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June 18, 2021

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

Dear Bethany,

Thank you for the opportunity to present Buck's actuarial services for the Ohio Retirement Study Council (ORSC). Building upon our 104-year-old legacy, we are the only provider serving government entities since our founding in 1916 – longer than any other benefits and retirement/actuarial consulting firm.

Buck is especially qualified to provide all the services requested by the ORSC because we understand the public sector, we understand financial modeling, review of valuations and, quinquennial experience studies. Often our clients request that we attend meetings and present on their behalf. We are flexible and nimble and work at the pace required to meet your business needs. But do not take our word for it, ask our references. We encourage you to contact our references to learn firsthand what it's like to work with Buck.

We will draw upon our previous experience and our success in serving clients such as the California Public Employees' Retirement System, the West Virginia Consolidated Public Retirement Board, Pennsylvania Public School Employees' Retirement System (PSERS), and Macomb County Employees Retirement System to ensure we provide the best partner experience for ORSC.

In conclusion, we have outlined our expertise and recommended work plan for this project. We look forward to speaking with you regarding the next stage of the procurement process. Please contact me at 412.588.7564 or tom.tomczyk@buck.com with any questions you may have as you review our response.

Sincerely,

A handwritten signature in blue ink that reads "Tom Tomczyk".

Principal, Pittsburgh and Ohio Market Leader



State Teachers Retirement System of Ohio

Actuarial Audit

June 18, 2021



Contacts

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Principal, Pittsburgh/Ohio Market Leader

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**Audit
Contact** David Kershner
Principal, Consulting Actuary

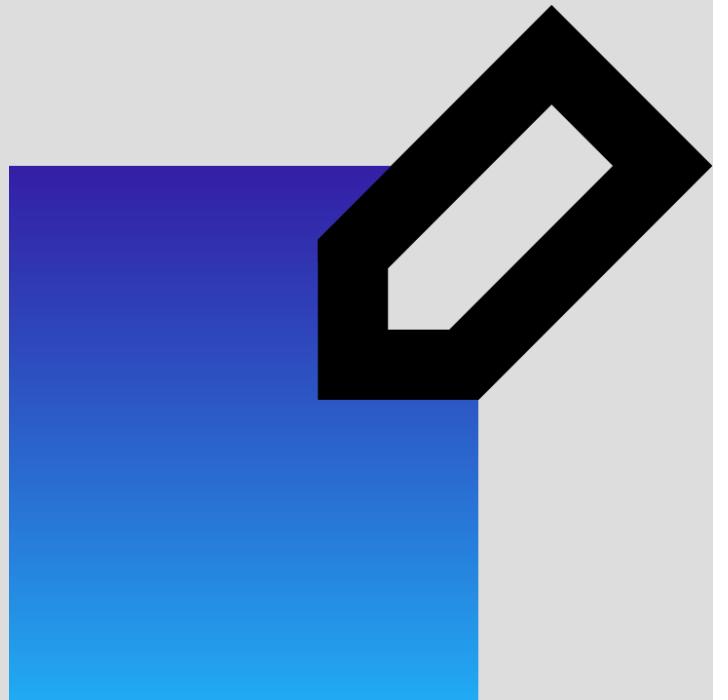
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Executive summary



Executive Summary

We appreciate having the opportunity to partner with the Ohio Retirement Study Council (ORSC) and provide our response to the Actuarial Audit of the State Teachers Retirement System (STRS). We recognize that ORSC was established in 1968 in direct response to the consolidation of local police and fire pension funds and 53 years later continues to provide oversight of the state pension funds to ensure they remain financially solvent. We recognize that the services you provide are vitally important to the budgetary stability of state and local governments and your decisions if not made carefully and with foresight could burden future generations of taxpayers.

We, like you, understand the importance of the work you do and impact it can have on Ohio and STRS members. For more than a century, the professionals at Buck have worked diligently to secure the financial wellbeing of individuals. This is a role we take very seriously, recognizing the importance of items from the allocation of taxpayer dollars to the financial stability and sustainability of the plans.

At the center of what makes Buck unique is our appreciation of the work and impact our clients have on people. We embrace this and make it our own. It is one of the main reasons we have long-standing client relationships and are trusted by some of the largest public sector entities in the world. Several examples include:

Client	Services performed by Buck
PSERS	Actuary since 1919 performing all actuarial consulting services including such items as pricing legislative changes and collective bargaining agreements.
City of New York	George B. Buck's first client in 1916 that led to the creation of the namesake company of today. Another relationship that has lasted over 100 years.
West Virginia Consolidated Public Retirement Board	In partnership, we have seen the state's pension funding status move from most poorly funded in the country to one of the best.
CalPERS	In partnership, we were retained to modernize the retirement system's in-house actuarial software while also completing audits for all their plans

Commitment to the public sector:

We're committed to the public sector; it's evident in the investment we've made in this business and in the industry at large, and in the professionals we continue to attract to our firm — including many who are just starting their actuarial careers. In the U.S., we employ 47 Fellows of the Society of Actuaries, 66 Associates of the Society of Actuaries, and 96 Enrolled Actuaries, and have been serving government entities since our founding in 1916 – longer than any other benefits and retirement/actuarial consulting firm.

We are reaffirming our commitment to the Public Sector with every intention of leading the way for another 100 years. Buck's leadership is demonstrating our investment and commitment with pricing and contracting that we believe is aggressive and compelling.

Our expertise your security:

Buck's consultants provide comprehensive retirement and actuarial consulting services including funding valuations, financial statement reporting, experience studies, plan design analyses, actuarial reviews, and multi-scenario projections. We currently provide actuarial and consulting services to over 150 public-sector retirement systems. As such, we offer significant public-sector pension and health care experience providing actuarial and benefits consulting services for state and local governments.

In the face of volatile capital markets, increased emphasis on fiduciary responsibility and disclosure, and higher regulatory and accounting standards, it's important to know that we take a balanced, conservative consulting approach that makes us well-suited to serve as your trusted advisor and help you maintain financial prudence, operational excellence, and fiduciary effectiveness. A hallmark of our longstanding history—which has served our clients well over the years—is a fiscally conservative approach to actuarial services and guidance, while also adopting new, innovative approaches that provide greater value to our clients.

Unique methodology, driving better insights leading to lower risk:

We have found through our audit experience that our approach to full replication audits stands out amongst our peers. In particular, even though the certification process uses a reasonable predetermined target tolerance (for example 5%) for differences in aggregate results, systematic errors could still be hidden in the valuation after this criterion is met. This is because the parallel valuations are not performed on a double-blind basis. The auditing actuaries know what results they are trying to match. If there is a discrepancy, the inclination is to look to causes that bring the results closer together until the tolerance threshold is crossed. Hidden differences that move the results in the opposite direction can be overlooked.

Only by looking at individual, participant-by-participant results does the auditing actuary develop full control and understanding of both the original and the replication valuations. We ask that the System actuary provide certain actuarial results by individual for each valuation being audited, and we will use this to perform an enhanced reconciliation process. In this enhanced reconciliation process, we will compare and tabulate differences not just in aggregate results but also in individual results for all participants in the valuation.

This detailed examination of valuation differences develops a better picture of the actuarial process being used at STRS, producing confidence that the actuarial results are being developed appropriately at the most basic level.

Actuarial technology and more:

We are process-centered and equipped with best-in-class technology, which permits us to be more responsive to your needs as they arise and enables you to be more responsive as well. Through our technology we “connect” our clients to their data and to highly useful analytical tools, thereby facilitating the kind of fact-based decisions that top organizations seek.

Our retirement consultants assist organizations with the design, financial evaluation, and administration of benefit plans and related arrangements through the delivery of the following services:

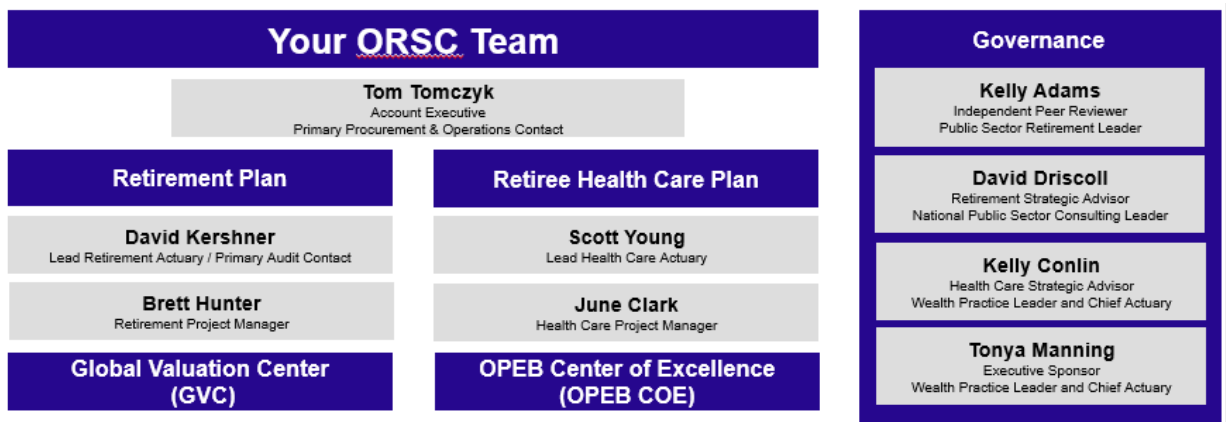
- Preparation of annual actuarial valuations
- Preparation of fiscal notes on proposed legislation
- Development of health care costs and trend rate assumptions
- Plan design strategy and costing
- Strategic analyses of contribution and cash flow projections
- Financial statement reporting disclosures for pension and OPEB plans
- Delivery of actuarial cost estimates in union negotiations
- Actuarial review studies
- Demographic forecasting
- Compliance, audit and governance
- Experience studies for review of actuarial assumptions
- Multi-year contribution and funded status projections
- Development of funding policy
- Asset/liability modeling
- Investment consulting

We would like to point out that while some of the services listed above aren't in scope, we provide these services to clients like those to which ORSC is responsible for oversight. Regardless of who provides these services, it is critical to understand each as they directly or indirectly impact our ability to provide the best audit services and may aide in ORSC's understanding of the Systems ORSC oversees.

People serving people:

Your Buck team members will be led by our most experienced and talented professionals as well as rising super stars on our public sector pension actuarial team. That's our commitment to you. The team we've assembled is comprised of actuarial professionals including Fellows and Associates of the Society of Actuaries. Each team member is selected based on their experience working with similar clients and their individual client load ensures you'll always have a white glove experience. They're seasoned professionals, each with over 20 years of experience, to ensure they have seen many different benefit provisions, funding policies and actuarial communications.

This experience lends itself to better actuarial audits than may be performed by actuaries with less experience and exposure to various industry standards and unique situations. Together, they'll deliver on our promises to you, your boards, committees, administrative staff, and others, while articulating complex actuarial concepts in ways that are relevant and understandable to each stakeholder group. Your one point of contact for the audit scope is, David Kershner, lead Retirement Actuary, FSA, EA, MAAA, FCA. He will coordinate all audit efforts in addition to his focus on the pension actuarial audit and experience study. Scott Young lead Health Actuary, FSA, EA, MAAA will focus on the retiree health care audit. We want our team focused on the audit and project deliverables so Tom Tomczyk will serve as the Account Executive and will be responsible for the procurement and operational activities including resource allocation, contracting, invoicing and overall client satisfaction.



Full biographies along with details on the broader team can be found within our response.

Now is the time for a fresh approach with Buck. Backed by deep industry experience, specialized expertise, empowering actuarial technology, and one of our very best teams of Public Sector consultants, we are committed and prepared to partner with and deliver exceptional services to the ORSC.

RFP responses



4.1 Proposal Summary

We understand the ORSC is seeking a qualified actuarial firm to independently validate and perform an analysis on the assumptions, procedures, and methods used by the STRS consulting actuary, Cheiron or Segal (based on the valuation and review periods requested).

Buck is fully capable of performing the actuarial audits of the following:

- STRS annual pension actuarial valuation as of June 30, 2020
- The five-year experience review for the period July 1, 2011 to June 30, 2016
- STRS annual retiree health care actuarial valuation as of June 30, 2020, including GASB Statement 74 disclosures

Buck has obtained copies of these valuations from the ORSC website and has briefly reviewed each one. We will request, from ORSC and STRS staff, any additional information needed to perform the audits.

As requested in the RFP, the audit will include Data Validity, Actuarial Valuation Methods and Procedures, Actuarial Valuation Assumptions, Parallel Valuation, Recommendations and a review of retiree health care contributions. Our audit will review the system actuary's compliance with Actuarial Standards of Practice as well as state legislative and other applicable standards to help ensure the actuarial soundness of the STRS. In completing our audit, we will adhere to all applicable Actuarial Standards of Practice.

Our proposal will cover the information requested in your Request for Proposal by including in this section general information and details about the following information in subsequent sections.

- Capabilities and experience
- Staff Qualifications
- References
- Methodology, work product and timeline
- Any additional information
- Glossary
- Cost information

We will provide monthly updates to the ORSC. The final reports will include: description of the work performed, an executive summary, and findings and recommendations. The key findings and recommendations will clearly identify to whom they are primarily directed (e.g., the Legislature, STRS Board, and ORSC). We will provide a digital and 25 bound copies of the final report to STRS and a digital and 25 bound copies of the final report to the ORSC not later than one week after the completion of the final report. Additionally, we will present this report, in person, to both the ORSC and the STRS Board.

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

The primary contact for both ORSC and STRS staff during the audit will be David Kershner. He may be contacted for all services of this audit engagement. However, Scott Young is the health care expert member of the proposed team and therefore may be contacted directly for the health care services, if preferable to ORSC and STRS staff. It is important to us that the subject matter experts are focused on the project. As such, Tom Tomczyk will serve ORSC as the Client Executive. Tom will be responsible for the procurement and operational activities including resource allocation, contracting, invoicing and overall client satisfaction.

David and Scott's contact information:

1. david.kershner@buck.com
602.803.6174
2. scott.young@buck.com
216.315.1929

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

Buck is one of the world's leading professional services firms, focused exclusively on human resources, actuarial and benefits consulting and brokerage, technology, and administration services. Our more than 100-year heritage of excellence dates to 1916, when our founder, George B. Buck, established the actuarial basis of the New York State and City retirement systems.

Since then, we have grown into a diversified firm that provides these services to both public and private entities, covering the entire employee benefit and human resource management fields.

Today we are an independently operated entity, with strong financial backing led by H.I.G. Capital. This has positioned us extremely well to not only deliver the high level of consulting and administration services our clients have grown to expect, but to create many new innovative tools and technologies.

We have approximately 2,250 professionals worldwide. Since becoming independent in August 2018, our headcount has grown by 30%.

Our global and US leadership structure is available on Buck.com.

- 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

Since becoming an independent company in 2018 no other changes have taken place and none are currently under review.

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

Each year we invest in an independently conducted client satisfaction survey that provides our Net Promoter Score (NPS). The NPS is based on how likely a client would recommend Buck either within its organization or to another organization. Our 2020 NPS for our US business rose to 73 from 59, on the -100 to +100 NPS scale; both scores positioning Buck in the "excellent" category. By way of comparison, Microsoft NPS is 45; Apple is 47; Google is 11 and Facebook is -21.

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

Like any company, Buck is subject to the legal actions, proceedings, claims, and disputes that arise in the normal course of business. However, Buck has no claims, proceedings, or actions pending against us that could reasonably be expected to materially impact our ability to meet our commitments or perform our obligations to our potential clients.

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

Buck has no claims, proceedings, or actions pending against us that could reasonably be expected to materially impact our ability to meet our commitments or perform our obligations to our potential clients.

- 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.

Over the past five years Buck has partnered with various entities of the five Ohio public retirement systems. Please see a listing below.

Buck is currently under contract or has contracted with the entities below within the last 5 years:

- State Teachers Retirement System (STRS)
- School Employees Retirement System (SERS)
- Ohio Police and Fire Pension Fund (OP&F)
- State Highway Patrol Retirement System (SHPRS)

None of the services provided constitute a conflict of interest relative to performing the proposed review. The services requested are an independent audit of the system actuary of STRS. Buck is not the system actuary and does not provide similar actuarial services to STRS. In addition, the team proposed for these services has no affiliation with nor provide services to STRS and therefore remain independent.

4.2 CAPABILITIES AND EXPERIENCE

Each proposal shall describe the firm's capabilities and recent experience (at least during the last five years) in performing actuarial valuations, audits, or studies of public employee retirement systems. The response should include information on the types and sizes of public employee retirement systems for which past work has been performed, including whether the systems were defined benefit or defined contribution plans, the types and number of participating employers, number of participants, and other relevant indicators of plan type, size, and comparability to STRS. You should include other information you believe may be relevant in demonstrating your capabilities in performing the actuarial audit, including other professional experience and data processing capabilities.

Supporting public sector clients is one of our core competencies. We have been serving government entities since our founding in 1916 – longer than any other benefits and retirement/actuarial consulting firm. We provide consulting services to numerous public-sector entities, with a broad range of size and complexity.

Because Buck is among the largest pension consulting firms in the US, it is difficult to provide the exact number of clients for which we have performed actuarial valuations, audits, experience studies, and pension consulting services within the past five years. However, it is safe to say that the number is well over one hundred. We have provided actuarial services for some of the most complex retirement programs in the US. Among them are some of the largest public-sector plans, including more than 20 statewide retirement systems. We have served and do serve as actuary for systems with defined benefit, defined contribution, and retiree health care benefits. Some of our clients have multiple tiers, complex benefit structures, Deferred Retirement Option Programs (DROP) and other complicated provisions. Our experience includes systems with multiple participating employers, especially with teacher retirement systems.

Buck has too many public sector clients to list all pertinent information on every one of them that relates to STRS. However, here is a small sampling of representative clients with relevant experience:

1. **CalPERS – Actuarial audit including Parallel Valuation**

Plan Type: Defined Benefit

Employer Type: Statewide

Number of Participating Employers: over 2,800

Membership: more than 2 million

Assets: over \$350 billion

Relevance: We performed parallel valuation audits of the CalPERS staff actuaries. These are the same services requested for STRS. CalPERS is the largest system in the US and has complicated benefits and huge datasets. The work performed for this client clearly indicates Buck is fully capable of handling large complex actuarial audits and datasets.

2. State of Alaska – Annual actuarial valuations and periodic experience studies

Plan Type: Defined benefit, defined contribution and retiree health care

Employer Type: Statewide, 5 separate systems with 7 total plans

Number of Participating Employers: -Teacher Retirement System – 58
-Public Employees Retirement System - 161

Membership: Approximately 118,000 participants

Assets: Approximately \$26 billion

Relevance: The Teachers Retirement System covers the same type of participants as STRS and has defined benefit, defined contribution and retiree health care benefits. Also, our actuarial work for the State of Alaska systems is required to be audited each year by an independent actuary. This demonstrates experience with cooperation between audit and annual service actuaries.

3. New York Office of the Actuary – Annual retiree health care valuations and general pension consulting

Plan Type: Retiree health care and defined benefit

Employer Type: Large City, 5 systems including TRS

Number of Participating Employers: Not Available

Membership: Systems total 810,142

Assets: Systems total \$185.9 billion

Relevance: The Teachers Retirement System (TRS) covers the same type of participants as STRS. We provide annual actuarial services for the retiree health care benefits. Providing the annual actuarial valuation services requires the same expertise as conducting a parallel valuation. Therefore, this demonstrates our expertise in a parallel valuation for STRS retiree health care benefits. It also demonstrates experience with a similar size as STRS.

4. Pennsylvania Public School Employees' Retirement System – Annual actuarial valuations and experience studies

Plan Type: Defined benefit, defined contribution and health care benefits

Employer Type: Statewide – school system, teachers

Number of Participating Employers: Not Available but all PA schools are eligible

Membership: 521,763 participants

Assets: Approximately \$58.7 billion

Relevance: The Teachers Retirement System (TRS) covers the same type of participants as STRS and is similar in size. We provide annual actuarial services for the same benefit types as STRS. Providing the annual actuarial valuation services requires the same expertise as conducting a parallel valuation. Providing experience studies for this client provides the expertise needed to audit experience studies of other actuaries.

5. West Virginia Consolidated Public Retirement Board – Annual actuarial services and experience studies for 5 of the 7 systems, review & general consulting on other 2 systems

Plan Type: Defined benefit

Employer Type: Statewide, 7 systems including TRS

Number of Participating Employers: Not Available

Membership: 178,990 participants

Assets: \$17.3 billion in assets

Relevance: The Teachers Retirement System (TRS) covers the same type of participants as STRS. We provide annual actuarial services for the same benefit types as STRS. Providing the annual actuarial valuation services requires the same expertise as conducting a parallel valuation. Providing experience studies for our client provides the expertise needed to audit experience studies of other actuaries. In addition, we work with the in-house actuary to review work and consult on the plans they service. When there was a period of time between in-house actuaries, we performed the work on the 2 systems and therefore also inherently audited the work of the in-house actuary.

We have recently performed actuarial audit services for South Dakota and AC Transit Authority as you will see in our reference section of this response. In the past, we have performed audit services for multiple other statewide systems including New Mexico, Colorado, Kansas, Montana, North Dakota, Missouri, and Utah.

Audits

We produce parallel valuations as if we were the consulting actuary, we then compare our results to those produced by the consulting actuary. To the extent there are differences, we will attempt to reconcile them and comment on the potential for changes in the valuation processes currently in place for STRS that could result in improvements in the work products it receives on an ongoing basis.

An approach we have taken to conducting audits when the requisite information has been available, is to attempt to match the system's actuary's calculations of costs and liabilities on a participant-by-participant basis. This is preferable to attempting to match the results produced by the system's actuary in the aggregate, as matching in the aggregate can camouflage problems in the development of costs for specific categories of participants, particularly if problems offset each other. If your consulting actuary will provide valuation results on a participant-by-participant basis, we will employ this approach in our audit of the actuarial work for STRS.

We have performed parallel valuations of this nature for CalPERS since 2015. The review includes verification of compliance with relevant laws, regulations and professional standards.

There is something that sets Buck apart when providing actuarial services but adds an extra advantage when performing actuarial audits. That something is our national independent peer review team. Buck maintains a peer review department, the Central Review Team, which is unique in the industry. Each Reviewing Actuary in this unit has more than 20 years of pension actuarial experience and is an Enrolled Actuary, a Member of the American Academy of Actuaries, and an Associate or Fellow of the Society of Actuaries. The Reviewing Actuaries are *independent from the consulting actuaries whose work they review*, and they have their own career path.

Also, the peer review actuary dedicated to public sector pension reviews is our Public Sector Retirement specialty practice leader and reviews deliverables for all of our public sector pension clients. The advantages this provides in performing actuarial audits is:

- Essentially the independent reviewer's day-to-day job is performing actuarial audits. They are not typically full parallel valuation audits but they are limited scope audits. The extent of the audit depends on the scope of the work but always include an analysis of the assumptions, procedures, and methods used as well as compliance with Actuarial Standards of Practice and Buck's high-quality standards. When performing audits every day, the peer reviewer can hone in on items that those that do audits less frequently may not necessarily be aware of. Therefore, they provide a final assurance that the actuary performing the audit for you has thought of all relevant issues.
- Due to the extent of work involved in being an excellent partner to actuarial consulting clients, actuaries across all firms can only have a limited book of business. This means their experience may be somewhat limited in the public sector clients they serve. This is acceptable, and sometimes necessary and preferable. However, since our national peer reviewers' scope of work is limited to reviews, they are able to see a wider array of clients. As mentioned above, the public sector reviewer sees all of our public sector clients and is able to understand a vast degree of differences and similarities among public sector retirement programs across the US. The information gathered, which includes differences in system demographics and sponsorship, is provided to the consultants across our public sector retirement practice who in turn use this expertise and insights when performing audits. Therefore, there is very little chance a Buck actuary performing an independent audit will come across something they have never been exposed to or experience before.

Actuarial services and consulting

In order to independently audit an actuarial valuation, an actuary needs to have experience in performing actuarial valuations and serving as system actuaries.

Buck provides actuarial services to numerous governmental plans across the country. In addition to performing the annual valuations for these clients, we work with them as needed to negotiate and implement appropriate strategies to control the obligations associated with their plans. And, given the budgeting limitations inherent in the financing of public entity plans, we also consider possible changes in future economic and demographic conditions and model the impact of those changes on the liabilities of the plans.

Many of our clients are systems with multiple plans or "tiers" that apply to participants in different occupational categories or who joined before and/or after particular dates. We serve clients with risk sharing provisions that vary based on the experience of the systems. We also have clients who offer both defined benefit and defined contributions benefits and retiree health care benefits.

Experience studies

Just like with actuarial services above, to independently audit an experience study an actuary needs to have conducted experience studies themselves.

Buck presently serves as actuary to retirement systems of all sizes including statewide public retirement systems, international public retirement funds, and local retirement systems.

Our clients range from large to small. Because the performance of regular experience studies has come to be widely regarded as a best practice among public retirement systems, we perform such studies for virtually all of our public sector clients and many of our large private sector clients. With a few exceptions (e.g., where a particular assumption is chosen by an external authority), our experience studies entail a review of all actuarial assumptions used by the subject systems and consider credibility of the experience when setting assumptions.

The credibility of the experience is an important consideration in experience studies that can sometime be overlooked. Often times with smaller public sector clients, there is not enough credible experience to provide a basis to set an assumption. Mid-size and even large clients may have only partially credible experience. Buck utilizes Proval (a licensed third-party system) for conducting experience studies. However, in addition, we developed an internal experience study tool that works with Proval but provides more flexibility in parsing data into subgroups to be analyzed as well as applying credibility weighting to the actual experience. This tool sets us apart from competitors who apply only professional judgement to determine credibility weighting or may not weight for credibility at all. The advantage of this internal tool is valuable in conducting experience study audits as well so that the auditing actuary can ensure the system actuary has parsed the data appropriately and applied any necessary credibility adjustments.

One example of our experience study expertise is evident in that we are currently finishing an experience study for a statewide teacher system with approximately 500,000 members, \$60 billion in assets and \$105 billion in liabilities. This client directly relates to STRS in types of members, multiple participating employers, defined benefit, defined contribution and retiree health care benefits. This system is fairly complicated with multiple plans or “tiers” that apply to participants in different occupational categories or who joined before and/or after particular dates.

Data processing capabilities

We operate four North American data centers, a pair in the US and a pair in Canada. There is a primary and a secondary Disaster Recovery (DR) data center in each country. We also manage our own hosting and network infrastructure.

The US data centers are in Atos colocations in Blythewood, South Carolina and Charlotte, North Carolina. These data centers fall in the secure and well-serviced “Golden Triangle” region where some of the world’s largest data centers are located. The locations were selected to ensure physical DR separation between the primary and secondary centers without negatively affecting the ability for real-time replication. They are ISO 20000, SSAE16, PCI and HIPAA certified. All data centers are protected against loss of power and both sites have enough generator capacity for full ongoing operation and fuel contracts with multiple suppliers of diesel fuel in the vicinity.

We currently support five types of secure file transfer protocols for data exchange. The protocols are: Mailboxes with Secure FTP (HTTPS); AS2 (EDIINT); FTP Server using PGP; SFTP or FTP/S; and Connect: Direct (NDM).

We can accept data in all commonly used formats.

Other Post-Employment Benefits (OPEB) Center of Excellence (CoE)

The theme continues... in order to audit a retiree health care actuarial valuation, an actuary needs to be experienced in performing retiree health care actuarial valuation. This is exactly what our OPEB Center of Excellence (COE) does.

Our OPEB CoE model combines specialized OPEB subject matter expertise with rigorous processes and standards to bring unparalleled actuarial health and welfare benefits services to our clients. Most other actuarial firms have OPEB work performed by retirement actuaries who have only cursory knowledge of health issues. Those retirement actuaries consult with health actuaries who develop per capita costs and other health-related assumptions but are otherwise not involved in the day-to-day work on the assignment. The result of that process is that the health actuary does not receive ongoing and updated information throughout the project, as a result many important factors may not be reflected in the calculations.

Your Buck OPEB team is comprised of seasoned, credentialed health actuaries who specialize in OPEB issues, including design, Medicare impacts and pharmacy strategies. Our specialists understand the cost drivers behind the numbers and look for strategic opportunities to deliver cost efficient benefits. Our team also has significant experience with funded OPEB plans and their unique issues. This level of OPEB knowledge cannot be found at other firms. We believe that the changing healthcare landscape requires specialized, technical OPEB experts and our CoE structure and staffing differentiates us from other consulting firms.

We are one of the few firms that have consultants who specialize in the public sector, providing our public sector clients with significant expertise on special issues relating to benefits, plan design, GASB, CAFR and the administration of public employee retirement systems. We currently provide health and OPEB consulting services for a large number of municipalities, states and quasi-governmental entities. Our team has implemented GASB 74 and 75 for many of these clients, so we are very familiar with these accounting standards.

Our OPEB CoE delivery model means that OPEB specialists experienced in the public sector are dedicated to both the strategic and the valuation needs of our client's OPEB plans. We believe this approach is a differentiator for Buck because our strategic consulting and valuation staff members are integrated into a single team. This also relates to OPEB actuarial audits, as the integrated team has a fuller understanding of things that other actuarial firms with non-integrated teams may miss.

One example of our experience, relevant to the services that will be audited for STRS, is that our proposed lead actuaries for pension and retiree health care benefits, David Kershner and Scott Young, work together on the State of Alaska team (including the TRS) performing annual actuarial valuations for pension and health care as well as conducting periodic experience studies.

4.3 STAFF QUALIFICATIONS

Each proposal shall, at a minimum, describe the qualifications of all management and lead professional personnel who will participate in the audit. Each personnel description shall include: (1) a resume; (2) a summary of experience each has had in performing actuarial valuations, audits, or studies of public employee retirement systems; and (3) a management plan identifying the responsibilities each will have on the audit.

We have assembled a top-notch team of public sector professionals who, based on the Scope of Audit services, will add value and provide expertise relevant to ORSC and STRS. Our team has extensive public sector experience with all types of plans and systems, including statewide systems designed for teachers. The lead health care actuary resides in the State of Ohio and therefore has local understanding of the needs and way of life of the participants and other stakeholders of the system.

Below is an organizational chart outlining key professional personnel proposed to lead the actuarial audit services for ORSC in relation to STRS.

The key roles and responsibilities proposed for the requested services are as follows:

- **Account Executive, Tom Tomczyk** – responsible for the procurement and operational activities, including resource allocation, contracting, invoicing and overall client satisfaction.
- **Lead Retirement Actuary, David Kershner** – Primary contact for Audit work. David will oversee, review and sign the audits of the retirement actuarial valuation and experience study. He will serve as contact for retirement related services, meet / communicate with ORSC staff and STRS staff to update on progress, obtain any necessary information or discuss any issues or concerns that may need to be vetted or system actuaries.
- **Lead Health Care Actuary, Scott Young** - Oversee, review and sign the audits of the retiree health care actuarial valuation and retiree health care related assumptions in the experience study. He will serve as contact for retiree health care related services, meet / communicate with ORSC staff and STRS staff to update on progress, obtain any necessary information or discuss any issues or concerns that may need to be vetted or system actuaries.
- **Retirement Project Manager, Jonathan Dobbs** – Manage retirement project timelines, adherence to Buck’s high-quality standards, lead team and check work of Global Valuation Center (GVC), apprise lead retirement actuary of any issues or concerns that may need to be vetted with ORSC staff, STRS staff or system actuaries.
- **Health Care Project Manager, June Clark** - Manage retiree health care project timelines, adherence to Buck’s high-quality standards, lead team and check work of OPEB Center of Excellence, apprise lead retiree health care actuary of any issues or concerns that may need to be vetted with ORSC staff, STRS staff or system actuaries.

- **Independent Peer Review, Kelly Adams** – Independently review all deliverables to ensure adherence to Buck’s high-quality standards and Actuarial Standard of Practice. She will share experiences and trends across all public sector retirement clients with client team for use in their audit and general client consulting and assist in applying strategic audit procedures that may apply to STSR.
- **Retirement Strategic Advisor, David Driscoll** – Support retirement team with strategic insights and advice around trends and activities among public sector retirement sponsors, as desired or needed. He will be available to ORSC and STRS staff if desired for any items that specific expertise adds value.
- **Health Care Strategic Advisor, Kelly Conlin** - Support retiree health care team with strategic insights and advice around trends and activities among public sector health care sponsors, as desired or needed. She will be available to ORSC and STRS staff if desired for any items that specific expertise adds value.
- **Executive Sponsor, Tonya Manning** –Support Buck client team, ORSC and STRS staff by ensuring client satisfaction and link to Buck’s Executive Leadership Team.

Please refer to Attachment A for team resumes.

Summary of relevant experience of key personnel

Tom Tomczyk is a Principal and Market Leader for Buck’s Pittsburgh and Ohio markets. As part of your team he will serve as the Account Executive, responsible for the procurement and operational activities, including resource allocation, contracting, invoicing and overall client satisfaction. He has 25 years of experience and is skilled in business strategy, consensus building, and teamwork.

David Kershner, FSA, EA, MAAA, FCA is a Principal and Consulting Actuary with over 30 years of experience in actuarial consulting. He serves as lead actuary for the State of Alaska (#2 in section 4.2). He currently works solely on public sector clients of various sizes. Some of which he is the lead actuary and others he is the senior actuary serving more of an advisor role to the lead actuary. Recently David completed a parallel actuarial valuation audit for the AC Transit Employees’ Retirement Plan (as shown in the following references section). Through this audit David has recent experience auditing the same firm that serves as the system actuary for STRS. David is a member of Buck’s Public Sector Retirement specialty practice and is active in the Conference of Consulting Actuaries meeting planning group for public plans.

Scott Young, FSA, EA, MAAA, FCA resides in the State of Ohio and is a Director and Consulting Actuary with over 25 years of experience in actuarial consulting. Scott works with David Kershner on the State of Alaska as the lead health care actuary (#2 in section 4.2). His experience includes presenting actuarial results and analysis to clients and at Board meetings, preparing and reviewing retiree health care actuarial valuations, pension and retiree health care expense calculations and annual disclosure results (GASB), government filings, medical, prescription drug, dental and vision plan analysis and plan experience studies. Scott serves as lead health care actuary on multiple public sector plans including plans in New York City and Buffalo. He is a member of Buck’s health care practice’s Public Plan leadership group.

Jonathan Dobbs, ASA, EA, MAAA is a Director and Technical Actuary with over 30 years of experience in actuarial analysis of design, funding and compliance of traditional and hybrid defined benefit plans and postretirement medical and life insurance plans.

Jonathan is a very technical actuary who serves as project manager and checking actuary for our Global Valuation Center (GVC). He ensures the analyst teams meet project timelines, understand the scope of the work, and adhere to high quality standards. He links the analyst with the lead retirement actuary. Jonathan is an instrumental member of Buck's CalPERS audit team (#1 in section 4.2). His work on the CalPERS team qualifies him as an experienced audit analyst handling the largest and one of the most complicated retirement systems in the U.S. He also worked with David Kershner on the recent audit for AC Transit. Jonathan serves a large number of public sector clients, is considered one of our public sector technical experts, has performed many public sector actuarial audits, and is a member of our Public Sector Retirement specialty practice.

June Clark, ASA MAAA is a Senior Consultant and consulting actuary and has over 30 years of actuarial experience working on large public sector retirement plans. June has performed all aspects of post-employment valuations for accounting and funding purposes including assumption setting, programming and analysis of results for both health and welfare and pension plans. She was instrumental in setting up the Governmental Accounting Standards Board Statements 74 and 75 work at Buck when they replaced Statements 43 and 45. June provides retiree health care services for the State of Alaska (#2 in section 4.2) and New York City Office of the Actuary (#3 in section 4.2). June also performs health care services for the State of Louisiana.

Kelly Adams, FSA, EA, MAAA, FCA is a Director, Leader of the Public Sector Retirement specialty practice, and national independent public sector reviewing actuary with over 23 years of public sector experience. Kelly focuses exclusively on public sector actuarial services. Kelly reviews the deliverables for all the clients listed in section 4.2 as well as all of Buck's other public sector clients. She joined Buck in 2018, prior to that she provided audit services for the Florida Retirement System, which includes Florida's teachers and education employees. She researches public sector trends and information and disseminates it to our public sector retirement actuaries. Kelly's everyday experience serving as an internal actuarial auditor (peer review) provides a unique insight into Buck's external audit work. Kelly also has extensive prior experience as the lead and support actuary for both retirement and retiree health care actuarial valuation services for a large number of public sector clients.

David Driscoll, FSA, EA, MAAA, FCA is Buck's National Public Sector Consulting Leader, and one of 8 actuaries on the California Actuarial Advisory Panel. He has over 30 years of experience and has worked with many state-level retirement systems, including current work on such clients as CalPERS (#1 in section 4.2), Pennsylvania PSERS (#4 in section 4.2), and West Virginia Consolidated Public Retirement Board (#5 in section 4.2). He is presently a member of the Actuarial Board for Counseling and Discipline and has served in the past on the Pension and General Committees of the Actuarial Standards Board. While on the latter committee, he led the task force that developed the most recent version of Actuarial Standards of Practice (ASOP) No. 23, Data Quality. David's extensive volunteer experience with the Actuarial Standards Board provides Buck with an in-house expert on Actuarial Standards of Practice that are crucial in understanding when performing actuarial audits.

Kelly Conlin, FSA, EA, MAAA is Chief Actuary and Regional Practice Leader in Buck's Health Care practice. She has over 20 years of experience as an actuary and benefits consultant and is responsible for management of Buck's OPEB Consulting Center of Excellence.

Buck's CoE model marries specialized OPEB subject matter expertise with rigorous processes and standards to bring unparalleled actuarial health and welfare benefits services to Buck clients.

Tonya Manning, FSA, EA, MAAA, FCA is Buck's Wealth Practice Leader and Chief Actuary with over 30 years of experience in actuarial consulting. Tonya serves as leadership support for the State of Alaska (#2 in section 4.2) and many other of Buck's public sector wealth practice clients. She is very active with many actuarial professional organizations and has been active with the National Association of State Retirement Administrators (NASRA) in which Buck is a premium associate member. She is also a lecturer for Columbia University's Master Program in Actuarial Science, which helps her explain complex actuarial topics in an understandable way.

You may have noticed that all the lead professionals listed in the proposed team have over 20 years of experience in the field. This was not by accident. An actuarial audit team with vast experience will most likely have seen, at some point in their career, anything and everything. This lends itself to being able to identify potential issues that less experienced actuaries may miss or not fully understand.

Audit Engagement Management Plan

At the top of this section, the team and their responsibilities for the audit were shown. Supporting this specified team will be analysts from our Global Valuation Center (GVC) and OPEB Center of Excellence.

It can be hard to accurately predict how much time each team member will spend working on actuarial audits. If there are potential issues uncovered or our results are not within a certain tolerance of the system actuary and if the system actuary does not fully cooperate in a timely manner the overall timing can be impacted. However, the bulk of the time working on the actuarial audits will be expended by the analysts and project managers. We may expect the management professionals to spend:

Management professional	Audit portion
Lead Actuary	5% - 15%
Project Managers	25% - 30%
Independent Peer Review	2% - 5%
Strategic Advisors	0% - 5%
Executive Sponsor	0% - 5%

4.4 REFERENCES

- Each proposal must include a list of at least three organizations, but no more than five, that may be used as references for your work on actuarial audits or studies.
- References may be contacted to determine the quality of the work performed, personnel assigned to the project, and contract adherence. The following should be included for the references listed:
 - Date of the actuarial audit work;
 - Name and address of client;
 - Name and telephone number of individual in the client organization who is familiar with the work; and
 - Description of the work performed.

California Public Employees' Retirement System	
Name/Contact Information	Navip Kang, Senior Program Auditor 400 Q Street Sacramento, CA 95811 916.795.0350 Navip.Kang@calpers.ca.gov
Date of actuarial audit work	2016 - 2020
Description of Work	Full-replication audits on a rotating schedule of actuarial valuations prepared by CalPERS's in-house actuarial staff; consulting on valuation software used by in-house actuarial staff.

AC Transit	
Name/Contact Information	Ralph Martini, Controller 1600 Franklin Street Oakland, CA 96412 510.891.7144 rmartini@actransit.org
Date of actuarial audit work	Since 2004, parallel valuation completed in 2021
Description of Work	Full-scope level 1 audit of pension plan actuarial valuation for 2016 completed by plan's actuary, Cheiron. Parallel valuation audit – independent valuation based on data received from plan actuary, Cheiron completed in 2021

South Dakota Retirement System	
Name/Contact Information	Douglas Fiddler, ASA, EA, MAAA, Senior Actuary 222 E. Capitol, Suite 8 P.O. Box 1098 Pierre, SD 57501 1-605-773-3543 Douglas.Fiddler@state.sd.us
Date of actuarial audit work	2015 - 2018
Description of Work	Actuarial audit review for retirement system in-house actuary. Limited scope audit performed in 2018. Experience study audit – demographic assumptions only completed in 2017.

4.5 METHODOLOGY, WORK PRODUCT, AND TIMELINE

Each proposal shall describe the proposed methodology for each element of the components listed in Section II, Scope of Audit. The description should include specific techniques that will be used, including anticipated sampling techniques and sizes, and proposed sources of data and information. You may propose alternative ways of addressing the elements of the audit's scope.

Elements. Data validity - validity, completeness, and appropriateness of financial and demographic information used.

We will perform the following:

- Request and review preliminary membership and asset data provided by STRS staff to the system actuary for the actuarial valuations and experience study. This review will involve reasonability checks and review of required data elements.
- Request the actuarial valuation and experience study ready data ("cleaned data") including all data elements used in the valuation for all members from the system actuary.
 - Compare this information against the data files provided by STRS staff in order to test all data screening procedures.
- For experience study data we will request both raw data files from STRS as well as final study data files from the system actuary to ensure proper categorization of decrements were implemented. We will also compare the movement of members for each year in the final experience study data to the reconciliations in the respective actuarial valuations. If these actuarial valuations are not available online, we will request them from ORSC or STRS staff.
- Check for adherence to Actuarial Standard of Practice 23: Data Quality.

Actuarial Valuation Method and Procedures - reasonable and consistent with generally accepted actuarial standards and practices.

We will perform the following:

- Review the standard actuarial methods used in the valuations, including cost method, amortization methods and asset valuation method.
- Review the application of the actuarial cost method for proper allocation of the plan's present value of benefits to past, current and future service, and proper determination of normal cost and actuarial accrued liability.
 - We will also review the actuarial value of assets and the market value of assets.
- Review methods and procedures based on the Actuarial Standards of Practice in effect at the time of the valuation and any that have become effective since the valuation.
- Advise the ORSC and STRS staff of any changes that may need to be made to comply with any newly effective Actuarial Standards of Practice.
- For the experience study, we will review the procedures for reasonableness and in relation to any applicable Actuarial Standards of Practice or Best Practice recommendations.

Most relevant ASOPs:

4: Measuring Pension Obligations and Determining Pension Plan Costs or Contributions

6: Measuring Retiree Group Benefits Obligations and Determining Retiree Group Benefits Program Periodic Costs or Actuarially Determined Contributions

44: Selection and Use of Asset Valuation Methods for Pension Valuations

25: Credibility Procedures

Actuarial Valuation Assumptions - reasonable and consistent with generally accepted actuarial standards and practices

We will perform the following:

- Review the demographic and economic assumptions used in the valuations.
- Where sample rates are provided in the valuation report, we will request a complete table of demographic assumptions from the system actuary, preferably in Excel format.
 - Compare these tables to the tables used.
- Review the assumptions for reasonableness and internal consistency.
- Review actuarial gains and losses over the past several actuarial valuations.
- Review the experience study for accuracy, reasonableness and appropriate credibility weighting to ensure the basis of the actuarial valuation assumptions was appropriate. We will also use our GEMS analysis to review the investment return rate and inflation. See section 4.6 Additional Information for details about GEMS.

The same consideration to ASOP as with the methods and procedures above will be applied.

Most relevant ASOPs:

27: Selection of Economic Assumptions for Measuring Pension Obligations

35: Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations

Parallel Valuation – parallel pension and OPEB valuations using the validated member census data and the same actuarial assumptions

We will perform the following:

- Request the key actuarial results presented in each valuation (normal cost, actuarial accrued liabilities, present value of benefits, present value future salary, etc.) on a per participant basis. These should roll up to the total amounts shown in each valuation.
 - If the contribution rates in the valuation report are to be determined using risk pools, we would also like the same individual results for all individuals in the risk pool. The preferable format for this data is Excel or text.
- Using the information provided, we will thoroughly review and update our coding of the valuations in ProVal, a commercially available, off-the-shelf valuation system used worldwide by actuaries and investment professionals and generate the initial actuarial results to be reconciled.
- Work with ORSC to determine the target percent tolerance for which our results should match the system actuary. This is typically set in the 2% to 5% range.

- In the reconciliation process, using the data provided and output data from ProVal, we will reconcile the results on both an aggregate basis and an individual basis. Reconciling results by individual participants instead of by rate plans or employers uncovers discrepancies that may offset producing a false positive result. This means that while valuation results may differ by less than the target tolerance in total, systematic errors with respect to a particular type of participant, when corrected, could produce a result outside of the target tolerance. As part of this enhanced reconciliation process, we will provide a frequency distribution of the percent difference in key actuarial results per person. This will allow us to quickly determine the root cause of results exceeding tolerance as well as to identify hidden material discrepancies for results that are within tolerance.
- Once we have reconciled the liabilities of Buck and the system actuary, we will then use those liabilities to produce the actuarial valuation results including the adequacy of the fixed rate contribution and length of time it will take to amortize the unfunded accrued liability.
- Compare Buck's and the system's actuarial valuation results.

Most relevant ASOPs:

41: Actuarial Communications

56: Modeling

Recommendations – if adjustments are recommended, provide detailed rationale for your recommendations and describe the general effect

We will perform the following:

- Produce a draft report of any recommendations including rationale and general effect for ORSC staff review. In the unlikely event material issues are discovered, additional analysis may be warranted.
 - We may recommend running projections over a longer time period to understand the entire magnitude of the differences. These projections could be performed by Buck, the system actuary or both. Any projections performed by Buck would be by request only and would be outside the scope of this engagement.

Review of Health Care – assess whether the system appropriately and consistently determine retiree contributions to health care and whether the implementation of the STRS' health care policies differ from those determinations

We will perform the following:

- Our comprehensive review of retiree contributions will include an analysis of the claims, enrollment, and methodology used in the calculations.
- Compare the calculations to the formal (or informal) contribution policy that includes communications provided to retirees explaining how contributions are determined. Any discrepancies or recommendations will be clearly explained to the ORSC and STRS staff.

Deliverables – monthly updates, report content minimum: description of the work performed, executive summary, and findings and recommendations

We will perform the following:

- Deliver monthly updates by media (email or conference call) agreed upon between ORSC staff and Buck and STRS staff if applicable.
 - Produce a full report in draft form initially and then finalize after discussion with ORSC staff.
 - For staff, Board or legislative meetings a presentation deck will be used to more succinctly and clearly communicate findings and recommendations.

Following is a summary of the methodology and the type and level of assistance needed from STRS.

Step 1: Meeting to Discuss Project Elements and Information Needed	
What Buck will do:	<p>Confirm the project steps and timetable Discuss history of the plan Discuss any particular concerns Discuss the format of the final reports and board presentation Request information:</p> <ul style="list-style-type: none"> • Actuarial valuation data and data for each year of the experience study • Data given to system actuary • Data used by system actuary • Access to actuarial valuation reports, if not available online • Results by individual participants • Sampling of benefit calculations covering different types of decrements and covering any different plan provisions; typically one of each type of decrement and each benefit formula. This may be unique to Buck as others may not request this; however, in our experience issues found in actuarial valuation coding are often uncovered due to provisions of the actuarial system not matching the administration of actual benefit calculations. • Confirmation of applicable statutes for each plan • Financial statements • Retiree contribution development • Discuss availability for test case details from the system actuary in the event we cannot match within the target tolerance. Often actuaries will not provide full test lives as they believe they are proprietary information. We need to understand how reconciliation will be accomplished.
Why does Buck do this?	<p>Our experience shows a meeting at the beginning allows us to thoroughly understand your objectives. We may uncover particular issues or items of concern from ORSC that we should focus on in addition to our regular audit techniques. You may wish to include the system actuary in this phase to get their buy-in, or you may wish to discuss this with Buck only so that you can be more candid.</p> <p>As for the data requests, we've learned that our clients can save a lot of time with data collection if we explain exactly what is needed and why. When requested information is difficult to obtain, if our clients understand exactly why such information is requested, then we can make a decision together as to whether the data is absolutely necessary, or whether an approximation could be made using more easily obtainable data.</p>

Step 2: Review of statutes	
What Buck will do:	This is an independent review of the plan provisions and statutes pertaining to each plan. We will verify that the statutes and the benefits being valued are consistent. The sample benefit calculations will be compared to system member test cases allowing us to test that the plan provisions were properly implemented into the actuarial valuation's liability calculations.
Why does Buck do this?	Any actuary can duplicate the numbers. Buck takes a step back to see the big picture so that we can review whether or not the actuarial valuations are consistent with statutory requirements and plan administration.

Step 3: Collection of member and valuation data	
What Buck will do:	While ORSC and STRS staff and the system actuary are collecting the data requested, Buck will begin review of the actuarial assumptions and the most recent experience study. We will also work with the system actuary to coordinate test cases if they are willing to provide them. Test cases are detailed calculation results for a sampling of the members included in the valuation.
Why does Buck do this?	Data collection is a critical component of the review. The main data needed is the final individual census data used by the system actuary as input to the valuations. The data supplied to the system actuary is also needed in order to review the original data preparation procedures. We have been involved in prior review situations where the actuarial calculations based on the data were accurate, but a significant number of participants were "lost" by the actuary in the data preparation step.

Step 4: Member data review	
What Buck will do:	As discussed above, Buck will verify the system actuary's data collection procedures. We will test several samples from the data supplied by ORSC or STRS staff to ensure it was appropriately classified for input to the actuarial valuations. We will also review the asset data provided to the system actuary to test proper inclusion in the valuations.
Why does Buck do this?	An actuarial valuation is only as good as the data used. An actuary who does not confirm the incoming data may give a clean audit report, despite "garbage in-garbage out" problems.

Step 5: Analysis of actuarial assumptions

<p>What Buck will do:</p>	<p>We will review the system actuary's experience study and the assumption selection process. We will review each assumption independently based on the data provided in the experience study. We will assess the impact of credibility on the assumption setting process. We will also review the assumptions as a whole for reasonableness and internal consistency and review the reports to check that assumptions were properly disclosed. We will also review the retiree contribution methodology to verify that they were determined in a manner consistent with the intended policies.</p>
<p>Why does Buck do this?</p>	<p>Actuarial standards define the assumption setting process for both demographic and economic assumptions. The experience study should document the findings of the study and the proposed assumptions resulting from the study. In addition, setting demographic assumptions that are not internally consistent with benefit eligibility requirements can add a hidden risk of significant liability swings in future valuations.</p>

Step 6: Calculation of individual member results

<p>What Buck will do:</p>	<p>This is a review of the liability calculated by the system actuary. We will calculate the liability for all participants and compare the results with the individual results provided by the system actuary. Where discrepancies appear, we will need to obtain additional information from the system actuary to determine precisely what the differences are. We will discuss the differences with the system actuary on an as-needed basis. Cooperation between actuaries will be vital in this circumstance.</p>
<p>Why does Buck do this?</p>	<p>This is the actuarial "detective work" where we quantify and qualify the differences. Our experience shows the following examples of common problems detected during this review:</p> <ul style="list-style-type: none"> • Improper application of retirement rates in valuing early retirement subsidies or late retirement benefits • Failure to value contribution refunds • Variety of issues around deferred termination benefits • Precise application of actuarial cost method • Temporary feature of a disability benefit • Improper handling of ancillary benefits (like death benefits) especially after a primary decrement • Service purchase subsidies

Step 7: Comprehensive analysis and peer review

What Buck will do:	<p>After the liability and experience analysis reviews are complete, we will take a comprehensive look at the results.</p> <p>We will analyze the funding method and actuarial asset valuation method and determine their reasonability. We will review the determination and appropriateness of the recommended contribution rates. We will reconcile any significant discrepancies between our results and those of the system actuary.</p> <p>Finally, we will thoroughly review and peer-review the actuarial and experience reports for completeness, comprehensibility, and accuracy.</p>
Why does Buck do this?	<p>The valuation results are reliable only if:</p> <ul style="list-style-type: none">• The plan provisions coded are accurate• The assumptions used are valid• The methods used are appropriate• The report is readable and complete <p>Our experience shows an actuarial audit is more than simply a check of the liability calculations. It must look at the big picture. Actuaries like to look at trees. The retirement system sees the forest. The actuarial review must consider both.</p>

Step 8: Completion of draft report and board presentation

What Buck will do:	<p>We will send a draft report and presentation to ORSC and will be available to discuss our findings with you and go over the report and draft board presentation in detail.</p>
Why does Buck do this?	<p>Our public plan clients' staffs don't like to surprise their boards. We find that the staff can often add insight to our findings. After receiving feedback, we will revisit any aspect of our work, as needed, and begin drafting a final report and presentation.</p>

Step 9: Final report issued	
What Buck will do:	As directed by ORSC staff, we will finalize the actuarial audit report and presentation. The presentation will be delivered in a timely manner so trustees may review it prior to the board meeting if they wish. This would also typically be the stage at which the system actuary is able to formally respond to the report.
Why does Buck do this?	Buck's experience shows that some Board members like to review material prior to the meeting so they can ask detailed questions at the meeting.

Step 10: Board of trustees presentation	
What Buck will do:	We will attend meetings, as needed, with the ORSC and STRS Boards and other state legislative groups, and explain the findings of the review.
Why does Buck do this?	<p>Buck prepares a Board presentation separately from the report because the report and presentation serve two totally different purposes.</p> <p>A key purpose of the report is comprehensiveness. By this point, we will have done a lot of work, and will want to make sure everything is documented.</p> <p>The key purpose of the presentation is comprehensibility. Your boards and legislators need to understand the major findings of the review and be comfortable with them.</p>

We do not anticipate any programming or space needs from the ORSC or STRS staff. To the extent any material issues are discovered and ORSC or STRS staff desire the system actuary to evaluate the impact, they will have to re-program their system for the differences.

See Attachment B for a sample audit report and Attachment C for a sample Board presentation deck. The deck is for an annual actuarial valuation and is meant to show a sample format of a presentation from Buck. However, the material will be changed to be applicable to an actuarial audit instead of an annual actuarial valuation.

We propose the project plan will be completed in accordance with a timeline similar to below. We would be happy to discuss the ORSC needs and make adjustments to this timeline as needed. This timeline assumes the same GVC analyst team will be used for the retirement actuarial valuation and experience study audits and the OPEB Center of Excellence team will be used for the retiree health care audit. Therefore, the retirement and retiree health care audits can run concurrently. If the timeline needs to be significantly accelerated, additional GVC analysts can be added so the retirement actuarial valuation and experience study audits can run more concurrently.

Task	Approximate Timeframe	Responsibility
Step 1A: Kick-off meeting with the ORSC staff to discuss project elements and information needed	Within 1 week of Start of Contract	Buck / ORSC
Step 1B: Information requests, as needed: member data from STRS and system actuary, confirmation of assumptions, confirmation of current statutes, financial statements, and other information identified at kick-off meeting	Following kick-off meeting	Buck / ORSC
Step 2: Review of statutes related to each plan	Within 2 weeks of Start of Contract	Buck
Step 3A: Receive valuation and experience study data and complete table of demographic assumptions from system actuary, and data provided to system actuary by STRS	Within 1 month of Start of Contract	Buck / System Actuary / ORSC and STRS
Step 3B: System actuary to provide requested liability information for all participants	Within 1.5 months from start of contract	System Actuary
Step 4: Complete review of member and asset data	Within 2 months of Start of Contract	Buck
Step 5A: Preliminary analysis of actuarial assumptions and review of experience study analysis; review retiree contribution development	Within 2 to 3 months of Start of Contract	Buck
Step5B: Review of prior valuation report to inform the attribution analysis	Within 2.5 to 3.5 months of Start of Contract	Buck
Step 5C: Review preliminary findings of attribution analysis with ORSC and collect additional information, if needed	Within 2.5 to 3.5 months of Start of Contract	Buck / ORSC
Step 6A: Programming and calculation of individual results	Within 2.5 to 3.5 months of Start of Contract	Buck
Step 6B: Analysis of individual results, including review of discrepancies with system actuary, as needed	Within 3 to 4 months of Start of Contract	Buck / System Actuary
Step 7: Review of the employer contribution rate calculated	Within 3 to 4 months of Start of Contract	Buck
Step 8A: Completion and issuance of draft report to ORSC	Within 3.5 to 4.5 months after Start of Contract	Buck

Task	Approximate Timeframe	Responsibility
Step 8B: Discussion with ORSC Staff to review findings in draft report	Within 3.5 to 4.5 months after Start of Contract	Buck / ORSC
Step 9: Completion and issuance of final report to ORSC	Within 4 to 5 months of Start of Contract	Buck
Step 10: Presentation of the findings to ORSC and STRS Boards and state legislative bodies, as needed	Within 4 to 5 months of Start of Contract	Buck / ORSC Board / Others

4.6 ADDITIONAL INFORMATION

Each proposal shall include any additional information that might be helpful to gain an understanding of the proposal. This may include diagrams, excerpts from reports, or other explanatory documentation that would clarify and/or substantiate the proposal. Any material included here should be specifically referenced elsewhere in the proposal.

As referenced in section 4.5 – GEMS will be used for auditing the economic assumptions

Our capital market assumptions are based on an economic scenario generating model developed by Conning and a company called GEMS®. GEMS incorporates historical data (back to inception of various indices), and uses a factor model to forecast future values for all relevant asset classes. GEMS also forecasts future levels of inflation, GDP growth, employment levels and other key economic statistics.

GEMS captures the real-life fact that means, volatilities and correlations are determined dynamically and can change over time. This means that expected returns over, say, a 10-year horizon may not equal those over a 20-year horizon. Based on Monte Carlo analysis, we derive sample means, standard deviations and correlations for reporting purposes. GEMS uses an inflation model with more robust properties than standard approaches to inflation modeling and produces realistic dynamic inflation that can vary with each Monte Carlo simulation. The model also produces realistic inflation term structures and relationships between nominal and real yields as well as realistic non-zero correlated relationships between inflation and interest rates.

The standard GEMS model approach reflects propensity for asset returns and inflation to (eventually) in part revert to historical norms, recognizing inherent difficulty in forecasting current conditions to persist for 30+ years. However, the recent market environment has tempered expectations of the speed at which returns will revert to historical average levels. The GEMS model is fully customizable and parameterized, so that we may adjust the model to reflect our (and/or our clients') views on the degree to which interest rates, investment returns, inflation and other factors revert to historic levels, as well as the speed of any such reversion.

As referenced in sections 4.3 and 4.5 - Global Valuation Center (GVC)

Buck's Global Valuation Center (GVC) made up of actuarial staff, based in the US, will support the lead retirement actuary. GVC staff use standardized processes that enhance project efficiency and consistency, delivering cost-savings for our clients with no reduction in quality or value. GVC staff also complement your lead retirement actuary's capabilities by freeing up strategic consulting time to identify possible higher level issues or diversion from industry and professional standards. By not having to focus solely on directly doing or in-depth checking the audit work, your Buck lead retirement actuary can deliver better long-term value from the overall audit relationship.

As referenced in section 4.2 - Buck Quality Review adds valuable insights to actuarial audits

Buck's Peer Review processes are unsurpassed. We have not only local peer review processes within each team, but Buck has the only national centralized peer review process in the actuarial consulting industry.

Through the years, a peer review approach has been paramount in our consulting philosophy. The established procedures require an appropriate peer must review all client work. These procedures allow Buck to provide a better work product and to provide the clients with another perspective.

Buck's Office of Chief Actuary has developed stringent peer review standards by identifying five levels of complexity in the actuarial work, based on concepts published by the American Academy of Actuaries. The level of review required depends on the complexity of the project.

Also, when a complex issue arises, the consultant will submit the issue to one of the Reviewing Actuaries to obtain independent advice. The Reviewing Actuaries avoid a one-size-fits-all philosophy, tailoring each review to the complexity of the material.

The review includes verification of compliance with relevant laws, regulations and professional standards.

The Central Review Team, together with senior consultants in the Knowledge Resource Center, provide advice on compliance with new laws and regulations. Working with the Office of Chief Actuary and information systems staff, they update or create proprietary software to help ensure compliance and facilitate dialogue on complex issues. They prepare internal memoranda on the actuarial standards for the actuarial staff. The Office of Chief Actuary, in turn, develops the appropriate internal actuarial standards.

- We require actuaries to adhere to the Code of Professional Conduct adopted by the major actuarial organizations, the Qualification Standards for Actuaries Issuing Statements of Actuarial Opinion adopted by the American Academy of Actuaries (AAA), and the Actuarial Standards of Practice (ASOPs) promulgated by the Actuarial Standards Board. These professional requirements are reinforced at all technical meetings.
- Buck has two chief actuaries: one for Retirement and one for Health and Productivity (as shown in section 4.3, both Chief Actuaries are ORSC team members). The two chief actuaries have jointly issued internal standards of qualification based on the principles expressed in the AAA's Qualification Standards. These internal guidelines include requirements for specific forms of continuing education to ensure that only actuaries familiar with the specialized knowledge required for governmental work and for retiree medical work undertake these assignments.
- Our practice maintains an Office of Chief Actuary, which provides leadership and guidance and ensures that the quality of professional services provided by our organization is of the highest order.
- Buck's policy on quality assurance and peer review requires each practice to develop its own quality assurance and peer review guidelines. Our two largest practices, Retirement and Health and Productivity, adopt peer review guidelines based on the most current version of our internal actuarial peer review standards.

4.7 GLOSSARY

Abbreviation	Term
AAA	American Academy of Actuaries
AS2	Application Statement 2
ASOPs	Actuarial Standards of Practice
CAFR	Comprehensive Annual Financial Reports
CoE	Center of Excellence
DR	Disaster Recovery
DRO	Domestic Relation Order
EA	Enrolled Actuary
EDIINT	Electronic Data Interchange Internet Integration
FCA	Fellow of the Conference of Consulting Actuaries
FSA	Fundamentals of Sustainability Accounting
FTP	File Transfer Protocol
FTP/S	File Transfer Protocol
GASB	Governmental Accounting Standards Board
GVC	Global Valuation Center
HTTPS	Hypertext Transfer Protocol Secure
MAAA	Member of the American Academy of Actuaries
NASRA	National Association of State Retirement Administrators
NDM	Network Data Manager
NPS	Net Promoter Score
OPEB	Post-Employment Benefits
OP&F	Ohio Police and Fire Pension Fund
ORSC	Ohio Retirement Study Council
PGP	Pretty Good Protection (encryption)
PSERS	Pennsylvania Public School Employees' Retirement System

Abbreviation	Term
RFP	Request for Proposal
SERS	School Employees Retirement System
SFTP	Secure File Transfer Program
SHPR	State Highway Patrol Retirement System
STRS	State Teachers Retirement System
TRS	Teachers Retirement System

4.8 COST INFORMATION

The pricing summary should include a breakdown of costs per element listed in Section II, Scope of Audit, including: personnel costs (including hourly rates and estimated hours for professional and clerical staff assigned to the audit), travel and lodging, data processing costs, materials, and any other potential costs. The cost estimates in the pricing summary must include all necessary charges to conduct the audit and must include a “not to exceed” figure.

The tables below represent the hourly rates by level and estimated hours used to develop our proposed “not to exceed” pricing”.

Level	Hourly Rate	Estimated Hours
Principal	\$473	10
Director	\$367	73
Senior Consultant	\$310	96
Consultant	\$237	137
Associate	\$192	211
Administrative Support and Interns	\$105	8

Our proposed “not to exceed” pricing is \$135,000. This includes all travel, lodging, and data processing while performing the scope of work. These fees include all elements described in Section II. Our proposed methodology does not easily warrant explicitly separating work performed on these elements. There are interdependencies and concurrent work intertwined in performing these audits. Should you need more details regarding fees, please let us know.



Attachment A Buck resumes





Kelly Adams, FSA, EA, MAAA, FCA

Director Retirement, Reviewing Actuary, Wealth Public Sector Specialty Practice Leader

About

Kelly Adams is a Director, Reviewing Actuary and leader of the Wealth Practice's Public Sector Specialty Practice with Buck. She works on the Central Review Team as the national public sector reviewer. In this capacity Kelly provides independent reviews of Buck's public sector retirement reports and communications for clients across the nation ensuring work completed by Buck actuaries is of high quality, complies with Buck's standards, Actuarial Standards of Practice (ASOP), any applicable laws and Governmental Accounting Standards. Her role allows her to see and understand a vast degree of differences and similarities among public sector retirement programs across the U.S. The information she gathers, which includes differences in system demographics and sponsorship, is provided to the consultants across Buck's public sector retirement practice who in turn bring this expertise and insights to their clients. She leads monthly calls with Buck's most experienced public sector actuarial consultants to share ideas and discuss current industry trends.

Role

Independent Peer Reviewer

Contact Information

kelly.adams@buck.com

Career Highlights

- 20+ years of actuarial consulting experience for defined benefit and other postemployment benefit plans.
- Joined Buck as reviewing actuary in 2018 from a national firm specializing predominantly in public sector actuarial consulting.
- Consulted clients in areas such as funding, accounting, experience studies, DROP benefits, plan design changes, plan benchmarking, and many other aspects related to retirement benefits.
- Served on prior firm's Governmental Accounting Standards Board (GASB) committee as well as the Other Postemployment Benefits (OPEB) committee.
- Assisted client's auditors in understanding GASB 43 / 45 when first implemented and then more recently GASB 67 / 68 and GASB 74 / 75.
- Extensive experience consulting Florida clients under Florida Statute Chapters 112, 175 and 185.
- Actuarial audit services for Statewide / large municipal clients.
- Member of Buck's Office of the Chief Actuary as a public sector retirement Subject Matter Expert

Recent Clients

- As reviewing actuary - Buck's portfolio of public sector retirement clients
- Prior to joining Buck – approximately 20 Florida and 7 other public sector defined benefit clients in addition to work on 2 state-wide plans

Education and Achievements

- Fellow of the Society of Actuaries
- Enrolled Actuary
- Member of the American Academy of Actuaries
- Fellow of the Conference of Consulting Actuaries
- Bachelor of Science in Mathematical Sciences – Actuarial Science from University of North Carolina at Chapel Hill



June Clark, ASA, MAAA

Senior Consultant, Health

Role

Health Care Project Manager

Contact Information

june.clark@buck.com

About

June Clark is a Senior Consultant and consulting health actuary at Buck. She joined Buck in 2006 and has over 30 years of benefits consulting experience. She has experience providing actuarial and retirement services for both health and welfare and pension plans in many different industries, including public and private corporations, tax-exempt entities, and multiemployer plans. Her areas of expertise include OPEB accounting valuations under GASB, FASB, IAS19, and NAIC. She has performed all aspects of post-employment valuations for both funding and accounting purposes including assumption setting, programming, analysis of results and preparing reports. Her experience also includes health claims underwriting, reserve analysis, forecasting, scenario modeling and plan design consulting. Recently, June served on Buck's GASB 74/75 task force, spearheading Buck's transition to the revised OPEB GASB standards.

Education and Achievements

- June is an Associate of the Society of Actuaries and a Member of the American Academy of Actuaries.
- She graduated from the University of Pennsylvania with an M.A. in mathematics and also holds a B.A. in mathematics from Bryn Mawr College.



Kelly Conlin, FSA, EA, MAAA, FCA

Chief Actuary and Regional Practice Leader, Health

Role

Chief Actuary

Contact Information

kelly.conlin@buck.com

About

Kelly Conlin is a Consulting Actuary at Buck. She is responsible for management of Buck's OPEB Consulting Centers of Excellence. Buck's COE model marries specialized OPEB subject matter expertise with rigorous processes and standards to bring unparalleled actuarial health and welfare benefits services to Buck clients. She serves as a consultant for a variety of international, public sector, multiemployer, and corporate clients. She is responsible for actuarial valuations of post-retirement and post-employment health and welfare benefit programs.

Experience

- Kelly joined Buck in 2004. She has nineteen years of experience as an actuary and benefits consultant.
- She is responsible for all phases of retiree medical valuation, including data collection and analysis, assumption setting, per capita cost development, programming, scenario modeling, and summarizing results. She has extensive experience with the design, measurement, and funding of employers' postretirement medical and life insurance programs.
- Kelly's experience also includes retiree and post-employment valuations for funding and expense purposes under numerous standards, including those promulgated by the IRS, GASB, FASB, and various international bodies.

Recent Clients

- Clayton County, GA
- Columbus Water Works
- Cook County, IL
- DSM
- National Retail Federation
- New York City Office of the Actuary
- SKF, USA
- The International Monetary Fund
- The World Bank
- Washington Post

Education and Achievements

- B.A. in actuarial science from the Smeal College of Business Administration of the Pennsylvania State University
- Fellow of the Society of Actuaries
- Enrolled Actuary
- Member of the American Academy of Actuaries.



Jonathan Dobbs, ASA, EA, MAAA

Director, Retirement

Role

Retirement Project Manager

Contact Information

jonathan.dobbs@buck.com

About

Jonathan Dobbs is a Director in the Retirement practice at Buck. He is a member of Buck's Global Valuation Center where he works on a broad range of retirement plans in the public and private sector. His responsibilities include but are not limited to managing all aspects of retirement plan valuations, performing experience studies, analyzing plan design alternatives, and projecting funding and accounting costs under multiple scenarios.

Career Highlights

- Jon joined Buck in 2005 after serving for 15 years with two other consulting firms.
- Jon's expertise includes the actuarial analysis of design, funding, and compliance issues affecting a broad range of employee benefit plans.
- Jon currently provides annual servicing to approximately 30 Buck clients. A significant number of these are in the public sector.

Recent Clients

- CalPERS
- Chicago Transit Authority
- City of San Diego
- Alameda-Contra Costa Transit District
- Ohio Police and Fire Pension Fund
- Middletown, RI
- North Miami Beach, FL
- City of Milwaukee
- San Joaquin Regional Transit District
- Branch County, MI

Education and Achievements

- M.A. in Mathematics from Indiana University
- Associate of the Society of Actuaries
- Member of the American Academy of Actuaries
- Enrolled Actuary



David Driscoll, FSA, EA, MAAA, FCA

Principal | Consulting Actuary, National Public Consulting Leader

Role

Retirement Strategic Advisor

Contact Information

David.Driscoll@buck.com

About

David Driscoll is a Principal and Consulting Actuary Buck, where he also serves as National Public Sector Consulting Leader. He joined Buck in 1999.

Career Highlights

- Strong proven delivery skills that have enabled her to manage
- David has more than 30 years of actuarial consulting experience.
- Prior to joining Buck, David worked in the actuarial consulting division of a major insurance company.
- David is a frequent speaker on actuarial aspects of retirement systems, and has spoken in recent years at gatherings of the Society of Actuaries, the National Conference on Public Employee Retirement Systems, the National Association of State Treasurers, and the Actuaries' Clubs of Boston and Hartford/Springfield.
- David is frequently quoted in press coverage on matters related to public retirement systems in such publications as the New York Times, USA Today, the Miami Herald and Pensions & Investments.

Recent Clients

- Alaska Retirement Management Board
- CalPERS
- Houston Firefighters' Relief and Retirement Fund
- Maine Deferred Compensation Plan
- Massachusetts Bay Transportation Authority Retirement Fund
- NBC Universal
- Oerlikon USA Holding, Inc.
- Public School Employees' Retirement System of Pennsylvania
- West Virginia Consolidated Public Retirement Board

Education and Achievements

- Fellow of the Society of Actuaries
- Enrolled to perform actuarial services under ERISA by the Joint Board for the Enrollment of Actuaries
- Member of the American Academy of Actuaries
- Fellow of the Conference of Consulting Actuaries
- Member, Pension Committee (2003-2006) and General Committee (2015 – 2017) of the Actuarial Standards Board
- Member, Actuarial Board for Counseling and Discipline, 2016 – present
- Bachelors of Arts with high distinction, Indiana University
- Master of Arts in Economics, University of Rochester



Tonya Manning

Practice Leader and Chief Actuary, Wealth

About

As Buck's US Wealth Practice Leader and Chief Actuary, Tonya Manning oversees the practice's talent, operations and strategic direction, and provides updates and guidance regarding emerging trends, consulting topics, technical issues, professional standards, and policies and procedures. Tonya also provides direct support for key clients and prospects and visibility for the practice in the market and within the profession.

Tonya is also a lecturer for Columbia University's Master's Program in Actuarial Science, where she developed and continues to teach their Pension course.

Career Highlights

- Before joining Buck, Tonya served for almost five years with the US Department of Treasury as a policy actuary. She was responsible for reviewing ruling requests and participating in regulation projects for the Internal Revenue Service's Employee Plans and Rulings & Agreements division; assisting practitioners and IRS personnel with technical questions; and representing the IRS at conferences, Webcasts, and phone forums sponsored by the IRS or professional organizations.
- Tonya previously was with another major benefit consulting firm for almost 22 years, in a variety of leadership roles. She spent her last five years there as chief actuary. In that capacity she was responsible for overseeing the practice's intellectual capital. She also served as a member the US Retirement Practice Leadership Council, represented the US on the Global Retirement Council and served as chair of the Global Retirement Innovation Council.

Recent Clients

Tonya plays an oversight role with respect to all Buck Wealth practice clients and serves as executive sponsor for key clients and prospects.

Actuarial Credentials

- Intersector Group: serves as a member of group of eight senior actuaries from top consulting firms who discuss the profession's needs and concerns with the IRS and PBGC through quarterly meetings
- Society of Actuaries:
 - Board: member 2007–2009; vice president, 2010–2011; president-elect, 2012; president, 2013; chair, 2014; penultimate president, 2015
 - Pension Section Council: board liaison 2015; member, 2004–2006; chair, 2006
 - Other current roles: Delegate for the International Actuarial Association's Pension and Employee Benefits Council; member of the Postretirement Needs and Risks Committee

Role

Executive Sponsor

Contact Information

tonya.manning@buck.com



Tonya Manning

Practice Leader and Chief Actuary, Wealth

Actuarial Credentials (cont'd)

- International Actuarial Association: Current president and chair of the Executive Committee; member of Pension and Employee Benefits Committee, Strategic Planning Committee, Audit and Finance Committee and Nominations Committee; SOA Council representative for 2013 & 2017-2018; previously vice-chair of Scientific Committee
- American Academy of Actuaries: member of Pension Practice Council; member of Pension Committee; member of Program Committee for the jointly sponsored Enrolled Actuaries meeting; previously co-chair of Joint Lifetime Income Committee, Chair of Retirement Communications Task Force, member of Communications Review Committee, member of the Volunteer Resource Committee and Special Director for the Board
- Conference of Consulting Actuaries: leader of Women in Consulting Community; member of Education Innovation Committee and Communications Committee; member of Program Committee for the jointly sponsored Enrolled Actuaries meeting; recipient of 2008 Most Valuable Volunteer Award
- Actuarial Standards Board: previously member of Pension Committee and ASOP 21 Task Force
- Author of the Enrolled Actuaries Report: “Changing Funding: Method or Madness?”
- Author of “Defined Benefit Employers’ Retirement Pension Schemes in the United States,” prepared for the Task Force on Employers’ Retirement Schemes sponsored by the International Monetary Fund and the US Bureau of Economic Analysis
- Fellow of the Society of Actuaries
- Fellow of the Conference of Consulting Actuaries
- Member of the American Academy of Actuaries
- Enrolled to perform actuarial services under ERISA by the Joint Board for the Enrollment of Actuaries
- B.S. in mathematics from the University of North Carolina at Chapel Hill

Role

Executive Sponsor

Contact Information

tonya.manning@buck.com



David Kershner, FSA, EA, MAAA, FCA

Principal, Retirement

Role

Primary Contact/Lead
Retirement Actuary

Contact Information

david.kershner@buck.com

About

David Kershner is a Principal and Consulting Actuary with Buck. He works exclusively with public sector clients, helping them manage the ongoing financial risks associated with their retirement plans. David is located in Estero, FL.

Career Highlights

David has 30+ years of experience focusing on the design, funding and financing of qualified and non-qualified pension and retiree welfare plans. His experience includes: long-term multi-scenario forecasts of costs and contributions, experience studies to evaluate the appropriateness of actuarial assumptions, GASB 67/6874/75 reporting, and advising clients of the cost impact of potential plan changes.

Recent Clients

- State of Alaska
- AC Transit
- El Paso City
- Pueblo County (CO)
- Clayton County (GA)
- North Miami Beach P&F

Education and Achievements

- Fellow of the Society of Actuaries
- Enrolled Actuary
- Member of the American Academy of Actuaries
- Fellow of the Conference of Consulting Actuaries
- Bachelor of Arts in Mathematics from York University in Toronto, Canada



Tom Tomczyk

Principal, Pittsburgh and Ohio Market Leader

Role

Account Executive

Contact Information

tom.tomczyk@buck.com

About

Tom is an accomplished professional with a proven record of organizational impact. He has over 25 years of successful sales and marketing experience and is skilled in business strategy, consensus building and teamwork. Currently, he is the Pittsburgh and Ohio Market Leader and helps clients more effectively manage their human capital. This includes programs for HR administration and consulting related to Health, Wealth, Career and Engagement.

Career Highlights

Tom has spent time with organizations like Conduent, Mercer, and CVS Health. His roles at these organizations have always been focused on assisting clients to effectively manage human resources. Tom and his team become an extension of your organization, providing customized solutions for all your HR needs with focus on improving efficiencies and identifying cost savings.

Recent Clients

- State Teachers Retirement System of OH (STRS)
- School Employees Retirement System of OH (SERS)
- Office of Group Benefits – State of Louisiana
- Western PA Teamsters
- Western & Southern Life Insurance
- Viatrix

Education and Achievements

- M.B.A. in Business and Marketing from Duquesne University
- B.S. in Mathematics from Westminster College



Scott Young, FSA, EA, MAAA

Director, Health Practice

Role

Lead Health Care Actuary

Contact Information

scott.young@buck.com

About

Scott Young is a Director and actuary in the Health Consulting practice at Buck. He is responsible for providing actuarial and consulting advice to organizations regarding the design, pricing, account, funding, and administration of benefit programs. He works out of the Berwyn, PA office.

Career Highlights

- Scott joined Buck in 2017 after spending 21 years at another global consulting firm working in both the Retirement and Health & Benefits practices. Having served as both a pension and health care actuary, he has extensive experience as the signing actuary for retirement plan valuations. These valuations have involved compliance with rules and regulations promulgated by the GASB, IRS, FASB, IASB, CASB, and NAIC.
- Scott has experience in VEBA and 401(h) funding, Medicare Part D, Employer Group Waiver Plans (EGWP), union negotiations, acquisitions / divestitures, and IBNR calculations for medical, prescription drug and dental plans. He has also assisted organizations with annual pricings to set financial budget, COBRA and participant contribution rates.

Recent Clients

- State of Alaska Public Employee Retirement System(PERS)
- Teacher Retirement System (TRS)
- New York City Economic Development Corporation
- New York City Housing Development Corporation
- Buffalo and Fort Erie Public Bridge Authority
- City of Middletown, RI

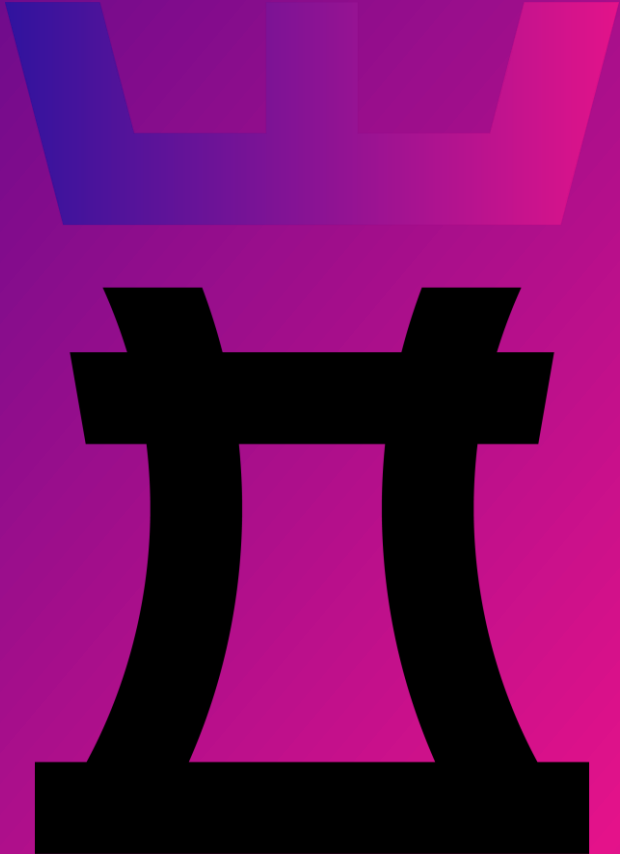
Education and Achievements

- Fellow of the Society Actuaries
- Enrolled Actuary
- Member of the American Academy of Actuaries
- Fellow of the Conference of Consulting Actuaries
- B.S. in Mathematics, Summa Cum Laude, Eastern Michigan University



Attachment B

Buck sample audit report





California Public Employees' Retirement System

Final Actuarial Review Report for the Period
March 1, 2016 through October 31, 2020

December 2020



110 West Berry Street
Suite 1300
Fort Wayne, IN 46802

December 1, 2020

Board of Administration
California Public Employees' Retirement System
P.O. Box 942701
Sacramento, CA 94229-2701

Members of the Board:

As provided in Contract 2015-8123, we have reviewed valuations prepared by the CalPERS professional actuarial staff in order to certify that such work satisfies applicable standards of the actuarial profession. In the following pages, we present a summary of findings from the actuarial reviews we've completed as a part of Contract 2015-8123, along with commentary on how issues were resolved and what issues remain outstanding.

The Table of Contents, which immediately follows, outlines the material contained in the report.

This report was prepared for the Board and professional staff of CalPERS for their use in evaluating the preparation of actuarial valuations by the System. Use of this report for any other purpose or by other parties may not be appropriate and may result in mistaken conclusions because of failure to understand applicable assumptions, methods, or inapplicability of the report for other purposes. Because of the risk of misinterpretation of actuarial results, Buck recommends requesting its advance review of any statement, document, or filing to be based on information contained in this report. Buck will accept no liability for any such statement, document or filing made without its prior review.

Actuarial Standard of Practice No. 56 ("ASOP 56") provides guidance to actuaries when performing actuarial services with respect to designing, developing, selecting, modifying, using, reviewing, or evaluating models. Buck uses third-party software for the review of valuations prepared by the CalPERS professional actuarial staff. The model is intended to replicate the liabilities associated with the CalPERS valuations. During the parallel valuation, Buck compares the results of the model developed from the third-party software with the results of CalPERS valuations, and any significant differences are investigated. Buck uses an extensive review process in which the results of liability calculations produced by the third-party software are checked using detailed sample output. Buck also reviews the third-party model when significant changes are made to the software or model. The review is performed by experts within the company who are familiar with applicable funding methods as well as the manner in which the model generates its output.

This report was prepared under the supervision of David L. Driscoll, a Fellow of the Society of Actuaries, a Member of the American Academy of Actuaries and an Enrolled Actuary, and Peer

Board of Administration
California Public Employees' Retirement System
December 1, 2020
Page 2

Reviewed by Kelly L. Adams, a Fellow of the Society of Actuaries, a Member of the American Academy of Actuaries and an Enrolled Actuary. We meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained in this report. This report has been prepared in accordance with all applicable Actuarial Standards of Practice, and we are available to answer questions about it.

Respectfully submitted,

Buck Global, LLC (Buck)



David L. Driscoll, FSA, EA, MAAA
Principal, Consulting Actuary



Kelly L. Adams, FSA, EA, MAAA
Director, Reviewing Actuary

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Section I - Introduction

Under the California Constitution, the Board of Administration has plenary authority and fiduciary responsibility to provide for actuarial services. The CalPERS Chief Actuary advises the Board and directs the activities of the CalPERS professional actuarial staff. The Board also retains the services of an outside actuarial firm to review the work of the CalPERS professional actuarial staff and to certify that such work satisfies actuarial professional standards.

Buck was contracted to provide parallel valuation and certification services to the Board.

This report presents a summary of findings from the actuarial reviews we have completed as a part of Contract 2015-8123, along with commentary on how issues were resolved and what issues remain outstanding.

Our review methodology for each actuarial valuation examined as part of Contract 2015-8123 was as follows:

- We did not audit or review the final valuation data provided to us by CalPERS for any of the actuarial reviews completed, as review of the data was explicitly excluded from the scope of this assignment.
- We reviewed the actuarial assumptions and methods used for each valuation under examination. Our review was based on Actuarial Standards of Practice (ASOP) applicable to the selection of economic assumptions (ASOP 27) and the selection of demographic assumptions (ASOP 35).
- We completed parallel actuarial valuations for each valuation under examination in order to compare our key valuation results with those published in the valuation report prepared for the plan. CalPERS requested that we reconcile any differences of more than 5% between the two sets of valuation results.
- We also reviewed each valuation report under examination for compliance with applicable Actuarial Standards of Practice, including:
 - ASOP 4 – Measuring Pension Obligations and Determining Pension Plan Costs or Contributions
 - ASOP 6 – Measuring Retiree Group Benefits Obligations and Determining Retiree Group Benefits Program Periodic Costs or Actuarially Determined Contributions
 - ASOP 51 – Assessment and Disclosure of Risk Associated with Measuring Pension Obligations and Determining Pension Plan Contributions

Section II of this report summarizes Tasks 1 and 4 of Contract 2015-8123, pertaining to CalPERS's Public Agency valuations. Specifically, it provides a recap of issues identified in those Tasks, commentary on how issues were resolved, and what issues remain outstanding. Section III provides the same information for Tasks 2 and 5, pertaining to CalPERS's State and Schools valuations. Section IV provides the same information for Tasks 3 and 6, pertaining to CalPERS's Judges, Legislators, and 1959 Survivors valuations. Section V presents our final comments and recommendations following the actuarial reviews we completed under Contract 2015-8123.

Section II – Summary of Tasks 1 and 4 – Public Agencies

In both Tasks 1 and 4, we concluded that the assumptions used in the Public Agency valuations were reasonable, and that the methodology used to select these assumptions was appropriate and consistent with guidance provided in ASOPs 27 and 35. We assessed the assumed annual rate of return assumption of 7.50% for valuations reviewed under Task 1 and the scheduled 7.00% assumption for valuations reviewed under Task 4 using our own economic modelling tool and determined both to be reasonable.

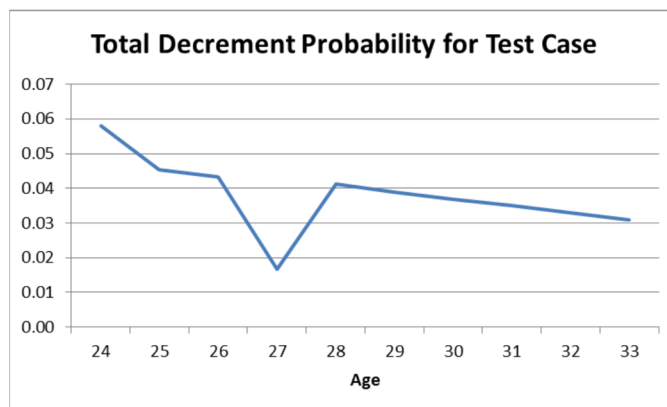
For the 10 largest public agency plans selected for both tasks, we replicated total present values of future benefits, actuarial accrued liabilities, normal costs, and total employer contribution rates within 5% of the corresponding results reported by CalPERS. In Task 1, there were discrepancies of more than 5% between our calculation and CalPERS' calculation of the present value of future benefits and/or accrued liabilities for four of the 10 random public agency plans reviewed. In Task 4, there were discrepancies of more than 5% between our calculation and CalPERS' calculation of the accrued liabilities for four of the 10 random public agency plans reviewed. The following points were noted as explanation for the discrepancies observed:

Task 1: Parallel Valuation and Certification of the Actuarial Valuations of the CalPERS Contracting Public Agency Plans as of June 30, 2014

In Task 1, we found that there was a difference in the application of the probabilities of termination for certain participants. In general, the affected participants had fewer than five years of service and were employed part-time or for other reasons had service less than their elapsed time since entry into the plan, although differences between Buck's and CalPERS's applications of the termination decrement occurred occasionally for other types of members as well.

As background, CalPERS employed two tables of decrements that are applied to participants who may terminate before retirement. One table consisted of probabilities that such participants would terminate and elect to take a refund of their contributions in lieu of leaving their money in the plan. The other table consisted of probabilities that they would terminate and leave their money in the plan instead of taking a refund – i.e., that they would choose to receive a retirement income benefit from the plan. These rates were based on vesting service and, together, the two tables indicated the overall probability of termination by a participant at each age. In general, these termination rates were applied consistently for participants who were vested or had been working in a full-time position in which service credited for benefit eligibility purposes was equal to elapsed time in the plan from date of hire. For such participants, after entry into the plan providing their coverage, the valuations posited continually decreasing probabilities of termination as they approach retirement.

Occasionally, we found situations in which rounding, the timing applied in the application of decrements, and the type of service used to select each decrement led to inconsistencies in the way decrements were applied in aggregate. The following chart illustrates one such example. It shows the total decrement probabilities for a sample active participant who was 24 years old and had completed 1.3 years of service on the valuation date. As can readily be seen, there was a temporary reduction in decrement probabilities in the year of attainment of age 27 due to the manner in which the termination probability was applied. The participant was projected to attain eligibility for vesting in that year, but not until after the manner in which decrements were applied led to an unexpected (and perhaps unintended) decrease in the assumed probability of termination



This issue was resolved, as noted in our Task 4 report.

The difference in the application of termination decrement probabilities was noted as a source of difference for two of the four plans for which the differences in Buck’s and CalPERS’s values of accrued liabilities exceeded the 5% threshold. Differences for two other plans exceeded the 5% threshold due to reasonable differences in the rounding conventions used for the calculation of service and age while allocating the present value of future benefits (PVFB) to past service and future service under the entry age normal cost method. The dollar amounts of such differences were very small, but the percentage difference could be significant simply because of the relatively small plan sizes (e.g. in one plan, a \$170 difference in calculated accrued liabilities resulted in a 15.99% overall difference). Because the dollar amounts were small, neither of these were considered significant for purposes of our review.

Final comments and recommendation from Task 1 included:

1. Add information to the reports to meet the then-new ASOP 4 requirements.

This recommendation was reflected in the June 30, 2017 valuations reviewed as part of Task 4.

2. Consider revising either the termination decrement tables or the process the valuation system uses to draw the probabilities. The suggestion was that the termination decrement issue described above could be resolved by implementing a single termination assumption with post-decrement probabilities applied to value the assumed rates of those who elect an annuity upon termination vs. those who elect a refund of contributions.

The termination decrement issue was resolved for the June 30, 2017 valuation reviewed as part of Task 4, though CalPERS continues to use the dual termination decrement approach.

3. Consider including additional demographic data in pooled public agency valuation reports.

This recommendation was not addressed in the June 30, 2017 valuations reviewed as part of Task 4 and remained a recommendation in our Task 4 report. The CalPERS Actuarial Office noted that they agreed with this recommendation and that they have begun implementing the addition of this information in all pooled reports beginning with the June 30, 2020 reports.

Task 4: Parallel Valuation and Certification of the Actuarial Valuations of the CalPERS Contracting Public Agency Plans as of June 30, 2017

In Task 4, our observations were organized into two categories:

1. Differences in valuation system. No two valuation systems will produce identical results due to differing approaches to age and service rounding, adjustments for mid-year timing, consideration of monthly-vs.-annual payments, and similar conventions. These differences generally will not produce materially different results.
2. Areas for which refinement of calculation would be advisable.

Differences in valuation system

The following observations relate to evident differences in valuation system. These are not errors; they simply reflect differences of approach. These items do not have a material effect on overall liabilities but can give rise to significant percentage differences at the level of individual participants.

- For new entrants, Buck's valuation system, ProVal, uses rounded funding ages, so that in the year of hire, the accrued liability is \$0. CalPERS's valuation system imputes a half-year of accrual to a new participant; i.e., the accrued liability is nonzero, which would result in a difference of 100% for such a participant. However, the dollar amounts involved are immaterial.
- Some of the large individual percentage differences in normal cost were observed for active participants over the maximum assumed retirement age, for whom ProVal will compute a normal cost of \$0 whereas CalPERS's valuation system always imputes a half-year of benefit accrual, causing their normal costs to be nonzero and a percentage difference of 100% in the results. However, the dollar amounts involved are inconsequential.
- For active participants, CalPERS uses rounded mid-year age to assign age-based decrement probabilities. For retirees, CalPERS uses rounded beginning-of-year age to assign the age-based decrement probabilities. This issue has an immaterial impact.
- For active participants, CalPERS calculates the present value of future benefits (PVFB) based on a data field representing benefit service earned as of the valuation date with the agency plan being valued. It then attributes this liability, using the entry age cost method, based on a data field that is representative of a full career with the CalPERS system. For most participants, these two data fields are consistent, i.e., the service they measure is substantially the same. There are individuals for which these two fields measure two different service periods, e.g., transfers and part-time employees. CalPERS determines the entry age normal cost rate using the full-career field, and then uses this rate to attribute the liability derived using the current-agency benefit service field.

We believe the theoretical basis for this approach can be illustrated by example: consider two identical plans A and B. CalPERS' method would result in identical normal cost and actuarial accrued liability values regardless of whether an individual stays in plan A or transfers to B (in which case there is also a benefit being valued in plan A). The case for this theoretical approach weakens if A and B are not identical. If B provides greater benefits than A, then there is the potential for "over-accruing" liability and vice versa if B provides lesser benefits than A. Assuming there is not significant transfer activity, it is unlikely that any resulting over/under-accrual would have a material effect on overall liabilities.

As noted, these are acceptable differences in valuation system; no action was required or expected to be taken. They do serve to explain some relatively large discrepancies on an individual basis.

Areas for refinement

We identified two areas where the refinement of the valuation calculations was advisable:

- First, there was an apparent inconsistency in the valuation of the refund of contributions benefit. The present value of a participant's future benefits was based on his or her actual accumulated balance as of the valuation date. However, the accrued liability and normal cost were determined using a theoretical accumulated balance built by assumption from entry age. Generally, the theoretical balance was greater than the actual, which produced some unusual results. For example, for contract package 101723 in Santa Clara, the present value of future benefits was \$38,305,221, normal cost was \$11,715,744, and accrued liability was -\$51,823,567. This was generally a small percentage of the overall liability, so resulting differences tended to be inconsequential, but it did show up more noticeably in some of the smaller PEPRA plans (which presently cover only those with short service).

Following discussions on this point with CalPERS staff, we deemed this issue to reflect a difference in valuation systems rather than an area for refinement. This was documented in our Task 5 report.

- For retirees with a child beneficiary under the continuance portion of the Post Retirement Survivor Allowance, the CalPERS valuation does not appear to reflect cessation of continuance when the beneficiary attains age 18. This issue did not lead to differences between the present values of future benefits calculated by Buck and CalPERS to exceed the 5% threshold for any plan under examination.

We understand this issue has been resolved by CalPERS.

The primary source of differences for the four relatively small plans in Task 4 noted with accrued liabilities outside of the 5% threshold was simply age and service rounding differences between CalPERS's and Buck's valuation systems.

Final comments and recommendations from Task 4 included:

1. Distinguish (where appropriate) between phasing in the impacts of economic assumption changes and phasing in of assumption changes themselves and identify margins for adverse deviations.

The phase-ins commented on above have been fully implemented, so there is no further action to be done in relation to this suggestion until and unless future phase-ins are made.

2. Consider including additional demographic data in pooled public agency valuation reports.

The CalPERS Actuarial Office noted that they agreed with this recommendation and that they have begun implementing the addition of this information in all pooled public agency valuation reports beginning with the June 30, 2020 reports.

Section III – Summary of Tasks 2 and 5 – State and Schools

For both Tasks 2 and 5, we concluded that the assumptions used in the State and Schools valuations were reasonable and the methodology used to select these assumptions was appropriate and consistent with guidance provided in ASOP 27 and 35. We assessed the assumed annual rate of return assumption of 7.50% for valuations reviewed under Task 2 and the scheduled 7.00% assumption for State valuations and 7.25% assumption for Schools valuations reviewed under Task 5 using our own economic modelling tool and determined both to be reasonable.

Task 2: Parallel Valuation and Certification of the Actuarial Valuations of the CalPERS State and Schools Plans as of June 30, 2015

For Task 2, we replicated employer contribution rates within 5% of the corresponding results reported by CalPERS for all plans under consideration. We also replicated total present values of future benefits, actuarial accrued liabilities, and normal costs within the 5% threshold for all plans except State Miscellaneous Tier 2. To identify the reasons for these discrepancies, we analyzed differences in the development of our results as compared to the development of CalPERS' results.

As background, Tier 2 participants have the option to purchase Tier 1 level benefits by making additional employee contributions beyond those required under Tier 2 benefit provisions. The valuation assumes that all Tier 2 participants will elect to make these additional employee contributions and purchase Tier 1 level benefits. To reflect this assumption in our parallel valuation, additional special employee contributions were projected to accumulate with interest from participants' dates of participation to their dates of termination. From participants' dates of termination to their projected dates of retirement, special employee contribution accounts were accumulated with interest only. This total special employee contribution account was used to reduce the gross liability.

We identified three areas where the refinement of the valuation report and/or calculations was advisable:

1. Add information to the reports to meet new ASOP 4 requirements

This recommendation was addressed in the June 30, 2018 valuations reviewed as part of Task 5.

2. For some separated participants in Tier 2, the special employee contribution account was set to zero in the participant data, with balances accumulating only for future years. This missing starting value for the special employee account balance resulted in smaller offsets to the gross liability in both the CalPERS and Buck valuations and therefore an overstatement of the expected net liability. We recommended that the valuation reflect the prior special employee contribution amounts, if they are available.

This issue appears to have been fixed for some, but not all, participants. Only 26% of Tier 2 separated participants observed in Task 5 had a non-zero conversion account balance in the data.

For separated participants in Tier 2, CalPERS accumulated the special employee contribution account with additional employee contributions in the future, even though they were no longer in covered employment and were thus unable to make such contributions. This assumption of continued special employee contributions by separated participants resulted in an overstatement of the value of the special employee contribution account and an understatement of the liability in the CalPERS valuation. We

suggested that the calculation of the special accumulated employee contributions should be adjusted to accumulate balances with interest only for participants who have separated from active employment.

The June 30, 2018 valuation reports appear to have addressed this recommendation.

3. Pre-Retirement Mortality for Separated Participants

For separated employees in all plans, we observed that the mortality assumption (decrement) was not being applied in the period prior to retirement for participants who have separated from employment and are entitled to benefits at a future retirement age. We believe the pre-retirement mortality decrement should be applied in determining liabilities for all participants for all future years.

The June 30, 2018 valuation reports appear to have addressed this recommendation.

There was another observation relating to active employees in State Miscellaneous Tier 2. We noted a slight difference between the approaches Buck and CalPERS took to implementing the Entry Age Normal Cost Method in the valuation. Buck accumulated the special employee contributions from entry age so that they replicated the special employee contributions balances as of the valuation date. CalPERS calculated special employee contributions from entry age independently of the balances on the valuation date. Both methods are reasonable and the difference in these approaches affects only the split of actuarial liabilities between past and future service and not the amounts of the liabilities themselves. The net impact for Miscellaneous Tier 2 is that the Buck valuation produced a lower normal cost and correspondingly higher actuarial accrued liability than the CalPERS valuation.

No action was recommended as this was deemed a difference in valuation system.

Task 5: Parallel Valuation and Certification of the Actuarial Valuations of the CalPERS State and Schools Plans as of June 30, 2018

In Task 5, our calculations for total present values of future benefits, actuarial accrued liabilities, and total normal costs differed by less than 5% from the corresponding results reported by CalPERS for all plans under consideration. We were able to closely replicate the present value of future benefits, in most cases within 0.5% of CalPERS' results. The attribution of this liability under the entry age method gave rise to a slightly greater variance, particularly in the normal cost. As part of this process we observed several items that contributed to this variance, which we categorized in one of two ways:

1. Differences in valuation system. No two valuation systems will produce identical results due to differing approaches to age and service rounding, adjustments for mid-year timing, consideration of monthly-vs.- annual payments, and similar conventions. These differences generally will not produce materially different results.
2. Areas for which refinement of calculation would be advisable.

The following observations relate to apparent differences in valuation systems. These are not errors; they simply reflect differences of approach. These items do not have a material effect on overall liabilities but can give rise to significant percentage differences in results calculated for individual participants.

- The present value of a participant's future benefits is based on his or her actual credited service amount as of the valuation date. However, the accrued liability and normal cost are determined using a theoretical

service amount built by assumption from entry age. Generally, the theoretical service is at least as much as the actual, which tends to produce a lower accrued liability and a higher normal cost than if actual service were used.

- Similar to the treatment of service noted above, the refund of contributions is valued by calculating the present value of a participant's future benefits based on his or her actual accumulated balance as of the valuation date, but the accrued liability and normal cost are determined using a theoretical accumulated balance built by assumption from entry age. If CalPERS were to apply the attribution method by projecting the current account balance as of the valuation date back to entry age and forward to future decrement ages (as opposed to creating the theoretical balance starting at entry age), we expect that the active accrued liability would increase and the normal cost would decrease, both to an immaterial degree. For example, applying this approach to the Safety plan, the accrued liability would increase by 0.2% and the normal cost would decrease by 0.4%.
- For new entrants, ProVal uses rounded funding ages, so that in the year of hire, their accrued liability is \$0. CalPERS imputes a half-year of accrual to a new participant; i.e., the accrued liability is nonzero, which would result in a difference of 100% for such participants. However, the dollar amounts involved are immaterial.
- Some of the large individual percentage differences in normal cost were observed for active participants over the maximum assumed retirement age, for whom ProVal will compute a normal cost of \$0 whereas CalPERS's valuation system always imputes a half-year of benefit accrual, causing their normal costs to be nonzero and a percentage difference of 100% in the results. However, the dollar amounts involved are inconsequential.

As noted, these are deemed to be acceptable differences in valuation systems; no action was required or expected to be taken. They do serve to explain some relatively large discrepancies identified in results for individual participants.

In Task 5, we identified two areas where the refinement of the valuation report and/or calculations was advisable:

1. The valuation reports indicated that when a member was eligible for retirement, the termination with vested benefit decrement ceased to apply. It appeared that this was not happening in some of the State valuations. Discussions with the CalPERS actuarial staff revealed that the continued application of the decrement after attainment of retirement eligibility was intentional. We suggested that the description of the decrement provided in the reports be modified to state this clearly.

The CalPERS Actuarial Office noted that they believed the application of the decrement in their valuation programs was correct. The description will be modified in the June 30, 2020 report to be consistent with the application.

2. Distinguish (where appropriate) between phasing in the impacts of economic assumption changes and phasing in of assumption changes themselves and identify margins for adverse deviations.

The economic assumptions (expected rate of investment return, payroll growth rate, and inflation rate) were changed effective with the June 30, 2018 valuations. In addition, for the Schools valuation, they were scheduled to be changed again in the June 30, 2019 valuation.

Our understanding is that the gradual phase-in is reflected only in the determination of contributions and thus constitutes a form of "direct contribution rate smoothing". Such smoothing for the impact of

assumption changes is identified as an Acceptable Practice in the 2015 paper of the California Actuarial Advisory Panel, “Actuarial Funding Policies and Practices for Public Pensions and OPEB Plans – and Level Cost Allocation Model”. We suggest that it be made clear that the phase-in of the change in the assumed rate of return is made solely for the purpose of determining contributions. Further, if the revised assumption incorporates any margin for adverse deviations, we recommend that such margins be quantified in accordance with the requirements of the applicable Actuarial Standards of Practice.

The phase-ins commented on above have been fully implemented, so there is no further action to be taken in relation to this suggestion until and unless future phase-ins are made.

Section IV – Summary of Tasks 3 and 6 – Judges, Legislators, and 1959 Survivors

For both Tasks 3 and 6, we concluded that the assumptions used in the Judges I (JRS I), Judges II (JRS II), Legislators (LRS), and 1959 Survivors valuations were reasonable and the methodology used to select these assumptions was appropriate and consistent with guidance provided in ASOP 27 and 35. We assessed the assumed annual rate of return assumptions under each of the valuations reviewed using our own economic modelling tool and determined all of them to be reasonable.

For both Tasks 3 and 6, we replicated total present values of future benefits, actuarial accrued liabilities, normal costs, and total employer contribution rates within 5% of the corresponding results reported by CalPERS for all of the plans.

Task 3: Parallel Valuation and Certification of the Actuarial Valuations of the Judges' Retirement Systems, Judges' Retirement Systems II, the Legislators' Retirement System, and the 1959 Survivor Benefit Program as of June 30, 2016

In Task 3, we identified three areas where the refinement of the valuation report and/or calculations was advisable:

1. For JRS I, JRS II, and LRS: add information to the reports to meet new ASOP 4 requirements.

This recommendation was resolved with the June 30, 2019 valuations reviewed as part of Task 6, with the following exceptions:

For JRS II and LRS, we recommended adding a statement regarding the impact of the funding policy on future contributions and funded status. The June 30, 2019 valuations did not contain such a statement. The CalPERS Actuarial Office noted that they agree with the suggested text modification and will implement such modifications beginning with the June 30, 2020 reports.

2. For JRS I: Pre-Retirement Mortality for Separated Participants

For separated employees in all plans, we observed that the mortality assumption (decrement) was not being applied in the period prior to retirement for participants who have separated from employment and are entitled to benefits at a future retirement age. We believe the pre-retirement mortality decrement should be applied in determining liabilities for all participants for all future years.

The June 30, 2019 valuation addressed this recommendation.

3. For 1959 Survivors: add information to the reports to meet new ASOP 6 requirements

The June 30, 2019 valuation did not address this recommendation. Specifically:

- a. **The report did not include a statement regarding the impact of the funding policy on future contributions and funded status**
- b. **The report did not include a statement about the appropriateness of reported measures of the funded status on the plan for various purposes.**

- c. The report did not include a statement about future measurements and the fact that they may differ from current measurements.**

The CalPERS Actuarial Office noted that they agree with the suggested text modification and will implement such modifications beginning with the June 30, 2020 reports.

Task 6: : Parallel Valuation and Certification of the Actuarial Valuations of the Judges' Retirement Systems, Judges' Retirement Systems II, the Legislators' Retirement System, and the 1959 Survivor Benefit Program as of June 30, 2019

In Task 6, we made a number of observations that relate to evident differences in valuation system. These are not errors; they simply reflect differences of approach. These items do not have a material effect on overall liabilities but can give rise to significant percentage differences in results computed for individual participants.

1. For JRS I: It appears that the present value of future benefits (PVFB) associated with Extended Service Incentive Program (ESIP) balances did not tie directly to the ESIP balance reported in the data. We suspect this to be the primary source of difference for several active records for which the differences between Buck's calculation and CalPERS's was outside of the 5% threshold. In any case, we consider these discrepancies to have an immaterial effect on the overall accuracy of the valuation.
2. For JRS II: Buck's PVFB calculation differed by more than 5% for approximately 3% of the population. This is due primarily to the treatment of individuals expected to retire on or after the maximum assumed retirement age. The maximum assumed retirement age is age 70 and since many individuals enter the plan at a relatively older age they may not be eligible to retire until age 70 or later. In those instances, CalPERS imputes one-half year of service in the year of retirement, whereas ProVal assumes retirement at beginning of year. Since those first eligible to retire on or after age 70 generally have fewer than 20 years of service, the imputed half-year of service can produce a benefit that is several percentage points different from the benefit ProVal computes,

In the CalPERS valuation, the present value of a participant's future benefits is based on his or her actual credited service amount as of the valuation date. However, the accrued liability and normal cost are determined using a theoretical service amount built by assumption from entry age. Generally, the theoretical service is at least as much as the actual, which tends to produce a lower accrued liability and a higher normal cost than if actual service were used. This difference in approach has an insignificant effect on calculation of the plan's funded status.

3. For LRS: In the CalPERS valuation, the present value of a participant's future benefits is based on his or her actual credited service amount as of the valuation date. However, the accrued liability and normal cost are determined using a theoretical service amount built by assumption from entry age. Generally, the theoretical service is at least as much as the actual, which tends to produce a lower accrued liability and a higher normal cost than if actual service were used. One of the two participants in the LRS plan has actual service that is lower than his "Normal Cost Start Date" would imply, which causes Buck's calculation of the normal cost to differ from CalPERS' normal cost by more than 5%. The difference in approach has an insignificant effect on the calculation of the plan's funded status, and though the percentage difference in the entry age normal costs exceeds 5%, the dollar amount of the difference is negligible relative to the \$115.8 million asset value as of June 30, 2019. We believe that CalPERS method is acceptable. In any case, changing this method would have no material effect on the plan's funding integrity.

We identified three areas in which the refinement of the valuation report and/or calculations was advisable:

1. For JRS I: Both ASOP 27 (Section 4.1.1) and ASOP 35 (Section 4.1.1) state that the actuary should disclose whether each significant assumption represents an estimate of future experience, an observation of the estimates inherent in market data or a combination. The mortality, inflation, salary increase, and payroll growth assumptions specifically refer to the separate experience study. It may be inferred that the requirement for these specific assumptions is met by the reference to the experience study. However, this is not the case for the other assumptions. We believe future reports would more completely fulfill the requirements of the ASOP 27 and ASOP 35 by including a statement that all assumptions represent an estimate of future experience.

The CalPERS Actuarial Office noted that they agree with the suggested text modification and will implement such modifications beginning with the June 30, 2020 reports.

2. For JRS II: **Add information to the report to meet communication requirements.**

We note the following items may be considered for inclusion in future reports in order to more completely fulfill the requirements of ASOP 27 and ASOP 35.

- a. In accordance with ASOP 27 (Section 4.1.1) and ASOP 35 (Section 4.1.1), a statement that all assumptions represent an estimate of future experience. We note the mortality, inflation, salary increases, and payroll growth assumptions specifically refer to the separate experience study. It may be inferred the requirement for these specific assumptions is met by the reference to the experience study. However, this is not the case for the other assumptions for which the experience study is not referenced.
- b. A description of the treatment of the Monetary Credit Account in the actuarial assumptions. In particular, participation and form of payment elections for the Monetary Credit Account benefit.

The CalPERS Actuarial Office noted that they agree with the suggested text modification and will implement such modifications beginning with the June 30, 2020 reports.

3. For LRS: **Add information to the report to meet communication requirements.**

We note the following items may be considered for inclusion in future reports in order to more completely fulfill the requirements of ASOP 27 and ASOP 35.

- a. In accordance with ASOP 27 (Section 4.1.1) and ASOP 35 (Section 4.1.1), a statement that all assumptions represent an estimate of future experience. We note the mortality and inflation assumptions specifically refer to the separate experience study. It may be inferred the requirement for these specific assumptions is met by the reference to the experience study. However, this is not the case for the other assumptions for which the experience study is not referenced.
- b. In accordance with ASOP 27 (Section 4.1.2), a disclosure of the rationale for the economic assumptions other than inflation. We note this may be accomplished by referencing the experience study for all assumptions to which it is applicable and explicitly stating the rationale for any assumptions to which the experience study is not applicable.

The CalPERS Actuarial Office noted that they agree with the suggested text modification and will implement such modifications beginning with the June 30, 2020 reports.

4. For 1959 Survivors:

a. **Add information to the report to meet ASOP 27 communication requirements.**

We note the following items may be considered for inclusion in future reports to more completely fulfill the requirements of ASOP 27.

- i. In accordance with Section 4.1.1, a statement that the return on investment assumption represents an estimate of future experience.
- ii. In accordance with Section 4.1.2, a disclosure of the rationale for the return on investment assumption.

The CalPERS Actuarial Office noted that they agree with the suggested text modification and will implement such modifications beginning with the June 30, 2020 reports.

b. **Revise the treatment of the new element of the projection of the unfunded liability (UAL) labeled “Changes in Contributions due to Contribution (Gain)/Loss.”**

The projected UAL is the base that is amortized as part of the required contribution determination. The element in question was added to “reflect differences in calculated Normal Costs from the prior year and the current year, as well as differences in Actual and Estimated members.” The idea is to anticipate contributions that deviate from expected levels due to the realization of head counts or changes in the normal cost rate; e.g., if actual head counts are greater than expected, then more contributions will be made than expected, resulting in a contribution gain. According to the indicated formula, a positive number serves to reduce the projected UAL and a negative number serves to increase the projected UAL. However, it appears that the reverse case should be applied.

Consider, for example, PA 1st Level Pool. The prior valuation assumed 7,300 actives, but there were actually 7,290. The lower head count would result in decreased contributions, which is an experience loss to the plan. A loss would increase the projected UAL, but in the projection on page 14, it is shown as lowering it.

It should be noted that the amortization treatment appears to be correct, and the resulting premium amounts are therefore unaffected. The two pools for which explicit amortization is applicable are as follows:

- State 5th Level –The “Projected Balance 6/30/2020” of \$38,741,015 shown on page 16 does not equal the projected UAL developed on page 13 (line 3h, \$38,276,781). On page 13, the “Changes in Contributions due to Contribution (Gain)/Loss” of \$224,395 reduced the projected UAL. On page 16, it was added to the amortization base as a loss.
- Public Agency 4th Level—the amortization is not explicitly described, but the report indicates that the amortization period is 30 years. The projected UAL shown on page 14 is (\$7,234,369) and reflects a “Changes in Contributions due to Contribution (Gain)/Loss” of (\$207,106). The amortization amount shown on page 14 (line 4d) is (\$596,979). This should be a 30-year amortization of the projected UAL, adjusted to mid-year with interest. Using this information to solve for the amortization base obtains (\$7,662,830). This can be shown to be the result of “reversing the signs”, i.e., increasing the projected UAL by \$207,106, but reducing the amortization base by \$207,106.

The CalPERS Actuarial Office noted that they agree with this suggestion and have implemented the change in their valuation programming. The June 30, 2020 report will reflect this change.

c. **Refine the projected UAL calculation with a more precise application of interest on the projected employee contributions.**

The premium employees pay is constant throughout the year; e.g., if the premium is \$2 per employee per month, then \$24 is collected for an active member over the course of the year. Thus, for purposes of determining funding requirements, the employee premium is a mid-year contribution, in effect. In instances in which the projected UAL is reduced for employee contributions in excess of funding requirements, the report is adjusting the expected employee premiums paid (line 3e) by one-half year's interest, i.e., it is the product of the annualized prior year premium rate, the projected active count, and the interest adjustment equal to $1.07^{1/2}$. Since the premiums are effectively mid-year, then the interest adjustment actually increases the value to end of year. Thus, the interest applied to that value in line 3h is unwarranted.

From a practical point of view, the only way this could have an effect is if the employee contributions only partially exceed the required contribution, which means that group would have to be nearly fully funded, but not entirely so. None of the seven groups are in this situation, thus, no group is affected this year since those groups for which the necessary condition applies (employee contributions are in excess of funding requirements) are so well-funded that the amortization is simply an offset of the normal cost; i.e., the UAL is not explicitly used in the amortization.

The CalPERS Actuarial Office noted that they are considering modifications pursuant to this recommendation. The June 30, 2020 report will likely incorporate some such modification.

d. **Provide more detail on the development of normal cost for all groups except PA Indexed Level Pool.**

The development of the normal costs should be more overt, including more detail on the historical information used to develop the normal cost. Also, for PA 1st, 2nd, 3rd and 4th Level Pools, we recommend furnishing more detail on how the grouping method, as explained in the footnote, was used to determine the normal cost for each individual pool.

The CalPERS Actuarial Office noted that they are considering modifications pursuant to this recommendation. The June 30, 2020 report will likely incorporate some such modification.

Section V – Final Comments and Recommendations

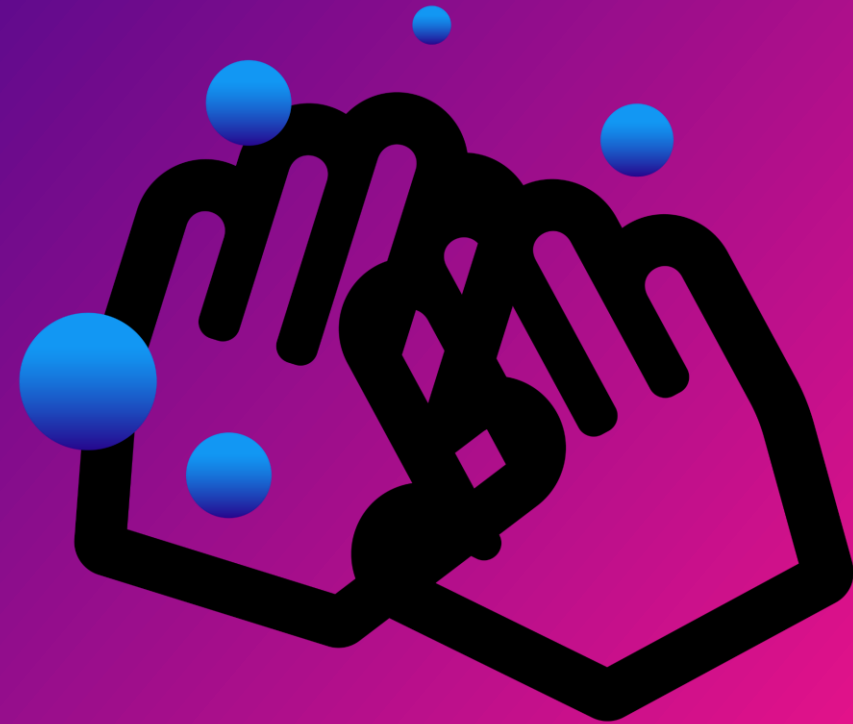
The results of the reviews completed by Buck pursuant to Contract 2015-8123 confirm that the actuarial process followed by CalPERS is thorough, complete, and complies with applicable Actuarial Standards of Practice. We have been able to closely replicate key valuation results, and differences generally were due to reasonable differences in valuation systems.

The CalPERS Actuarial Office has addressed each of the outstanding issues noted in this report, and have indicated their intention to resolve them with the June 30, 2020 valuations.



Attachment C

Buck sample board presentation





<Client> Retirement Systems

Presentation to Actuarial Committee

June X, 20XX Valuation Results and Projections

March xx, 20xx

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Overview of Valuation Results

Overview

- Each year's valuation is a snapshot measurement of the plan's assets and liabilities
- The results from the 6/30/19 valuations, plus expected FY20 experience, determine the "expected 6/30/20" figures
- We compare the "actual 6/30/20" figures to the "expected 6/30/20" figures to derive the gains/losses for FY20
 - If experience was *favorable* to the plan, we have a *gain*
 - If experience was *unfavorable* to the plan, we have a *loss*
- For purposes of the impact on Additional State Contributions shown in item #4 on the next two slides, "expected" is based on the 2019 valuation projections including the FY22 contribution rates that were adopted by the MB in September 2020

Overview of 6/30/20 Valuation Results - <Plan Name>

		Favorable	Unfavorable
1	FY20 Asset Returns		
1(a)	- Market Value		4.1% (\$556M loss)
1(b)	- Actuarial Value		5.8% (\$275M less than expected)
2	6/30/20 Actuarial Accrued Liability		
2(a)	- Pension	\$91M less than expected	
2(b)	- Healthcare	\$350M less than expected	
2(c)	- Total	\$441M less than expected	
3	6/30/20 Unfunded Actuarial Accrued Liability	\$166M less than expected	
4	Impact on Projected Additional State Contributions		
4(a)	- FY23	\$7M less than expected	
4(b)	- FY23 through FY39*	\$170M less than expected	

- Deferred Asset Losses at 6/30/20 = \$420M to be recognized over the next 1-4 years
- Projected FY23 DB/DCR payroll is \$6M less than expected, which (all other things being equal) *increases* contribution rates and Additional State Contribution for FY23

* FY39 is the final year with a projected Additional State Contribution for A.

Overview of 6/30/20 Valuation Results - <Plan Name>

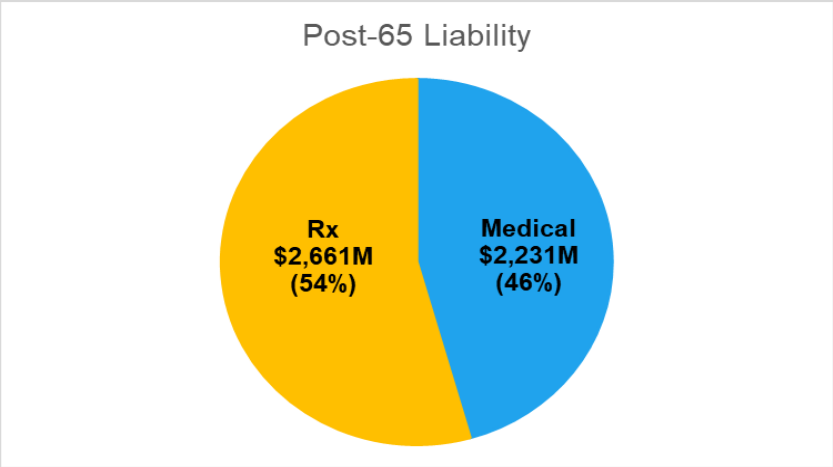
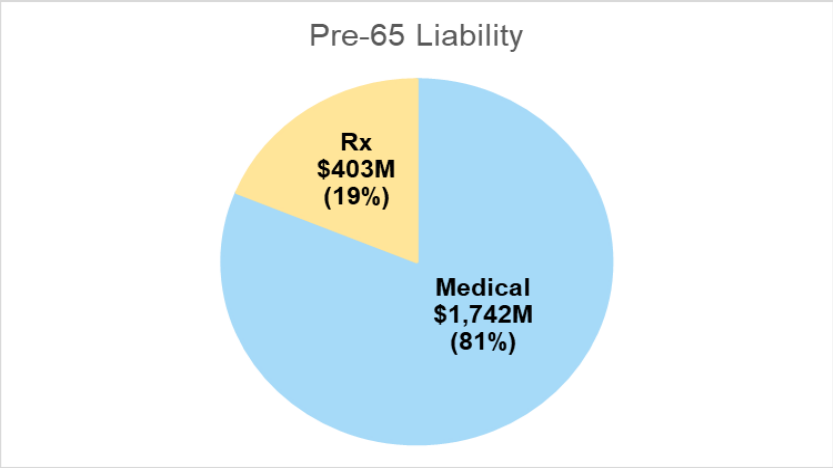
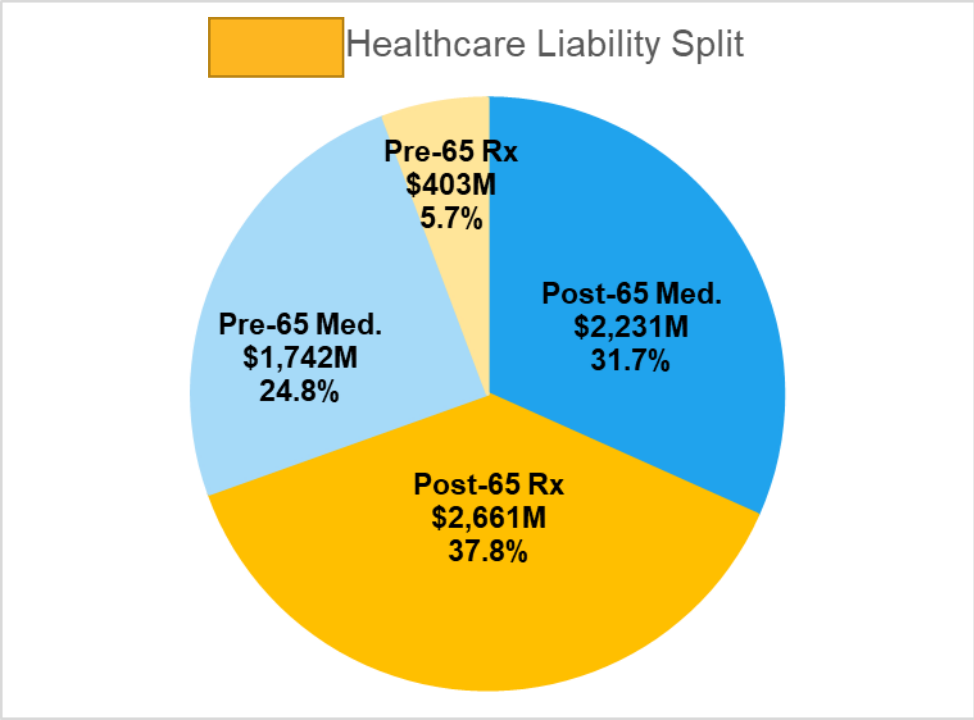
		Favorable	Unfavorable
1	FY20 Asset Returns		
1(a)	- Market Value		4.1% (\$274M loss)
1(b)	- Actuarial Value		5.8% (\$139M less than expected)
2	6/30/20 Actuarial Accrued Liability		
2(a)	- Pension	\$31M less than expected	
2(b)	- Healthcare	\$123M less than expected	
2(c)	- Total	\$154M less than expected	
3	6/30/20 Unfunded Actuarial Accrued Liability	\$15M less than expected	
4	Impact on Projected Additional State Contributions		
4(a)	- FY23	\$5M less than expected	
4(b)	- FY23 through FY47*	\$213M less than expected	

- Deferred Asset Losses at 6/30/20 = \$210M to be recognized over the next 1-4 years
- Projected FY23 DB/DCR payroll is \$6M more than expected, which (all other things being equal) decreases contribution rates and Additional State Contribution for FY23

* FY47 was the final year with a projected Additional State Contribution for TRS based on the 2019 valuation projections. Based on the 2020 valuation projections, the final year with a projected Additional State Contribution for TRS is FY46.

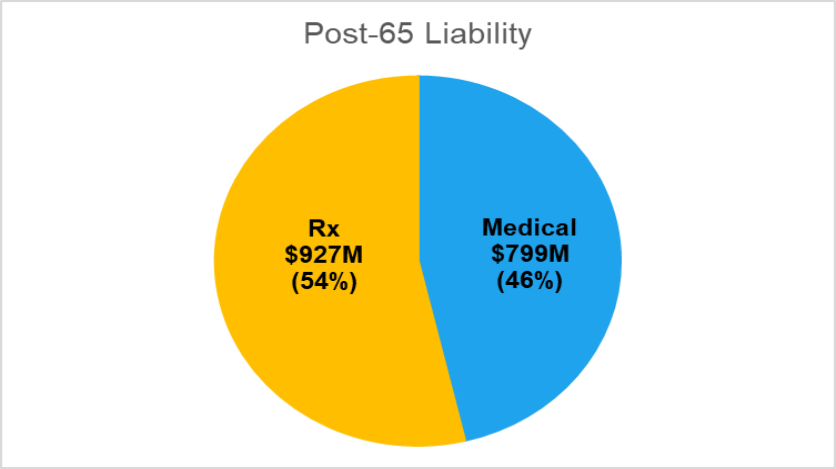
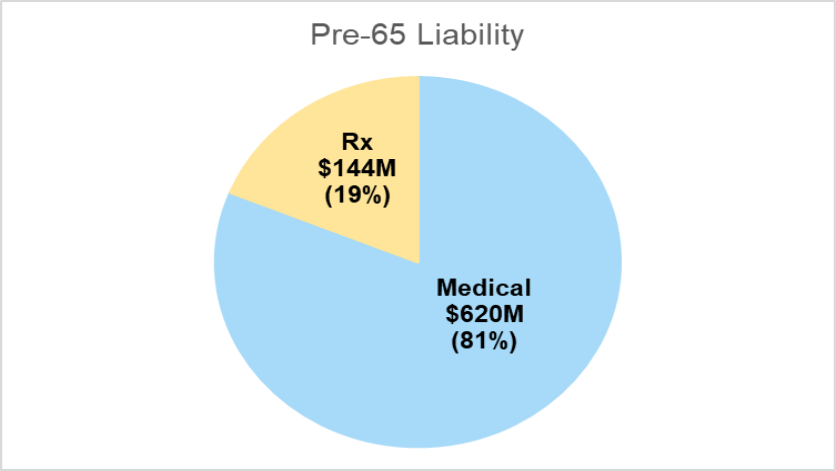
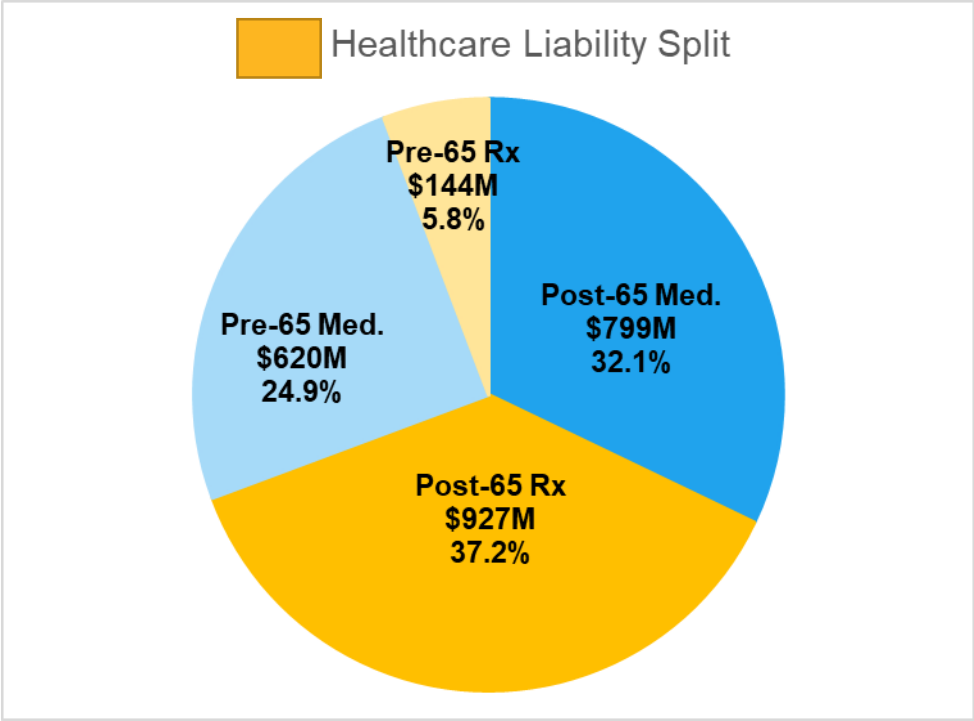
Healthcare Liability Allocations

Healthcare 6/30/20 Liability Allocations - <Plan Name>



Note: Post-65 Rx liability shown is net of \$1,059M EGWP liability offset.

Healthcare 6/30/20 Liability Allocations - <Plan Name>



Note: Post-65 Rx liability shown is net of \$369M EGWP liability offset.

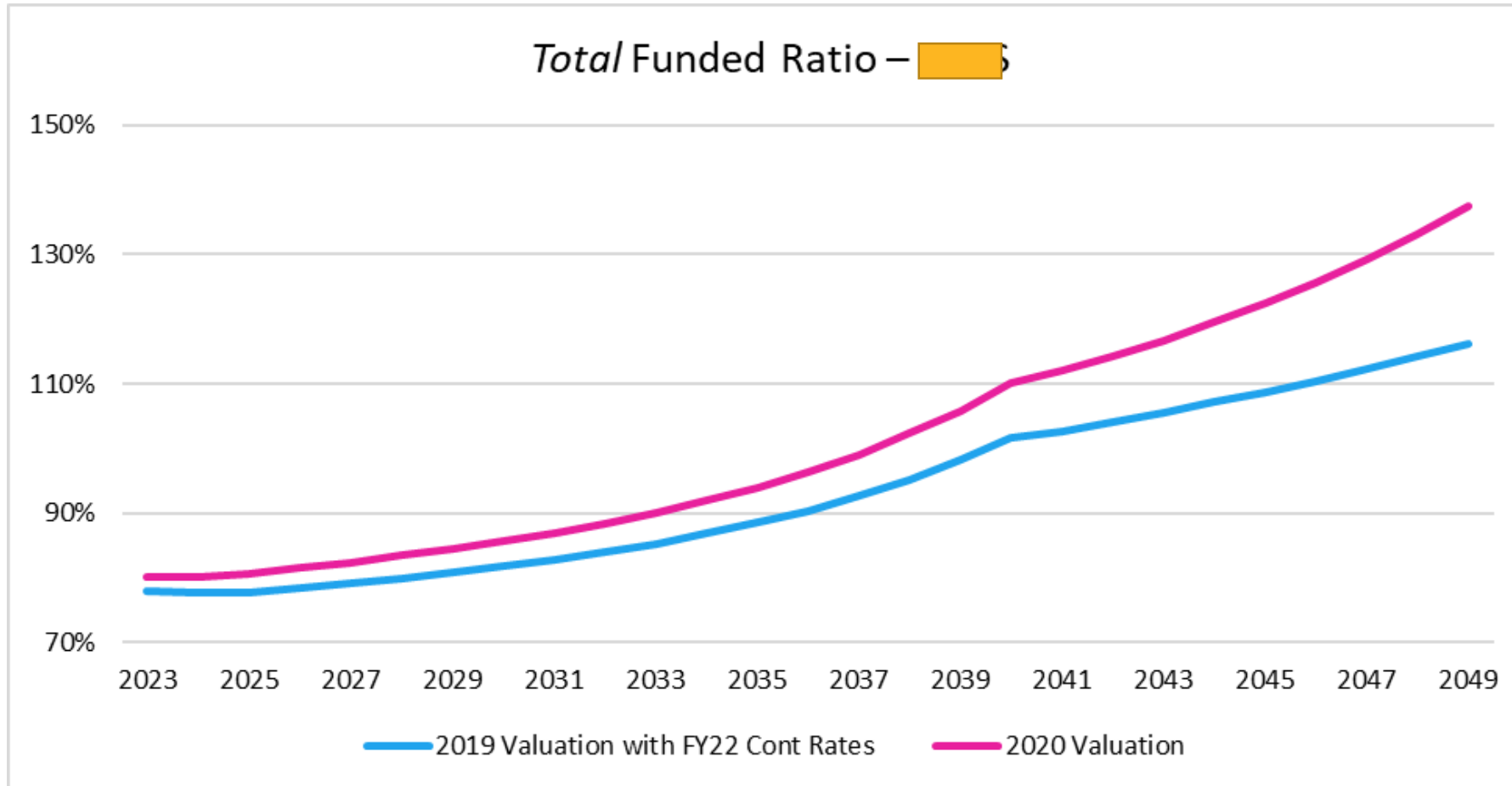
2020 Valuation Baseline Projections

Baseline Projections* – Assumptions

- All experience after 6/30/20 matches valuation assumptions
- 0% active plan population growth overall, all new hires enter the DCR plans
- DCR contribution rates as of 6/30/20 assumed to remain constant every year
- Active rehire assumption grades to zero uniformly over 20 years
- Normal Cost percentage load for administrative expenses assumed to remain constant
- Additional State Contributions allocated 100% to pension each year

* Baseline projections reflect the FY22 contribution rates that were adopted by the ARMB in Sept 2020.

Total Funded Ratio - <Plan Name>



- Total funded ratio is *higher* in all years under 2020 valuation projections, primarily because of the improved 6/30/20 funded status of the Healthcare trust
- Total funded ratio is projected to *exceed 100%* because surplus in Healthcare trust continues to grow as Healthcare Normal Cost is contributed at a minimum

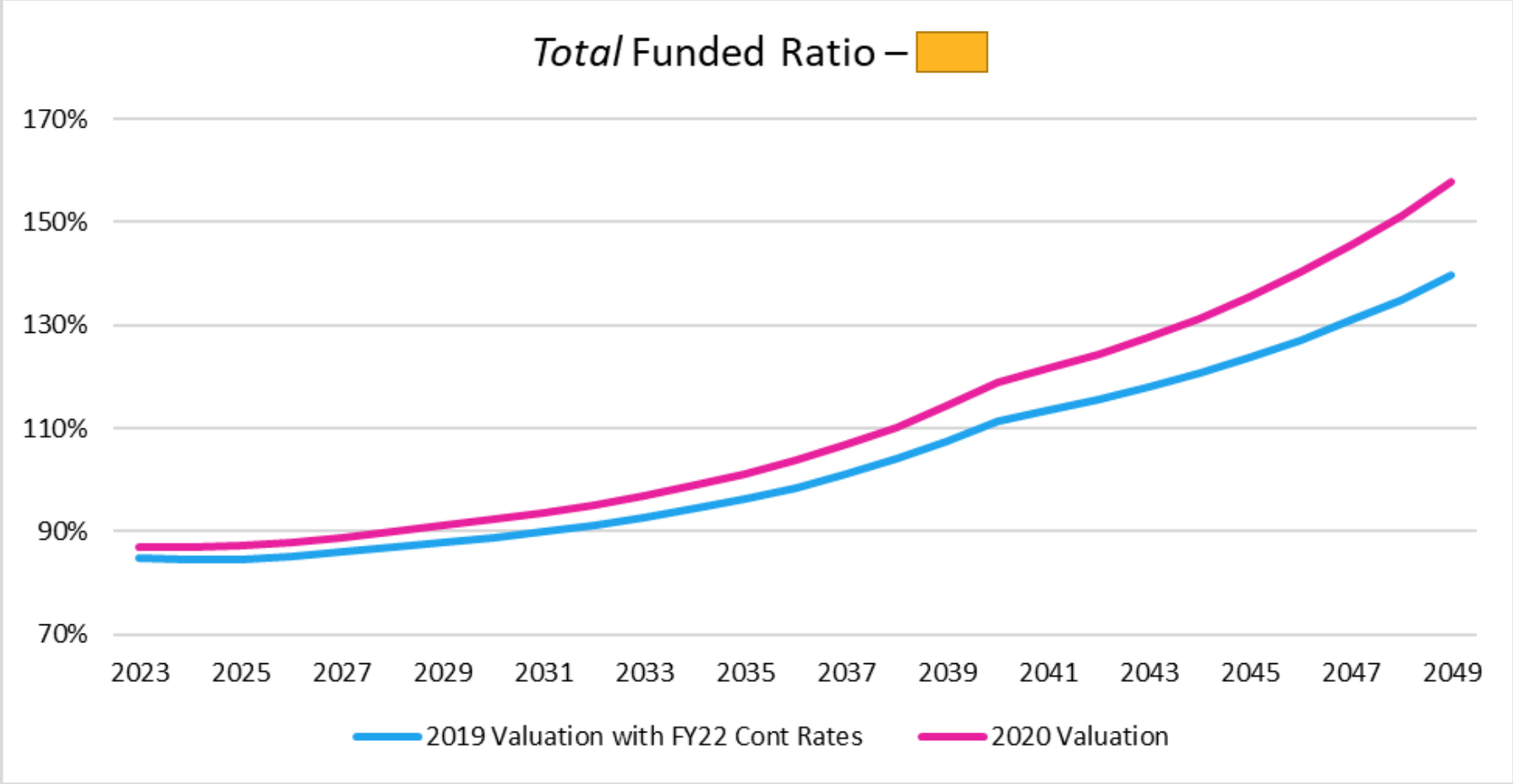
Impact of 2020 Baseline Projections – <Plan Name>

(\$000's)

Fiscal Year	Based on 2020 Valuation				Based on 2019 Valuation with FY22 Contribution Rates				Decrease in Additional State Cont
	Funded Ratio (AVA basis)			Additional State Cont	Funded Ratio (AVA basis)			Additional State Cont	
	Pension	Healthcare	Total		Pension	Healthcare	Total		
2023	64.5%	113.8%	80.2%	196,014	63.5%	107.4%	77.9%	203,510	(7,496)
2024	64.6%	113.5%	80.2%	205,353	63.5%	106.5%	77.6%	214,064	(8,711)
2025	65.0%	113.6%	80.6%	212,934	63.7%	106.0%	77.7%	223,183	(10,249)
2026	65.8%	114.4%	81.5%	217,230	64.5%	106.3%	78.4%	227,027	(9,797)
2027	66.6%	115.2%	82.4%	222,128	65.3%	106.7%	79.1%	231,409	(9,281)
2028	67.5%	116.2%	83.4%	227,103	66.2%	107.1%	80.0%	236,796	(9,693)
2029	68.4%	117.2%	84.5%	233,272	67.1%	107.6%	80.8%	242,807	(9,535)
2030	69.5%	118.4%	85.7%	239,495	68.1%	108.1%	81.8%	249,405	(9,910)
2031	70.6%	119.6%	87.0%	246,654	69.3%	108.7%	82.8%	256,223	(9,569)
2032	71.9%	121.1%	88.4%	253,868	70.6%	109.3%	84.0%	263,599	(9,731)
2033	73.4%	122.6%	90.1%	261,695	72.1%	110.0%	85.3%	271,880	(10,185)
2034	75.1%	124.4%	91.9%	269,842	73.8%	110.8%	86.8%	279,924	(10,082)
2035	77.1%	126.3%	94.0%	278,057	75.7%	111.6%	88.5%	288,620	(10,563)
2036	79.4%	128.5%	96.4%	287,481	78.1%	112.6%	90.4%	298,196	(10,715)
2037	82.1%	131.0%	99.1%	297,180	80.8%	113.7%	92.6%	308,277	(11,097)
2038	85.2%	133.8%	102.3%	307,514	84.0%	114.9%	95.2%	319,120	(11,606)
2039	88.9%	136.9%	105.9%	317,725	87.7%	116.3%	98.2%	329,816	(12,091)
2040	93.4%	140.5%	110.1%	0	92.2%	117.8%	101.6%	0	0
2041	93.9%	144.5%	112.0%	0	92.8%	119.6%	102.7%	0	0
2042	94.5%	149.1%	114.2%	0	93.5%	121.6%	104.0%	0	0
2043	95.3%	154.2%	116.7%	0	94.4%	123.8%	105.5%	0	0
2044	96.3%	160.1%	119.6%	0	95.6%	126.4%	107.2%	0	0
2045	96.9%	166.7%	122.5%	0	96.3%	129.3%	108.8%	0	0
2046	97.2%	174.1%	125.7%	0	96.8%	132.5%	110.5%	0	0
2047	97.5%	182.5%	129.2%	0	97.2%	136.2%	112.2%	0	0
2048	97.8%	192.0%	133.1%	0	97.6%	140.3%	114.2%	0	0
2049	98.1%	202.6%	137.6%	0	97.9%	144.9%	116.3%	0	0
2050	98.2%	214.4%	142.6%	0	n/a	n/a	n/a	n/a	0
Total				4,273,545				4,443,856	(170,311)

- Projected funded status (Pension, Healthcare and Total) in FY39 is *higher* based on the 2020 valuation projections
- Projected Pension funded status in FY49 is essentially the *same* under both scenarios, but *higher* overall due to Healthcare funded ratio
- Net effect is a *decrease* in projected Additional State Contributions

Total Funded Ratio - <Plan Name>



- Total funded ratio is *higher* in all years under 2020 valuation projections, primarily because of the improved 6/30/20 funded status of the Healthcare trust
- Total funded ratio is projected to *exceed 100%* because surplus in Healthcare trust continues to grow as Healthcare Normal Cost is contributed at a minimum

Impact of 2020 Baseline Projections – <Plan Name>

(\$000's)

Fiscal Year	Based on 2020 Valuation				Based on 2019 Valuation with FY22 Contribution Rates				Decrease in Additional State Cont
	Funded Ratio (AVA basis)			Additional State Cont	Funded Ratio (AVA basis)			Additional State Cont	
	Pension	Healthcare	Total		Pension	Healthcare	Total		
2023	74.9%	122.0%	87.0%	145,601	73.9%	115.8%	85.0%	150,213	(4,612)
2024	74.5%	122.2%	86.9%	152,859	73.3%	115.3%	84.6%	158,325	(5,466)
2025	74.4%	122.6%	87.2%	158,813	73.1%	115.1%	84.5%	165,463	(6,650)
2026	74.9%	123.9%	88.0%	162,694	73.5%	116.0%	85.2%	169,613	(6,919)
2027	75.4%	125.3%	88.9%	166,575	74.0%	116.9%	86.0%	173,725	(7,150)
2028	75.9%	126.8%	89.9%	170,766	74.5%	117.9%	86.9%	178,166	(7,400)
2029	76.5%	128.5%	91.1%	175,032	75.1%	119.1%	87.8%	182,611	(7,579)
2030	77.2%	130.4%	92.3%	179,570	75.7%	120.4%	88.8%	187,538	(7,968)
2031	78.0%	132.6%	93.7%	184,399	76.5%	121.8%	90.0%	192,511	(8,112)
2032	78.9%	135.0%	95.2%	189,331	77.5%	123.4%	91.2%	197,650	(8,319)
2033	80.0%	137.6%	96.9%	194,428	78.6%	125.2%	92.7%	202,896	(8,468)
2034	81.3%	140.6%	98.9%	199,591	79.9%	127.2%	94.4%	208,501	(8,910)
2035	82.9%	144.0%	101.2%	205,075	81.4%	129.4%	96.3%	214,185	(9,110)
2036	84.7%	147.8%	103.8%	210,628	83.3%	131.9%	98.5%	219,936	(9,308)
2037	86.9%	152.0%	106.8%	216,515	85.5%	134.7%	101.1%	226,073	(9,558)
2038	89.5%	156.8%	110.3%	222,475	88.1%	137.8%	104.1%	232,385	(9,910)
2039	92.6%	162.1%	114.3%	228,679	91.3%	141.4%	107.5%	238,733	(10,054)
2040	96.3%	168.1%	118.9%	17,649	95.1%	145.3%	111.5%	28,043	(10,394)
2041	96.6%	174.9%	121.5%	18,300	95.4%	149.8%	113.4%	28,864	(10,564)
2042	96.9%	182.5%	124.3%	18,754	95.8%	154.8%	115.5%	29,706	(10,952)
2043	97.3%	191.1%	127.6%	19,444	96.3%	160.5%	117.9%	30,570	(11,126)
2044	97.7%	200.6%	131.4%	18,190	96.9%	166.7%	120.7%	29,588	(11,398)
2045	98.3%	211.1%	135.6%	6,649	97.7%	173.7%	123.8%	18,703	(12,054)
2046	98.7%	222.7%	140.2%	1,338	98.3%	181.4%	127.2%	7,866	(6,528)
2047	99.1%	235.5%	145.4%	0	98.8%	189.9%	130.9%	4,031	(4,031)
2048	99.5%	249.7%	151.2%	0	99.3%	199.3%	135.0%	0	0
2049	99.8%	265.7%	157.7%	0	99.7%	209.8%	139.6%	0	0
2050	99.9%	283.5%	164.9%	0	n/a	n/a	n/a	n/a	0
Total				3,263,355				3,475,895	(212,540)

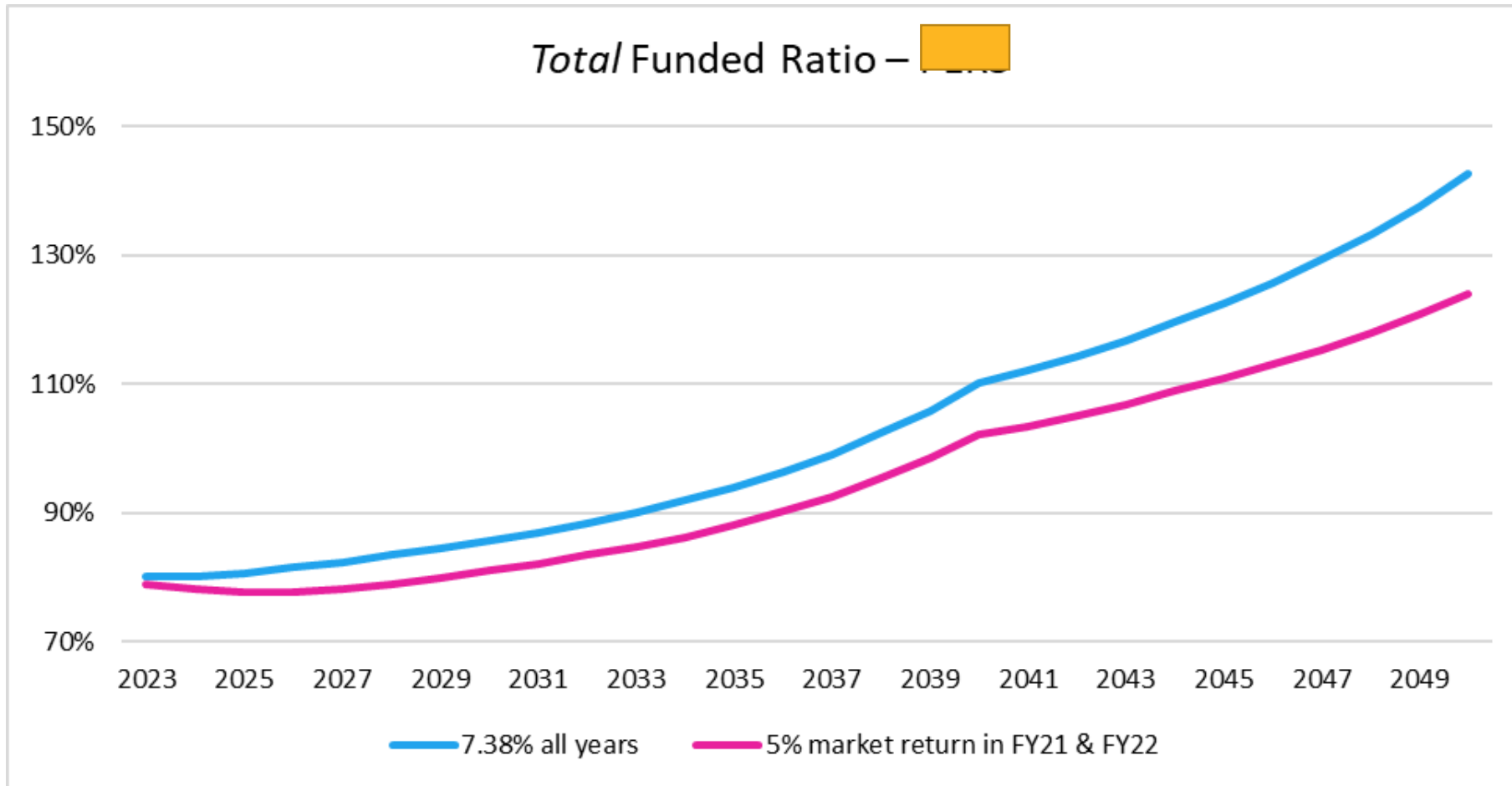
- Projected funded status (Pension, Healthcare and Total) in FY39 is *higher* based on the 2020 valuation projections
- Projected Pension funded status in FY49 is essentially the *same* under both scenarios, but *higher* overall due to Healthcare funded ratio
- Net effect is a *decrease* in projected Additional State Contributions

Sensitivity Analysis

Sensitivity Analysis – 2020 Valuation Projections

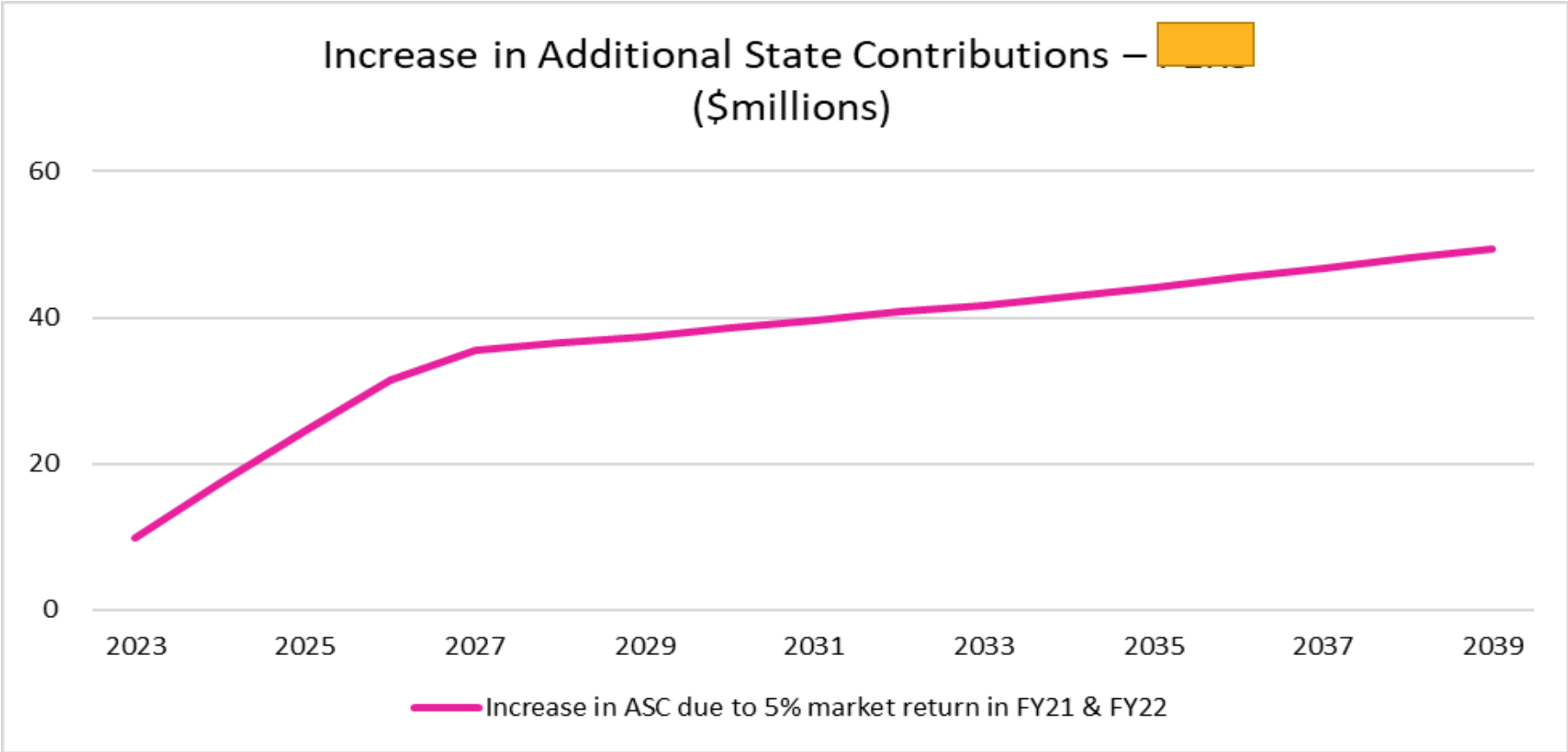
- For purposes of this presentation, two risk factors (asset returns and medical/Rx costs) were selected to illustrate the potential impact on projected contributions if actual results differ from expectations. The ASOP 51 section of the draft 6/30/20 valuation reports contains details regarding these and other risk factors.
- Projection Scenarios
 - Baseline: 7.38% return each year
 - Alternative 1: 5% market asset returns in FY21 and FY22, 7.38% return each year thereafter
 - Alternative 2: Medical/Rx claims are 5% higher than expected in FY21 and FY22, expected trend thereafter
- Other than the risk factors identified above, we assumed no other gains/losses after 6/30/20

Total Funded Ratio - <Plan Name>



- Total funded ratio is *lower* in all years under adverse asset return scenario as assets have to “catch up” because of lower investment earnings in FY21 and FY22

Increase in Additional State Contributions - <Plan Name>



- Increases in Additional State Contributions are *larger* in *earlier* years as deferred asset losses accumulate due to lower investment returns in FY21 and FY22, then increases level off over time

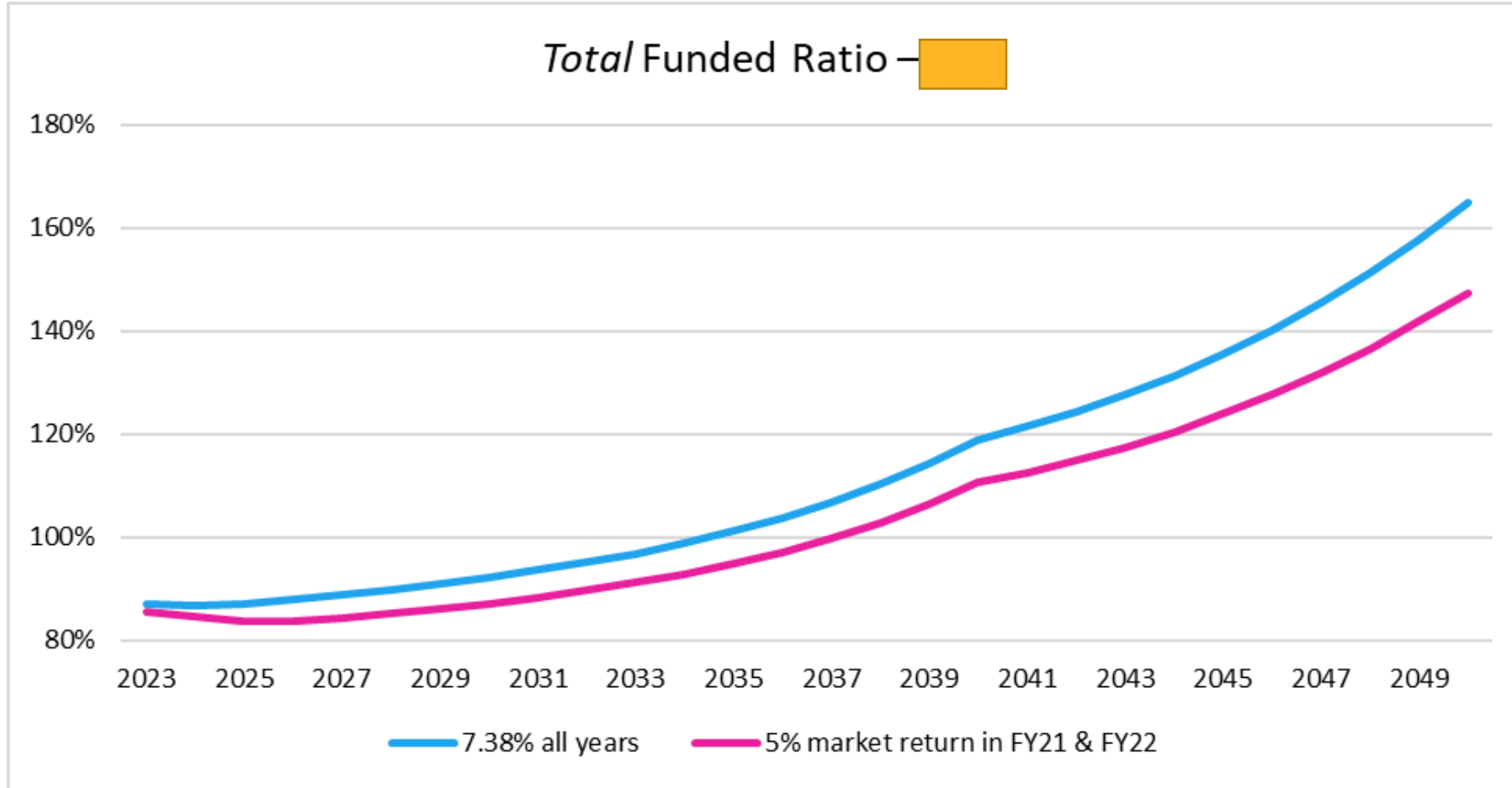
Impact of Adverse Asset Returns – <Plan Name>

(\$000's)

Fiscal Year	7.38% return each year				5% return in FY21 and FY22, 7.38% thereafter				Increase in Additional State Cont
	Funded Ratio (AVA basis)			Additional State Cont	Funded Ratio (AVA basis)			Additional State Cont	
	Pension	Healthcare	Total		Pension	Healthcare	Total		
2023	64.5%	113.8%	80.2%	196,014	63.5%	112.1%	79.0%	205,875	9,861
2024	64.6%	113.5%	80.2%	205,353	63.0%	110.5%	78.2%	222,830	17,477
2025	65.0%	113.6%	80.6%	212,934	62.7%	109.3%	77.7%	237,465	24,531
2026	65.8%	114.4%	81.5%	217,230	62.9%	108.8%	77.7%	248,760	31,530
2027	66.6%	115.2%	82.4%	222,128	63.4%	108.8%	78.2%	257,638	35,510
2028	67.5%	116.2%	83.4%	227,103	64.3%	109.4%	79.0%	263,674	36,571
2029	68.4%	117.2%	84.5%	233,272	65.3%	110.0%	80.0%	270,720	37,448
2030	69.5%	118.4%	85.7%	239,495	66.3%	110.7%	81.0%	278,132	38,637
2031	70.6%	119.6%	87.0%	246,654	67.5%	111.4%	82.1%	286,281	39,627
2032	71.9%	121.1%	88.4%	253,868	68.8%	112.2%	83.4%	294,619	40,751
2033	73.4%	122.6%	90.1%	261,695	70.2%	113.1%	84.8%	303,341	41,646
2034	75.1%	124.4%	91.9%	269,842	72.0%	114.2%	86.3%	312,706	42,864
2035	77.1%	126.3%	94.0%	278,057	73.9%	115.3%	88.1%	322,193	44,136
2036	79.4%	128.5%	96.4%	287,481	76.2%	116.6%	90.2%	332,937	45,456
2037	82.1%	131.0%	99.1%	297,180	79.0%	118.0%	92.6%	343,989	46,809
2038	85.2%	133.8%	102.3%	307,514	82.2%	119.6%	95.3%	355,720	48,206
2039	88.9%	136.9%	105.9%	317,725	85.9%	121.5%	98.5%	367,077	49,352
2040	93.4%	140.5%	110.1%	0	90.4%	123.5%	102.2%	0	0
2041	93.9%	144.5%	112.0%	0	91.0%	125.9%	103.5%	0	0
2042	94.5%	149.1%	114.2%	0	91.8%	128.5%	105.0%	0	0
2043	95.3%	154.2%	116.7%	0	92.7%	131.5%	106.8%	0	0
2044	96.3%	160.1%	119.6%	0	93.9%	134.9%	108.9%	0	0
2045	96.9%	166.7%	122.5%	0	94.7%	138.7%	110.9%	0	0
2046	97.2%	174.1%	125.7%	0	95.3%	143.1%	113.0%	0	0
2047	97.5%	182.5%	129.2%	0	96.0%	147.9%	115.3%	0	0
2048	97.8%	192.0%	133.1%	0	96.7%	153.4%	118.0%	0	0
2049	98.1%	202.6%	137.6%	0	97.3%	159.6%	120.9%	0	0
2050	98.2%	214.4%	142.6%	0	97.7%	166.4%	123.9%	0	0
Total				4,273,545				4,903,957	630,412

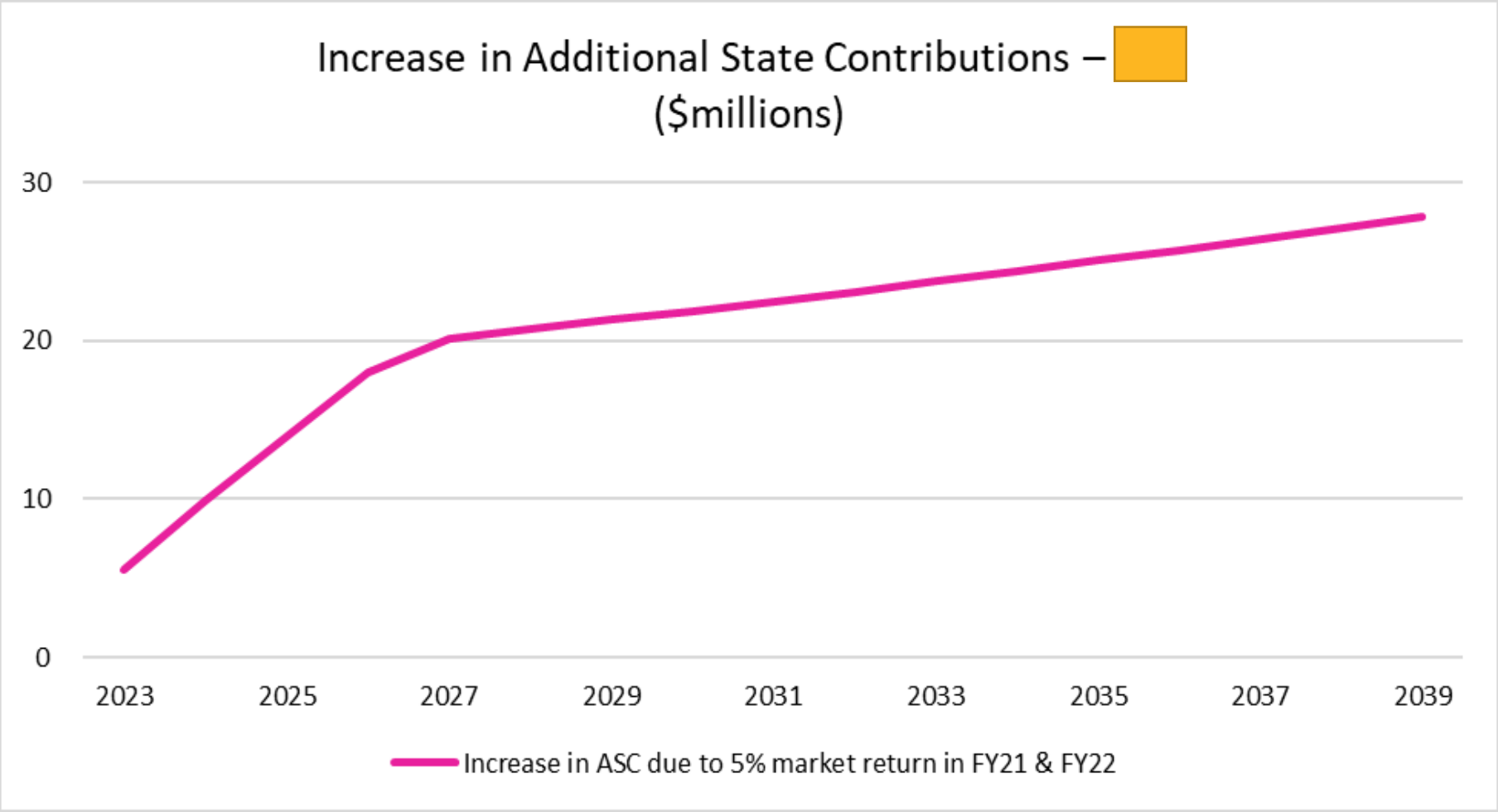
- Projected funded status (Pension, Healthcare and Total) in FY39 is *lower* under the adverse asset return scenario
- Projected Pension funded status in FY50 is slightly *lower* under the adverse asset return scenario despite higher Additional State Contributions, which is the result of playing “catch up” along the way

Total Funded Ratio - <Plan Name>



- Total funded ratio is *lower* in all years under adverse asset return scenario as assets have to “catch up” because of lower investment earnings in FY21 and FY22

Increase in Additional State Contributions - <Plan Name>



- Increases in Additional State Contributions are *larger in earlier* years as deferred asset losses accumulate due to lower investment returns in FY21 and FY22, then increases level off over time
- Graph shows increases thru FY39 only, but there is an additional increase totaling approximately \$268M projected for years after FY39 (see next slide)

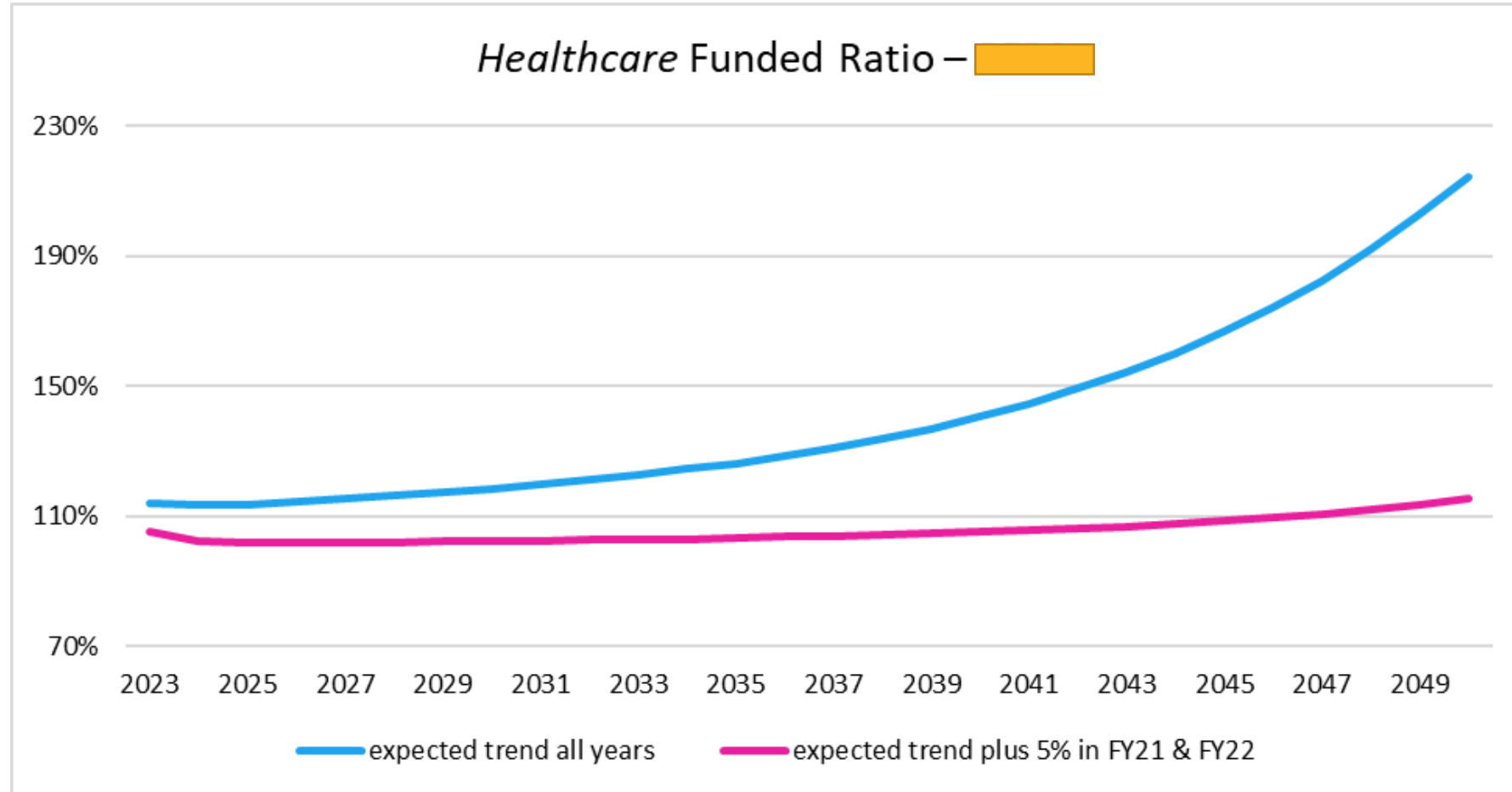
Impact of Adverse Asset Returns – <Plan Name>

(\$000's)

Fiscal Year	7.38% return each year				5% return in FY21 and FY22, 7.38% thereafter				Increase in Additional State Cont
	Funded Ratio (AVA basis)			Additional State Cont	Funded Ratio (AVA basis)			Additional State Cont	
	Pension	Healthcare	Total		Pension	Healthcare	Total		
2023	74.9%	122.0%	87.0%	145,601	73.8%	120.2%	85.7%	151,111	5,510
2024	74.5%	122.2%	86.9%	152,859	72.5%	119.0%	84.7%	162,708	9,849
2025	74.4%	122.6%	87.2%	158,813	71.7%	118.1%	83.9%	172,737	13,924
2026	74.9%	123.9%	88.0%	162,694	71.4%	118.0%	83.9%	180,658	17,964
2027	75.4%	125.3%	88.9%	166,575	71.5%	118.5%	84.3%	186,720	20,145
2028	75.9%	126.8%	89.9%	170,766	72.0%	119.7%	85.2%	191,484	20,718
2029	76.5%	128.5%	91.1%	175,032	72.6%	120.9%	86.1%	196,365	21,333
2030	77.2%	130.4%	92.3%	179,570	73.3%	122.3%	87.2%	201,471	21,901
2031	78.0%	132.6%	93.7%	184,399	74.0%	123.9%	88.3%	206,903	22,504
2032	78.9%	135.0%	95.2%	189,331	74.9%	125.7%	89.7%	212,397	23,066
2033	80.0%	137.6%	96.9%	194,428	76.0%	127.6%	91.2%	218,173	23,745
2034	81.3%	140.6%	98.9%	199,591	77.3%	129.8%	92.9%	223,958	24,367
2035	82.9%	144.0%	101.2%	205,075	78.8%	132.3%	94.9%	230,184	25,109
2036	84.7%	147.8%	103.8%	210,628	80.7%	135.1%	97.2%	236,324	25,696
2037	86.9%	152.0%	106.8%	216,515	82.9%	138.2%	99.8%	242,920	26,405
2038	89.5%	156.8%	110.3%	222,475	85.5%	141.7%	102.9%	249,608	27,133
2039	92.6%	162.1%	114.3%	228,679	88.6%	145.6%	106.4%	256,572	27,893
2040	96.3%	168.1%	118.9%	17,649	92.4%	150.0%	110.6%	46,329	28,680
2041	96.6%	174.9%	121.5%	18,300	92.8%	155.0%	112.6%	47,794	29,494
2042	96.9%	182.5%	124.3%	18,754	93.2%	160.6%	114.8%	49,092	30,338
2043	97.3%	191.1%	127.6%	19,444	93.8%	166.9%	117.5%	50,533	31,089
2044	97.7%	200.6%	131.4%	18,190	94.6%	173.8%	120.5%	50,166	31,976
2045	98.3%	211.1%	135.6%	6,649	95.5%	181.6%	123.9%	39,537	32,888
2046	98.7%	222.7%	140.2%	1,338	96.3%	190.1%	127.7%	35,165	33,827
2047	99.1%	235.5%	145.4%	0	97.2%	199.5%	131.9%	31,049	31,049
2048	99.5%	249.7%	151.2%	0	98.2%	209.9%	136.6%	17,120	17,120
2049	99.8%	265.7%	157.7%	0	99.0%	221.6%	141.8%	1,702	1,702
2050	99.9%	283.5%	164.9%	0	99.5%	234.8%	147.4%	0	0
Total				3,263,355				3,888,780	625,425

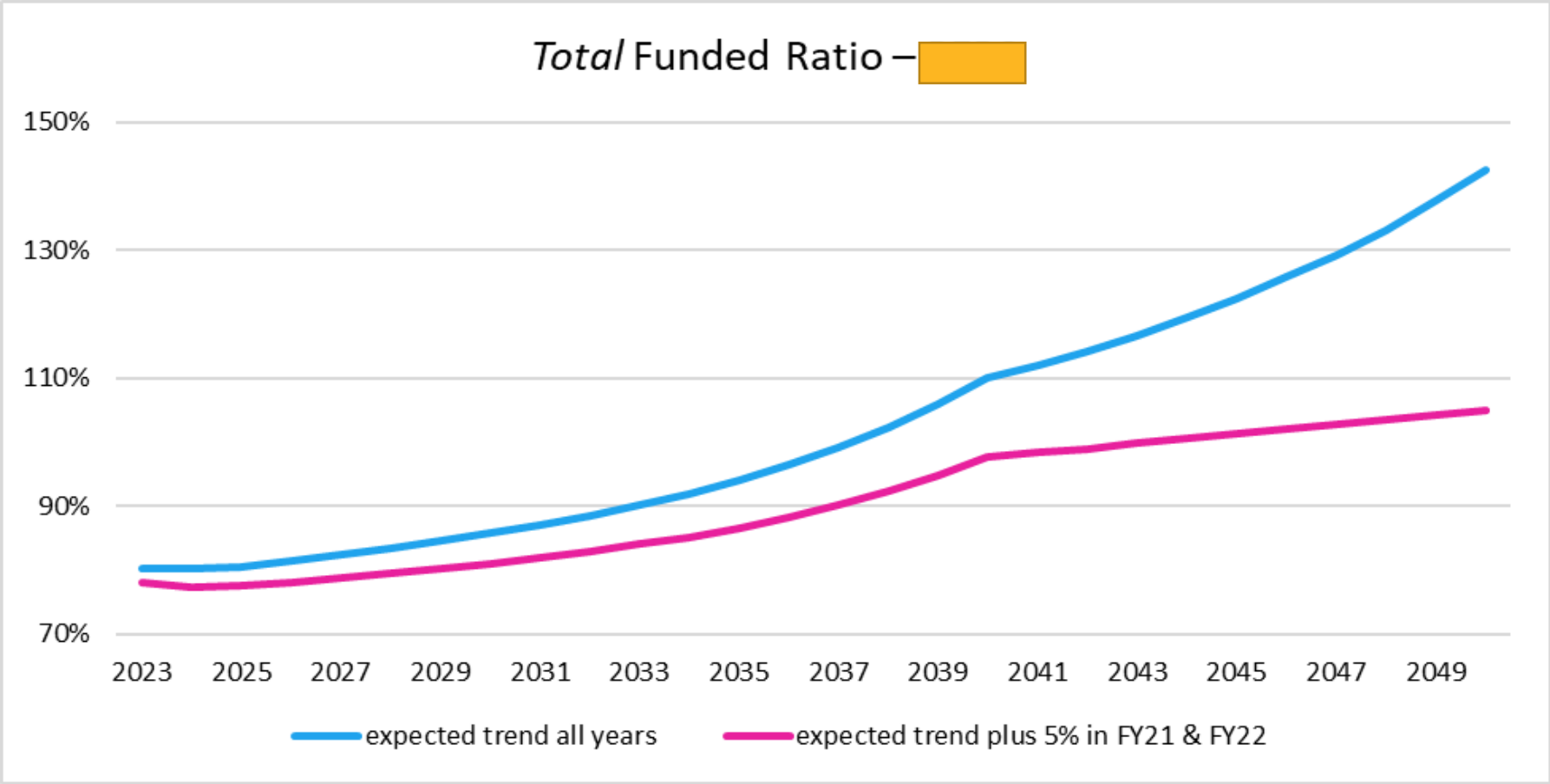
- Projected funded status (Pension, Healthcare and Total) in FY39 is *lower* under the adverse asset return scenario
- Projected Pension funded status in FY50 is *essentially the same* under the adverse asset return scenario despite higher Additional State Contributions, which is the result of playing “catch up” along the way

Healthcare Funded Ratio - <Plan Name>



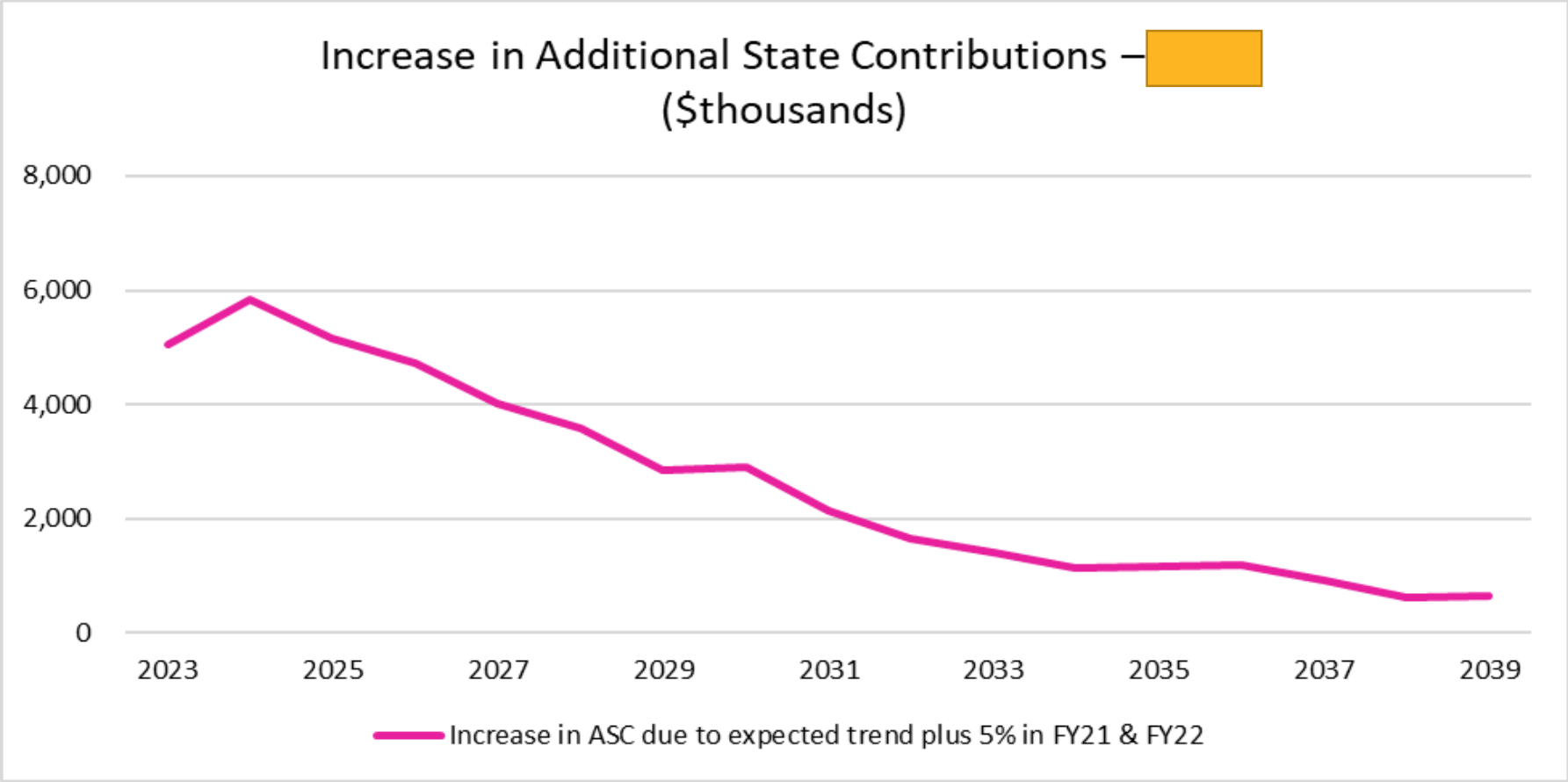
- Healthcare funded ratio is *lower* in all years under adverse asset claims scenario as projected Healthcare liabilities are approximately 10% higher
- Projected Healthcare funded ratio still remains above 100%, so higher Additional State Contributions are deposited in the Pension trust

Total Funded Ratio - <Plan Name>



- Total funded ratio is *lower* under adverse claims scenario due to lower Healthcare funded ratio
- There is a small effect on Pension funded ratio as higher Additional State Contributions are deposited in the Pension trust

Increase in Additional State Contributions - <Plan Name>



- Increases in Additional State Contributions become less over time

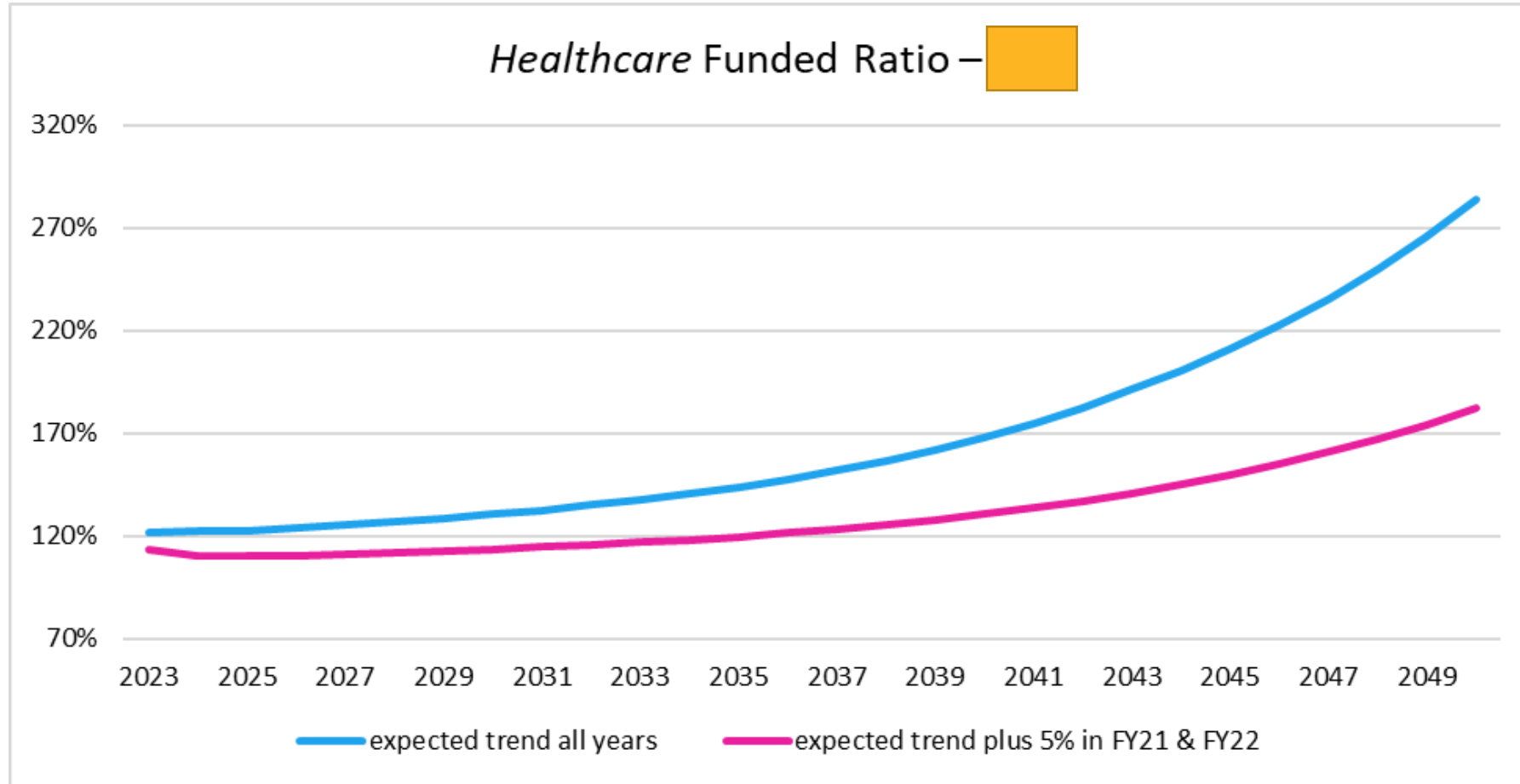
Impact of Adverse Medical/Rx Costs – <Plan Name>

(\$'000's)

Fiscal Year	expected trend each year				expected trend plus 5% in FY21 and FY22				Increase in Additional State Cont
	Funded Ratio (AVA basis)			Additional State Cont	Funded Ratio (AVA basis)			Additional State Cont	
	Pension	Healthcare	Total		Pension	Healthcare	Total		
2023	64.5%	113.8%	80.2%	196,014	64.5%	105.3%	78.1%	201,064	5,050
2024	64.6%	113.5%	80.2%	205,353	64.6%	102.2%	77.4%	211,179	5,826
2025	65.0%	113.6%	80.6%	212,934	65.0%	101.7%	77.5%	218,085	5,151
2026	65.8%	114.4%	81.5%	217,230	65.8%	101.8%	78.1%	221,947	4,717
2027	66.6%	115.2%	82.4%	222,128	66.6%	101.9%	78.8%	226,157	4,029
2028	67.5%	116.2%	83.4%	227,103	67.5%	102.0%	79.5%	230,683	3,580
2029	68.4%	117.2%	84.5%	233,272	68.4%	102.1%	80.2%	236,132	2,860
2030	69.5%	118.4%	85.7%	239,495	69.5%	102.3%	81.0%	242,406	2,911
2031	70.6%	119.6%	87.0%	246,654	70.6%	102.4%	81.9%	248,811	2,157
2032	71.9%	121.1%	88.4%	253,868	71.9%	102.6%	82.9%	255,520	1,652
2033	73.4%	122.6%	90.1%	261,695	73.4%	102.8%	84.0%	263,102	1,407
2034	75.1%	124.4%	91.9%	269,842	75.1%	103.0%	85.2%	270,993	1,151
2035	77.1%	126.3%	94.0%	278,057	77.1%	103.3%	86.6%	279,234	1,177
2036	79.4%	128.5%	96.4%	287,481	79.4%	103.6%	88.3%	288,685	1,204
2037	82.1%	131.0%	99.1%	297,180	82.1%	103.9%	90.1%	298,103	923
2038	85.2%	133.8%	102.3%	307,514	85.2%	104.3%	92.3%	308,144	630
2039	88.9%	136.9%	105.9%	317,725	89.0%	104.7%	94.8%	318,370	645
2040	93.4%	140.5%	110.1%	0	93.4%	105.1%	97.8%	0	0
2041	93.9%	144.5%	112.0%	0	93.9%	105.6%	98.3%	0	0
2042	94.5%	149.1%	114.2%	0	94.5%	106.2%	99.0%	0	0
2043	95.3%	154.2%	116.7%	0	95.3%	106.9%	99.8%	0	0
2044	96.3%	160.1%	119.6%	0	96.3%	107.6%	100.7%	0	0
2045	96.9%	166.7%	122.5%	0	96.9%	108.5%	101.4%	0	0
2046	97.2%	174.1%	125.7%	0	97.2%	109.4%	102.0%	0	0
2047	97.5%	182.5%	129.2%	0	97.5%	110.8%	102.8%	0	0
2048	97.8%	192.0%	133.1%	0	97.8%	112.2%	103.5%	0	0
2049	98.1%	202.6%	137.6%	0	98.1%	113.6%	104.3%	0	0
2050	98.2%	214.4%	142.6%	0	98.2%	115.2%	105.0%	0	0
Total				4,273,545				4,318,615	45,070

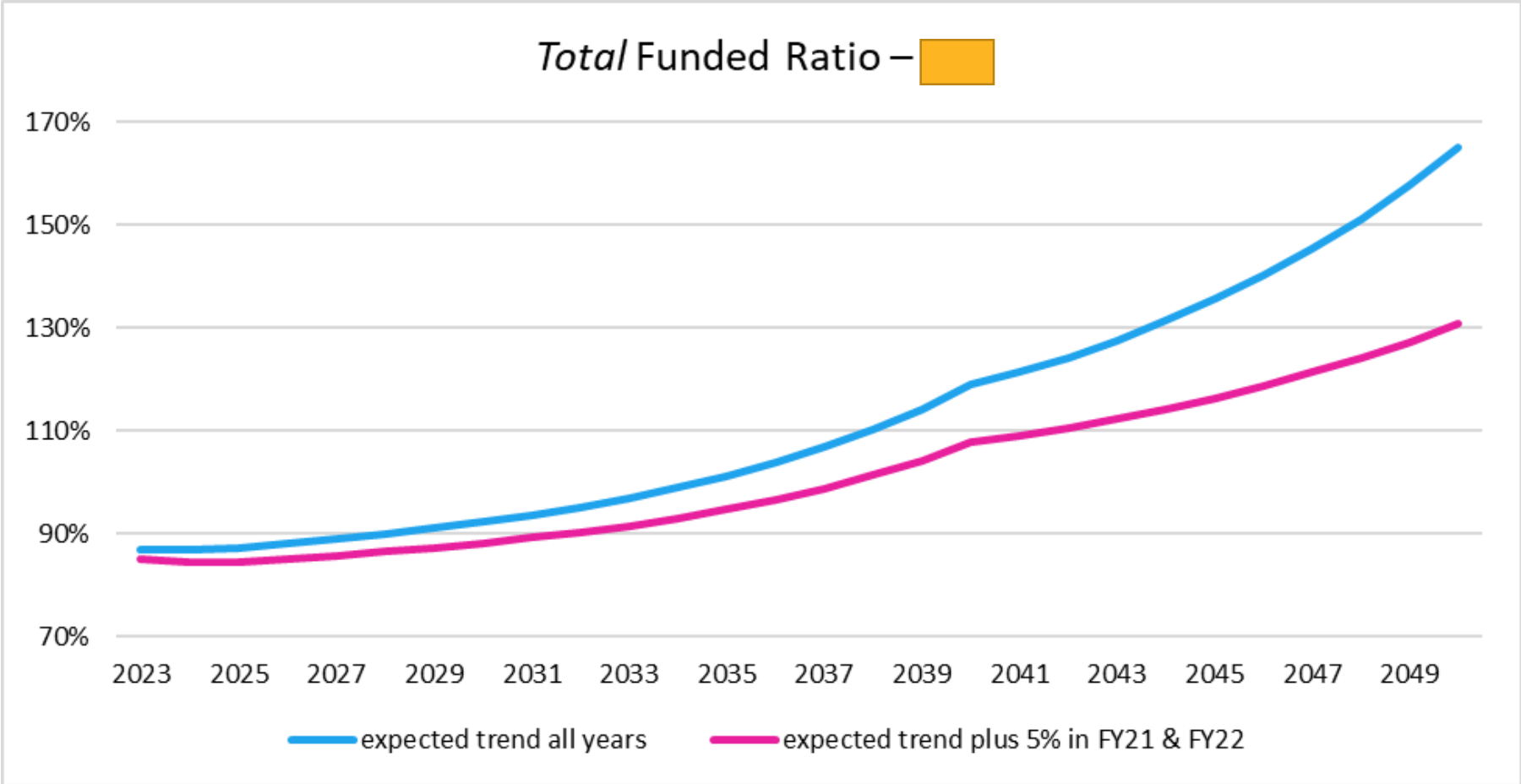
- Projected Healthcare funded status in all years is *lower* under the adverse claims experience scenario, but still above 100%
- *Total* funded ratio in FY50 still projected to be above 100%

Healthcare Funded Ratio - <Plan Name>



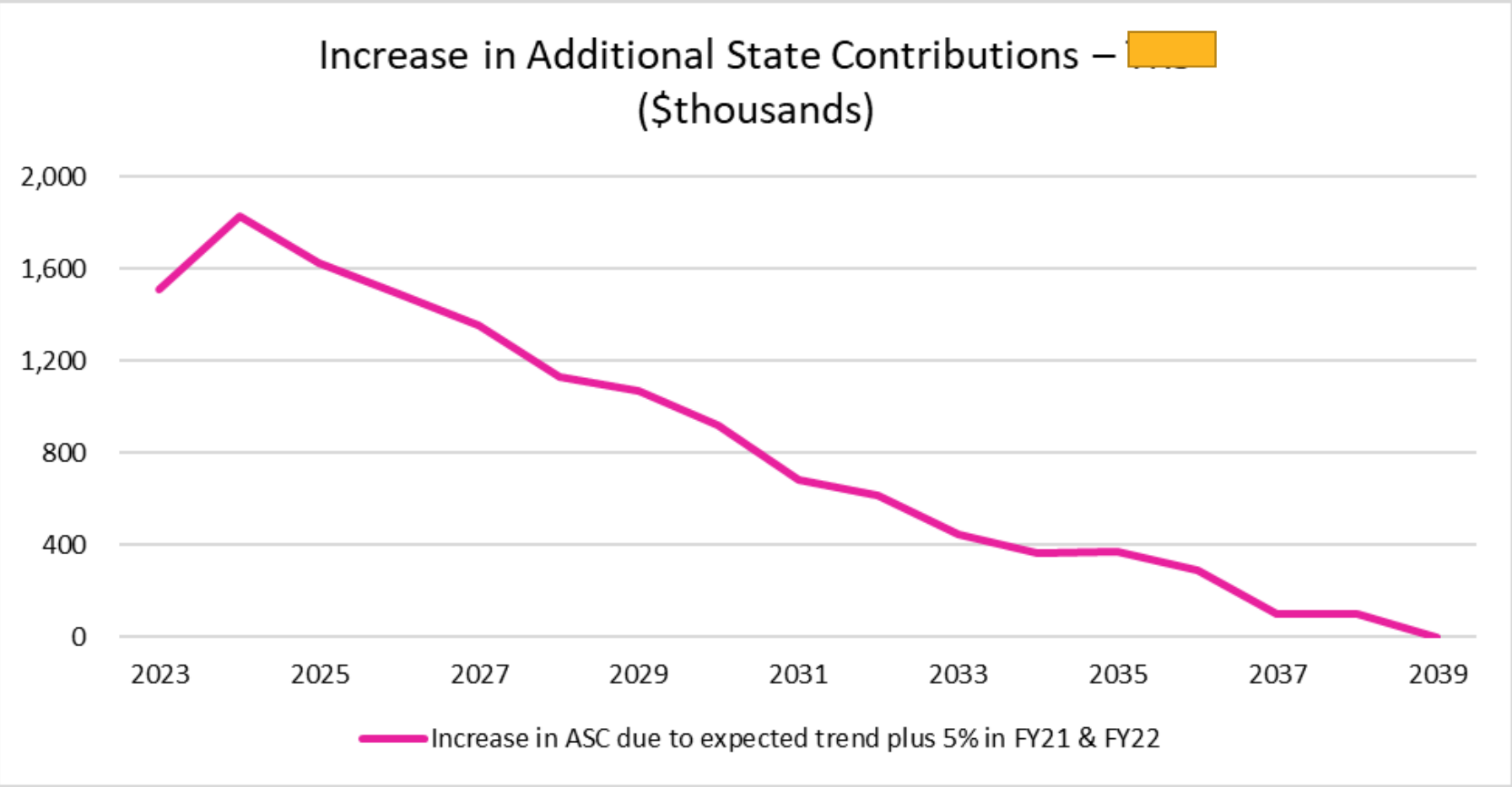
- Healthcare funded ratio is *lower* in all years under adverse asset claims scenario as projected Healthcare liabilities are approximately 10% higher
- Projected Healthcare funded ratio still remains above 100%, so higher Additional State Contributions are deposited in the Pension trust

Total Funded Ratio - <Plan Name>



- Total funded ratio is *lower* under adverse claims scenario due to lower Healthcare funded ratio
- There is a small effect on Pension funded ratio as higher Additional State Contributions are deposited in the Pension trust

Increase in Additional State Contributions - <Plan Name>



- Increases in Additional State Contributions become less over time



Impact of Adverse Medical/Rx Costs – <Plan Name>(\$000's)

Fiscal Year	expected trend each year				expected trend plus 5% in FY21 and FY22				Increase in Additional State Cont
	Funded Ratio (AVA basis)			Additional State Cont	Funded Ratio (AVA basis)			Additional State Cont	
	Pension	Healthcare	Total		Pension	Healthcare	Total		
2023	74.9%	122.0%	87.0%	145,601	74.9%	113.1%	85.2%	147,111	1,510
2024	74.5%	122.2%	86.9%	152,859	74.5%	110.2%	84.4%	154,691	1,832
2025	74.4%	122.6%	87.2%	158,813	74.4%	110.0%	84.5%	160,437	1,624
2026	74.9%	123.9%	88.0%	162,694	74.9%	110.6%	85.1%	164,185	1,491
2027	75.4%	125.3%	88.9%	166,575	75.4%	111.2%	85.8%	167,928	1,353
2028	75.9%	126.8%	89.9%	170,766	75.9%	112.0%	86.5%	171,899	1,133
2029	76.5%	128.5%	91.1%	175,032	76.5%	112.7%	87.3%	176,103	1,071
2030	77.2%	130.4%	92.3%	179,570	77.2%	113.6%	88.2%	180,493	923
2031	78.0%	132.6%	93.7%	184,399	78.0%	114.6%	89.2%	185,083	684
2032	78.9%	135.0%	95.2%	189,331	78.9%	115.7%	90.3%	189,943	612
2033	80.0%	137.6%	96.9%	194,428	80.0%	116.9%	91.6%	194,874	446
2034	81.3%	140.6%	98.9%	199,591	81.3%	118.2%	93.0%	199,956	365
2035	82.9%	144.0%	101.2%	205,075	82.9%	119.7%	94.7%	205,448	373
2036	84.7%	147.8%	103.8%	210,628	84.7%	121.4%	96.6%	210,915	287
2037	86.9%	152.0%	106.8%	216,515	86.9%	123.3%	98.8%	216,613	98
2038	89.5%	156.8%	110.3%	222,475	89.5%	125.5%	101.3%	222,575	100
2039	92.6%	162.1%	114.3%	228,679	92.6%	127.9%	104.3%	228,679	0
2040	96.3%	168.1%	118.9%	17,649	96.3%	130.5%	107.8%	17,754	105
2041	96.6%	174.9%	121.5%	18,300	96.6%	133.6%	109.1%	18,407	107
2042	96.9%	182.5%	124.3%	18,754	96.9%	137.0%	110.6%	18,865	111
2043	97.3%	191.1%	127.6%	19,444	97.3%	140.9%	112.3%	19,444	0
2044	97.7%	200.6%	131.4%	18,190	97.8%	145.1%	114.2%	18,190	0
2045	98.3%	211.1%	135.6%	6,649	98.3%	149.8%	116.4%	6,530	(119)
2046	98.7%	222.7%	140.2%	1,338	98.7%	155.0%	118.7%	1,217	(121)
2047	99.1%	235.5%	145.4%	0	99.1%	160.8%	121.3%	0	0
2048	99.5%	249.7%	151.2%	0	99.5%	167.2%	124.2%	0	0
2049	99.8%	265.7%	157.7%	0	99.8%	174.3%	127.3%	0	0
2050	99.9%	283.5%	164.9%	0	99.9%	182.4%	130.8%	0	0
Total				3,263,355				3,277,340	13,985

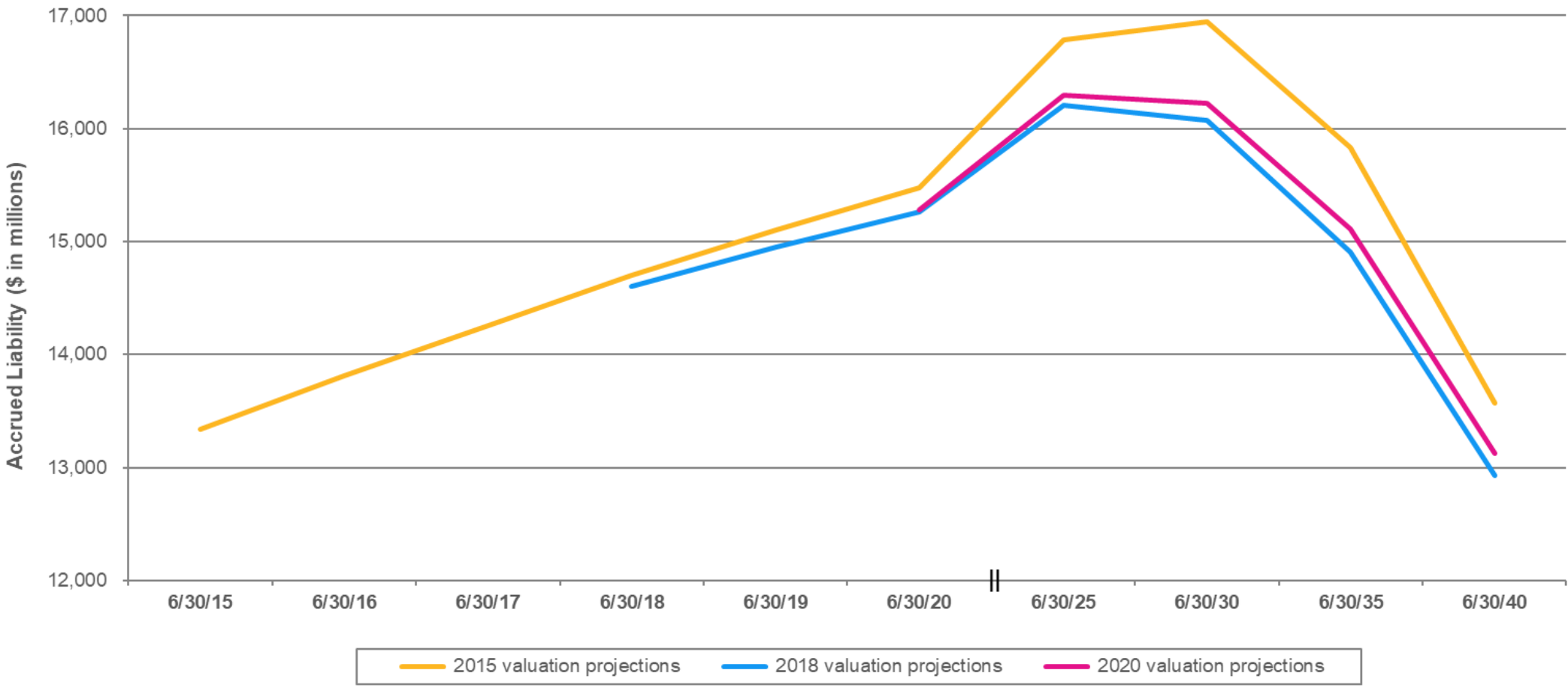
- Projected HC funded status in FY39 is lower under the adverse claims experience scenario
- Projected HC funded status in FY50 is lower under the adverse claims experience scenario, but still well above 100%
- After FY39, differences in Employer/State contribution rate are very small, which explains odd pattern of increases in Additional State Contributions in FY40-FY46

Historical Comparison

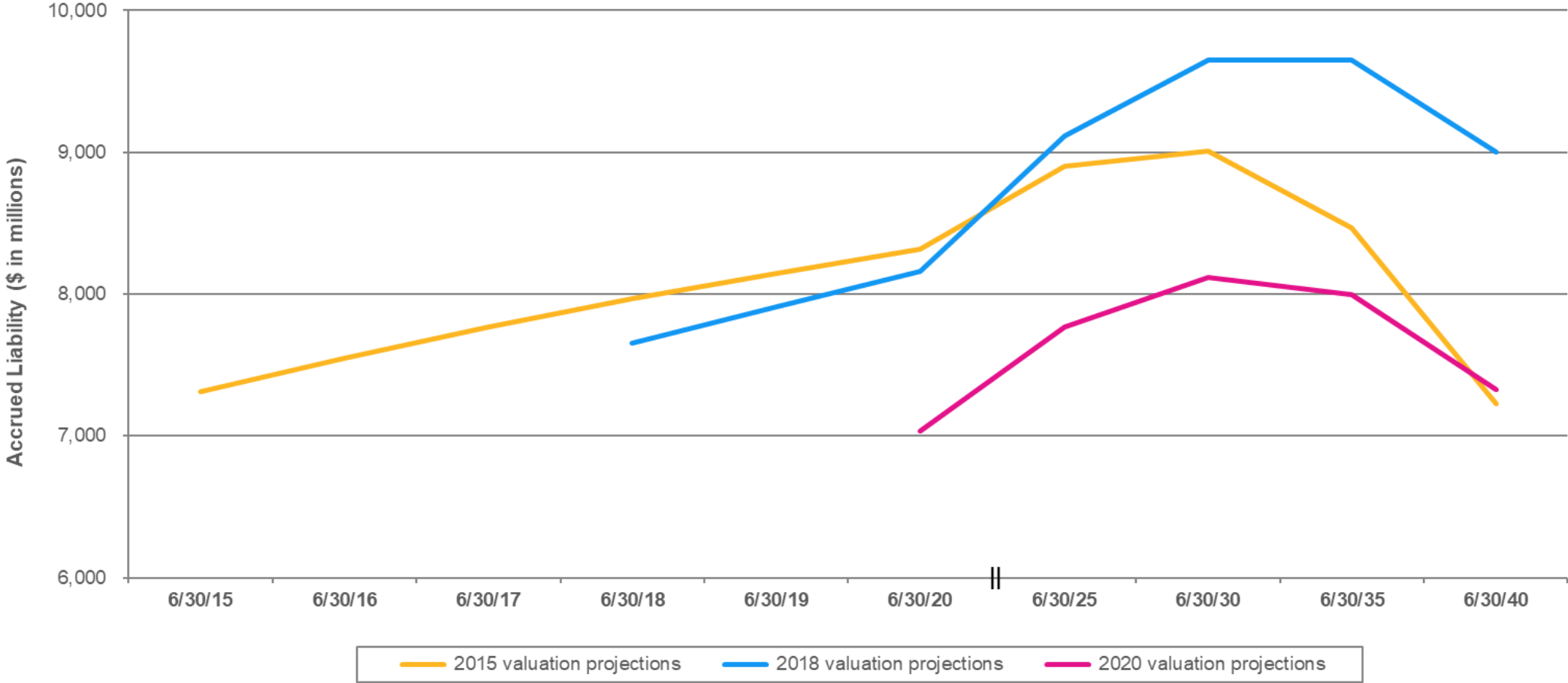
PERS Historical Comparison

- The graphs on the next few slides compare the baseline projections from the 2015, 2018 and 2020 valuations of 
- They illustrate how the long-term projections have changed over time based on changes in  assets and liabilities as measured in the valuations from these years
- Each graph is shown separately – Pension, Healthcare, Total. (Note: The scale of the vertical axis changes for each graph depending on the magnitude of the figures.)
- The following measures are included: Actuarial Accrued Liability, Actuarial Value of Assets, Unfunded Actuarial Accrued Liability, Contribution Rates as of each valuation date (as % of DB/DCR payroll), DB/DCR payroll
- To enhance readability, results for 6/30/15 through 6/30/20 are shown for each year, and future years (after 6/30/20) are shown for every 5 years
- Slides 43-45 show the impact of each year's (gains)/losses on contribution rates and amounts. Figures are grouped into six major (gain)/loss categories: asset returns, salary increases, medical/Rx claims, demographic experience, assumption/method changes, and actual vs expected contributions.
 - The \$1B Additional State Contribution made in FY15 to the Pension trust is the reason for the large decrease in Pension contribution rate in the 6/30/15 valuation.

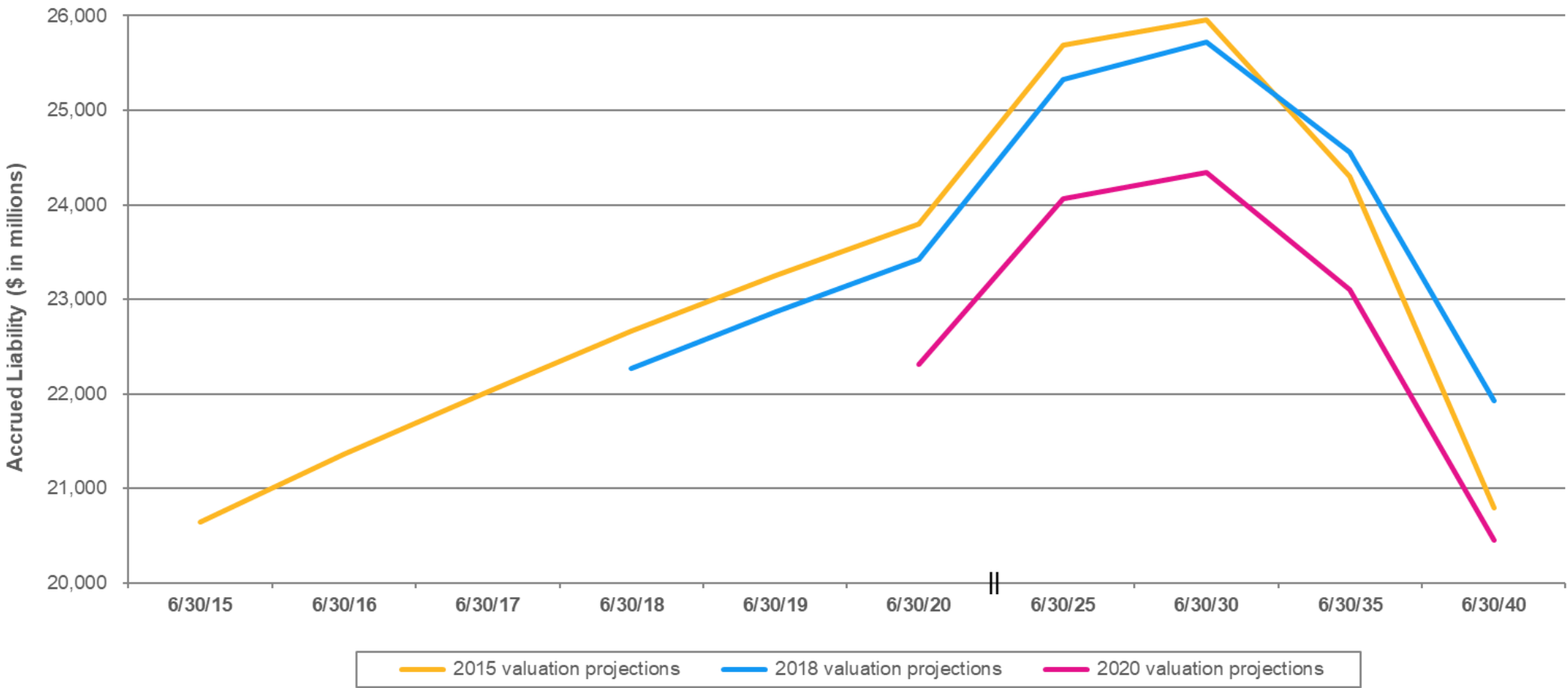
Actuarial Accrued Liability – Pension



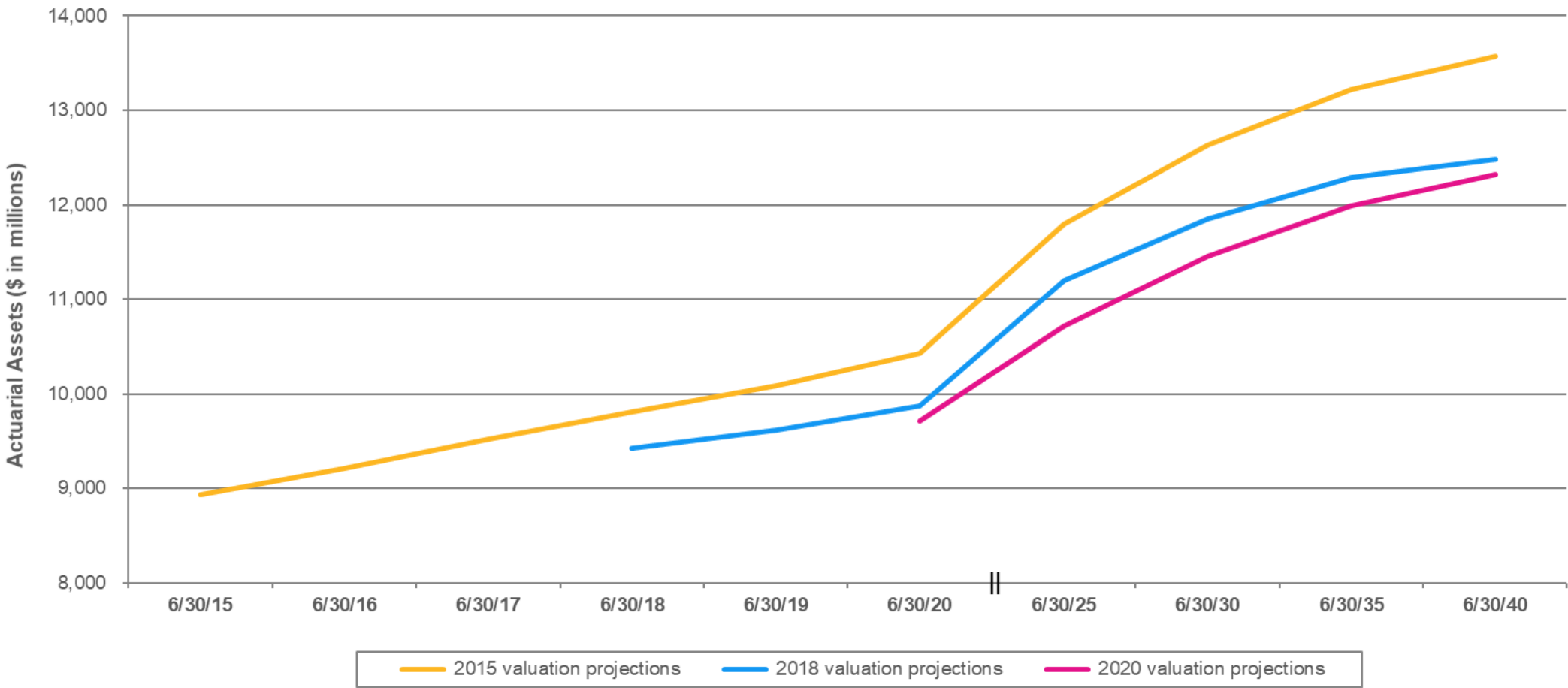
Actuarial Accrued Liability – Healthcare



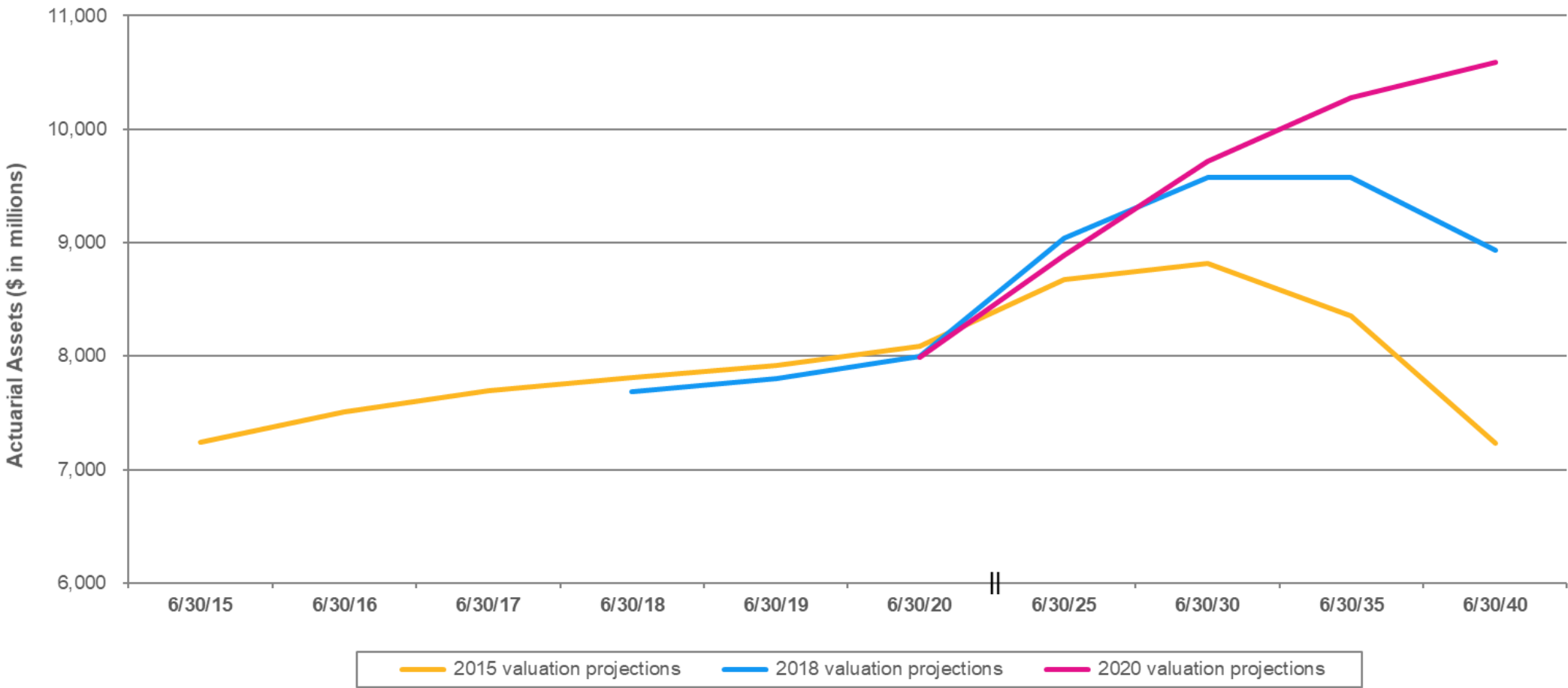
Actuarial Accrued Liability – Total



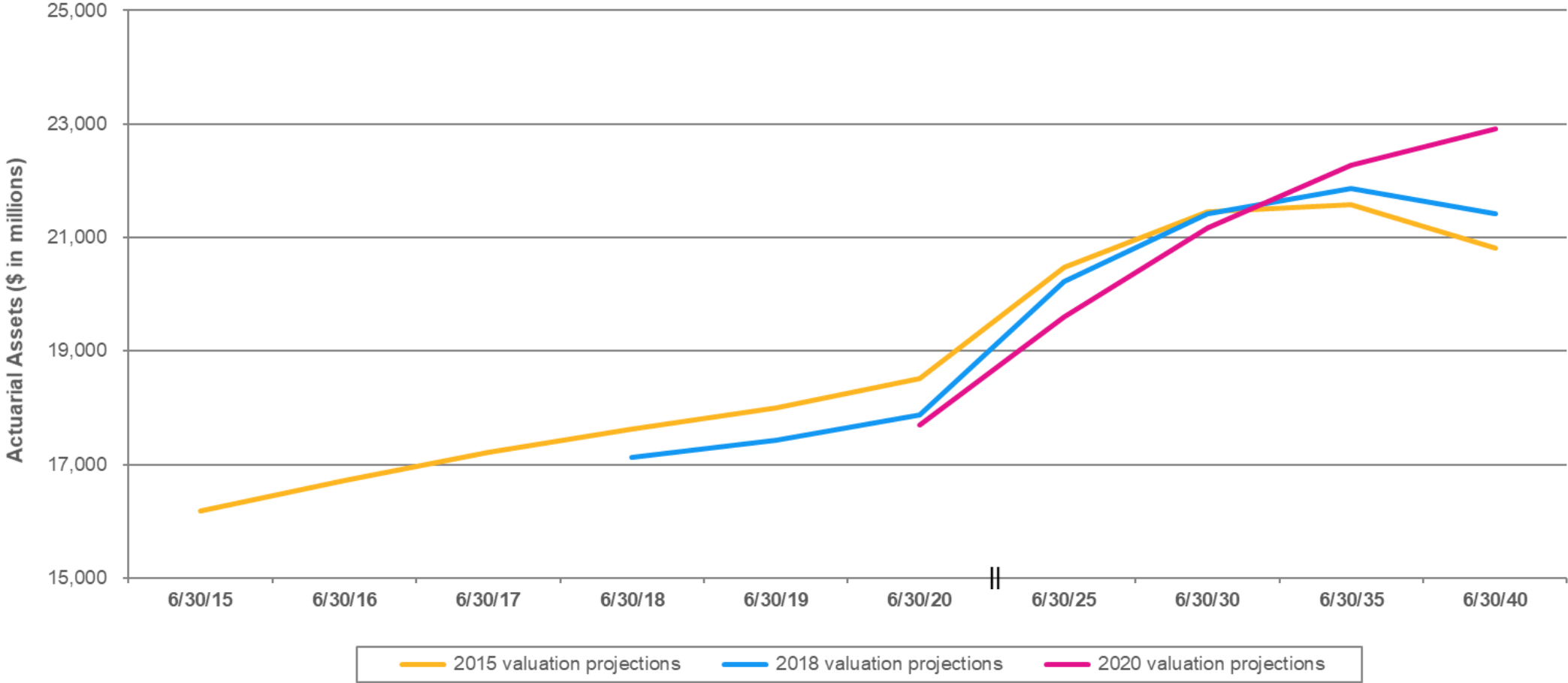
Actuarial Value of Assets – Pension



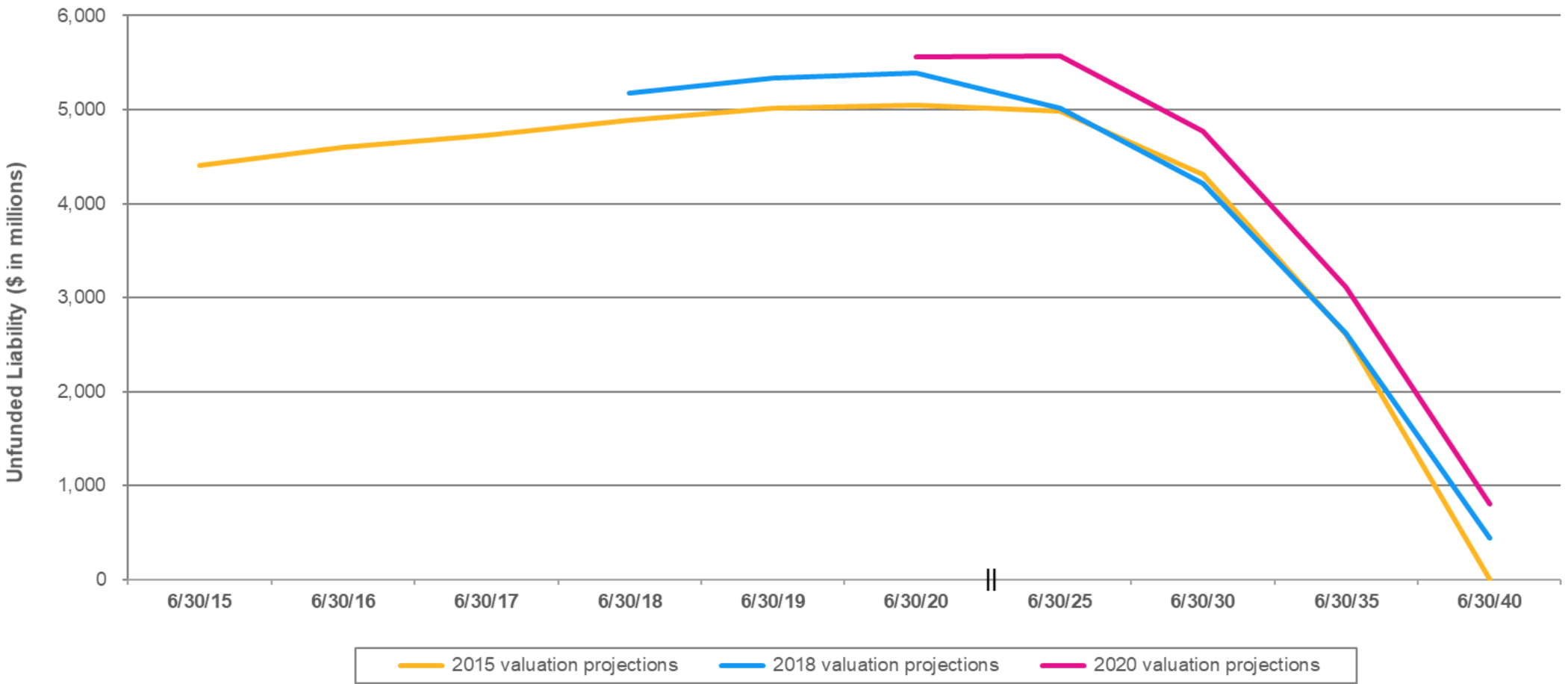
Actuarial Value of Assets – Healthcare



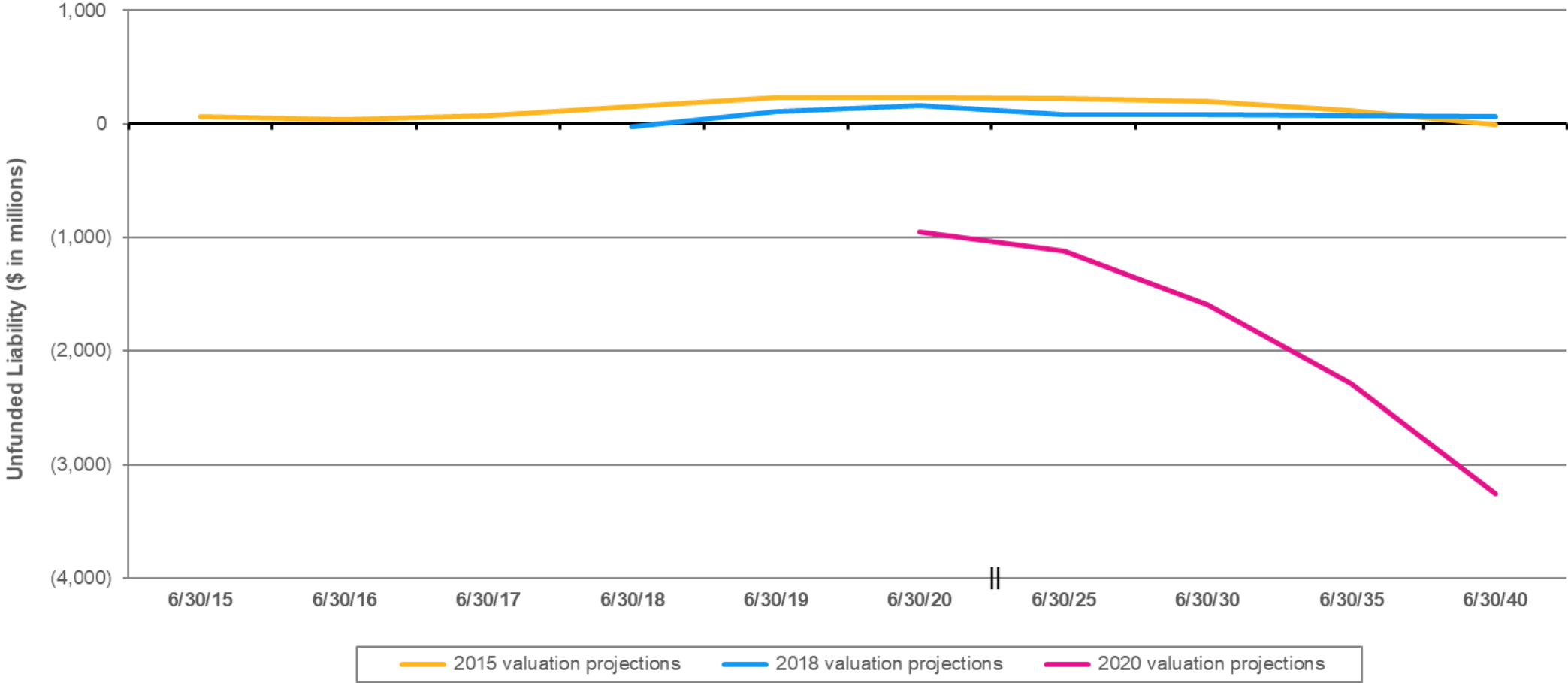
Actuarial Value of Assets – Total



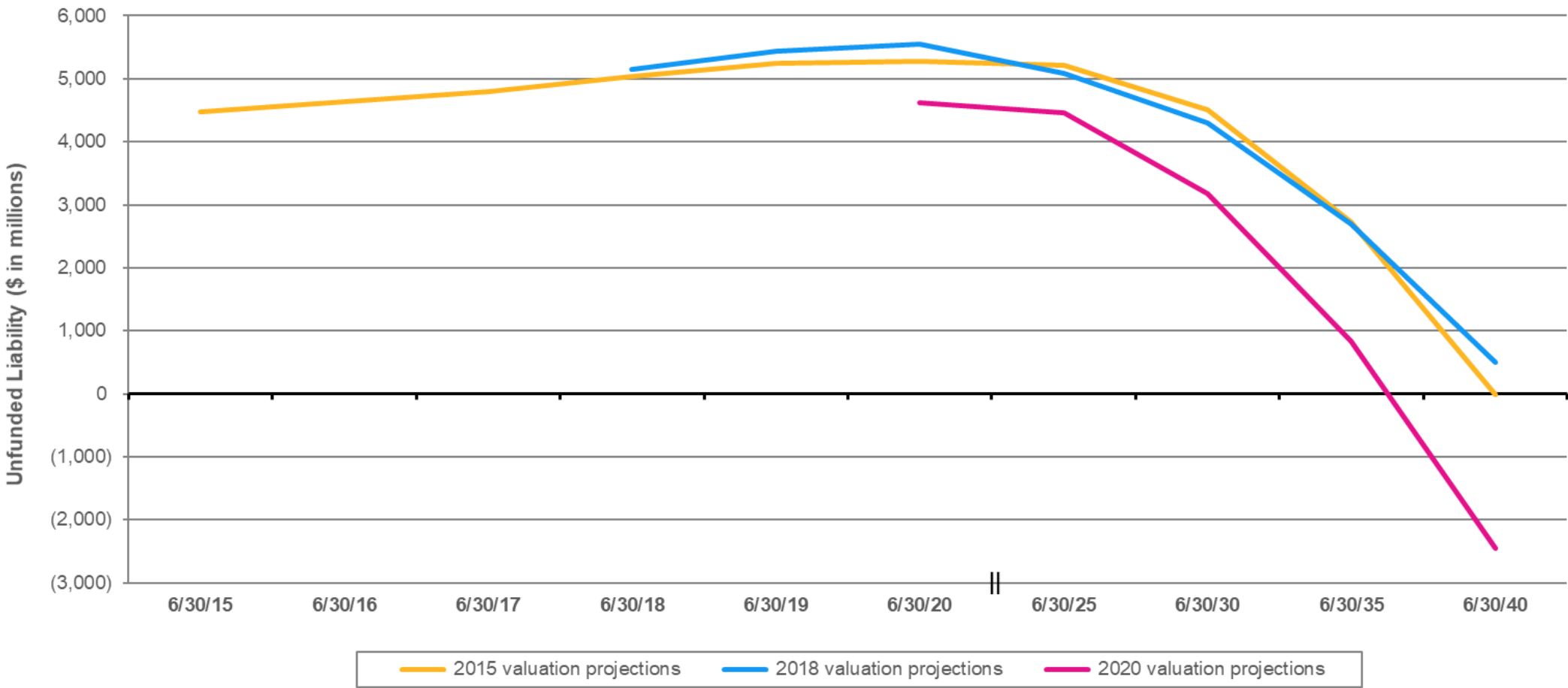
Unfunded Actuarial Accrued Liability – Pension



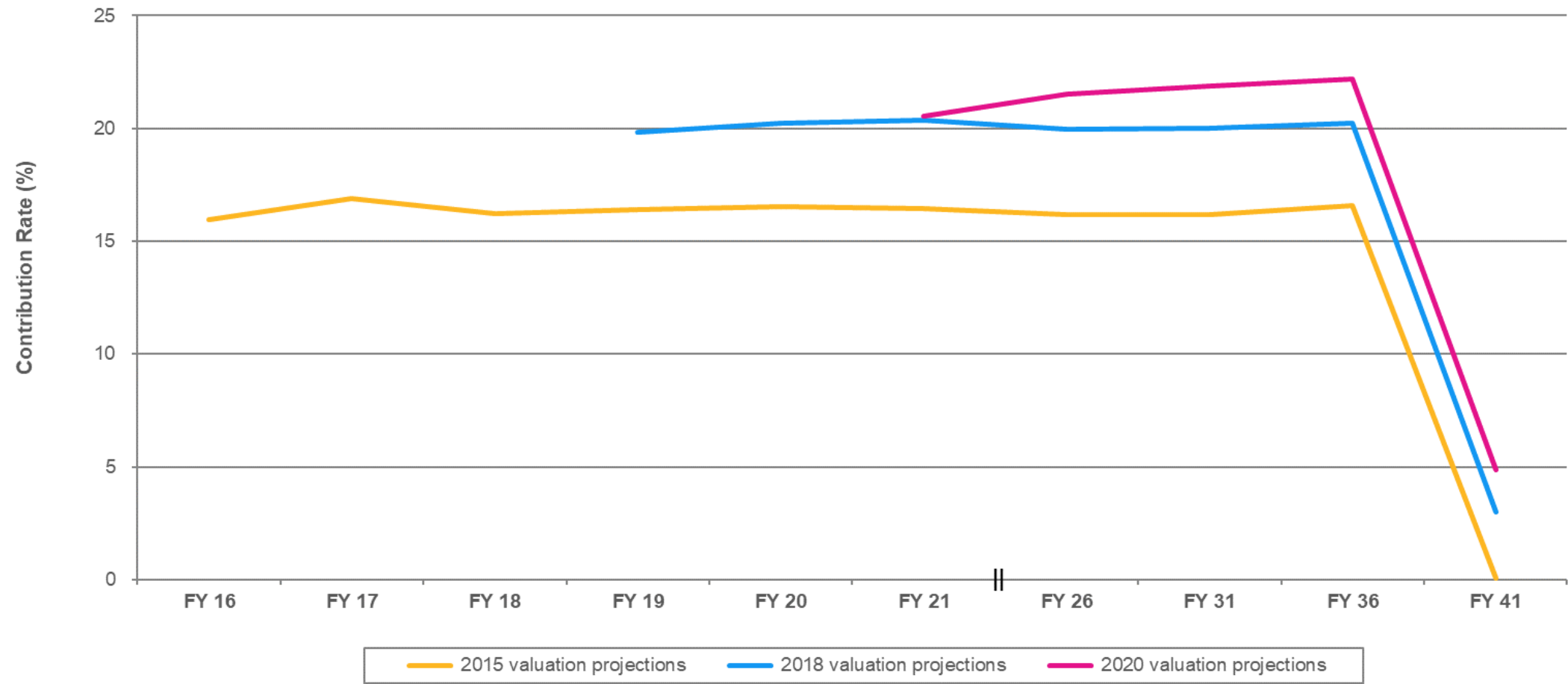
Unfunded Actuarial Accrued Liability – Healthcare



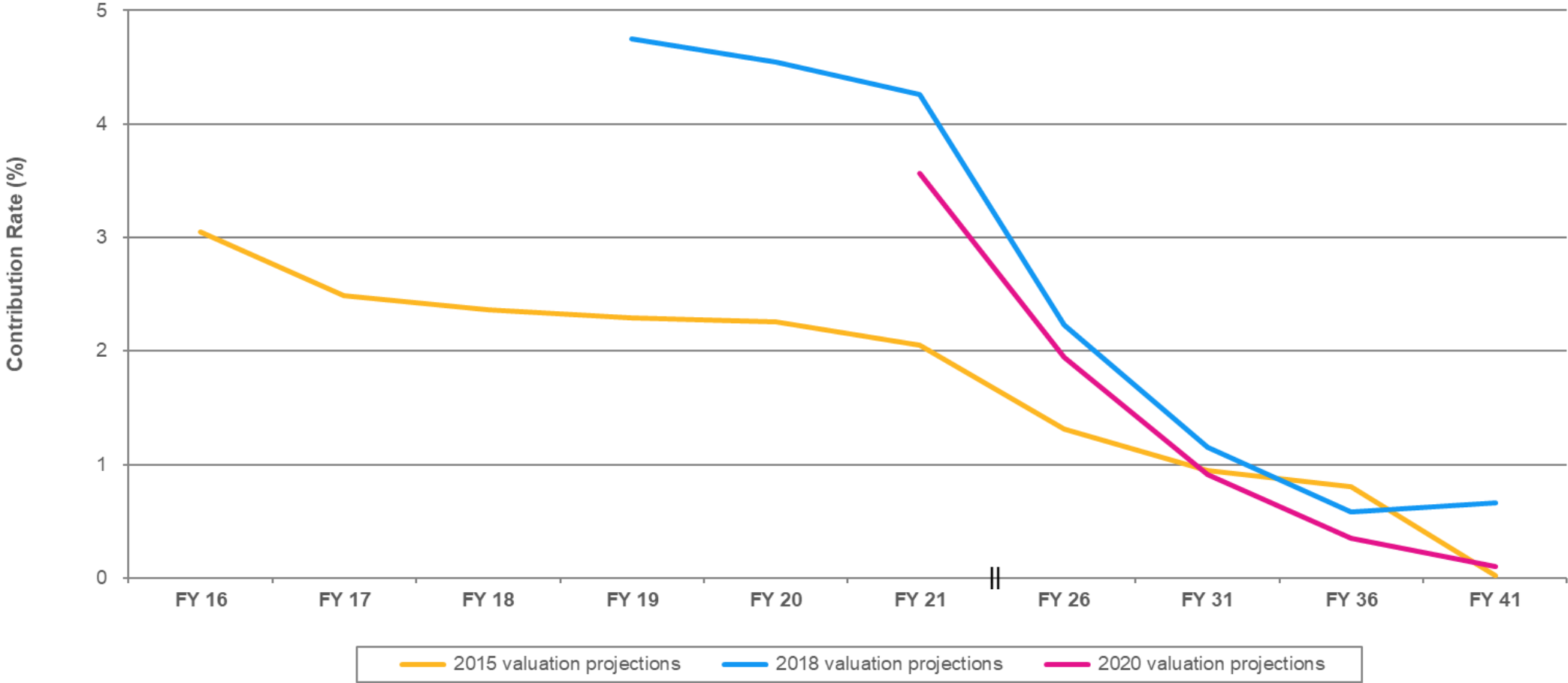
Unfunded Actuarial Accrued Liability – Total



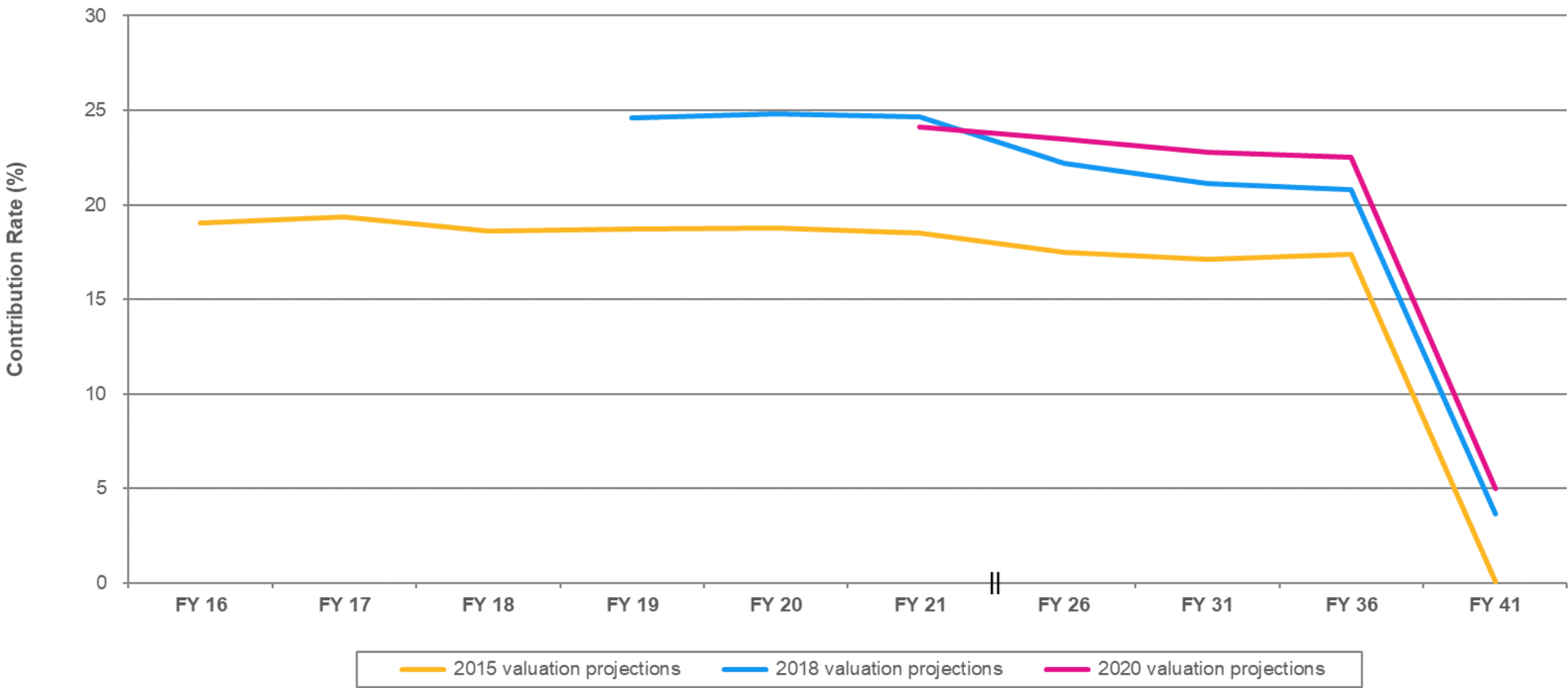
Contribution Rates – Pension



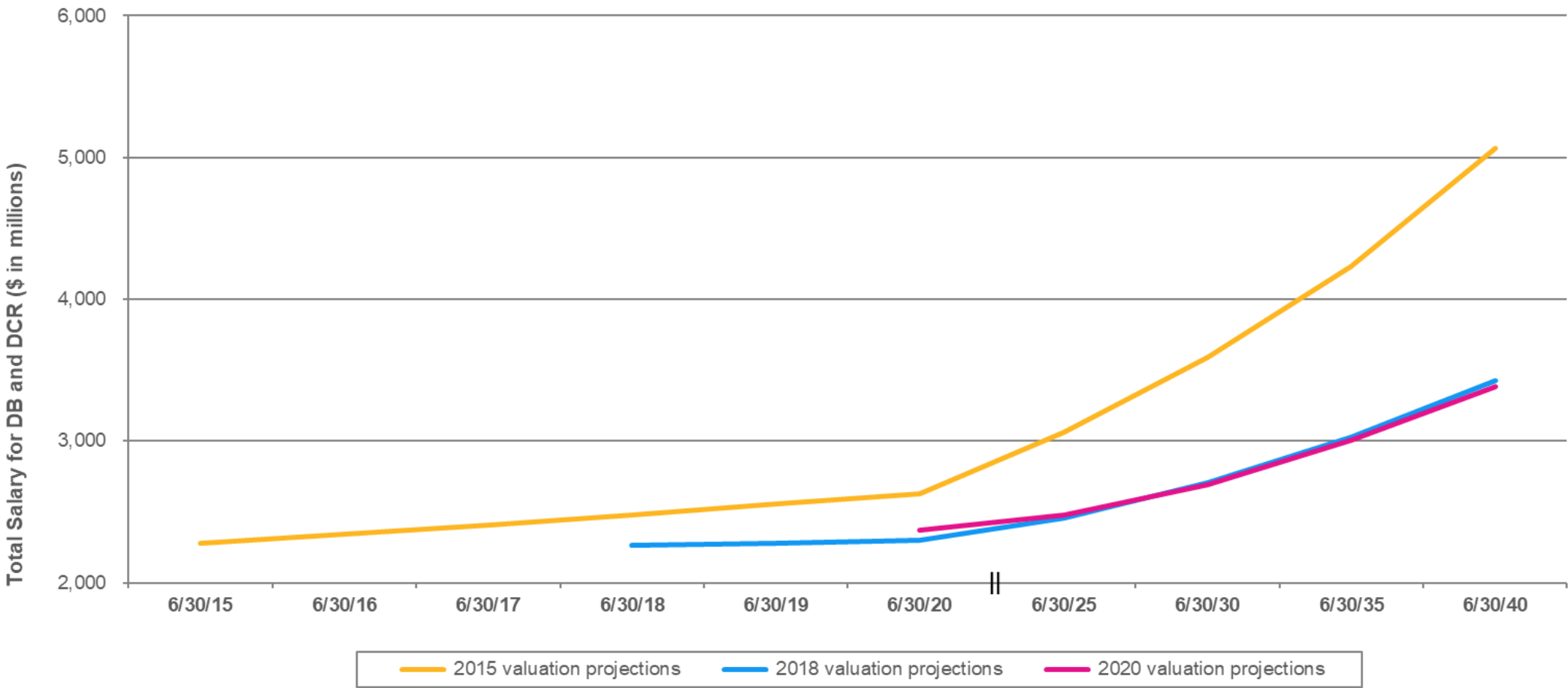
Contribution Rates – Healthcare



Contribution Rates – Total



DB/DCR Payroll – [Redacted] DCR



Impact of (Gains)/Losses – Pension

6/30/2015
6/30/2016
6/30/2017
6/30/2018
6/30/2019
6/30/2020

Impact of Annual (Gains)/Losses on 6/30 Contribution Rate (% of DB and DCR pay)

• Asset Returns	0.23%	0.73%	0.64%	0.52%	0.50%	0.44%
• Salary Increases	(0.39%)	(0.20%)	(0.36%)	(0.30%)	0.16%	(0.03%)
• Medical / Rx Claims	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
• Demographic Experience	0.27%	(0.33%)	(0.19%)	0.26%	(0.45%)	(0.19%)
• Assumption/Method Changes	0.00%	1.00%	0.00%	1.65%	0.00%	0.00%
• Actual vs Expected Contributions	<u>(2.36%)</u>	<u>0.16%</u>	<u>0.15%</u>	<u>0.14%</u>	<u>0.11%</u>	<u>0.15%</u>
• Total	(2.25%)	1.36%	0.24%	2.27%	0.32%	0.37%

Impact on 6/30 Contribution Amount Based on Projected Pay (\$000's)

							<u>6-Yr Total</u>
• Asset Returns	\$ 5,238	\$ 16,652	\$ 14,769	\$ 11,913	\$ 11,337	\$ 10,328	\$ 70,237
• Salary Increases	(8,882)	(4,562)	(8,308)	(6,873)	3,628	(704)	(25,701)
• Medical / Rx Claims	0	0	0	0	0	0	0
• Demographic Experience	6,149	(7,527)	(4,385)	5,957	(10,203)	(4,460)	(14,469)
• Assumption/Method Changes	0	22,811	0	37,802	0	0	60,613
• Actual vs Expected Contributions	<u>(53,746)</u>	<u>3,650</u>	<u>3,462</u>	<u>3,207</u>	<u>2,494</u>	<u>3,521</u>	<u>(37,412)</u>
• Total	\$ (51,241)	\$ 31,024	\$ 5,538	\$ 52,006	\$ 7,256	\$ 8,685	\$ 53,268

Impact of (Gains)/Losses – Healthcare

6/30/2015

6/30/2016

6/30/2017

6/30/2018

6/30/2019

6/30/2020

Impact of Annual (Gains)/Losses on 6/30 Contribution Rate (% of DB and DCR pay)

• Asset Returns	0.20%	0.60%	0.51%	0.40%	0.38%	0.31%
• Salary Increases	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
• Medical / Rx Claims	(3.37%)	0.59%	(2.46%)	(1.51%)	(2.39%)	(0.87%)
• Demographic Experience	0.00%	0.00%	(0.48%)	(1.08%)	1.16%	0.38%
• Assumption/Method Changes	0.00%	0.50%	2.89%	2.20%	0.00%	0.00%
• Actual vs Expected Contributions	<u>(0.19%)</u>	<u>(0.41%)</u>	<u>(0.12%)</u>	<u>0.06%</u>	<u>0.02%</u>	<u>(0.16%)</u>
• Total	(3.36%)	1.28%	0.34%	0.07%	(0.83%)	(0.34%)

Impact on 6/30 Contribution Amount Based on Projected Pay (\$000's)

							<u>6-Yr Total</u>
• Asset Returns	\$ 4,555	\$ 13,686	\$ 11,769	\$ 9,164	\$ 8,616	\$ 7,277	\$ 55,067
• Salary Increases	0	0	0	0	0	0	0
• Medical / Rx Claims	(76,748)	13,458	(56,769)	(34,595)	(54,189)	(20,422)	(229,265)
• Demographic Experience	0	0	(11,077)	(24,743)	26,301	8,920	(599)
• Assumption/Method Changes	0	11,405	66,692	50,403	0	0	128,500
• Actual vs Expected Contributions	<u>(4,327)</u>	<u>(9,352)</u>	<u>(2,769)</u>	<u>1,375</u>	<u>453</u>	<u>(3,756)</u>	<u>(18,376)</u>
• Total	\$ (76,520)	\$ 29,197	\$ 7,846	\$ 1,604	\$ (18,819)	\$ (7,981)	\$ (64,673)

Impact of (Gains)/Losses – ████████ Total

6/30/2015 6/30/2016 6/30/2017 6/30/2018 6/30/2019 6/30/2020

Impact of Annual (Gains)/Losses on 6/30 Contribution Rate (% of DB and DCR pay)

• Asset Returns	0.43%	1.33%	1.15%	0.92%	0.88%	0.75%
• Salary Increases	(0.39%)	(0.20%)	(0.36%)	(0.30%)	0.16%	(0.03%)
• Medical / Rx Claims	(3.37%)	0.59%	(2.46%)	(1.51%)	(2.39%)	(0.87%)
• Demographic Experience	0.27%	(0.33%)	(0.67%)	(0.82%)	0.71%	0.19%
• Assumption/Method Changes	0.00%	1.50%	2.89%	3.85%	0.00%	0.00%
• Actual vs Expected Contributions	<u>(2.55%)</u>	<u>(0.25%)</u>	<u>0.03%</u>	<u>0.20%</u>	<u>0.13%</u>	<u>(0.01%)</u>
• Total	(5.61%)	2.64%	0.58%	2.34%	(0.51%)	0.03%

Impact on 6/30 Contribution Amount Based on Projected Pay (\$000's)

							<u>6-Yr Total</u>
• Asset Returns	\$ 9,793	\$ 30,338	\$ 26,538	\$ 21,078	\$ 19,953	\$ 17,605	\$ 125,305
• Salary Increases	(8,882)	(4,562)	(8,308)	(6,873)	3,628	(704)	(25,701)
• Medical / Rx Claims	(76,748)	13,458	(56,769)	(34,595)	(54,189)	(20,422)	(229,265)
• Demographic Experience	6,149	(7,527)	(15,461)	(18,787)	16,098	4,460	(15,068)
• Assumption/Method Changes	0	34,216	66,692	88,205	0	0	189,113
• Actual vs Expected Contributions	<u>(58,073)</u>	<u>(5,703)</u>	<u>692</u>	<u>4,582</u>	<u>2,948</u>	<u>(235)</u>	<u>(55,789)</u>
• Total	\$ (127,761)	\$ 60,220	\$ 13,384	\$ 53,610	\$ (11,562)	\$ 704	\$ (11,405)

Appendix

Explanation of Terms

- “6/30/19”
 - The results from the 6/30/19 valuation
- “6/30/20 Expected”
 - Results as of 6/30/20 if FY20 experience matched all of the assumptions that were used in the 6/30/19 valuation (e.g., assets earned 7.38%, salaries increased as expected, members retired according to what the retirement assumption predicted, etc.)
- “6/30/20 Actual”
 - Results as of 6/30/20 reflecting actual FY20 asset performance, and actual changes in the participant data from 6/30/19 to 6/30/20
- Gains and losses are the differences between “6/30/20 Expected” and “6/30/20 Actual”
 - If the difference is *favorable* to the plan, we have an actuarial *gain*
 - If the difference is *unfavorable* to the plan, we have an actuarial *loss*

Valuation Results - <Plan Name>

– Valuation Results (Pension)

(\$000's)

	6/30/19	6/30/20 Expected	6/30/20 Actual
Actuarial Accrued Liability	15,039,180	15,370,337	15,279,525
Actuarial Value of Assets	9,576,693	9,873,715	9,713,710
Market Value of Assets	9,489,405	9,779,985	9,469,161
Unfunded Actuarial Accrued Liability*	5,462,487	5,496,622	5,565,815
Funded Ratio*	63.7%	64.2%	63.6%
Normal Cost (without loads)	119,185	108,221	109,953
Employer/State Contribution Rate as of 6/30**			
- Normal Cost (net of EE contributions)	3.34%	not available	3.09%
- Unfunded Liability Amortization	16.83%	not available	17.45%
- Total (not less than Normal Cost)	20.17%	not available	20.54%

* Based on Actuarial Value of Assets

** % of DB/DCR payroll

– Valuation Results (Healthcare)

(\$000's)

	6/30/19	6/30/20 Expected	6/30/20 Actual
Actuarial Accrued Liability	7,151,694	7,386,509	7,036,550
Actuarial Value of Assets	7,810,491	8,104,221	7,989,358
Market Value of Assets	7,767,692	8,058,264	7,813,511
Unfunded Actuarial Accrued Liability*	(658,797)	(717,712)	(952,808)
Funded Ratio*	109.2%	109.7%	113.5%
Normal Cost (without loads)	75,131	68,312	68,230
Employer/State Contribution Rate as of 6/30**			
- Normal Cost (net of EE contributions)	3.91%	not available	3.57%
- Unfunded Liability Amortization	(1.84)%	not available	(2.66)%
- Total (not less than Normal Cost)	3.91%	not available	3.57%

* Based on Actuarial Value of Assets

** % of DB/DCR payroll

– Valuation Results (Total)

(\$000's)

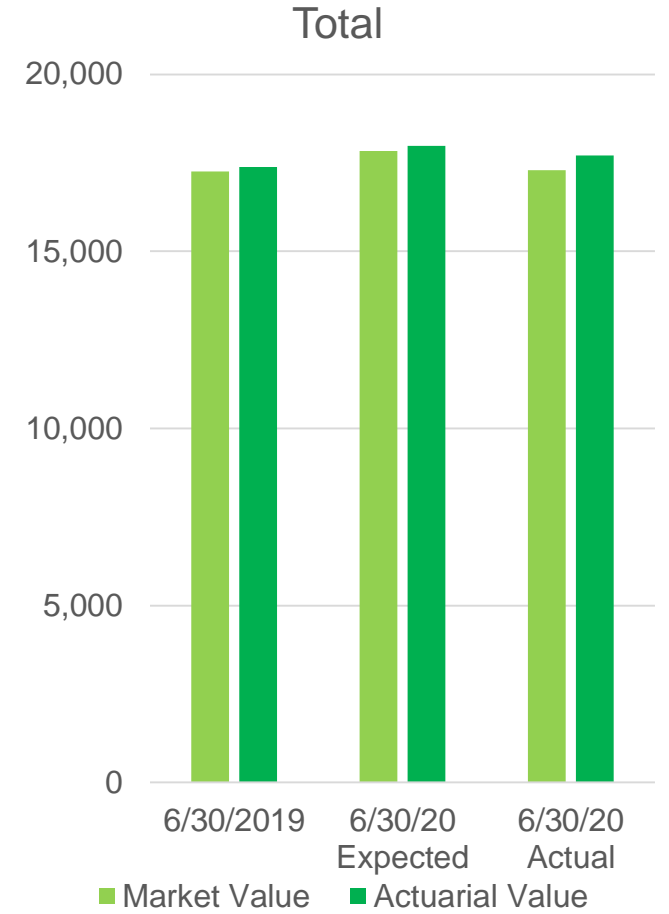
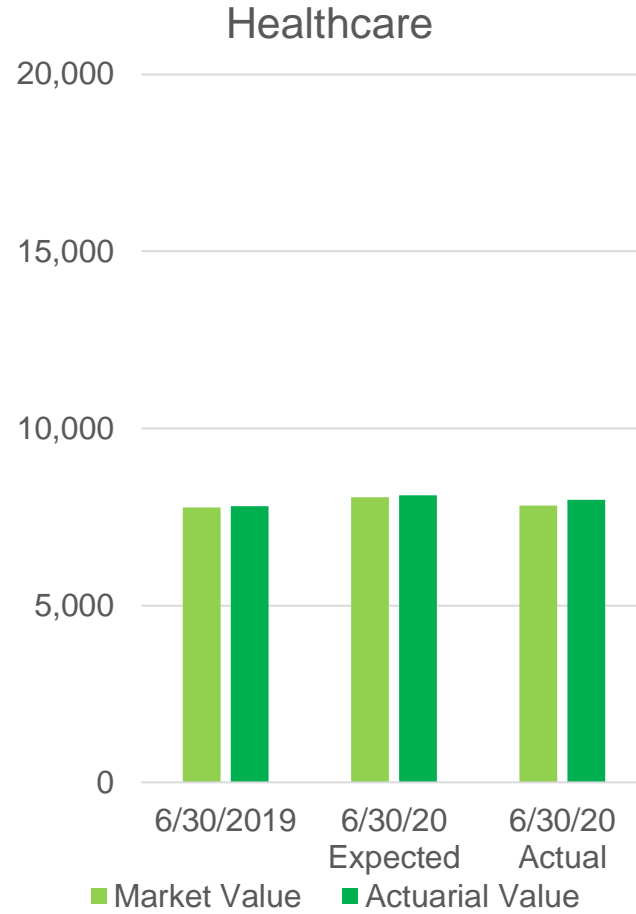
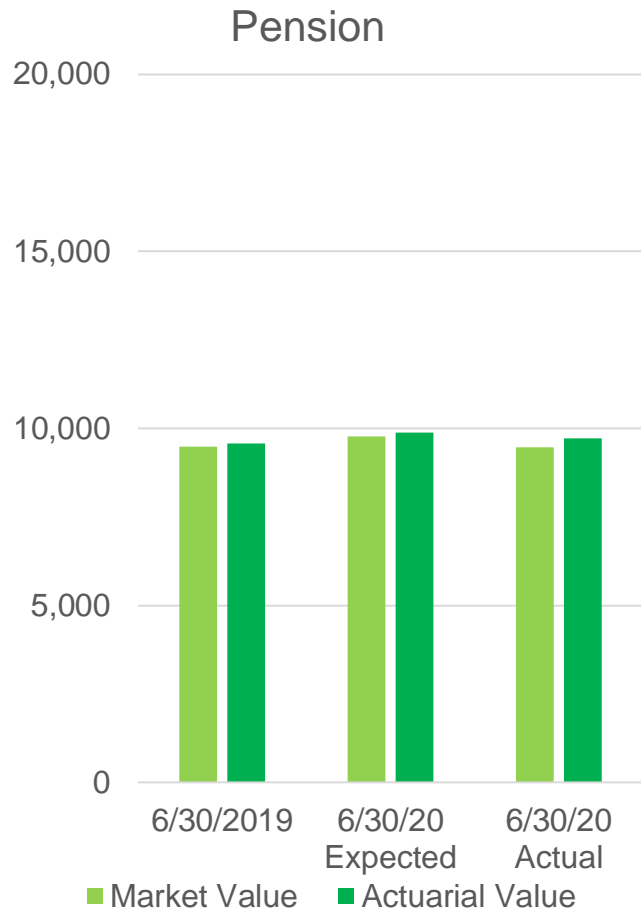
	6/30/19	6/30/20 Expected	6/30/20 Actual
Actuarial Accrued Liability	22,190,874	22,756,846	22,316,075
Actuarial Value of Assets	17,387,184	17,977,936	17,703,068
Market Value of Assets	17,257,097	17,838,249	17,282,672
Unfunded Actuarial Accrued Liability*	4,803,690	4,778,910	4,613,007
Funded Ratio*	78.4%	79.0%	79.3%
Normal Cost (without loads)	194,316	176,533	178,183
Employer/State Contribution Rate as of 6/30**			
- Normal Cost (net of EE contributions)	7.25%	not available	6.66%
- Unfunded Liability Amortization	16.83%	not available	17.45%
- Total (not less than Normal Cost)	24.08%	not available	24.11%

* Based on Actuarial Value of Assets

** % of DB/DCR payroll

Assets

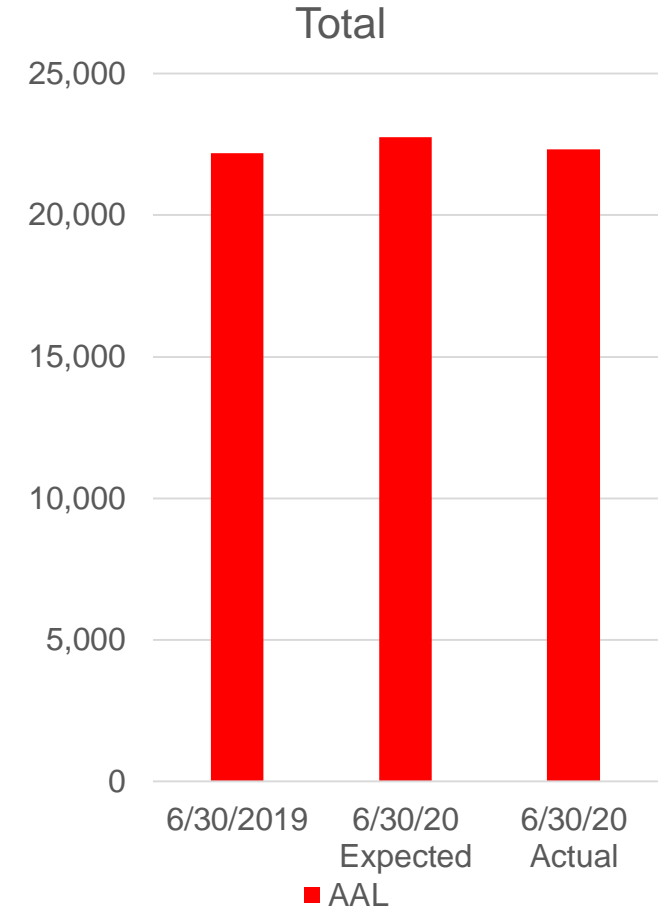
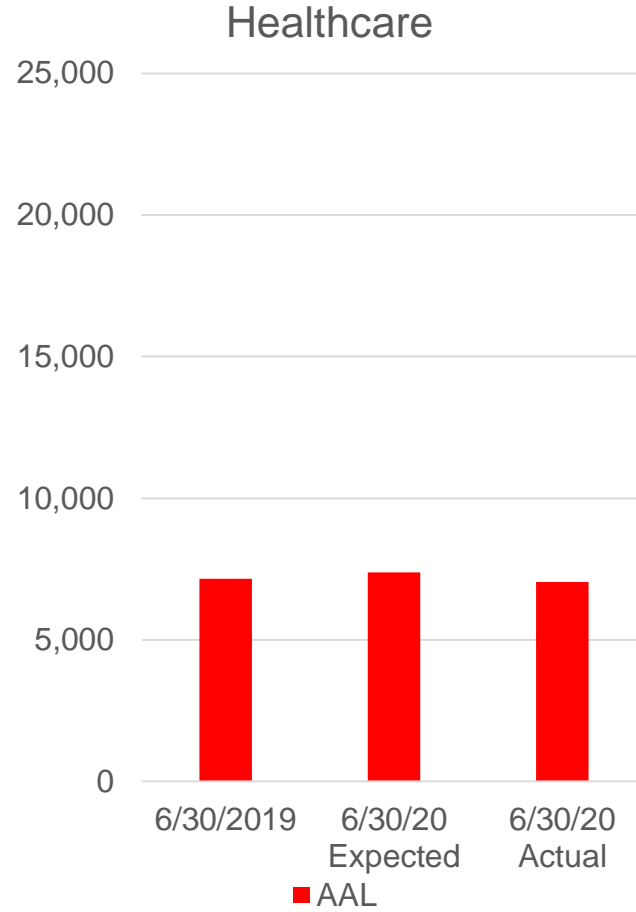
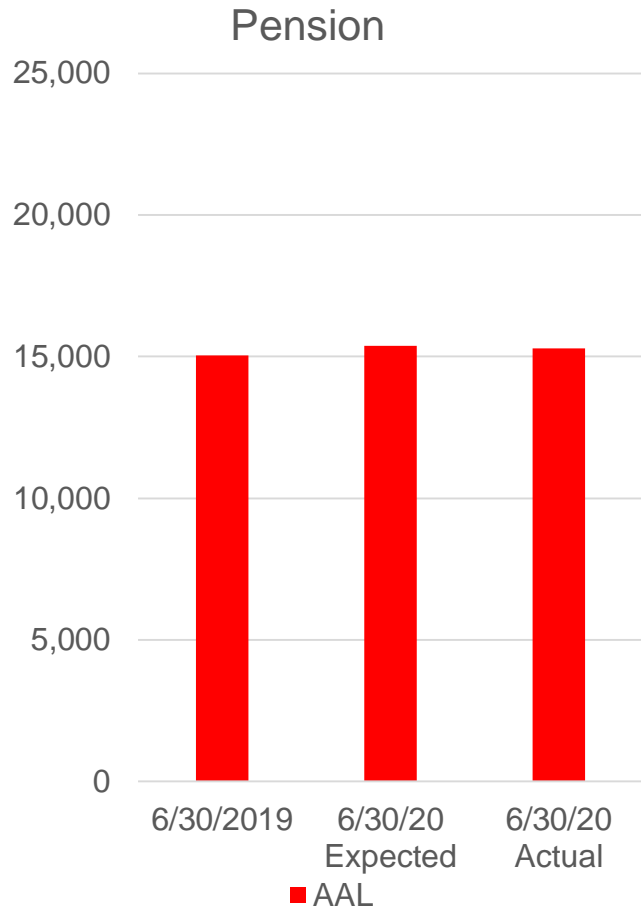
(\$millions)





– Actuarial Accrued Liability

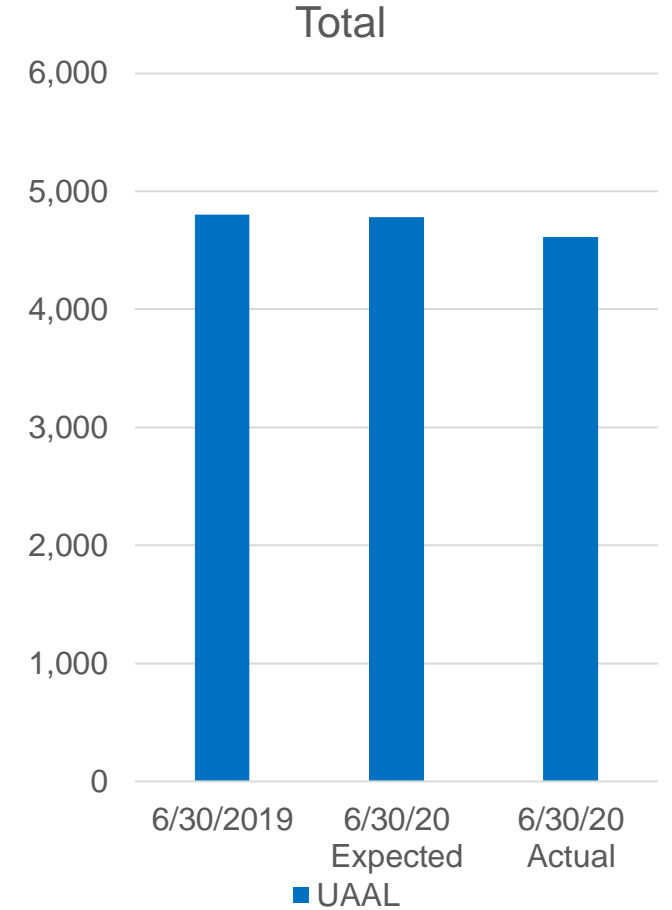
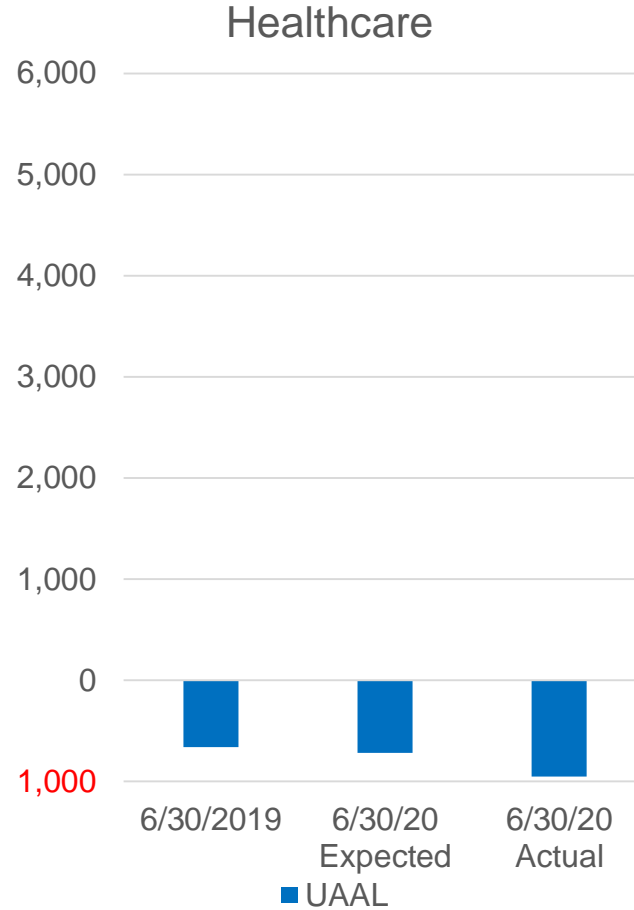
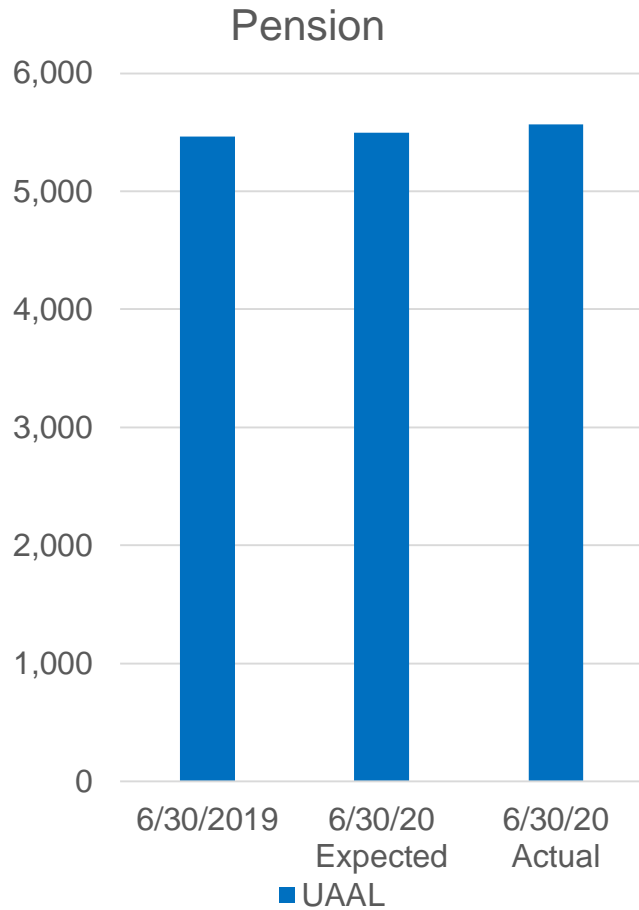
(\$millions)



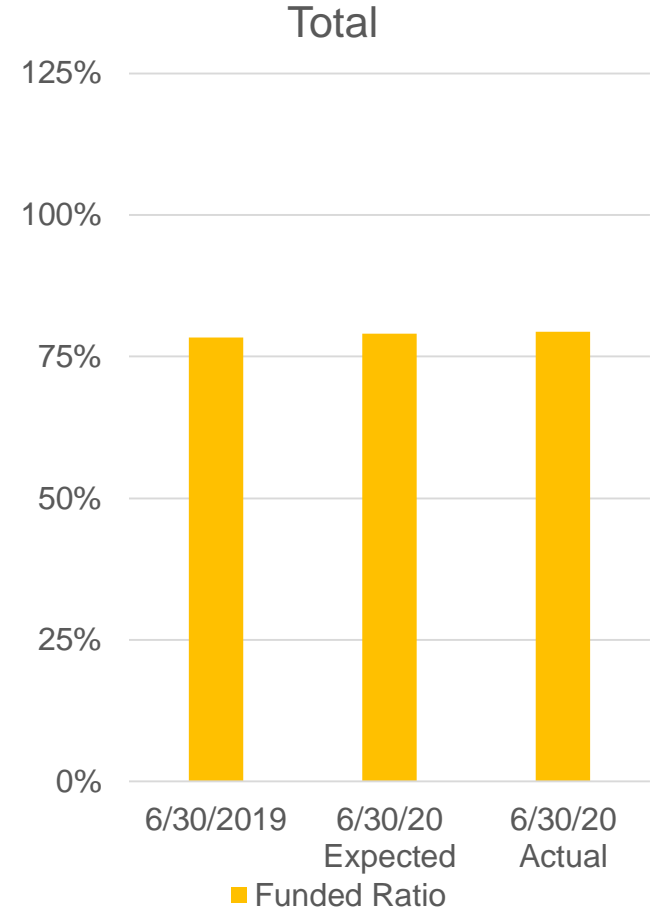
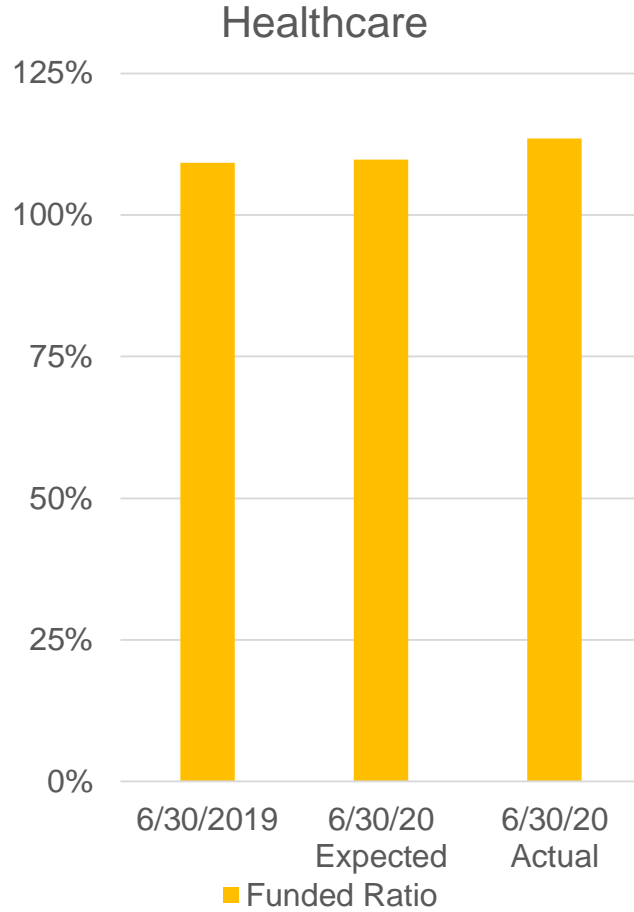
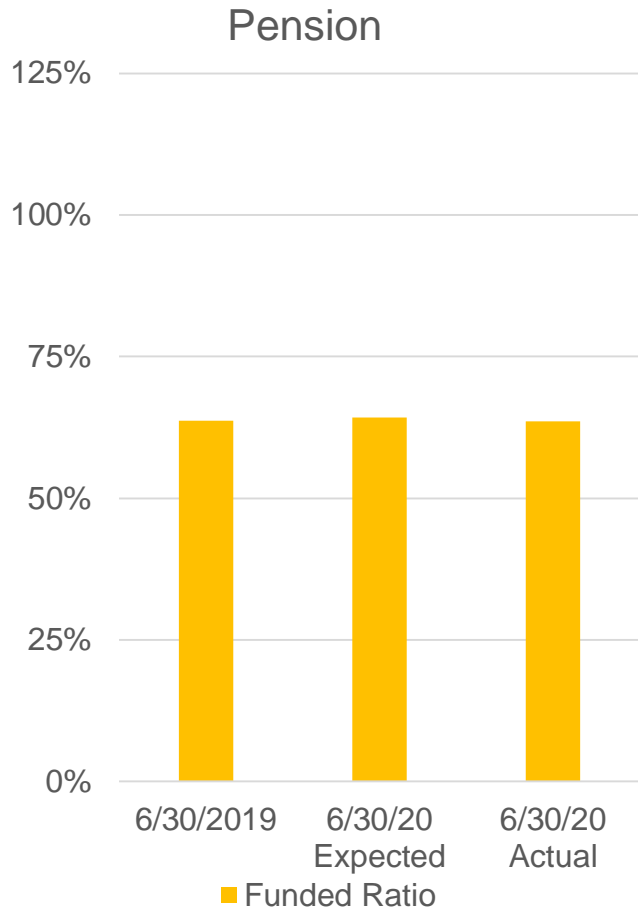


– Unfunded Actuarial Accrued Liability

(\$millions)



— Funded Ratio (AVA vs. AAL)



– FY20 Actuarial Gains/(Losses)

(\$millions)

	Pension	Healthcare	Total
Actuarial Accrued Liabilities			
- Demographic Experience (non-mortality)	(7.0)	(2.3)	(9.3)
- Mortality Experience	(6.4)	0.2	(6.2)
- Salary Increases	11.2	n/a	11.2
- Rehires (net of rehire load)	8.4	16.0	24.4
- COLA/PRPA Increases	78.8	n/a	78.8
- Per Capita Claims Cost	n/a	278.8	278.8
- COVID-19 Experience	n/a	25.9	25.9
- Medicare Part B Only Experience	n/a	6.3	6.3
- Changes in Dependent Coverage Elections	n/a	23.4	23.4
- Miscellaneous*	<u>5.8</u>	<u>1.7</u>	<u>7.5</u>
- Total	90.8	350.0	440.8
Actuarial Value of Assets	(160.0)	(114.9)	(274.9)
Actual vs Expected Contributions	(55.4)	59.1	3.7
Actual vs Expected Admin Expenses	<u>0.1</u>	<u>(2.4)</u>	<u>(2.3)</u>
TOTAL	(124.5)	291.8	167.3

FY19 liability and asset gains/(losses) for comparison purposes (\$millions):

- Actuarial Accrued Liabilities
 - Pension: \$(75.5)
 - Healthcare: \$775.3
 - Total: \$699.8
- Actuarial Value of Assets
 - Pension: \$(181.6)
 - Healthcare: \$(138.3)
 - Total: \$(319.9)

* Includes the effects of various data changes that are typical when new census data is received for the annual valuation, the effects of the differences between expected and actual benefit payments, and other items that do not fit neatly into any of the other categories shown on this slide.

Actuarial Certification

Actuarial Certification

The purpose of this presentation is to provide the [redacted] Actuarial Committee with (i) June 30, 2020 valuation results and projections, and (ii) draft June 30, 2020 actuarial valuation reports for discussion at the March 17, 2021 meeting. This presentation should be considered part of the June 30, 2020 actuarial valuation report services.

The data, assumptions, methods, and plan provisions used to determine the results shown in this presentation are as shown in the draft June 30, 2020 valuation reports. These draft reports include detailed information related to potential risks associated with the plans (ASOP 51), and information regarding our use of models (ASOP 56).

Where presented, references to “funded ratio” and “unfunded actuarial accrued liability” typically are measured on an actuarial value of assets basis. It should be noted that the same measurements using market value of assets would result in different funded ratios and unfunded actuarial accrued liabilities. Moreover, the funded ratio presented is appropriate for evaluating the need and level of future contributions but makes no assessment regarding the funded status of the plan if the plan were to settle (i.e., purchase annuities) all or a portion of its liabilities.

Future actuarial measurements may differ significantly from current measurements due to plan experience differing from that anticipated by the economic and demographic assumptions, increases or decreases expected as part of the natural operation of the methodology used for these measurements, and changes in plan provisions or applicable law.

The results were prepared under the direction of David Kershner and Scott Young, both of whom meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein. These results have been prepared in accordance with all applicable Actuarial Standards of Practice.

David Kershner
FSA, EA, MAAA, FCA
Principal, Retirement

Scott Young
FSA, EA, MAAA
Director, Health