefits under GASB 43, dated October 13, 2015

We have duplicated these January 1, 2015 actuarial valuations conducted by Buck Consultants, now known as Conduent (Buck) and the results match quite closely. This match confirms that Buck is able to capture the complexity of OP&F accurately, and that OP&F should have confidence in the actuarial calculations provided to them. In addition, we reviewed Buck's August 23, 2017 Quinquennial Actuarial Experience Review for 2012 through 2016 and its recommendations.

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. This is confirmed on the tables and discussion below.

Our most significant concern is with Buck's disclosure of calculation methods and assumptions, which is addressed in the following sections.

The following tables summarize the actuarial liabilities and normal costs produced by Buck and PTA/KMS actuarial valuations.

Actuarial Liabilities and Normal Cost as of January 1, 2015 ($ in thousands) - Pension Benefits			
	Buck	**PTA/KMS**	**% Diff.**
Present Value of Future Benefits	21,470,374	20,980,485	-2.28%
Accrued Liability	18,415,042	17,937,808	-2.59%
Normal Cost	332,805	324,053	-2.63%

Actuarial Liabilities and Normal Cost as of January 1, 2015 ($ in thousands) - Health Care Benefits			
	Buck	**PTA/KMS**	**% Diff.**
Present Value of Future Benefits	8,221,539	8,073,585	-1.80%
Accrued Liability	5,399,550	5,191,757	-3.85%
Normal Cost	216,966	212,015	-2.28%

The grand total actuarial liability calculated by PTA/KMS was within 2.9% of the same calculated by Buck. Our grand total normal cost was within 2.5% of that calculated by Buck. Both are well within actuarial norms and strong evidence that the Buck actuarial valuations are reliable.

This is illustrated by the following chart:

Total Actuarial Liabilities Matched within 2.9%
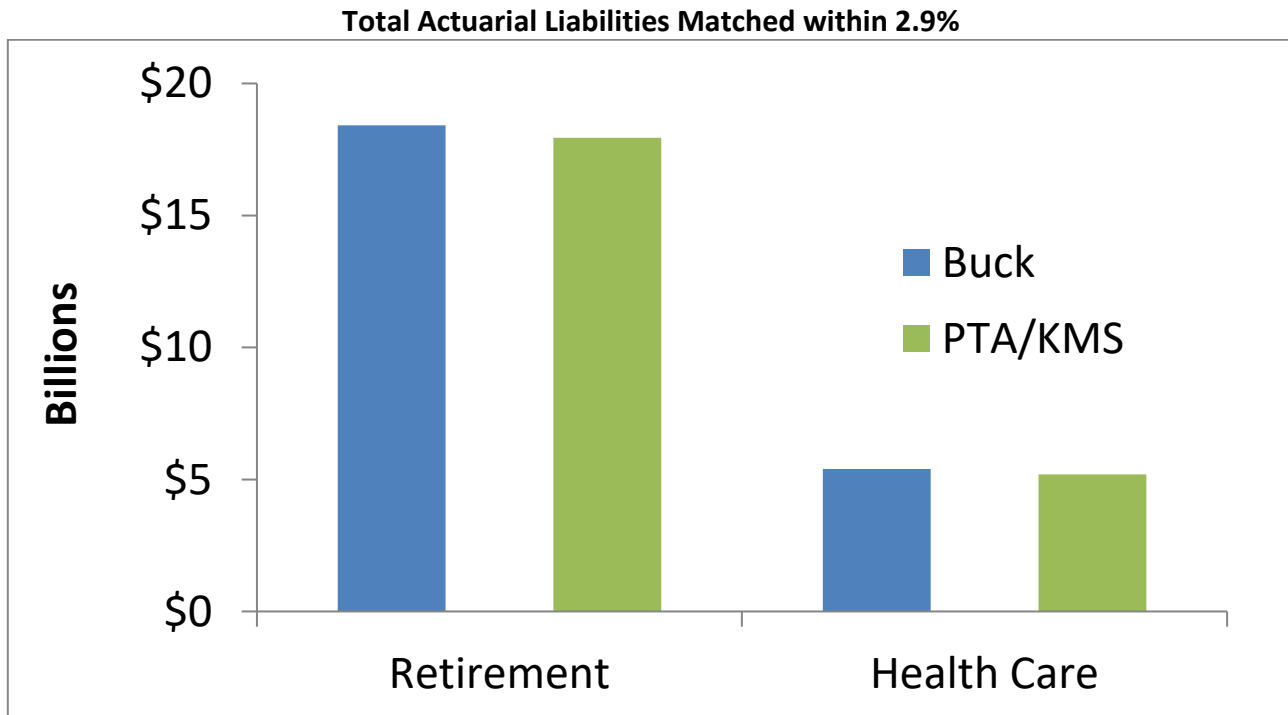
Although the match was reasonably close, there is still room for improvement. We make the following recommendations for enhancement in the accuracy of calculations and completeness in the reports:

- Correct minor calculations as discussed in the following pages
- Expand disclosure of methodology and assumptions more rigorously in the next actuarial experience study and valuation reports
- Reconsider certain actuarial assumptions in the next experience study, including:
    - Percentage of employees who do not retire when first eligible enter DROP
    - Marriage rates
    - Age difference between husbands and wives
    - Number of dependents
    - Annuity option selection
    - Administrative expenses
    - Short-term return on employer assets
    - Gross claim rate derivation
    - Morbidity
    - Health plan participation rates and elections

Section 2 – Audit of Actuarial Methods, Factors and Assumptions

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

ACTUARIAL METHODS

Buck uses several actuarial methods in determining costs and liabilities for OP&F.

- — The actuarial funding method is the Individual Entry Age actuarial cost method
- — The actuarial asset valuation method for pension is a four-year smoothed market value
- — The amortization of the unfunded actuarial accrued liability is based on 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 Individual Entry Age Normal actuarial cost method is used for both 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 OP&F. Buck is applying the method reasonably, consistently and accurately.

Actuarial Asset Valuation Method

Buck employs a four-year smoothed market value actuarial asset valuation method for the retirement plan actuarial valuation. 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 Buck, but might use quite different methods. We have reviewed the precise provisions of the method that Buck employs and find them to be reasonable, consistently applied, and accurate.

The Buck 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. This is a reasonable and appropriate method.

Amortization Method for Determining Funding Amounts

In addition to the Entry Age Normal actuarial cost method, Buck and OP&F use a conventional method for amortizing components of unfunded liability. The method was a closed period, which decreased from 33 years as of January 1, 2014 to 30 years as of January

1, 2015. Since then, it has fallen to 29 years as of January 1, 2016, but is anticipated to increase with the adoption of proposed changes in actuarial assumptions. OP&F only tests this for thirty-year compliance every three years, with the actuarial valuation as of January 1, 2019 being the third year. Despite making the attainment of a thirty-year funding period more challenging we encourage the board to adopt the proposed OP&F assumption changes.

The funding period is calculated by subtracting the employer normal cost from the total employer contributions, and then measuring how many years it would require to fully amortize the unfunded retirement liability from these contributions. While this would tend to decrease every year (by one year if all actuarial assumptions are met), there will certainly be years when the period rises. OP&F struggles to maintain a funding period of 30 years, due to volatile investment return, strengthening of actuarial assumptions, and the provision of health care benefits, which, although modest, prevent the funded status from otherwise improving.

Many if not most statewide pension systems continue to use an open period to amortize the unfunded liability. 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 more appropriate.

The other amortization feature being used is to amortize the costs as a constant percentage of payroll. With payroll growing at an assumed rate of 3.75% per year, this maintains steady costs. An alternative would be to amortize costs in constant dollars, which would result in higher costs in early years when expressed as a percentage of pay. We believe this is a reasonable approach for funding, despite the changes in the GASB rules which will not permit this method for GASB determinations. The 3.75% payroll growth rate is reasonable in the aggregate based on a stable population. Buck has proposed a reduction in the 3.75% payroll growth rate to 3.25%, based on a decrease in the assumed inflation rate from 3.25% to 2.75%. We note that the number of covered defined benefit members has dropped somewhat since 2009, for example, from 28,927 as of January 1, 2009 to 27,446 as of January 1, 2016. While this is only a 5% reduction over seven years, if the trend continues, it undermines the benefit of assuming that payroll increases by 3.25%. We recommend that Buck explicitly consider this in their next experience study. While 3.25% might be an appropriate price inflation assumption, if population is forecasted to decline, OP&F may wish to adjust its total payroll growth assumption in order to minimize the likelihood of increasing costs.

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

ACTUARIAL ASSUMPTIONS

We have reviewed the actuarial assumptions used by the actuary and find them to be reasonable, consistent, and accurate. Buck presented their Quinquennial Actuarial Experience Review for 2012 through 2016 last month. We found this presentation to be thorough, appropriate and very clearly presented. We encourage the OP&F Board to adopt the proposed assumption changes.

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

- Demographic Assumptions
  - Post-Retirement Mortality
  - Disabled Post-Retirement Mortality
  - Pre-Retirement Mortality
  - Withdrawal from Service Before Retirement
  - Retirement
  - Disability Retirement
  - Other Demographic Assumptions

- Economic Assumptions
  - Investment Return Rate
  - Inflation
  - Wage Inflation
  - Individual Salary Increases

- Post-Employment Healthcare Assumptions
  - Gross Claim Rate Derivation
  - Health Care Cost Trend Rate
  - Morbidity
  - Retiree – Paid Premiums
  - Health Plan Participation Rates and Elections

Detailed comments on each assumption are included below.

DEMOGRAPHIC ASSUMPTIONS

Rates of Post-Retirement Mortality

Actuaries are getting more sophisticated in their techniques for anticipating future mortality improvements. Buck is using the more sophisticated method of 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 2017 (born in 1937) would have higher mortality rates than a future 80-year old retiree born in 1987. Buck began using this more robust methodology in 2009, despite the complexities of actuarial benefit factors, which incorporate mortality assumptions. With the generational table

being used, either the factors need to change every year, or the policy would need to change.

Buck has proposed changing the mortality projection basis from a projection Scale AA to their own Conduent modified MP-2016 projection scale. Mortality improvement projection has been a very controversial issue in the past few years.

Many trends have contributed to lengthening life expectancies, including:

- Continued eradication of diseases
- Advances in medicine
- Advances in nutrition
- Improved access to medical care

But other trends may suggest that life expectancies may not continue to improve, including:

- Obesity
- Many factors which improved mortality are one-time, and cannot be repeated, for example, smoking cessation trends (one can only quit smoking once)
- More sedentary lifestyles
- Substance abuse
- Climate change
- Emergence of new diseases

As a result of the uncertainty of these contrary trends, we endorse Buck's consideration of the Conduent Modified MP-2016 rather than other projection scales such as the Society of Actuaries' MP-2016 which suggest greater mortality improvement.

Buck's proposed modification in mortality assumption for retired Firefighters appears reasonable, based on 893 deaths in the five-year period, when 773 were expected. Similarly, Buck's proposed alteration in mortality assumption for retired Police also appears reasonable, based on 940 deaths in the five-year period, when 1,002 were expected.

Rates of Disabled Post-Retirement Mortality

Buck's proposed alteration in mortality assumption for disabled Police and Firefighters appears reasonable, based on recent experience. We have some concern that the substantial changes for younger disabled retirees may result in mortality rates even lower than active members. For example, consider a disabled firefighter age 40. The current methodology is to use a three-year set-forward, or assume an age 43 raw rate

(0.1299%). For a healthy active firefighter, a six-year set-back is employed, meaning an age 34 raw rate (0.0702%). But experience has shown much lower mortality rates for younger disabled members than expected. The recent experience study recommended adjusting for this by multiplying certain rates by 35%. This would result in a new rate of 0.0455%, which is lower than the healthy firefighter rate. We recommend that this be explored further. It seems hard to justify rates that assume such a large disparity between healthy firefighters and disabled firefighters. While there are certainly risks of these hazardous duty occupations, the experience and current assumptions find that the overall excellent health of Ohio Police and Fire outweighs the occupational risks and that they have lower mortality risks than the general public.

Rates of Pre-Retirement Mortality

Buck's proposed pre-retirement mortality assumption also appears reasonable, and based on 117 deaths in the five-year period, where 130 were expected.

Withdrawal from Service before Retirement

We concur that the withdrawal tables used by Buck are reasonable, consistent and accurate. Buck uses a table based on age and service rather than one based only 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. Buck also varies the rates between police and firefighters. This would result in more consistency between overall pension plan experience and that predicted by the actuarial assumptions.

The Buck experience study appropriately balanced prior assumptions with recent experience and considered the credibility of the data effectively.

Retirement

We concur that the retirement tables used by Buck are reasonable, consistent and accurate. Buck uses different retirement tables for those in and out of the Deferred Retirement Option Program (DROP) and for those in DROP, different retirement tables for members entering DROP after July 1, 2013. This is a sound method because individuals have much different retirement patterns when DROP is involved. We would recommend that the experience study also distinguish between pre-DROP and post-DROP retirement rates. However, because of 2013 changes to DROP provisions, this data would not yet be relevant and credible.

Buck also assumes that 90% of those who do not retire when first eligible elect to enter DROP. No data was provided in the experience study presentation to support this assumption. We recommend that Buck include this important assumption in its experience study.

Finally, we noted that the Health valuation does not distinguish retirement tables between members entering DROP pre-July 1, 2013 and post-July 1, 2013 as in the Pension valuation. We recommend Buck adopt these tables for the next Health valuation.

Disability Retirement

Disability rates have continued to fall for both police and firefighters. Buck has proposed to reduce the assumed disability incidence further. We concur that the disability tables used by Buck are reasonable, consistent and accurate.

The disability assumption also includes a component as to type of disability (Permanent and Total, Partial On-Duty, and Off-Duty). Recent experience has shown that fewer disabilities are Partial and Total than expected, while more are Off-Duty than expected. As a result of this, Buck modified its assumptions somewhat. While we may have made slightly different modifications, we find that the disability-type assumption is reasonable, consistent and accurate.

Other Demographic Assumptions

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

Marriage Rates – Buck assumes 75% of future retirees would be married. Current retirees use actual marriage data at the time of valuation. We support this approach. Buck offered no specific support for this assumption in its experience study report other than to indicate that "Data of new retirees from 2012 to 2016 suggests that 75% is still reasonable." We recommend that this be included more explicitly in the formal report.

Age Difference between Husbands and Wives – Buck assumes husbands are 3 years older than wives. We find Buck's analysis reasonable. Three years is a widely established norm. But given the large volume of OP&F data available, we recommend that Buck make some effort to demonstrate support for this assumption rather than merely rely on anecdotal norms.

Number of Dependents – Buck assumes that members have two dependent children born when the member was 26, and whose dependency will end at age 22. This was not explicitly mentioned in the experience study presentation, but seems very reasonable. We recommend that this be analyzed explicitly. The Health valuation states that children may be enrolled, generally until age 28, but does not explicitly state in the assumptions the age when dependency ceases. We recommend that the assumption for the age when dependency ceases be consistent between Pension and Health.

Annuity Option Selection – The Buck experience study indicated that the assumption that 33% of service retirees and 10% of disability retirees will elect a J&S pension is still reasonable. The assumed average of a 50% benefit to the joint annuitant is to be changed to 40%, based on recent experience. While we find these assumptions reasonable, and their significance is only modest, we recommend that Buck explicitly report the findings of the experience study which support these decisions.

Retirement Age for Inactive Vested Participants – Buck assumes that these members elect to retire at the later of age 48 and the completion of 25 years of service. This was not explicitly mentioned in the experience study presentation, but seems reasonable. We recommend that this be analyzed explicitly in the next experience study.

ECONOMIC ASSUMPTIONS

Investment Return Rate

Buck recommends a decrease from 8.25% to 8.00% for the investment return rate. This assumption change is consistent with rates used by most systems. Wilshire Associates reports that the median assumption is 7.50%. According to the Public Funds Survey as of December, 2016, the median assumption for 152 large primarily state systems is also 7.50%. In particular:

- 122 of the 152 (80%) use assumptions lower than 8.00%,
- 52 (34%) use a 7.50% assumption, the most commonly used,
- 27 (18%) use an 8.00% assumption, and
- Only 3 (2%, including OP&F) use an assumption greater than 8.00%.

An 8.00% or 8.25% rate would still be the highest rate used by the statewide systems in Ohio. The other systems' expected rates are:

- School Employees Retirement System of Ohio – 7.50%
- State Teachers Retirement System of Ohio – 7.45%
- Ohio Public Employees Retirement System – 7.50%
- Ohio Highway Patrol Retirement System – 7.75%

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.

Buck used a 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 was calculated independently, then summed (net of expenses) to develop the net investment return assumption.

Their 8.00% net return assumption is comprised of 2.75% inflation plus 5.25% real return net of administrative expenses. Inflation is discussed in the section below, so we will focus on the real return component and the administrative expense component.

Real Rate of Investment Return – To calculate the assumed real rate of return, Buck used its GEMS® Economic Scenario Generator in its experience study combined with the OP&F target asset allocation policy. This resulted in a nominal rate of 8.00%, which fell between the 15 and 20-year time horizon median return. The assumed inflation rate of 2.75% was then subtracted to obtain a real rate of 5.25%.

Based on our experience, investment consultants continue to pare back their expectations for future returns. This is partially a consequence of continued low inflation expectations and short term fixed income rates, but can also be on a real return basis. Consequently, we would expect that it is likely that the next experience study would suggest another drop in nominal investment return, all other things being equal.

According to the Public Funds Survey as of December, 2016, the median real rate of return assumption for 144 large primarily state systems which disclosed this is 4.50%. Although not specifically asked, this is presumably after reduction for administrative expenses in most responses. In particular:

- 38 of the 144 (26%) use assumptions lower than 4.50%,
- 33 (23%) use a 4.50% assumption, the most common assumption,
- 73 (51%) use an assumption greater than 4.50%, and
- Only 7 of the systems use a real rate of return assumption higher than the 5.25% assumed by OP&F.

A 5.25% real rate would still be the highest rate used by the statewide systems in Ohio. The other systems' expected real rates of return are:

- School Employees Retirement System of Ohio – 4.50%
- State Teachers Retirement System of Ohio – 4.95%
- Ohio Public Employees Retirement System – 5.00%
- Ohio Highway Patrol Retirement System – 5.00%

Administrative Expenses – Buck simply incorporates OP&F anticipated administrative expenses into its valuation. The investment return rate is assumed to be net of administrative expenses. We found no documented support in the actuarial valuation or experience study for this critical assumption. We recommend that Buck research this and develop a more robust expense assumption.

Health Care Plan Rate of Investment Return – Buck uses a 4.25% investment return assumption for the healthcare valuation. Buck developed this using a weighting between the assumed return from plan assets (8.25% currently) and an estimated short-term return of 4.00% on employer assets. The weighting is based on the portion of the total contribution toward the Annual Required Contribution. We recommend that Buck document the support for the 4.00% return on employer assets in the quinquennial experience study. In particular, if the assumed inflation rate is decreasing by 0.50%, it would make sense that the return on employer assets would also decrease by 0.50%.

DROP Interest Crediting Rate – Buck analyzed a range of assumed bond yields and its model suggested reducing this rate from 4.50% to 4.00%. We find this reasonable, appropriate and accurate.

Inflation

We reviewed the confirmation of the 2.75% inflation rate developed by Buck. Buck developed this primarily by looking at its GEMS® Economic Scenario Generator in its experience study. Buck did not disclose detail as to how this was developed, but we find that the resulting 2.75% assumption is very reasonable. We anticipate that Buck also considered forward looking data such as the yields on inflation-indexed treasury bonds, and economist forecasts to the extent that they are not purely short term. The end result supports a reduction from the 3.00% - 3.50% range to the 2.50% - 3.00% range. As a result of the 2017 experience study, the recommended inflation assumption was reduced from 3.25% to 2.75%. Because of the continued low inflation environment, we support this assumption.

According to the Public Funds Survey as of December, 2016, the median inflation assumption for 144 large, primarily state, systems who reported their inflation rate is 3.00%. In particular:

- 61 of the 144 (42%) use assumptions lower than 3.00%,
- The most common assumption is 3.00%, which is used by 37 (26% of the total), and
- 47 (33%) use an assumption greater than 3.00%.

A 2.75% rate is also used by one other statewide system in Ohio. The other systems' expected inflation rates are:

- School Employees Retirement System of Ohio – 3.00%
- State Teachers Retirement System of Ohio – 2.50%
- Ohio Public Employees Retirement System – 2.50%
- Ohio Highway Patrol Retirement System – 2.75%

CPI-Based COLA Assumption – Buck analyzed a range of assumed inflation rates and its model suggested reducing the COLA assumption (for certain future retirees) from 2.6% to 2.2%. We find this reasonable, appropriate and accurate.

Wage Inflation

Buck proposes a real wage inflation, or payroll growth rate, of 0.50%. When added to 2.75% inflation, this results in a total payroll growth assumption of 3.25%. We find this to be reasonable, consistent and accurate. Buck did not provide support for this assumption in its experience study, but 0.50% is typical and reasonable in our opinion. As mentioned above, however, this wage inflation assumption is also used for the amortization policy. If the population continues to decline, this 3.25% assumption may no longer be appropriate.

Individual Salary Increases

Buck analyzed individual salary increase rates, and found the real increase rates to be appropriate and not needing to be change. Buck recommended decreasing the nominal salary growth rate assumptions by 0.50% at all years to reflect the reduction in assumed inflation. This is probably a reasonable change. They supported this through data comparing the nominal salary growth experienced with that expected. We believe, however, that it is important to analyze *real* (inflation-adjusted) salary growth. Inflation averaged only 1.36% during the five-year period, compared with a new assumed rate of 2.75%. With such a large disparity between 2.75% and 1.36%, it is possible that the gap between actual and expected nominal returns could suggest that an increase in real salary increases is required. We recommend that Buck expand its methodology in the next experience study to include real salary growth, not merely nominal salary growth.

POST-EMPLOYMENT HEALTHCARE ASSUMPTIONS

Gross 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 Buck 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 Buck disclosure of health assumptions is consistent with general practice, but not as strong as their disclosure of pension assumptions or best practice.

Based on our 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, Buck took the following steps.
- — Develop average costs for the self-insured medical and prescription drug plans based on claims experience and current enrollment
- — Adjust the costs with trend and plan changes to arrive at a claims cost per member
- — Apply age-based morbidity factors to the gross costs to arrive at the 2015 Age-Specific Monthly Gross Costs

We have reviewed the resulting gross rates and find them reasonable, appropriately calculated and accurate.

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. Buck disclosed the following with respect to the establishment of the trend assumption:

"The trend rate is the annual rate at which the cost of covered medical services is assumed to increase from the current year to the next year. The valuation reflects costs and premiums established for 2015 and 2016 for Non-Medicare, Non-AARP and Rx."

We find this approach reasonable and the trend rates which it produces reasonable. In addition, we recommend that Buck disclose rationale for the trend assumptions relating to AARP and Medicare Part B.

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 and gender. Buck did not disclose in the valuation report what data was used for development of aging factors.

We encourage Buck 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 Buck 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. In developing the Plan's liability, Buck used the OP&F allowance percentage times the total claims cost. We reviewed the methodology used by Buck and found it appropriate.

Health Plan Participation Rates and Elections

Buck assumes that 60% of non-Medicare members eligible for retiree health benefits elect coverage and 90% of Medicare eligible members elect coverage. Buck also assumes 50% of non-Medicare members who elect coverage and 70% of Medicare members who elect coverage elect coverage for their spouses and children. Further, Buck assumes 88% in the Health valuation (and 90% in the Pension valuation) of future Medicare members will elect the Medicare Part B benefit and 75% of all non-Medicare members who waived coverage will elect coverage once they become Medicare eligible. No supporting documentation is provided for these assumptions.

We recommend that Buck perform a more rigorous analysis of these assumptions. Further, we recommend that the Medicare Part B assumption be consistent between the Pension valuation and the Health valuation.

DISCLOSURE OF ACTUARIAL ASSUMPTIONS AND METHODOLOGY

Buck's disclosure of the majority of actuarial assumptions (and methods) was robust. But because of the complexity of OP&F, it is necessary for Buck to make dozens of additional assumptions regarding arcane and/or barely-material plan provisions. Many of these were either undisclosed or not supported in writing.

Actuarial Standard of Practice (ASOP) No. 41 on Actuarial Communications states:

In the actuarial report, the actuary should state the actuarial findings, and identify the methods, procedures, assumptions, and data used by the actuary with sufficient clarity that another actuary qualified in the same practice area could make an objective appraisal of the reasonableness of the actuary's work as presented in the actuarial report.

For the most part, the actuarial valuation report and experience study report did provide this information. That is because the dozens of assumptions and methods which were not fully disclosed were nearly negligible. But several assumptions and methods did rise to the level of materiality and we believe should be more rigorously disclosed and supported.

If OP&F were ever to change actuaries from Buck, the new actuary might not be able to confirm the reasonableness of Buck calculations without the above information. Even in the amicable process

of an actuarial audit, the limited disclosure required some back-and-forth questions with Buck as to how specific assumptions and methods were applied.

Because much of our items of concern are nearly immaterial, we do not necessarily recommend that Buck expand the actuarial valuation report and experience study report to address the more arcane concerns. A better approach might be for Buck to provide OP&F with a supplemental methodology and assumption report documenting the dozens of assumptions and methods used which do not rise to the level required by ASOP 41. We are not aware of all of these, because they were not disclosed, but those which we were able to discover include:

Pension Valuation:

1. Disclose that members who become disabled while in DROP remain in DROP.

2. Disclose limitations in the census data for inactive members with respect to the hire date information and its impact on the stated valuation assumption of commencement at the later of age 48 and 25 years since the hire date.

3. Disclose support for three-year age difference assumption between males and females.

4. Clarification of justification for mortality set-backs for various members.

5. Justification for 75% marriage rate assumption.

6. Disclosure of capital market assumptions cited in experience study report.

7. Disclose assumption for members withdrawing their contributions.

8. Disclose assumption for disability benefits.

Health Care Valuation:

1. Disclose in Benefit Provisions that Spouses' benefits revert to a Benefit Recipient upon the death of the retiree.

2. Disclose in Assumptions that liabilities are developed for the youngest child for current retirees.

3. Provide greater detail on the development of the Age-Specific Monthly Gross Costs for Benefit Recipients, Spouses and Children.

4. Disclose the States in which AARP/UHC does not vary its premium rates by length of Medicare Part B coverage at initial enrollment.

5. Disclose support for plan participation rates and elections.

6. Disclose the eligibility criteria for current benefit recipients, spouses and children for the various healthcare benefits.

7. Disclose the assumption regarding valuation of future children's benefits, including age at which dependency ceases.

8. Disclose assumption that Non-AARP covered retirees under 65 switch to AARP at 65 and Non-AARP covered retirees 65 and older remain covered under Non-AARP.

9. Disclose more robust rationale for the health care cost trend rates.

Disclose any other of the items discussed in Section 2 above that Buck believes are important enough to be disclosed in the actuarial report rather than the experience study or supplemental report.

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 Buck for the retirement system. Consequently, we conclude that the valuation results are reasonable, accurate and consistent.

The following table summarizes the present value of future benefits, actuarial liability and normal cost for the Pension Benefits produced by Buck and PTA/KMS actuarial valuations.

Table 3.1
Pension Benefits Liabilities as of January 1, 2015

Actuarial Liabilities and Normal Cost as of January 1, 2015 ($ in thousands)			
TOTAL	**Buck**	**PTA/KMS**	**% Diff.**
Present Value of Future Benefits			
Active Members	11,204,175	10,876,870	-2.92%
Vested Former Members	30,971	30,788	-0.59%
Rehired Retirees	12,083	12,083	0.00%
Retirees and Disableds	9,519,905	9,353,803	-1.74%
Beneficiaries and Survivors	675,060	679,299	0.63%
Contributions Refund Due	28,180	27,641	-1.91%
Total	21,470,374	20,980,485	-2.28%
Accrued Liability			
Active Members	8,148,843	7,834,193	-3.86%
Vested Former Members	30,971	30,788	-0.59%
Rehired Retirees	12,083	12,083	0.00%
Retirees and Disableds	9,519,905	9,353,803	-1.74%
Beneficiaries and Survivors	675,060	679,299	0.63%
Contributions Refund Due	28,180	27,641	-1.91%
Total	18,415,042	17,937,808	-2.59%
Normal Cost	332,805	324,053	-2.63%

Note -- Rehired Retirees were not separately identified in the Pension census data; Buck provided the additional liabilities for this group, based on the account balances provided to Buck by OP&F. Buck liabilities were approximately $12 million, less than 0.1% of the total.

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

Table 3.2
Retiree Health Benefits Liabilities as of January 1, 2015

Actuarial Liabilities and Normal Cost as of January 1, 2015 ($ in thousands)			
	Buck	**PTA/KMS**	**% Diff.**
Present Value of Future Benefits			
Active Members	5,670,343	5,660,397	-0.18%
Inactive Members	35,103	34,059	-2.97%
Retirees, Spouses and Beneficiaries	2,516,093	2,379,129	-5.44%
Total	8,221,539	8,073,585	-1.80%
Accrued Liability			
Active Members	2,848,354	2,778,569	-2.45%
Inactive Members	35,103	34,059	-2.97%
Retirees, Spouses and Beneficiaries	2,516,093	2,379,129	-5.44%
Total	5,399,550	5,191,757	-3.85%
Normal Cost	216,966	212,015	-2.28%

Summary of Deviation of Results

	Pension Benefits Valuation Results	Retiree Health Valuation Results
Accrued Liability	-2.59%	-3.85%
Normal Cost	-2.63%	-2.28%

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 Buck to explore further:

— In valuing the Pension and Retiree Health benefits, the following are a few items we uncovered that could be corrected, but overall would be immaterial to the valuation results:

1. In developing the Spouse Statutory Benefit, apply COLA increase of 3%, capped at the amounts disclosed in the valuation report, for all retirees regardless of pension COLA method provided in the data.

2. Apply a Medicare Part B reimbursement assumption of 88% for members assumed to be eligible for reimbursement once they reach age 65 for consistency with Health Benefits valuation.

3. Include service-related retirement rates to distinguish between benefits available at termination and benefits available at retirement. For example, a member may terminate at age 48 under a Service Commuted retirement with payments commencing at the later of age 48 and 25 years from hire date, but requires 15 years of service. Retirement rates at age 48 are 10%, however, the rates presumably do not apply here but termination rates do.

4. Apply different retirement rates for members entering DROP after July 1, 2013 in the Retiree Health valuation to be consistent with the Pension valuation.

OP&F provided us with the System data for all active members and pensioners. Detailed data layouts that identified all the data elements used by Buck were provided for the Pension valuation. Buck also provided us with the data files they utilized in performing the valuations. In performing our replication, we utilized the data files provided by Buck.

The following tables summarize the demographic statistics for the Pension Benefits and Retiree Health Benefits valuations produced by Buck and PTA/KMS actuarial valuations.

Table 3.4
Inactive Members as of January 1, 2015

POLICE	Male			Female			Total		
	Buck	PTA/KMS	% Diff.	Buck	PTA/KMS	% Diff.	Buck	PTA/KMS	% Diff.
Eligible for Allowances	105	105	0.00%	7	7	0.00%	112	112	0.00%
Eligible for Refunds Only	2,031	2,031	0.00%	322	322	0.00%	2,353	2,353	0.00%
Total	2,136	2,136	0.00%	329	329	0.00%	2,465	2,465	0.00%

FIREFIGHTERS	Male			Female			Total		
	Buck	PTA/KMS	% Diff.	Buck	PTA/KMS	% Diff.	Buck	PTA/KMS	% Diff.
Eligible for Allowances	67	67	0.00%	1	1	0.00%	68	68	0.00%
Eligible for Refunds Only	596	596	0.00%	58	58	0.00%	654	654	0.00%
Total	663	663	0.00%	59	59	0.00%	722	722	0.00%

TOTAL	Male			Female			Total		
	Buck	PTA/KMS	% Diff.	Buck	PTA/KMS	% Diff.	Buck	PTA/KMS	% Diff.
Eligible for Allowances	172	172	0.00%	8	8	0.00%	180	180	0.00%
Eligible for Refunds Only	2,627	2,627	0.00%	380	380	0.00%	3,007	3,007	0.00%
Total	2,799	2,799	0.00%	388	388	0.00%	3,187	3,187	0.00%

Table 3.5
Retirees and Beneficiaries as of January 1, 2015

SERVICE RETIREES	Police			Firefighters			Total		
	Buck	PTA/KMS	% Diff.	Buck	PTA/KMS	% Diff.	Buck	PTA/KMS	% Diff.
Number of Members	7,842	7,842	0.00%	5,972	5,972	0.00%	13,814	13,814	0.00%
Annual Allowance	348,564,651	348,564,651	0.00%	261,888,511	261,888,511	0.00%	610,453,162	610,453,163	0.00%
Average Allowance	44,448	44,448	0.00%	43,853	43,853	0.00%	44,191	44,191	0.00%
Average Age	67.8	67.8	0.00%	69.0	69.0	0.00%	68.3	68.3	0.00%

DISABILITY RETIREES	Police			Firefighters			Total		
	Buck	PTA/KMS	% Diff.	Buck	PTA/KMS	% Diff.	Buck	PTA/KMS	% Diff.
Number of Members	3,784	3,784	0.00%	2,576	2,576	0.00%	6,360	6,360	0.00%
Annual Allowance	140,778,964	140,778,964	0.00%	99,892,505	99,892,505	0.00%	240,671,469	240,671,469	0.00%
Average Allowance	37,204	37,204	0.00%	38,778	38,778	0.00%	37,841	37,841	0.00%
Average Age	61.8	61.9	0.16%	64.0	64.0	0.00%	62.8	62.8	0.00%

SURVIVORS & BENES	Police			Firefighters			Total		
	Buck	PTA/KMS	% Diff.	Buck	PTA/KMS	% Diff.	Buck	PTA/KMS	% Diff.
Number of Members	4,403	4,403	0.00%	3,386	3,386	0.00%	7,789	7,789	0.00%
Annual Allowance	45,392,789	45,392,790	0.00%	34,658,596	34,658,595	0.00%	80,051,385	80,051,385	0.00%
Average Allowance	10,310	10,310	0.00%	10,236	10,236	0.00%	10,277	10,277	0.00%
Average Age	71.0	71.1	0.14%	73.5	73.5	0.00%	72.1	72.1	0.00%

TOTAL	Police			Firefighters			Total		
	Buck	PTA/KMS	% Diff.	Buck	PTA/KMS	% Diff.	Buck	PTA/KMS	% Diff.
Number of Members	16,029	16,029	0.00%	11,934	11,934	0.00%	27,963	27,963	0.00%
Annual Allowance	534,736,404	534,736,405	0.00%	396,439,612	396,439,612	0.00%	931,176,016	931,176,017	0.00%
Average Allowance	33,361	33,361	0.00%	33,219	33,219	0.00%	33,300	33,300	0.00%
Average Age	67.3	67.3	0.00%	69.2	69.2	0.00%	68.1	68.1	0.00%

PENSION TRUSTEE ADVISORS

KMS ACTUARIES

Section 4 – Other Considerations

ACTUARIAL REPORT

For the most part, we found the Buck actuarial valuation reports and experience study reports to be 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 Buck reports generally comply with the guidance of ASOP 41.

We would recommend a few modifications to enhance the completeness of the actuarial valuation reports. These include items discussed in Section 3 as well as the following:

- We recommend that Buck include the following in the Pension Benefits and Retiree Health Benefits valuation reports:

  - Rationale for economic and demographic assumptions under the guidance of ASOP 27 and ASOP 35, respectively.
  - breakout of liabilities by pre-65 and post-65 health care benefits.

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

The actuarial experience study and report were similarly comprehensive, complete and clear.

ACTUARIAL AUDIT PROCESS

Buck, unlike most actuaries at this time, we believe, has a policy which does not permit sharing of detailed individual calculations supporting the calculations reported in the actuarial valuation report. We have performed more than a dozen actuarial audits of public pension systems over the past two decades. In the vast majority of the cases, the actuary provides detailed calculations for a few select individuals. These detailed calculations provide hundreds of individually specific data-points which make it fully transparent exactly how calculations are being performed. This full transparency makes it possible for the auditing actuary to understand the precise calculations.

In the case of OP&F and Buck, rather than providing hundreds of detailed numbers for specified individuals, only twelve numbers are provided. This means that rather than reviewing the actuaries work, the auditing actuary must try to replicate the number without any specific information other than written descriptions in the report and statute. Buck tried to accommodate this obstacle by reviewing our calculations (we do not have such a no-sharing policy) in some instances and identifying differences. But as a consequence of this lack of information, (1) we cannot confirm that Buck is properly making the calculations, only that our calculations match within a reasonable

margin, and (2) the audit process is much more tedious, time-consuming and drawn out than normally.

We understand that there may be sound business, competitive or legal reasons for Buck to have this non-disclosure policy. We also understand that at some other major actuarial firms (some of which do not consult to public pensions) have a similar policy. However, it is important to point out that this policy makes actuarial audits much more problematic, lengthy and dubious than normal, as indicated in the previous paragraph. It would probably be helpful if future auditors were aware of the limits on shared information in advance.

These limits on audit disclosures plus the dozens of nuances in the assumptions and methodologies which are not currently disclosed make OP&F very dependent on Buck. This could be problematic should OP&F at some point choose to use a different actuary. We believe that a supplemental report to OP&F (which could be shared with future auditors) would alleviate this risk.

CONCLUSIONS

We found Buck'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:

— Clarify certain language in the actuarial valuation reports
— Document the development of health care claim costs more rigorously either in the actuarial reports or in the experience study or both
— Examine several actuarial assumptions (discussed above) more rigorously in the next experience study
— Correct minor discrepancies in the next actuarial valuation
— Alert future auditors of the limits in disclosure

Buck, the ORSC, and particularly the OP&F staff were fully cooperative and responsive, which assisted in the process. Finally, we wish to reaffirm that the work done by Buck was reasonable, consistent and accurate.

Appendix A – Group Results

The following tables summarize the actuarial liability and normal cost for the Pension Benefits for each group produced by Buck and PTA/KMS actuarial valuations.

Table A-1
Pension Benefits Liabilities

Actuarial Liabilities and Normal Cost as of January 1, 2015 ($ in thousands)			
POLICE	**Buck**	**PTA/KMS**	**% Diff.**
Present Value of Future Benefits			
Active Members	5,769,112	5,635,578	-2.31%
Vested Former Members	19,270	19,151	-0.62%
Rehired Retirees	8,250	8,250	0.00%
Retirees and Disableds	5,463,145	5,370,696	-1.69%
Beneficiaries and Survivors	394,001	396,522	0.64%
Contributions Refund Due	20,639	20,180	-2.23%
Total	11,674,417	11,450,377	-1.92%
Accrued Liability			
Active Members	4,189,098	4,054,523	-3.21%
Vested Former Members	19,270	19,151	-0.62%
Rehired Retirees	8,250	8,250	0.00%
Retirees and Disableds	5,463,145	5,370,696	-1.69%
Beneficiaries and Survivors	394,001	396,522	0.64%
Contributions Refund Due	20,639	20,180	-2.23%
Total	10,094,403	9,869,322	-2.23%
Normal Cost	175,972	171,160	-2.73%

Actuarial Liabilities and Normal Cost as of January 1, 2015 ($ in thousands)			
FIRE	**Buck**	**PTA/KMS**	**% Diff.**
Present Value of Future Benefits			
Active Members	5,435,063	5,241,291	-3.57%
Vested Former Members	11,701	11,637	-0.55%
Rehired Retirees	3,833	3,833	0.00%
Retirees and Disableds	4,056,760	3,983,108	-1.82%
Beneficiaries and Survivors	281,059	282,777	0.61%
Contributions Refund Due	7,541	7,462	-1.05%
Total	9,795,957	9,530,107	-2.71%
Accrued Liability			
Active Members	3,959,745	3,779,670	-4.55%
Vested Former Members	11,701	11,637	-0.55%
Rehired Retirees	3,833	3,833	0.00%
Retirees and Disableds	4,056,760	3,983,108	-1.82%
Beneficiaries and Survivors	281,059	282,777	0.61%
Contributions Refund Due	7,541	7,462	-1.05%
Total	8,320,639	8,068,486	-3.03%
Normal Cost	156,833	152,893	-2.51%

PENSION TRUSTEE ADVISORS

KMS ACTUARIES

Appendix B – Sample Actuarial Audit Presentation

Presentation on the Actuarial Audit of the

Ohio Police & Fire Pension Fund

for Ohio Retirement Study Council

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

To ORSC October 12, 2017
To OP&F TBD, 2017

Agenda

- Major Findings of Actuarial Review

- Actuarial Assumptions

  - Demographic

  - Economic

  - Healthcare

- Actuarial Methods

- Actuarial Liability

- Healthcare Review

- Audit Conclusions

Major Findings

- ## We believe the numbers are correct
  - Our calculations match Conduent calculations
  - Although the OP&F benefit structure is very complex, the Buck/Conduent calculations captured key provisions accurately

- ## Improved transparency in the Buck reporting is desirable
  - Development of assumptions
  - Disclosure of calculations

- ## Actuarial Assumptions are reasonable, but anticipate that they will be revised based on results of recent experience study
  - Costs and liabilities will likely increase
  - 8.25% return may be reduced
  - Mortality improvement change results in lesser mortality improvement

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PTA

Findings of Actuarial Review - Summary

Actuarial Assumptions
➥Reasonable and consistent

➥Some minor concerns

Actuarial Methods
➥Reasonable and consistent

➥Some concerns with disclosure

Actuarial Valuation Replication
➥Close match (2.9% on total liability)

➥Reasonable, consistent and accurate

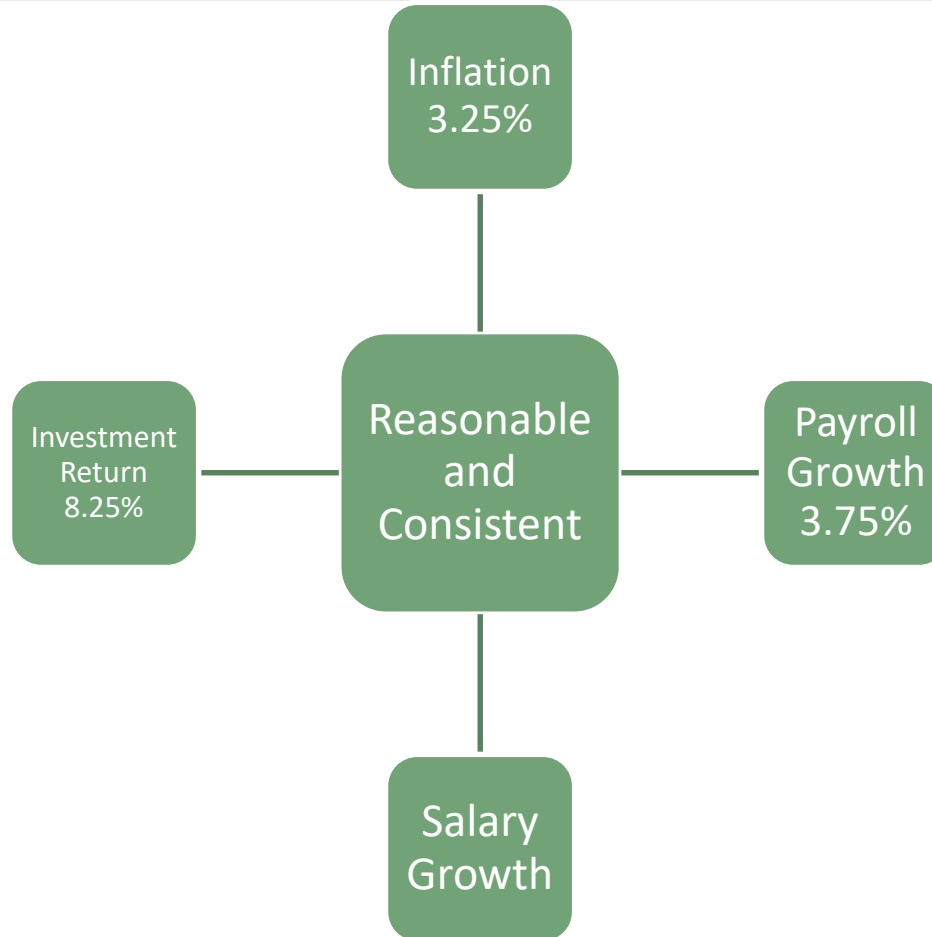## Actuarial Process
➥ Unable to precisely verify detailed calculations

➥ But overall close replication match suggests confidence in numbers

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Demographic Assumptions

Economic Assumptions

Inflation
3.25%

Investment
Return
8.25%

Reasonable
and
Consistent

Payroll
Growth
3.75%

Salary
Growth

Economic Assumptions

- Investment Return Rate of 8.25%

    - Among the highest of other systems (median is 7.50%)

    - Reduction to 8.00% consistent with low inflation environment and peers

- Inflation Rate of 3.25%

    - Consistent with peers (median is 3.00%)

    - Current market rate is much lower

    - Reduction next cycle to 2.75%

- Payroll Growth of 3.75%

    - Reduction next cycle to 3.25%

- Salary Growth Rate

    - Reasonable, but some concerns with recognition of inflation
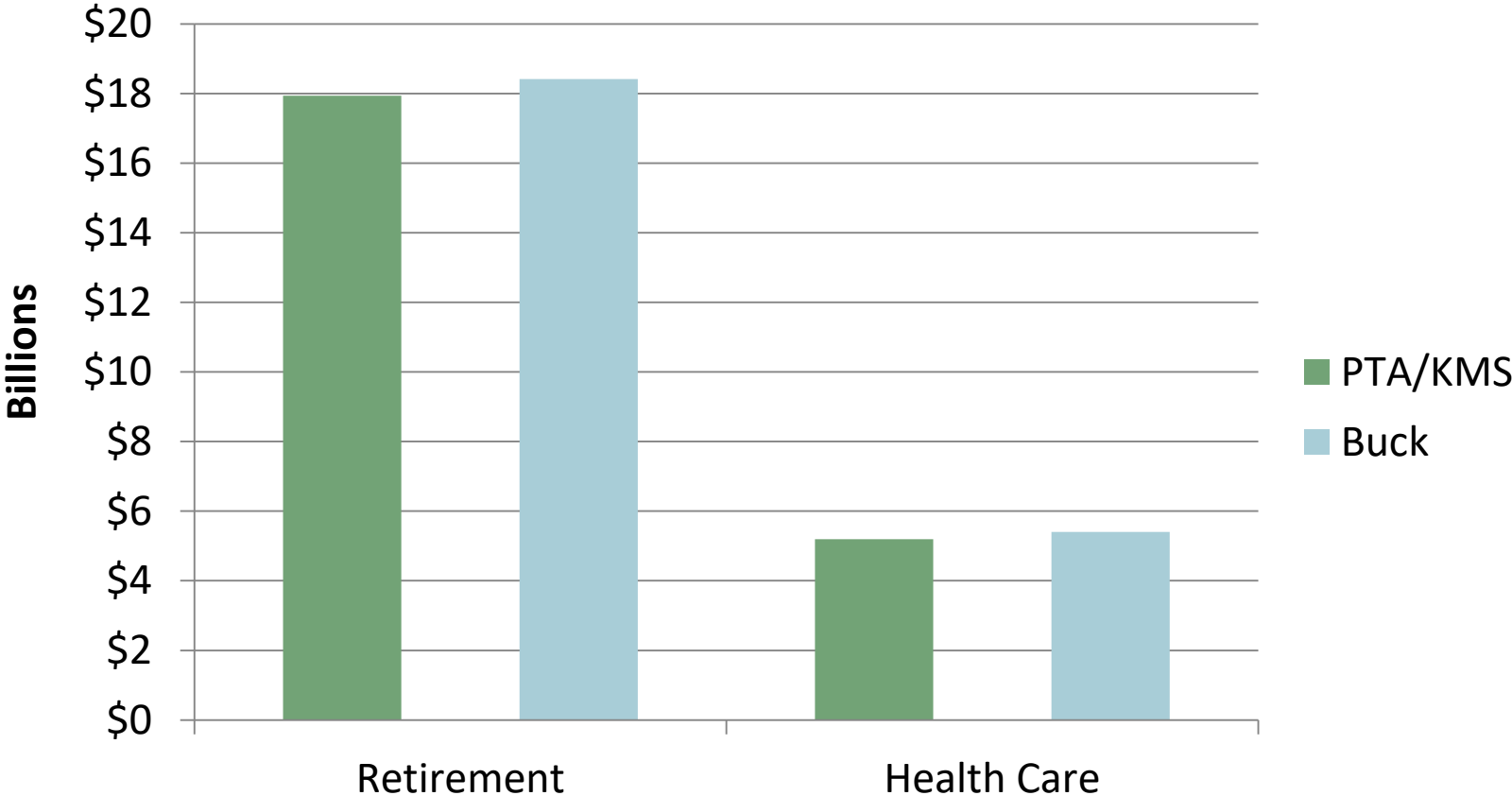
Healthcare Assumptions

Actuarial Methods
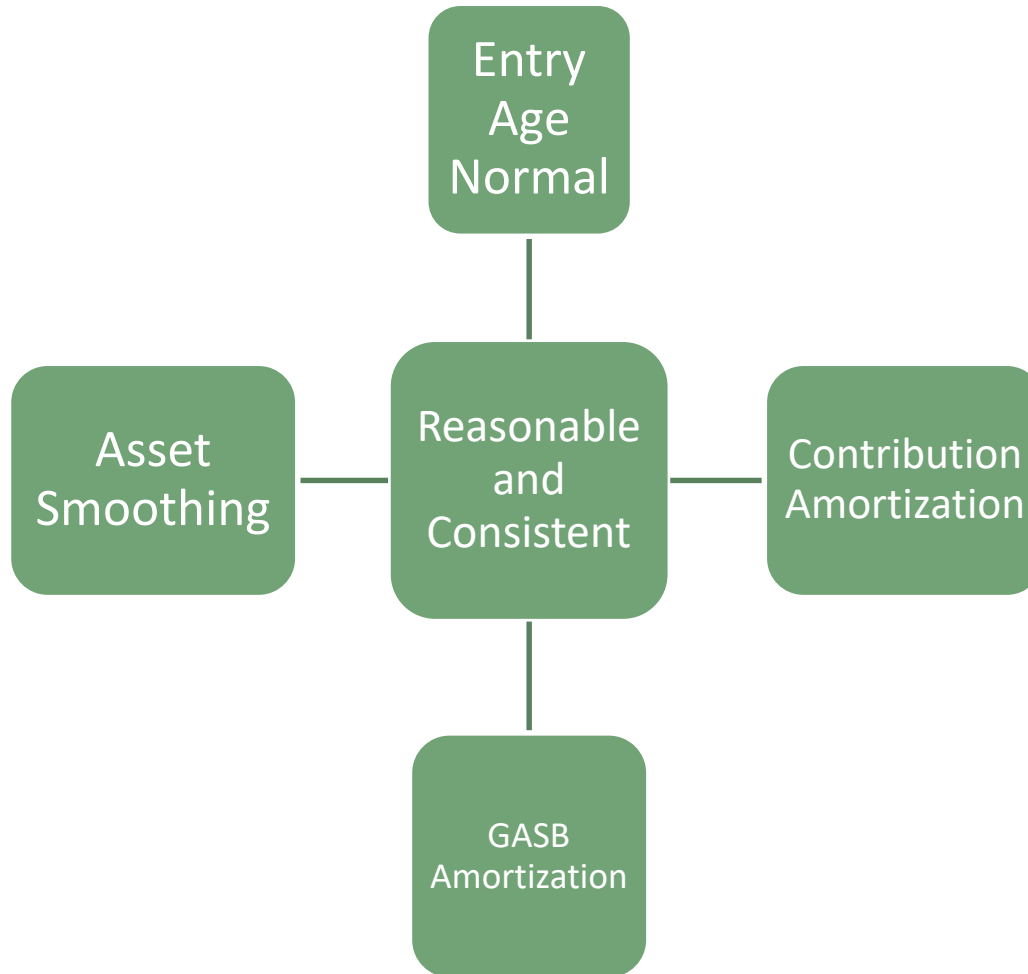
Amortization Methods

- ## For determination of contribution requirements
  - Based on increasing payroll (3.75% of total payroll)
  - Amortization period is 30 years as of January 1, 2015
    - Down from 33 years as of January 1 2014
  - Adoption of proposed assumptions will make attainment of 30-year funding period more challenging

- ## Adequacy of Contribution under Ohio Revised Code
  - Performed every two years
  - This analysis is separate from Actuarial Audit, which is generally performed every ten years
  - OP&F attained 30 year target at last review
    - as of January, 2015
    - report issued October, 2015

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Actuarial Valuation Replication

- Data used by Buck matches data provided by OP&F

- Reasonable match

- Actuarial liabilities match within 2.9% in total

- Thorough, complete work by Buck (Conduent)

Actuarial Liability

Health Care Review

- Assumed 2015 monthly rates are reasonable
- Age-adjusted rates reflect reasonable morbidity by age, are consistent with monthly rates and are reasonable

Audit Conclusions

- Reasonable match in valuation replication
- Assumptions, Methods and Factors
  - Reasonable
  - Consistent
  - Accurate
- Health care rates are reasonable
- Buck reports are complete
- Recommendations
  - Provide next auditor with transparent calculations
  - Correct minor issues mentioned in audit report

Minor Concerns and Areas for Improvement

- Clarify disabled life mortality

- Technical actuarial concerns with historical salary growth analysis

- ORSC and System may wish to consider timing of changes in actuarial assumptions with timing of actuarial audit

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 OP&F World

- Buck was helpful and responsive in clarifying plan provisions and assumptions

- Buck would not provide detailed calculations
  - PTA/KMS could only try to replicate individual calculations through trial and error
  - After detailed questions and clarifications, we were able to match to totals reasonably

- We recommend that Buck provide fully transparent sample calculations
  - And enhance minor reporting issues in the next experience study report and/or actuarial valuation 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 (2.9% on total liability)

➥Reasonable, consistent and accurate

Actuarial Process

➥ Unable to precisely verify detailed calculations

➥ But overall close replication match suggests confidence in numbers

KMS
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