Kentucky Retirement Systems Board of Trustees
Quarterly Board Meeting
March 1, 2023, 10:00 a.m. ET
Live Video Conference/Facebook Live
AGENDA

1.	**Call to Order**	**Lynn Hampton**
2.	**Legal Public Statement**	**Office of Legal Services**
3.	**Roll Call/Public Comment**	**Sherry Rankin**
4.	**Adjournment of January 26, 2023 Meeting***	**Lynn Hampton**
5.	**Approval of Minutes – December 1, 2022; December 22, 2022; January 19, 2023; and January 26, 2023***	**Lynn Hampton**
6.	**Update on SPRS Trustee Election**	**Kristen Coffey**
7.	**Joint Audit Committee Reports and Recommendations***	**Lynn Hampton** **Kristen Coffey**
8.	**Joint Retiree Health Plan Committee Reports and Recommendations***	**Dr. Crystal Miller** **Connie Pettyjohn**
9.	**Quarterly Financial Reports** a. **Quarterly Financial Statements** b. **Quarterly Administrative Expenses to Budget** c. **Contribution Report** d. **Outstanding Invoices** e. **Penalty Waiver**	**Michael Lamb** **Rebecca Adkins**
10.	**Investment Committee Reports and Recommendations***	**Prewitt Lane** **Steve Willer**
11.	**Quasi-Governmental Employer Audits (KRS 61.5991) Update***	**D'Juan Surratt** **Rebecca Adkins**
12.	**Legislative Updates**	**Rebecca Adkins**
13.	**KPPA Updates**	**Rebecca Adkins**
14.	**KRS Updates**	**Lynn Hampton**
15.	**CEO Report**	**John Chilton**
16.	**New Business**	**Lynn Hampton**
17.	**Closed Session****	**Lynn Hampton**
18.	**Adjourn***	**Lynn Hampton**

**Board Action Required*
***Board Action May Be Required*

MINUTES OF MEETING
KENTUCKY RETIREMENT SYSTEMS
BOARD OF TRUSTEES MEETING
DECEMBER 1, 2022, AT 10:00 AM ET
VIA LIVE VIDEO TELECONFERENCE

At the meeting of the Kentucky Retirement Systems Board of Trustees held on December 1, 2022, the following members were present: Lynn Hampton (Chair), Keith Peercy, David Adkins, John Cheshire, Prewitt Lane, Pamela Thompson, Ramsey Bova, and Dr. Crystal Miller. Staff members present were KRS CEO John Chilton, CERS CEO Ed Owens, III, David Eager, Erin Surratt, Victoria Hale, Steve Willer, Kristen Coffey, Connie Davis, D'Juan Surratt, Leigh Ann Davis, Ann Case, Jared Crawford, Elizabeth Smith, Ashley Gabbard, Steve Willer, Katie Park, Shaun Case, and Sherry Rankin. Others present included Danny White and Janie Shaw with GRS, David Lindberg, Craig Morton, and Chris Tessman with Wilshire Advisors, LLC., and Allen Norvell, Ryan Graham, and Jordan Miller with Blue and Co.

Ms. Hampton called the meeting to order.

Mr. Board read the Legal Public Statement.

Ms. Rankin called roll.

There being no ***Public Comment*** submitted, Ms. Hampton introduced agenda item ***Approval of Minutes – November 1, 2022***. A motion was made by Mr. Adkins and seconded by Mr. Lane to approve the November 1, 2022, minutes as presented. The motion passed unanimously.

Ms. Hampton introduced agenda item ***Approval of 2022 Actuarial Valuation and Contribution Rates*** *(Video 00:09:40 to 00:14:29).* Ms. Janie Shaw with GRS presented an overview of the 2022 Actuarial Valuation Results. Mr. Peercy made a motion to approve the 2022 Actuarial Valuation and Contribution Rates. Mr. Cheshire seconded the motion and the motion passed unanimously.

Ms. Hampton introduced agenda item ***Joint Audit Committee Report and Recommendations*** *(Video 00:14:30 to 00:23:15).* Ms. Kristen Coffey presented the Joint Audit Committee Report and

Recommendations. She stated that the Joint Audit Committee met on November 28, 2022 and requested that the KRS Board of Trustees to ratify the actions taken by the Joint Audit Committee and approve the following items: (1) Draft results of the fiscal year ended June 30, 2022 audit, including the draft Financial Section of the Annual Report; and (2) Purchase of Infrastructure and Application Security Assessment. Ms. Connie Davis reported that the Joint Audit Committee also reviewed the draft results of the fiscal year ended June 30, 2022, audit, including the draft financial section of the Annual Report. Mr. Ryan Graham with Blue & Co. provided a brief overview of the draft results of the audit. Dr. Miller made a motion to approve the audited financial statements as presented. The motion was seconded by Mr. Adkins. The motion passed unanimously. Mr. Adkins made a motion to approve the purchase of the Infrastructure and Application Security Assessment for 2023. The motion was seconded by Ms. Bova and passed unanimously.

Ms. Hampton introduced agenda item ***Quarterly Investment Performance Report*** *(Video 00:23:16 to 00:37:50).* Mr. Steve Willer, Chief Investment Officer, presented the Quarterly Investment Performance Report. He provided an overview of the report presented to the KRS Investment Committee on November 10, 2022. Mr. Willer reported continued volatility and difficult market conditions; however, the plans held up well and outperformed their IPS benchmarks. Mr. Willer advised that volatility would likely continue into 2023. Next, he reviewed the multi-statistics as provided by Wilshire Advisors, LLC. Mr. Willer stated that a Special Called Meeting of the KRS Investment Committee would be scheduled before year end to present several mandates and request the funding of those mandates. Then, a Special Called Meeting of the KRS Board of Trustees would be scheduled to ratify the actions of the KRS Investment Committee. Mr. Willer also reported that the new Senior Investment Analyst position had been filled and would begin work in later in the month. The Portfolio Manager, Private Equity position had been posted externally and internally, and the Junior Analyst position would be backfilled in early 2023, said Mr. Willer.

Ms. Hampton introduced agenda item ***Hazardous Duty Position Requests*** *(Video 00:37:51 to 00:39:47).* Mr. D'Juan Surratt stated that the Kentucky State Police requested hazardous duty coverage for three positions: CVE Officer Senior, CVE Master Officer, and CVE Officer First Class. Mr. Surratt advised that all three positions meet the guidelines for hazardous duty coverage. Mr. Peercy made a motion to approve the Hazardous Duty Position Requests as presented. Mr. Cheshire seconded the motion and the motion passed unanimously.

Ms. Hampton introduced agenda item ***Quarterly Financial Statements*** *(Video 00:39:48 to 00:54:18).* Ms. Connie Davis reviewed the Combining Statement of Fiduciary Net Position of the Pension Funds as of September 30, 2022, and the and advised the KRS Board of Trustees that a variance explanation for any percent change greater than 10% was included at the bottom of each statement. Next, Ms. Davis briefly reviewed the Combining Statement of Changes in Fiduciary Net Position of the Pension Funds for the three-month period ending September 30, 2022, Combining Statement of Fiduciary Net Position of Insurance Funds as of September 30, 2022, and the Combining Statement of Changes in Fiduciary Net Position of Insurance Funds for the three-month period ending September 30, 2022, with the Board. Ms. Davis went on to present the CERS, KERS, and SPRS Pension and Insurance Funds Contribution Reports for three-month period ending September 30, 2022. Lastly, Ms. Davis briefly presented the KPPA Administrative Budget FY 2022-2023 for the three-month period ending September 30, 2022, CERS Outstanding Invoices by Type and Employer, and Penalty Invoices Report.

Ms. Hampton introduced agenda item ***Update on Annual Comprehensive Financial Report and Summary Annual Financial Report*** *(Video 00:54:19 to 00:57:00).* Ms. Connie Davis advised that the Executive Letter from last year's publication was included (pp. 8-9) in error. She reported that the Annual Comprehensive Financial Report (ACFR) was almost complete and was being formatted and thoroughly reviewed. The ACFR is due to the Government Finance Officers Association (GFOA) by December 31, 2022. The Summary Annual Financial Report (SAFR) was also being reviewed and would be sent to the printers in mid-December in time for the legislative session in January, said Ms. Davis. Mr. Eager echoed that the SAFR was in the final stages advised that the Executive Letter for the ACFR would be ready within the next few days.

Ms. Hampton introduced agenda item ***CEO Update*** *(Video 00:57:01 to 01:30:30).* Mr. Chilton briefly mentioned items in which he had recently been involved, the Housekeeping Bill, litigation matters, and the Annual Report. He stated that a joint CERS and KRS response to the letter received from the Kentucky Attorney General regarding ESG would be drafted and sent mid-December. Mr. Eager stated that the drafted response letter was to be voted on during the meeting. Mr. Michael Board advised that the letter was included in the meeting materials. Mr. Eager reviewed the drafted response letter with the KRS Board of Trustees and modifications were discussed. It was decided to prepare separate response letters for CERS and KRS. Ms. Hampton directed Mr. Chilton to prepare the modified response letter as discussed by the Board of Trustees with the assistance of Mr. Board.

Mr. Adkins made a motion to delegate CEO John Chilton to draft a response to the request from the Attorney General and the State Treasurer on behalf of KRS consistent with the comments and advice offered and discussed by the Board of Trustees. Mr. Lane seconded the motion and the motion passed unanimously.

Mr. Board wished to clarify a statement made during item ***Joint Audit Committee Report and Recommendations.*** A Trustee asked if the recommendations approved by the Joint Audit Committee would also be taken to the KPPA Board of Trustees for approval. He clarified that approved recommendations of the Joint Audit Committee are ratified by the CERS and KRS Board of Trustees; however, the Audit of Financial Statements does require approval from the KPPA Board of Trustees.

Ms. Hampton introduced agenda item ***KPPA Update*** *(Video 01:30:31 to 01:32:20).* Mr. David Eager reported that the new Chief Financial Officer had been selected and would begin work during the second week of January. Additionally, there were 14 new employees hired and 11 departures within the last three months, said Mr. Eager. He announced that Representative Tipton, the bill sponsor, would present the Housekeeping Bill to the Public Pension Oversight Board (PPOB) on December 19, 2022.

Ms. Hampton stated that there would be no ***New Business***.

Ms. Hampton introduced agenda item ***Closed Session***. A motion was made by Mr. Adkins and seconded by Ms. Bova to enter closed session. The motion passed unanimously.

Mr. Board read the following statement and the meeting moved into closed session:
A motion having been made in open session to move into a closed session for a specific purpose, and such motion having carried by majority vote in open, public session, the Board shall now enter closed session to consider the dismissal of an employee pursuant to KRS 61.810(f) and 61.810(1)(k), it is necessary to enter closed session because of the sensitive nature of the material to be considered regarding this employee and the requirement of KRS 61.661(1) that each member's account be administered in a confidential manner and pursuant to KRS 61.810(1)(c), because of the necessity of protecting the confidentiality of the Systems' litigation strategy and preserving any available attorney-client privilege.

Ms. Hampton called the meeting back to open session and stated that no reportable action was taken.

Ms. Hampton requested a motion to ***adjourn***. Mr. Lane made a motion and was seconded by Mr. Cheshire to adjourn the meeting. The motion passed unanimously.

Copies of all documents presented are incorporated as part of the Minutes of the Board of Trustees held December 1, 2022, except documents provided during a closed session conducted pursuant to the open meetings act and exempt under the open records act.

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CERTIFICATION

I do certify that I was present at this meeting, and I have recorded the above actions of the Trustees on the various items considered by it at this meeting. Further, I certify that all requirements of KRS 61.805-61.850 were met in conjunction with this meeting.

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Recording Secretary

I, the Chair of the Board of Trustees of the Kentucky Retirement Systems, do certify that the Minutes of Meeting held on December 1, 2022, were approved on March 1, 2023.

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Chair of the Board of Trustees

I have reviewed the Minutes of the December 1, 2022, Board of Trustees Meeting for content, form, and legality.

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Executive Director
Office of Legal Services

MINUTES OF MEETING
KENTUCKY RETIREMENT SYSTEMS
BOARD OF TRUSTEES MEETING
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Ms. Hampton called the meeting to order.

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Mr. Adkins made a motion to delegate CEO John Chilton to draft a response to the request from the Attorney General and the State Treasurer on behalf of KRS consistent with the comments and advice offered and discussed by the Board of Trustees. Mr. Lane seconded the motion and the motion passed unanimously.

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Ms. Hampton stated that there would be no ***New Business***.

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Mr. Board read the following statement and the meeting moved into closed session:
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Ms. Hampton called the meeting back to open session and stated that no reportable action was taken.

Ms. Hampton requested a motion to ***adjourn***. Mr. Lane made a motion and was seconded by Mr. Cheshire to adjourn the meeting. The motion passed unanimously.

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Recording Secretary

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Chair of the Board of Trustees

I have reviewed the Minutes of the December 1, 2022, Board of Trustees Meeting for content, form, and legality.

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Executive Director
Office of Legal Services

MINUTES OF MEETING
COUNTY EMPLOYEES RETIREMENT SYSTEM
AND
KENTUCKY RETIREMENT SYSTEMS
BOARD OF TRUSTEES SPECIAL CALLED MEETING
INVESTMENT TRAINING
JANUARY 19, 2023, AT 2:00 P.M. ET
VIA LIVE VIDEO TELECONFERENCE

At the special called meeting of the County Employees Retirement System (CERS) Board of Trustees and the Kentucky Retirement Systems (KRS) Board of Trustees held on January 19, 2023, the following CERS Trustees were present: Betty Pendergrass (Chair), Dr. Patricia Carver, George Cheatham, Michael Foster, JT Fulkerson, Dr. Merl Hackbart, Dr. Martin Milkman, William O'Mara, and Jerry Powell. The following KRS Trustees were present: David Adkins, Ramsey Bova, John Cheshire, Prewitt Lane, Dr. Crystal Miller, and William Summers, V. Staff members present were CERS CEO Ed Owens, III, David Eager, Rebecca Adkins, Erin Surratt, Michael Board, Victoria Hale, JJ Alleman, Steve Willer, Anthony Chiu, Joe Gilbert, Jared Crawford, Brian Caldwell, Ann Case, Michael Lamb, William Prince, Madeline Perry, Matthew Daugherty, Ashley Gabbard, Katie Park, Glenna Frasher and Sherry Rankin. Others present included David Lindberg, Craig Morton, Chris Tessman, Mike Rush, Shawn Quinn, Maddy Osadjan and Matt Acker with Wilshire Advisors, LLC.

Dr. Hackbart called the meeting to order.

Mr. Board read the Opening Statement.

Ms. Rankin called Roll for CERS and KRS Trustees.

There being no ***Public Comment*** submitted, Ms. Pendergrass introduced agenda item ***Investment Training*** *(Video 00:8:25 to 01:57:51).* David Lindberg, Craig Morton, Chris Tessman, Mike Rush, Shawn Quinn and Maddy Osadjan with Wilshire Advisors, LLC. provided a robust Trustee education session focusing on capital market assumptions, asset allocations and private markets. KPPA Chief Investment Officer, Steve Willer, and KPPA Deputy Chief Investment Officer, Anthony Chui gave a presentation on carried interest and real return markets.

Dr. Hackbart opened the floor for a motion to ***adjourn***. Mr. Powell made a motion to adjourn the meeting and was seconded by Mr. Fulkerson. The motion passed unanimously.

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Recording Secretary

I, the Chair of the Board of Trustees of the Kentucky Retirement Systems, do certify that the Minutes of Meeting held on January 19, 2023, were approved on March 1, 2023.

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Chair of the Board of Trustees

I have reviewed the Minutes of the January 19, 2023, Board of Trustees Meeting for content, form, and legality.

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Executive Director
Office of Legal Services

MINUTES OF MEETING
COUNTY EMPLOYEES RETIREMENT SYSTEM
AND
KENTUCKY RETIREMENT SYSTEMS
BOARD OF TRUSTEES SPECIAL CALLED TRAINING MEETING
JANUARY 26, 2023, AT 2:00 P.M. ET
VIA LIVE VIDEO TELECONFERENCE

At the special called meeting of the County Employees Retirement System (CERS) Board of Trustees and the Kentucky Retirement Systems (KRS) Board of Trustees held on January 26, 2023, the following CERS Trustees were present: Betty Pendergrass (Chair), Dr. Patricia Carver, George Cheatham, Michael Foster, JT Fulkerson, Dr. Merl Hackbart, Dr. Martin Milkman, William O'Mara, and Jerry Powell. The following KRS Trustees were present: Lynn Hampton (Chair), David Adkins, Ramsey Bova, John Cheshire, and Pamela Thompson. Staff members present were CERS CEO Ed Owens, III, KRS CEO John Chilton, David Eager, Rebecca Adkins, Michael Board, Victoria Hale, Michael Lamb, Steve Willer, Madeline Perry, William Prince, Melinda Wofford, Matthew Daugherty, Shaun Case, Glenna Frasher, Ashley Gabbard, and Sherry Rankin. Others present included Tom Sgouros with Brown University, Scott McCarty, Board Chair of the Arizona Public Safety Personnel Retirement System, and Eric Branco with Johnson Bowman Branco, LLP.

Ms. Pendergrass called the meeting to order.

Mr. Michael Board asked Ms. Rankin if there was a quorum of the Kentucky Retirement Systems (KRS) Board of Trustees. Ms. Rankin confirmed that a quorum was present. Mr. Board stated that there was also a quorum of KRS present at the Special Called Meeting of the County Employees Retirement System (CERS) Board of Trustees and the Kentucky Retirement Systems (KRS) Board of Trustees held on January 19, 2023, the CERS Board. The CERS Board of Trustees made a motion to adjourn, however, KRS did not. Therefore, Mr. Board asked that a motion be made by KRS to adjourn the January 19, 2023, meeting. Ms. Hampton made a motion to adjourn the January 19, 2023, Special Called Meeting of the KRS Board of Trustees. The motion was seconded by Mr. Adkins and the motion passed unanimously.

Mr. Board read the Opening Statement.

Ms. Rankin called Roll for CERS and KRS Trustees.

Ms. Pendergrass announced that several ***Public Comments*** *(Video 00:11:38 to 00:18:05)* had been submitted and requested that Ms. Rankin read aloud the comments which discussed a COLA. Ms. Rankin read each comment aloud to the CERS Board of Trustees:

From Mark Doran – I understand the legal process for CERS COLA, and it can be done. One important step is for KPPA to take the lead and lobby for us. Don't leave us "without" while other branches of the pension system have strong support. Now is the time while the State has a surplus. The discussion of funding sources to justify funding other branches is mute. We are all KPPA now.

From Patricia and James Thorpe – We are asking that this Board of Trustees take whatever measures they have to assist us CERS Hazardous Duty Retirees in receiving a COLA. We have not received a COLA since July 2011. Between my husband and I, we devoted 48 years of public service and so many others in this state who have done the same. HB 90 from what I understand does not include CERS so we need any kind of support we can get. We have contacted our legislature representatives to ask them to include CERS in this bill. Any measures or assistance you can do or make would be greatly appreciated. Thank you.

From Steven L. Haines – Retirees need some type of COLA. Most retirees only have their pension, and a COLA is deserving with our current economy. Please consider this issue.

Ms. Pendergrass read aloud a written response to these comments.

Ms. Pendergrass advised that one additional public comment was submitted and asked Ms. Rankin to summarize the comment. Ms. Rankin stated that the comment was submitted by Dallas Cox regarding his retiree health benefits and included personal information; therefore, the comment was not read aloud. The comment was sent to the Chair and CEO of the CERS Board of Trustees and the Executive staff for a response. Ms. Pendergrass stated that Mr. Jerry Powell, CERS Board of Trustees Vice-Chair and Chair of the Joint Retiree Health Plan Committee would be working with Director of Benefits, Erin Surratt, to address the concerns of Mr. Cox and provide a response.

Ms. Pendergrass introduced agenda item ***Pension Performance Analytics*** *(Video 00:18:06 to 02:17:28)* and introduced Tom Sgouros with Brown University and Scott McCarty, Board Chair of the Arizona Public Safety Personnel Retirement System. Mr. Sgouros and Mr. McCarty presented Measuring Public Pension Health: New Metrics and New Approaches.

Mr. Board advised that KRS no longer had a quorum due to several Trustees exiting the meeting. Therefore, the KRS Board of Trustees was unable to adjourn the meeting and would need to adjourn at the beginning next meeting of the Kentucky Retirement Systems (KRS) Board of Trustees.

Dr. Milkman made a motion to adjourn the meeting of the CERS Board of Trustees. The motion was seconded by Mr. Fulkerson and passed unanimously.

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Chair of the Board of Trustees

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Executive Director
Office of Legal Services

KENTUCKY PUBLIC PENSIONS AUTHORITY
David L. Eager, Executive Director
1260 Louisville Road • Frankfort, Kentucky 40601
kyret.ky.gov • Phone: 502-696-8800 • Fax: 502-696-8822

Kentucky Public Pensions Authority

To: Kentucky Retirement Systems Board of Trustees

From: Kristen N. Coffey, CICA KNC
Division Director, Internal Audit Administration

Date: March 1, 2023

Subject: Update on State Police Retirement System Election

On January 20, 2023, the election opened for the State Police Retirement System (SPRS) representative that serves on the Kentucky Retirement System (KRS) Board of Trustees. The election will close on March 1, 2023. All electronic votes must be cast by 11:59 p.m. on that date and all paper ballots must be post marked by that date. The results of the elections are due to the KRS Chief Executive Officer by March 15, 2023. The winning candidate will serve a term of April 1, 2023 to March 31, 2027.

As of December 31, 2022, there were 2,935 SPRS members eligible to vote in the election. An electronic ballot was sent to all eligible voters who have a valid email address on file. A paper ballot was provided to eligible voters who do not have a valid email address on file or who requested to receive a paper ballot. There are 2,427 SPRS members with an email address on file. Of those, 59 requested a paper ballot. Results as of February 21, 2023 are below:

- Electronic Votes Cast – 281
- Paper Ballots Received – 27
- Total Votes Received – 308
- Voter Turnout – 10.49%

KPPA posts weekly reminders on social media pages to remind voters of the election. The previous election held in 2019 has an overall voting population of 2,677. In that election, 500 ballots were received for a voter turnout of 19.26%.

This memorandum is for informational purposes only.

KENTUCKY PUBLIC PENSIONS AUTHORITY
David L. Eager, Executive Director
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Kentucky Public Pensions Authority

To: Kentucky Retirement Systems Board of Trustees

From: William O'Mara, Chair
Joint Audit Committee

Kristen N. Coffey, CICA
Division Director, Internal Audit Administration

Date: March 1, 2023

Subject: Summary of Joint Audit Committee Meeting

The County Employees Retirement System (CERS) and Kentucky Retirement Systems (KRS) Joint Audit Committee held a regularly scheduled meeting on February 28, 2023.

1. Items to be forwarded to the Kentucky Public Pensions Authority:
   a. **Results of the GASB 68 and GASB 75 Proportionate Share audits for fiscal year ended June 30, 2022* – The Joint Audit Committee accepted the reports as presented and requests that the KRS Board approve the report and forward to the KPPA Board for ratification and approval to publish the reports.**

RECOMMENDATION: We request the KRS Board of Trustees ratify the actions taken by the Joint Audit Committee and recommend that the KPPA representatives on the KRS Board take these items to KPPA for consideration.

2. **The following other items were also discussed during the Joint Audit Committee meeting. These are presented for informational purposes only.**
   a. Updates to the presentation of the external Audit Report. This will be reviewed by staff and recommendations represented to the Board for review by December 2023.
   b. Financial statements for the quarter ended December 31,2022.
   c. LRC audit reporting requirements for fiscal year ended June 30, 2022.
   d. Internal Audit Budget – *43.67% of budget remaining*. Internal Audit Director will work with CFO to determine if a revision to the budget needs to be presented for the second half of fiscal year 2023.
   e. Status of current internal audits – *14 open projects and 4 completed projects.*
   f. Issued audit – Review of Chase Accounts – *12 reportable findings* (attached)
   g. Outstanding recommendations from the prior fiscal year – *18 recommendations not yet implemented*. (attached). Since preparation of this report, the first two findings have been resolved, leaving 16 open items.

***Board of Trustees action required**

Attachment

Kentucky Public Pensions Authority

Internal Audit Administration

Kentucky Public Pensions Authority

To: Members of the Joint Audit Committee

From: Kristen N. Coffey, CICA KNC
Division Director, Internal Audit Administration

Date: February 28, 2023

Subject: Follow-up on Open Audit Findings

The Division of Internal Audit Administration (Internal Audit) has been working on a project to review all open internal audit findings. An open finding is defined as a finding with a recommendation that has not yet been implemented. Attached is a list of open audit findings as of February 17, 2023. An update on the status of these items will be presented at the next Audit Committee meeting. This is presented for informational purposes only.

No action requested of the Joint Audit Committee.

Open Audit Findings and Recommendations

Entity	Project Name	Business Contact	Issue Title	Recommendation Title	Recommendation State	Implementation Due Date	Days Overdue	Notes
Cash Management Branch	AP Invoice Review	Connie Davis	Invoices not Submitted to Accounting Timely	Update Procedures to Include Timeline on Submitting Documentation	In Progress	7/1/2019	949.00	Exceptions noted during follow-up. Questions with Accounting to determine cause of the exceptions. Status of finding will be presented at the May Audit Committee meeting.
Cash Management Branch	AP Invoice Review	Connie Davis	Invoices not Paid Timely	Ensure Invoices are Paid in Compliance with State Statutes	In Progress	9/30/2019	884.00	Exceptions noted during follow-up. Questions with Accounting to determine cause of the exceptions. Status of finding will be presented at the May Audit Committee meeting.
Cash Management Branch	AP Invoice Review	Connie Davis	Miscellaneous Invoice Issues	Correct Miscoded Expenditures and Ensure PII is not uploaded in eMARS	In Progress	12/31/2019	818.00	Instances of PII were noted during follow-up testing. Worked with Legal Services on a resolution. Auditor will follow-up with Legal prior to the May Audit Committee meeting to determine if corrective action was implemented.
Executive Director	PPW FY 2020	Liz Smith	Budget not Approved Timely	Ensure Budget is Approved Prior to Start of Fiscal Year	Not Started	2/28/2021	516.00	Follow-up testing requested from PPW Board of Directors on 2/21/2023. Will present status of findings at Audit Committee meeting in May.
Executive Director	PPW FY 2020	Anne Baker; Connie Davis	Duplicate Payment	Document Procedure to Review for Carry-Forward Balances	Not Started	2/28/2021	516.00	
Executive Director	PPW FY 2020	Anne Baker	Invoice Receipt Date Unknown	Stamp Invoices with Date of Receipt	Not Started	2/28/2021	516.00	
Executive Director	PPW FY 2020	Liz Smith	Payment does not Match Invoice	Ensure Payment Matches Invoice Amount	Not Started	2/28/2021	516.00	Follow-up testing requested from PPW Board of Directors on 2/21/2023. Will present status of findings at Audit Committee meeting in May.
Executive Director	PPW FY 2020	Connie Davis	PPW Policies not Up-to-Date	Update Policies	Not Started	2/28/2021	516.00	
Executive Director	PPW FY 2020	Liz Smith	PPW Unidentifiable Assets	Identify Fixed Assets	Not Started	2/28/2021	516.00	
Executive Director	PPW FY 2020	Liz Smith	Rent Payments not made Timely	Ensure Rent is Receive Timely	Not Started	2/28/2021	516.00	
Cash Management Branch	Employer Penalty Waiver	Connie Davis	Policies and Procedures are not Up-to-Date	Update Employer Penalty Invoice Waiver Policy and Related Procedures	Management Response-Accepted	2/28/2022	254.00	Follow-up testing not yet completed. Status of finding will be presented at the May Audit Committee meeting.
Cash Management Branch	Employer Penalty Waiver	Connie Davis	Support for Waivers not Easily Accessible by Staff	Support for Waivers not Easily Accessible by Staff	Reviewed-Accepted	2/28/2022	254.00	Follow-up testing not yet completed. Status of finding will be presented at the May Audit Committee meeting.
Procurement Branch	Procurement and Contract Management	Kathy McNaughton	Training not Provided for Contract Monitoring	Provide Training to Those Responsible for Contract Monitoring	In Progress	2/28/2023		Training is to be provided to those who monitor contracts in February 2023. Status of finding will be presented at the May Audit Committee meeting.
Office of Investments	Custodial Fee Payment Process	Steve Willer	Duplicate Services may be Provided	Determine if Duplicate Investment Services are Being Provided by Vendors	In Progress	2/28/2023		Duplication of services is currently under review by the Investment Compliance Officer. Status of finding will be presented at the May Audit Committee meeting.
Office Services Branch	Building Security	Anne Baker	Policy Manual not Developed	Develop Policy Manual Specific to Building Security	In Progress	6/30/2023		Security Manual will be developed, but additional time is needed. New implementation date of 6/30/2023 was provided.
Security	Security Access Review	Chris Johnson	Manual Reviews not Completed Timely	Establish Deadline for Completing Manual Reviews	Management Response-Submitted	8/31/2023		One of two manual reviews tested was not completed timely. Staff indicated that follow-up was conducted with the responsible individual via Skype; however, there is no evidence to show that proper follow-up was taken. New remediation date of August 2023 was provided.
Security	Security Access Review	Chris Johnson	Security Access Reviews not Completed Timely	Establish Deadline for Completing Security Access Reviews	Management Response-Submitted	8/31/2023		Two of seven Security Access Reviews tested were not completed timely. Staff indicated that follow-up was conducted with the responsible individual via Skype; however, there is no evidence to show that proper follow-up was taken. New remediation date of August 2023 was provided.
Office Services Branch	Building Security	Anne Baker	Additional Security Training Needed	Provide Additional Security Training to Staff	In Progress	9/29/2023		Training on Building Security procedures will be conducted after the Building Security Manual is developed. New remediation date of 9/30/2023 was provided.

Kentucky Public Pensions Authority

Internal Audit Administration

Kentucky Public Pensions Authority

To:	Members of the Joint Audit Committee
From:	Kristen N. Coffey, CICA KNC Division Director, Internal Audit Administration
Date:	February 28, 2023
Subject:	Final Audit Report Released

Please find attached the final audit report entitled **Review of Chase Accounts.** The report is dated February 22,2023. The Division of Internal Audit Administration noted 12 findings, which are summarized below. The detailed findings and recommendations as well as management's responses are attached for your review.

Summary of Audit Results

1. Use of non-custodial accounts.
2. Lack of controls over access to non-custodial accounts.
3. KERS funds spent to cover expenses of other plans.
4. Excess funds remaining in the non-custodial accounts.
5. Lack of controls over reconciliations.
6. Lack of review of journal entry transactions.
7. Payments from KPPA addressed improperly.
8. Activity in the Unfunded Liability Trust Fund is not monitored.
9. Member banking information is not kept in a secure location.
10. Wording in Kentucky Revised Statutes 61.706 may be out-of-date.
11. Inaccurate amounts reported on the Administrative Expense spreadsheet.
12. Meeting minutes not posted to the KPPA website timely.

Attachment

KPPA

Kentucky Public Pensions Authority

Review of Chase Accounts

February 20, 2023

Executive Summary

The following acronyms will be used throughout the report.

1. KPPA - Kentucky Public Pensions Authority
2. CERS - County Employees Retirement System
3. KERS - Kentucky Employees Retirement System
4. SPRS - State Police Retirement System
5. KRS - Kentucky Retirement System
6. KHAZ - KERS Hazardous
7. CHAZ - CERS Hazardous
8. CIO - Chief Investment Officer
9. CFO - Chief Financial Officer
10. CEO - Chief Executive Officer
11. KPPA Executive Management team - KPPA Executive Director, KPPA Deputy Executive Director, KPPA CIO, KPPA Executive Director-Office of Legal Services, and KPPA Executive Director-Office of Benefits
12. Accounting - KPPA Division of Accounting
13. Retiree Payroll - KPPA Division of Retiree Services-Payroll
14. Chase - JP Morgan Chase
15. BNY Mellon/custodial bank - Bank of New York Mellon
16. Finance - Finance and Administration Cabinet
17. Treasury - Kentucky State Treasurer
18. eMARS - enhanced Management Administrative Reporting System
19. LOB - Line of Business
20. NSF - insufficient funds
21. JV - journal voucher

The following findings were noted during our review of Chase accounts. Additional details and the related recommendations can be found in the Audit Results section of the report.

1. Use of non-custodial accounts.
2. Lack of controls over access to non-custodial accounts.
3. KERS funds spent to cover expenses of other plans.
4. Excess funds remaining in the non-custodial accounts.
5. Lack of controls over reconciliations.
6. Lack of review of journal entry transactions.
7. Payments from KPPA addressed improperly.
8. Activity in the Unfunded Liability Trust Fund is not monitored.
9. Member banking information is not kept in a secure location.
10. Wording in Kentucky Revised Statutes 61.706 may be out-of-date.
11. Inaccurate amounts reported on the Administrative Expense spreadsheet.
12. Meeting minutes not posted to the KPPA website timely.

Commendations

The CFO joined KPPA in early January 2023. This individual quickly familiarized himself with the audit and cooperatively worked with Internal Audit staff to develop recommendations that both corrected the noted findings and were feasible for Accounting staff to implement.

Background

KPPA maintains twelve accounts at Chase:

1. One Clearing account – The clearing account receives member and employer contributions, which are then transferred to BNY Mellon through the daily qualification wire process reviewed in the Plan Liquidity Phase 1 audit. The current audit did not review this account other than to verify that wires left Chase correctly.
2. One Excess Benefit account – This account is funded by the five pension accounts held at Chase and is used to pay retirees who earn more than the allowable limit set by federal law.
3. Five pension accounts and five insurance accounts (KERS, KHAZ, CERS, CHAZ, and SPRS) – These accounts are funded by wires from BNY Mellon and are used to pay retiree payroll, administrative expenses, and some insurance premiums and the associated insurance administrative fees. The accounts can receive checks or pre-tax retirement account rollovers from members who purchase service. However, checks can only be written against the non-hazardous accounts.

Accounts held at BNY Mellon will be referenced throughout the descriptions, testing methodology, and cashflow diagrams. These accounts were not tested in this audit. However, Internal Audit staff had extensive conversations with BNY Mellon representatives to develop a better understanding of KPPA's account structure (see Appendix A).

Comprehensive descriptions of each transaction type reviewed, the accompanying cashflow diagrams, and testing methodologies are included in Appendix B.

Objective, Scope, and Sampling

The scope of the audit was July 1, 2021 to June 30, 2022. The objectives of the Review of Chase Accounts audit were to gain a general understanding of each account, document the type of transactions that flow through the account, verify the accuracy of these transactions, and determine if the number of accounts is reasonable. Depending on the test type, either 100% of the population was reviewed or a judgmental sample was selected. Please refer to Appendix B for more detail.

Methodology

Please refer to Appendix B for details on the testing methodologies used for each test completed.

Risks

The following risks were identified during the audit:

1. In addition to the accounts at Chase, there may be other non-custodial KPPA, KRS, CERS, and/or SPRS bank accounts
2. There may be improper access to the Chase accounts.
3. Administrative expenses transferred from BNY Mellon may not equal the deposits in Chase and subsequent transfers to the state General Fund.
4. Transfers for administrative expenses may exceed the actual amount needed.
5. Deposits may be made to the wrong account.
6. Withdrawals from the Chase accounts may not be accurate.
7. Checks written from the Chase accounts may not be accurate.
8. The Chase accounts may not be properly reconciled.
9. Excess funds may remain in the Chase accounts.

Recommendations for Future Audits

During this audit, we noted several items that are being recommended for review in future audits.

1. Investment manager fees - there is a risk that these fees could be inaccurate as well as a risk that KPPA staff are not recalculating manager's fees prior to payment.
2. Correct investment reports pertaining to manager fees may not be included on the KPPA website.
3. Payment of expenses may not be handled consistently. Some items are paid from the state General Fund, some are paid directly from the non-custodial accounts, and others are paid directly from the custodial bank.
4. Information in eMARS may not reconcile to Great Plains, which is used to generate the financial statements. *This is being reviewed in a current audit - Reconciliation of eMARS to Great Plains.*
5. Information in eMARS and Great Plains may not be coded properly. *This is being reviewed in a current audit - Reconciliation of eMARS to Great Plains.*
6. Administrative expenses may not be allocated in the manner approved by KPPA.
7. Recurring and Supplemental payroll procedures including how additional funds are requested.
8. Process for stopping and reissuing the checks.
9. Processes related to overpayment invoices, including whether these invoices are reconciled and how the balance is monitored.
10. For overpayments from members who have passed, ensure that overpayments are paid from the death benefit.
11. Confirm that NSFs from members participating in multiple systems have adjusting entries where the system that paid for the total NSF is reimbursed for the portion of the payment assigned to a different system.
12. Outstanding check balance may not be accurate.
13. KPPA may not be receiving all owed monies since checks are made out to the State Treasurer.
14. Service Purchase process.
15. Excise tax process.
16. Humana insurance reimbursement process.

Audit Results

1. Use of Non-Custodial Accounts

Condition:	KPPA currently utilizes 12 non-custodial accounts. These accounts are currently held at Chase. One account (Clearing Account) is used to receive employer and employee contributions. The other 11 funds should serve as pass-through accounts in the payment of expenses. Multiple items were noted with these accounts: 1. Assets held in a non-custodial account may be outside the statutory oversight of the Board of Trustees. 2. Chase bank has been designated as a state depository for the receipt of public funds. However, the assets administered by KPPA are statutorily identified as trust funds. Chase bank cannot be designated as a fiduciary to oversee trust funds. Additionally, Chase does not have the ability to unitize funds held in the accounts that are currently set up at Chase. 3. If KPPA continues to utilize a non-custodial account, the number of accounts as well as the number of transfers may be excessive. a. Contributions are received into a non-custodial Clearing Account (one account). b. Funds are then transferred to one of two master trust accounts at the custodial bank (pension or insurance). c. Various times throughout the month, funds are transferred from the custodial bank back to the non-custodial bank into one of ten bank accounts (five pension and five insurance accounts). d. Funds related to administrative expenses are then transferred from the five pension accounts into one state owned General Fund. It should be noted that some expenses are paid directly from the non-custodial accounts and some are paid directly from the master trust accounts held at the custodial bank. e. Example of excessive transfers – A Humana insurance reimbursement was deposited into the KERS insurance account at Chase; however, portions of the reimbursement were owed to the other insurance funds. Four transfers were made from the KERS insurance account to the various insurance accounts at Chase. Five transfers were then made from the Chase insurance accounts to the Master Trust Insurance account at BNY Mellon. At a minimum, ten monetary transfers were needed to move the reimbursement to the custodial bank. If Humana had sent the reimbursement directly to the Master Trust Insurance account at BNY Mellon, fewer transfers would have been needed.
Criteria:	<u>Ownership/Control of Assets</u> Kentucky Revised Statutes 16.642, 61.650, and 78.790 each state, "The board, through adopted written policies, shall maintain ownership and control over its assets held in its unitized managed custodial account." <u>State Depository</u> 1. Kentucky Revised Statutes 41.210 states, "All public money received into the Treasury shall be deposited on the day it is received in one or more state depositories." 2. Kentucky Revised Statutes 41.220 states, "Not less than three solvent banks shall be designated as the state depositories for state funds."

	<u>Public Funds</u> 1. Kentucky Revised Statutes 16.510, 61.515, and 78.520 establish SPRS, KERS, and CERS, respectively. Each state, "All assets received in the fund shall be deemed trust funds...." 2. Public funds are generally described as taxpayer money, which is used to fund government service programs. Oxford's dictionary defines trust funds as those assets belonging to a trust, held by the trustees for the beneficiaries.
Cause:	1. Trustees may not have been aware that the Board of Trustees ownership and control over assets may be limited to those held in accounts at the unitized managed custodial account (BNY Mellon). 2. Staff may not have a clear understanding on how to identify the funds received by KPPA or whether use of a non-fiduciary, state depository bank is required. 3. Staff indicated that multiple accounts are maintained at Chase because assets cannot be comingled. However, contributions come into one account (Clearing Account) and administrative expenses are paid from one account (General Fund). When funds are transferred to the custodial bank, they are held in two separate master trust accounts, either pension or insurance. When KPPA staff discuss comingling, there seems to be an interpretation that this means if the funds are held in one account, then the funds from any plan can be used to pay the expenses of another plan. However, this is not the proper definition of comingling. Holding funds from multiple plans in one account, does not mean funds from one plan will pay expenses from another. Unitization of accounts is used to ensure this does not happen. The custodial bank can hold pension assets for all plans in one pension master trust account because they are able to unitize the amounts being held. This ensures that funds belonging to one plan are not used for expenses of another plan. See Appendix A for definitions of comingled, pooled, and unitized funds.
Effect:	1. Trustees may not have full oversight and control over all assets. 2. Accounts may be unnecessarily established. 3. Excessive accounts and transfers increase the risk of errors. It also makes it more difficult to reconcile activity in the accounts and ensure that all transactions are valid. 4. In May 2022, KPPA was charged a $64,868.34 overdraft fee by the custodial bank as a result of a transfer not being sent timely from the depository bank. This fee was reimbursed to KPPA in October 2022.
Recommendations:	1. KPPA Executive Director of Legal Services should work with the CERS and KRS legal counsels to determine the definition of the unitized managed custodial account as referenced in KRS 16.642, 61.650, and 78.790. Based upon that definition, it should be determined if the Boards of Trustees have legal ownership and control over assets not held in the custodial account at BNY Mellon. While current staff and Trustees may agree that the Boards of Trustees have full oversight, it is necessary to have a legal opinion on file that provides guidance to current and future staff and Trustees. 2. The CIO should meet with BNY Mellon and review the unitization method discussed in more detail in Appendix A. Changing to the unitization method could potentially reduce the number of times cash is moved per transaction. In turn, this would reduce the risk of error and/or fraud for each transaction. 3. The KPPA Executive management team and the KPPA CFO should work with the CEOs and Boards of Trustees of CERS and KRS to determine the account structure needed to ensure cash flows occur in an efficient manner and in a way that limits opportunities for error and fraud, whether utilizing the custodial bank for all transactions or continuing to use both custodial and non-custodial bank accounts.

	4. Kentucky Revised Statutes identify all assets received in the fund as trust funds. KPPA Executive management, the KPPA CFO, and the CEOs of CERS and KRS, should work together to determine if it is appropriate to continue use of a non-fiduciary, state depository bank. While it is understood that an Attorney General Opinion was provided on this topic in 1979, that opinion may not be relevant as it indicates that funds received by KPPA are public funds and not trust funds. KPPA staff outlined in this recommendation determine if it is feasible to move all trust fund activity to the custodial bank. The following items would need to be considered: a. Can all contributions received be deposited in a clearing account at BNY Mellon? b. Can eMARS be linked to the custodial accounts so that all expenses are paid directly from the trust accounts? c. Would BNY Mellon charge an additional fee to perform the accounting services that would be needed if trust fund activity were to be moved to the custodial bank? The current BNY Mellon contract contains a fee for accounting services so it is possible no additional fee would be incurred. 5. If a non-custodial bank will continue to be utilized, KPPA Executive management, the KPPA CFO, and the CEOs of CERS and KRS should consider reducing the number of non-custodial accounts in use. Physical, separate accounts are not required. Assets can be held in a limited number of accounts (as currently seen at the custodial bank) as long as steps are taken to ensure that funds belonging to one plan do not pay expenses for another plan. A form of unitization already occurs with the accounting entries made in Great Plains. a. One non-custodial clearing account could be maintained to receive contributions. Two non-custodial accounts (one pension and one insurance) could be maintained to pay expenses. Monthly, staff could determine the amount of funds needed to pay the current month's expenses. As contributions are received, the amount needed to pay current expenses could be transferred from the clearing account into the appropriate pension or insurance non-custodial account. Excess contributions should be immediately transferred to the custodial bank. This would reduce the number of transfers between bank accounts. If the contributions received are not enough to pay all monthly expenses, additional funds could be transferred from the custodial bank. i. There should be proper documentation kept on file for the amount that is retained in the non-custodial accounts. ii. Each payment made from the non-custodial account should be properly supported. b. If a non-custodial bank continues to be utilized as a depository bank, KPPA Executive Management, the KPPA CFO, and the CEOs of CERS and KRS should consider the benefit of linking eMARS to the custodial bank. This would greatly reduce the number transfers and would ensure all payments are treated consistently (all expenses would be paid directly from the custodial bank). Currently, funds flow out of the custodial bank and into the non-custodial accounts and then out of the non-custodial accounts and into a state-owned General Fund. Linking eMARS to the custodial bank would allow funds to stay within the oversight of those charged with fiduciary responsibility of the assets.
KPPA Executive Management Response:	The issues and recommendations are complex and may require statutory changes. As such, the KPPA Executive Director will form a study task force to examine all the recommendations and seek to identify other issues that may warrant action and/or legislation as well. Our timetable for completion will likely be 12 to 24 months. The finding regarding the $64,868.34 overdraft fee is not relevant to the Chase Audit and should not have been included in the report since it was not a result of the structure of the accounts. Rather, it was a result of Chase's own

	enhanced fraud detection controls. Further, the amount in question plus interest has been reimbursed and the system incurred no loss.
Implementation Date:	6/28/2024
Auditor Response:	Any item that comes to the attention of Internal Audit staff during an audit may be reported. In this instance, the overdraft fee is directly related to the account structure. However, internal audit staff did not issue a finding regarding the overdraft fee; the situation was noted only as an effect of the current structure of the accounts. The use of non-custodial accounts requires transfers of funds to the custodial bank. The delay in the transfer from the non-custodial bank to the custodial bank is what caused the overdraft fee to be incurred.

2. **Lack of Controls over Access to Non-Custodial Accounts**

Condition:	KPPA staff have not designed internal controls to ensure that access levels to the non-custodial accounts are accurate. Lack of controls over non-custodial account access was shown when Internal Audit staff requested a listing of individuals with access to the non-custodial accounts. Both KPPA Accounting staff and Chase employees provided a listing of individuals with access; however, the individuals on the two lists did not agree. After interviewing Chase employees and KPPA staff, it was determined that neither list provided was accurate, but the listing from Chase was the most complete. 1. Access levels are not reviewed periodically, to ensure access granted to employees does not exceed the level necessary for completion of job duties. 2. Only one individual can request changes to access levels. Internal Audit staff confirmed with Chase employees that a backup has not been officially named for this responsibility. 3. Only one individual has access to transfer money between Chase accounts. This individual can initiate, approve, and release transfers between Chase accounts without approval of a second individual.
Criteria:	1. 200 KAR 38:070 §2 (1)(2) states, "The agency head shall perform the responsibilities of fiscal officer or delegate the responsibilities to an employee with adequate skills to perform the job duties...Each fiscal officer shall develop and document internal controls to both prevent and detect abuse, unintentional errors, and the fraudulent disbursement of funds or use of state assets. In addition, the fiscal officer shall work with agency personnel to implement the internal controls and monitor their effectiveness." 2. KPPA Access Control Policy Section 5 #1 states, "All data shall be classified in accordance with the Data Classification Policy, its access determined by the business owner, and access granted based on the Principle of Least Privilege." While this policy is related to internal data, the Principle of Least Privilege is good practice for all access levels at KPPA.
Cause:	In the past, KPPA staff have not considered reviewing access to the non-custodial accounts because access to these accounts is automatically deactivated by Chase if an account is not utilized in six months. However, this does not ensure that staff who regularly access the accounts have appropriate access levels.
Effect:	Individuals could unintentionally (or intentionally) initiate improper transactions in the Chase accounts.
Recommendations:	1. If the non-custodial accounts are to continue being utilized, the CFO should establish controls around access to these accounts. These controls should be documented. At a minimum, the following procedures should be documented:

	a. How access is granted to the non-custodial accounts, including the individual responsible for authorizing access. It is recommended that final approval be the responsibility of the CFO. b. When and how access to the non-custodial accounts is to be removed from individuals. c. How access to the non-custodial accounts will be reviewed. This procedure should outline who will perform the review and how often it will be performed. To be consistent with other KPPA access reviews, staff could perform these review every six months. 2. The CFO should work with Accounting staff to determine if changes are needed to access levels at the non-custodial accounts. At a minimum, the following should be considered: a. A backup who can request changes to KPPA staff access should be established with Chase. It is recommended that the CFO serve as one of the individuals who can request changes to access levels. b. Two options can be considered regarding transfers: i. A second person could be granted access to transfers and the current individual's access to Release Own Payments should be removed. This would ensure a second level of review for transfers. ii. Access to transfers could be removed from all KPPA staff since it was indicated that transfers take place utilizing eMARS and not Chase.
Accounting Management Response:	We concur with the finding and will review and enhance controls regarding access and access levels with regards to KPPA's Chase bank accounts. Such controls will include procedures to grant, change, and remove access to such accounts. In addition, we will review, and adjust where appropriate, the actions that can be performed by individuals who have access to these accounts. Furthermore, we will identify back-up(s) and ensure segregation of duties exist or are mitigated by compensating controls. This enhancement will include the implementation of a periodic review and approval (not to exceed every 6 months) of internal and external access reports. This review shall begin presently and be fully implemented by June 30, 2023.
Implementation Date:	6/30/2023
Auditor Response:	We appreciate the CFO's agreement to implement controls surrounding access to the accounts maintained at Chase, including ensuring the existence of segregation of duties or proper mitigating controls.

3. KERS Funds Spent to Cover Expenses of Other Plans

Condition:	During fiscal year 2022, several instances were found where KERS pension assets were used to pay amounts owed by other plans. 1. 125 individual NSF withdrawals totaling 112,780.17. This is 40% of the NSF withdrawals reviewed. Internal Audit and Accounting staff spoke with representatives from Chase and the Kentucky State Treasurer and discovered the issue pertaining to NSF withdrawals has been occurring since Chase first began working with KPPA in 2011. However, since this file was created based on information from KPPA's prior bank, it is possible that this issue existed throughout that partnership as well. a. CERS pension - 119 withdrawals totaling $103,393.30. b. KHAZ pension - 4 withdrawals totaling $2,415.57. c. SPRS pension - 2 withdrawals totaling $6,971.30.

	2. June 2022 Excess Benefits totaling $31,216,28. a. KHAZ pension - $8,464.48 b. CERS pension - $9,138.48 c. CHAZ pension - $13,613.32
Criteria:	1. 200 KAR 38:070 §2 states, "(2) Each fiscal officer shall develop and document internal controls to both prevent and detect abuse, unintentional errors, and the fraudulent disbursement of funds or use of state assets...(3) An internal control plan shall include...(c) Procedure that provides for the internal review of all transactions processed by the agency...The internal review shall include, but is not limited to, the following: (4) Review of transactions for appropriate accounting codes and accuracy...." 2. Kentucky Revised Statutes 61.663 (KERS), 78.652 (CERS) and 16.568 (SPRS) states, "There is created and established: An excess benefit plan to be known as the Kentucky Employees Retirement System (County Employee Retirement System) (State Police Retirement System) Excess Benefit Plan. The plan is created for the purpose of providing the retirement allowances payable from the retirement system under Kentucky Revised Statutes 61.515 to 61.705 (78.520 to 78.852) (16.510 to 16.652) that would otherwise be limited by 26 U.S.C. sec. 415."
Cause:	1. The wrong company ID was used when the NSF withdrawal accounts were set up with Chase in 2011. In addition, Accounting has not established procedures to ensure NSF withdrawals are made from the proper account. 2. There is no formal review process in place for the excess benefit process, so this error was not discovered until the audit was conducted. No review is performed for journal entry transactions created in Great Plains (see Lack of Review of Journal Entry Transactions), so errors cannot be caught before the entry is made. In addition, this type of error cannot be caught as a part of the monthly reconciliation procedures because those procedures do not require comparing activity in Chase to the source documents from LOB (see Chase Transactions not Reconciled to Source Documents).
Effect:	1. The KERS pension account covered NSFs for members of CERS, SPRS and KHAZ. This audit only covered one year of data, and it has been confirmed that this issue has existed since at least 2011. Furthermore, it is possible the issue existed prior to that date. The total impact to KERS pension has not yet been determined. 2. KERS pension funds were used to fund a total of $31,216.28 in excess benefits payments for other plans. This audit only reviewed one year of data; it is possible that past fiscal years had a similar error.
Recommendations:	1. The CFO and Accounting staff should review the following items to determine the extent of the impact to the KERS pension plan. Once both reviews are completed, the CFO should work with KPPA Executive management and the CEOs and Board of Trustees for CERS and KRS to determine how the errors will be corrected. Internal Audit staff can assist with or conduct these reviews at the request of management. a. Work with Chase and possibly former depository banks to determine the total due to the KERS pension account as a result of the error related to NSF withdrawals being improperly made from the KERS pension account. b. Review excess benefits from prior years to determine if additional errors exist. 2. The CFO should ensure controls are established to ensure that one plan is not covering NSFs for members of another plan. Finance staff do not have access to LOB and cannot verify that each member in the NSF file participates in the system that is covering the NSF. It is KPPA's responsibility to confirm that the correct fund is being charged.

	a. Option 1: Accounting staff could develop procedures to take over the creation of the NSF files, rather than having Finance staff create these files. The NSF files could be generated in-house through the Chase secure portal and then uploaded to eMARS. b. Option 2: If Finance staff will continue to create the NSF files, Accounting staff should review the file provided to ensure the proper fund is covering the NSFs. c. Once an option is chosen, procedures should be documented. At a minimum, the procedures should include the following: i. How each person in the file will be compared to LOB. Retiree Payroll staff already have a process in place to review each member individually, but these procedures do not include a step to compare the system that covered the NSF to the system of the member's participation. Accounting staff may be able to coordinate with Retiree Payroll staff to perform this review. ii. An explanation of how the files used will be retained for historical purposes in a format that cannot be edited. 3. The KERS pension cash account should be reimbursed for the excess benefits paid on behalf of other funds: a. KERS Hazardous Pension - \$8,464.48 b. CERS Non-Hazardous Pension - \$9,138.48 c. CERS Hazardous Pension - \$13,613.32
Accounting Management Response:	We concur with the finding. 1. Regarding Condition 1: We will work with IT and Finance to correct the erroneous company ID in the report to prevent future errors as soon as possible. In addition, we will work with Finance and Retiree Payroll to implement a review of such reports to determine that the NSF is credited to the proper account upon occurrence, and we will continue this review monthly. This will be implemented by June 30, 2023. Furthermore, we will work with Chase, Finance, Retiree Payroll, and potentially Internal Audit to examine occurrences of this back to at least 2011, to the extent possible, and determine the overall impact. We will present that impact to the CEOs, and Board of Trustees of CERS and KRS to determine the next course of action, including if examination prior to 2011 is practical. We will have the review completed by December 31, 2023. 2. Regarding Condition 2: We refunded the \$31,216.28 to the KERS pension account on December 13, 2022, and we will investigate the most efficient control structure to have in place regarding a second review of the journal entries in Great Plains. Once determined, we will document that process, train accounting staff, and implement. We will complete and implement by September 30, 2023.
Implementation Date:	1. 6/30/2023 and 12/31/2023 2. 9/30/2023
Auditor Response:	1. We commend Accounting staff for working with Internal Audit, Retiree Payroll, Finance, and Chase on determining the cause of the NSF error. Internal Audit understand that determining the impact will not be an easy task and we appreciate the effort staff will put into making this determination. Internal Audit is willing to provide any assistance that may be needed on this project. 2. We commend Accounting staff for working quickly to reimburse KERS when this error was brought to their attention. Internal Audit staff verified that the KERS pension cash account was reimbursed on December 13, 2022.

4. Excess Funds Remaining in Non-custodial Accounts – *Recurring Issue*

Condition:

1. The Internal Audit team reviewed the fiscal year 2022 month-end balances for each non-hazardous pension and insurance account maintained at Chase (72 total months). The Internal Audit team used a current ratio of 1.5 as the ideal remaining month-end balance to ensure sufficient funds remained to cover outstanding checks. For 59 of the 72 historical month-end balances reviewed (81.94%), funds in excess of the 1.5 ratio remained in the non-custodial accounts. The first table below shows the amount in excess of the 1.5 ratio that remained in the various accounts each month as well as the average remaining monthly balance for each account.
2. The Internal Audit team also reviewed the fiscal year 2022 month-end balances for each hazardous pension and insurance account maintained at Chase (48 total months). Checks are not written from the hazardous accounts so there is no need to maintain a balance to cover outstanding items. The second table below shows the account balance at the end of each month as well as the average remaining monthly balance for each account.

Excess funds over Ideal Balance	PENSION				INSURANCE			
	KERS	CERS	SPRS	Mothly Total	KERS	CERS	SPRS	Monthly Total
July	$ 115,742.50	$ 146,900.08	$ 50,141.91	**$ 312,784.48**	$ 144,025.21	$ 145,443.89	$ 48,951.45	**$ 338,420.54**
August	$ 674,650.66	$ 846,261.18	$ 42,887.06	**$ 1,563,798.89**	$ 236,191.01	$ 312,907.68	$ 49,463.99	**$ 598,562.68**
September	$ 912,909.94	$ 975,452.79	$ 99,624.99	**$ 1,987,987.72**	$ 281,485.86	$ 465,516.20	$ 40,283.12	**$ 787,285.17**
October	$ -	$ -	$ 41,806.13	**$ 41,806.13**	$ 331,637.19	$ 636,868.21	$ 48,464.49	**$ 1,016,969.89**
November	$ 1,099,627.56	$ -	$ 70,263.02	**$ 1,169,890.58**	$ 142,434.15	$ 133,370.10	$ 49,451.39	**$ 325,255.63**
December	$ -	$ -	$ 36,717.39	**$ 36,717.39**	$ 45,485.51	$ 47,408.28	$ 49,451.39	**$ 142,345.17**
January	$ 27,438.76	$ 150,691.78	$ 35,608.82	**$ 213,739.36**	$ 101,929.59	$ 195,642.40	$ 25,933.04	**$ 323,505.02**
February	$ 347,112.31	$ 340,662.64	$ 25,839.86	**$ 713,614.81**	$ 173,728.82	$ 409,425.36	$ 18,886.55	**$ 602,040.73**
March	$ -	$ -	$ 33,398.60	**$ 33,398.60**	$ 82,841.76	$ 87,327.51	$ 17,208.79	**$ 187,378.05**
April	$ -	$ -	$ 34,306.12	**$ 34,306.12**	$ 140,710.50	$ 278,200.11	$ 17,928.13	**$ 436,838.73**
May	$ -	$ -	$ 14,863.03	**$ 14,863.03**	$ 106,367.21	$ 173,464.20	$ 17,928.13	**$ 297,759.54**
June	$ -	$ -	$ 6,928.87	**$ 6,928.87**	$ 90,971.43	$ 96,647.81	$ 17,648.93	**$ 205,268.16**
Monthly Average	**$ 264,790.14**	**$ 204,997.37**	**$ 41,032.15**	**$ 510,819.66**	**$ 156,484.02**	**$ 248,518.48**	**$ 33,466.61**	**$ 438,469.11**

Hazardous Balances	PENSION			INSURANCE		
	KHAZ	CHAZ	Monthly Total	KHAZ	CHAZ	Monthly Total
July	$ 52,468.40	$ 177,544.75	**$ 230,013.15**	$ 50,691.36	$ 64,815.99	**$ 115,507.35**
August	$ 126,429.87	$ 240,605.51	**$ 367,035.38**	$ 52,096.35	$ 63,710.77	**$ 115,807.12**
September	$ 148,091.47	$ 295,268.69	**$ 443,360.16**	$ 52,122.70	$ 69,356.15	**$ 121,478.85**
October	$ 42,065.36	$ 64,234.41	**$ 106,299.77**	$ 53,318.39	$ 70,683.47	**$ 124,001.86**
November	$ 191,914.32	$ 161,007.43	**$ 352,921.75**	$ 54,962.74	$ 54,100.55	**$ 109,063.29**
December	$ 40,556.30	$ 44,173.37	**$ 84,729.67**	$ 56,367.73	$ 57,435.90	**$ 113,803.63**
January	$ 67,899.47	$ 88,251.05	**$ 156,150.52**	$ 26,221.20	$ 50,125.63	**$ 76,346.83**
February	$ 75,402.54	$ 182,660.97	**$ 258,063.51**	$ 6,835.09	$ 41,530.62	**$ 48,365.71**
March	$ 47,571.31	$ 59,031.18	**$ 106,602.49**	$ 23,397.42	$ 22,801.34	**$ 46,198.76**
April	$ 81,494.67	$ 71,223.29	**$ 152,717.96**	$ 22,131.47	$ 23,007.80	**$ 45,139.27**
May	$ 111,867.77	$ 32,702.25	**$ 144,570.02**	$ 23,682.63	$ 19,613.92	**$ 43,296.55**
June	$ 30,270.65	$ 10,941.68	**$ 41,212.33**	$ 25,233.79	$ 19,165.98	**$ 44,399.77**
Monthly Average	**$ 84,669.34**	**$ 118,970.38**	**$ 203,639.73**	**$ 37,255.07**	**$ 46,362.34**	**$ 83,617.42**

3. Funding for each pension related supplemental/recurring payroll is transferred from the custodial bank to the non-custodial bank. The following items were noted as a result of the excess funding in the non-custodial accounts:
   a. No additional funds had to be drawn down from the custodial bank for 7 of the 46 pension supplemental payrolls that occurred in fiscal year 2022.
   b. Funds to cover every insurance supplemental payroll during fiscal year 2022 were held in the non-custodial accounts and did not require an additional draw down from the custodial bank.
   c. For the November 23, 2021 supplemental/recurring payroll an additional $520,877.77 was transferred from the KERS pension account at BNY Mellon to the corresponding Chase account. This amount was related to the CERS supplemental/recurring payroll. An immediate correction was not needed because enough funds remained in the CERS pension account at Chase to cover the incorrect transfer amount. When the expense was actually paid, the correct amounts were paid by KERS pension and CERS pension.

Criteria:

1. Kentucky Revised Statutes 16.555 [SPRS], 61.570 [KRS], and 78.630 [CERS] state, "All the assets of the system shall be held and invested in the [State Police Retirement Fund] [Kentucky Employees Retirement Fund] [County Employees Retirement Fund] and credited, according to the purpose for which they are held, to one of three accounts, namely, the members' account, the retirement allowance account, and the accounts established pursuant to 26 U.S.C. sec 401(h) within the funds established in Kentucky Revised Statutes 16.510, 61.515, and 78.520, as prescribed by Kentucky Revised Statutes 61.702(3)(b)."
2. 200 KAR 38:070 §2 states, "(2) Each fiscal officer shall develop and document internal controls to both prevent and detect abuse, unintentional errors, and the fraudulent disbursement of funds or use of state assets...."

Cause:	1. KPPA staff have not requested guidance from the Boards of Trustees on the ideal balance that should remain in the Chase accounts. 2. The procedures currently used by Accounting staff to determine how much money to transfer back to the custodial bank is not documented. 3. Review procedures for wire transfers do not require the reviewer to compare the wire amount to the source document to ensure that the wire is accurate. In the case of the November 23, 2021 supplemental/recurring payroll, the reviewer of the wire did not compare the wire amounts to the supplemental payroll report to verify that the correct amounts were scheduled to be wired from the custodial bank.
Effect:	Assets that could be transferred to the custodial bank and used for investment activities may be sitting in the Chase accounts.
Recommendations:	1. If the Chase accounts are to continue being utilized, the KPPA CFO should work with the KPPA Executive Management team as well as the CEOs and Board of Trustees for CERS and KRS to determine an appropriate balance to remain in the various Chase accounts. This decision should be documented so that current and future KPPA staff have written guidance to follow. 2. The CFO should work with Accounting staff to update procedures related to the review of wires. The procedures should include a step for the reviewer to compare the wire to the source document to ensure the amount scheduled to be transferred is accurate and is being transferred from the correct account.
Accounting Management Response:	We concur with the finding and will work with Trustees to establish the" ideal balance" that should remain in the non-custodial bank accounts above the immediate cash needs for administrative expenses, retiree benefit payments, and outstanding items (the excess). This will take analysis of past, current, and future balances, as well as research on our part for the Trustees to make an informed decision. Therefore, we will initiate specific metrics to report quarterly, starting in June 2023, and obtain feedback on those metrics through April of 2024. Through this process we will establish a documented ideal to utilize post April 2024. Furthermore, we will review procedures regarding the review of wire transfers from the custodial bank and implement enhancements where necessary by September 30, 2023.
Implementation Date:	1. 6/30/2024 2. 9/30/2023
Auditor Response:	We commend the corrective action plan that has been presented by the CFO and Accounting staff. This plan is well structured and thought out and should provide the Trustees with sufficient insight to make a well-informed decision regarding the non-custodial accounts.

5. **Lack of Controls Over Reconciliations**

Condition:	Several issues were noted with the various reconciliations performed related to the Chase accounts: 1. There is a lack of segregation of duties. a. Reconciliations of the Chase bank accounts are performed by an individual who has access to create and approve transactions at Chase, in Great Plains, and in eMARS. b. The individual who generates reports from eMARS to compare to Great Plains has the ability to enter transactions in both eMARS and Great Plains.

	2. There is only one individual who serves as a backup for the monthly reconciliation process. This individual serves as the backup for both staff members who generally perform the reconciliation. If both those individuals are out, the reconciliations cannot be completed. 3. Reconciliations are performed in an unprotected excel worksheet. a. The reconciliations can be edited after they are completed. During testing, we noted two worksheets had missing information that Accounting staff indicated was originally on the worksheets. It appears that this information was somehow removed before testing started. b. There is no way to verify that different individuals prepared and approved the monthly reconciliation because these activities are documented only by adding initials to the excel file. c. There is no way to tell if the reconciliations were completed in a timely manner because there are no time stamps showing the completion date. 4. KPPA staff do not have a process in place to review individual checks written against the pension accounts held at Chase. While these issues were detected and corrected by an outside party, KPPA Accounting staff do not have procedures in place to review for these types of errors or to verify the corrections made by these outside agencies. In addition, KPPA Accounting staff are not aware of the status for individual checks because checks are not reviewed on an individual basis. a. Three CERS pension checks totaling $8,863.71 were fraudulently cashed but reimbursed by Finance staff (these checks were cashed by non-CERS members or beneficiaries). b. Ten CERS pension checks totaling $10,434.01 were cashed for the wrong amount but were corrected by Chase staff. c. Six CERS pension checks totaling $3,982.62 were voided, but subsequently cashed; this was reversed by Finance staff. d. One CERS insurance check totaling $252.52 was cashed for the wrong amount but was corrected by Chase staff. e. Two KERS pension checks totaling $2,526.73 were cashed for the wrong amount but were corrected by Chase staff. f. Three KERS pension checks totaling $1,777.21 were voided, but subsequently cashed; this was reversed by Finance staff.
Criteria:	200 KAR 38 §2 states, "(1) The agency head shall perform the responsibilities of fiscal officer or delegate the responsibilities to an employee with adequate skills to perform the job duties...(2) Each fiscal officer shall develop and document internal controls to both prevent and detect abuse, unintentional errors, and the fraudulent disbursement of funds or use of state assets...(3) An internal control plan shall include the following (a) Organizational structure and alignment of job duties that provide the appropriate segregation of duties for the proper safeguarding of agency assets to prevent one individual from controlling or processing a transaction from beginning to end...."
Cause:	1. There is a limited number of Accounting staff qualified to perform reconciliations. 2. Reconciliations have always been performed via an unprotected excel spreadsheet and staff have not found it necessary to find a new way to perform this task. Staff do not have a process in place to retrain historical records in a format that cannot be altered. 3. KPPA is reliant on staff at Chase and Finance to catch errors related to written checks.

	a. Values, routing numbers, or account numbers may be entered incorrectly by bank tellers. Staff at Chase detected the difference and reimbursed or withdrew the difference from the corresponding Chase account. b. Stale dated checks can still be cashed erroneously because the member may have a copy of the paper check. The member's bank may not realize that the checks have been voided. Finance staff detected these items and reimbursed the appropriate Chase account. c. For the fraudulent checks, a member's legitimate paper check was edited to remove the original payee's name, address and amount. A non-KPPA member's or beneficiary's information was added to the check. The bank teller could not tell that the check had be altered and proceeded to cash the fraudulent check.
Effect:	1. Lack of segregation of duties and weak controls over reconciliations leads to an increased risk of human error. If a person is reconciling a transaction that they previously created or approved, accidental errors may be overlooked. This could ultimately lead to misstatements on the financial statements. Additionally, without segregation of duties, there is an increased risk of fraud since there is little to no oversight to ensure that everything is accurate. 2. If staff at Chase or Finance fail to catch these types of errors, then they would not be detected. Additionally, staff at Chase or Finance could make a withdraw from any of the Chase accounts and code it as a correction to a check. Since KPPA Accounting staff do not review these corrections, this type of transaction would not be caught.
Recommendations:	The CFO should work with Accounting staff to implement controls over the various reconciliations that are performed: 1. Train additional individuals on how to perform the various reconciliations. This would create a sufficient number of back-ups and establish segregation of duties. a. The individual reconciling Chase bank accounts should not have access to create and approve transactions at Chase, in Great Plains, and in eMARS. b. The individual who reconciles eMARS to Great Plains should not have the ability to enter transactions into eMARS and Great Plains. c. Each step in the reconciliation process should have an individual back-up. A sufficient number of individuals should be trained so that reconciliations can be completed even if those generally responsible for the task are out of office. 2. Perform reconciliations in a manner that does not allow for the work to be edited afterwards. 3. Determine if additional review should be taken in relation to checks written from the various Chase accounts. The following items should be considered: a. For duplicate checks, review the check images and confirm that duplicates have been properly reversed. b. For checks that fall outside the proper check numbering sequence, review the check images and ensure the check is valid or has been properly reversed. c. For every transaction in Chase with a comment about a check being cashed incorrectly, verify that the correction should have happened by comparing the value of the original check to the value of the cashed check. The difference between these two values should match the correcting transaction. d. For every transaction in Chase with a comment saying that a check was reversed, confirm that the check should have been reversed. e. For every re-issued check, compare the value of the original check to the value of the re-issued check.

	4. Update reconciliation procedures to include the following: a. Detailed steps that describe all items that need to be included in the reconciliations. b. A step for the preparer and/or reviewer to compare items to source documents to ensure the accuracy of transactions. c. A way to document who has completed and reviewed the reconciliation, other than initials in an excel spreadsheet. d. A way to document when the reconciliations were completed.
Accounting Management Response:	We concur with the finding. We will review and enhance controls regarding the various reconciliations performed. Such controls will include a review and approval by someone who does not have ability to create transactions, presumably the CFO. In addition, we will identify back-up(s) where appropriate, as well as explore alternatives to evidencing reviews in an excel spreadsheet. Regarding the fraudulent or erroneous checks cashed but caught by either Chase and/or Finance, we believe controls are in place and working, as evidenced in the audit finding; however, we acknowledge that if these controls were to fail, errors could go undetected by KPPA staff. Therefore, we will review our current controls, in conjunction with the controls being deployed by Chase and Finance and determine what, if any, additional measures should be implemented. These reviews and enhancements will be concluded by September 30, 2023.
Implementation Date:	9/30/2023
Auditor Response:	We appreciate the CFO's willingness to review processes and enhance controls where needed.

6. Lack of Review of Journal Entry Transactions

Condition:	A Graduate Accountant creates a journal entry in Great Plains. That journal entry automatically creates a journal voucher (JV) document in Great Plains that goes to a JV inquiry queue where the same Graduate Accountant selects the JV to be uploaded to eMARS. All JV documents uploaded to eMARS during the day are automatically processed overnight by Finance. Once the JV is processed, Finance sends a file to Chase that is uploaded into the Chase system. When the file is uploaded, funds are transferred from one Chase account to another. The journal entry created in Great Plains is not checked by a second KPPA staff member. Staff at Finance and Chase are not responsible for verifying the accuracy of JV documents or transfers. In addition, staff at Finance and Chase could not verify the accuracy of these transactions because they do not have sufficient documentation on hand to do so.
Criteria:	200 KAR 38:070 §2 states, "(2) Each fiscal officer shall develop and document internal controls to both prevent and detect abuse, unintentional errors, and the fraudulent disbursement of funds or use of state assets...(3) An internal control plan shall include...(c) Procedure that provides for the internal review of all transactions processed by the agency…."
Cause:	There is no second review of JV transactions created in Great Plains because a second review function in Great Plains does not currently exist and Accounting staff do not have procedures in place to work around this missing work flow function.
Effect:	Procedures are not in place to catch errors in transferring funds either before or after the transfer occurs, so funds could overpay certain items, as was seen with excess benefits during June 2022.

Recommendation:	The CFO should establish procedures to ensure journal entry transactions are reviewed for accuracy. These procedures should be documented. Accounting could consider emailing a screenshot of the JV window to a second Accounting staff member for approval prior to sending the transaction to Finance. The individual performing the review should compare the journal entry amount to LOB to ensure the transferred amounts are accurate.
Accounting Management Response:	We concur with the finding and will investigate the most efficient control structure to have in place regarding a second review of the journal entries in Great Plains. Once determined, we will document that process, train accounting staff, and implement. We will complete and implement by September 30, 2023.
Implementation Date:	9/30/2023
Auditor Response:	We appreciate the CFO's willingness to investigate this matter and explore and options for increasing oversight of the journal entry process in Great Plains.

7. Payments from KPPA Addressed Improperly

Condition:	Payments made outside of the custodial bank are issued in the name of the State Treasurer, Finance Cabinet, or Personnel Cabinet. If these payments made by check, they are sent in an envelope listing KPPA as the return address. Payments made by direct deposit do not contain information identifying the funds as coming from KPPA, CERS, or KRS.
Criteria:	1. Kentucky Revised Statutes 61.660(1) states, "...Payments may be made in the form of checks, which shall clearly show on the envelope or other mailing device the name and address of the Kentucky Retirement Systems, County Employees Retirement System, or direct deposit bank transfers." 2. Kentucky Revised Statutes 45.305(4) states, "...The accounting system prescribed and installed by the Finance and Administration Cabinet shall provide for the settlement of transactions between budget units…."
Cause:	Payments made outside the custodial bank are made utilizing eMARS; these payments are automatically issued by the State Treasurer and the envelopes for paper checks are automatically generated with the KPPA listed as the return address.
Effect:	KPPA is not currently in compliance with state statutes regarding identification of payments. This could lead to confusion on who made the payment and who controls the assets being used to make payments.
Recommendations:	1. The KPPA Executive management team, the KPPA CFO, and the CEOs of CERS and KRS, should work with Finance to ensure payments are properly addressed. 2. KPPA Executive Director of Legal Services should work with the legal counsels for CERS and KRS legal counsels to determine if an update is needed to Kentucky Revised Statutes 61.660 regarding the name that must be on issued payments. 3. The KPPA Executive Director of Legal Services should work with the legal counsels for CERS and KRS to determine if payments to non-budgetary units can be made without utilizing eMARS. If so, the KPPA Executive management team and the KPPA CFO should work with the CEOs and Boards of Trustees of CERS and KRS to determine if it would be beneficial for payments to non-budgetary units to be made in another manner that would more easily allow for payments to be issued in the correct name.

KPPA Executive Management Response:	1. The title to issue #7 "Payments from KPPA Addressed Improperly" is misleading since the issue was not KPPA sending materials to "improper addresses" (i.e., the wrong people). Rather, the return addresses on the envelopes were not labeled with a return address naming CERS or KRS as required. KPPA will find the appropriate solution as described below in response #2. 2. KPPA Office of Legal Services disagrees that counsel for CERS or KRS have any role in resolving this issue. KPPA Office of Legal Services also disagrees that the issue to be resolved is what name must be on the issued payment. Kentucky Revised Statutes 61.660(1) requires the name of KRS or CERS to be on the envelope, not the payment. Currently, the name on the envelope is Kentucky Public Pensions Authority. The State Treasurer currently produces and mails the checks for us. KPPA can either work with the Treasurer to program the printing of KRS or CERS on the appropriate envelopes or we can pursue a statutory change that allows for KPPA's name to be on the mailing envelope. We will explore both options. 3. KPPA Office of Legal Services disagrees that counsel for CERS or KRS have any role in resolving this issue. KPPA Office of Legal Services disagrees that this issue needs to be addressed. As mentioned in the response to #2 above, the issue to be resolved is not the name on the payment, it is the name on the envelope, per Kentucky Revised Statutes 61.660(1). That issue can be resolved in one of two ways (see response to #2 above). There is no problem with issuing the payments in the correct name.
Implementation Date:	12/31/2023
Auditor Response:	1. We appreciate your feedback on the title of the finding as we strive to ensure clear communication. Internal Audit staff believe that an incorrect return address on an envelope meets the definition of an improperly addressed item. In contrast, if there had been finding related to payments being made to the wrong person (as referenced in management's response), Internal Audit staff would likely have used "Payments Made to the Improper Vendor" as the title of the finding. 2. Management has offered a response to correcting the name listed on the envelopes. While this is being researched, we recommend legal counsels determine if payments made by direct deposit also need to be identified in some way as coming from CERS or KRS. 3. The third recommendation pertains to a review of determining whether eMARS is required to be utilized for payment to non-budgetary units. Internal Audit recommends this item be reviewed. 4. The statute referenced specifies Kentucky Retirement Systems and County Employee Retirement Systems; therefore, it seems pertinent that those Boards and their staff (CEO and/or General Counsel) be included in this review.

8. Activity in the Unfunded Liability Trust Fund is not Monitored

Condition:	The Kentucky Retirement System Unfunded Liability Trust fund is not being monitored to ensure funds are being dispersed to KPPA.
Criteria:	Kentucky Revised Statutes 61.706 states, "(1) The Kentucky Retirement Systems unfunded liability trust fund is created and shall be administered by the Finance and Administration Cabinet...(2)(a)(3) The trust fund shall consist of…Any other proceeds from grants, appropriations, or other moneys made available for the purpose of the trust fund...(3)(a) Moneys in the trust fund shall be disbursed quarterly to the Kentucky Retirement Systems...."

Cause:	Since this fund is controlled by Finance, reports on this account would have to be created by Finance staff. KPPA staff have not previously requested reports related to the Unfunded Liability Trust Fund.
Effect:	There could be funds owed to either CERS, KERS, or SPRS unknowingly sitting in the Unfunded Liability Trust Fund.
Recommendation:	Amounts held in the Unfunded Liability Trust Fund are owed to the various plans administered by KPPA; therefore, the KPPA Executive Management team should work with Finance staff to determine if a report can be provided to show the activity in the Unfunded Liability Trust Fund. If so, the KPPA Executive Management team should determine who will receive and review this report and how often this report should be received (it is recommended that the report be received at least quarterly). If this type of report is not available, KPPA Executive Management should work with Finance staff to determine how information related to the activity in the Unfunded Liability Trust Fund can be communicated to KPPA.
KPPA Executive Management Response:	KPPA Executive Management Response: Control of the Kentucky Retirement System Unfunded Liability Trust Fund rests with the State Finance Cabinet. In short, we cannot force distribution of those funds. However, KPPA Management will request a report from the Finance Cabinet regarding the balance in this fund.
Implementation Date:	12/29/2023
Auditor Response::	To clarify, the recommendation by Internal Audit did not indicate that KPPA management should attempt to "force distribution" of funds held in the Kentucky Retirement Systems Unfunded Liability Trust Fund. Internal Audit recommended that KPPA monitor the activity in this trust since any funds held in that trust are owed to the plans administered by KPPA.

9. Member Banking Information is not Protected

Condition:	Finance staff sends emails pertaining to NSF transactions to the KPPA Accounting Assistant Director, Cash Management branch. These emails contain files with member names and banking information. Accounting staff print and store the files on a bookshelf that is kept in an open space, which is accessible to anyone who has access to Building C of the KPPA Frankfort campus.
Criteria:	1. Kentucky Revised Statute 61.932 (1)(a) states, "An agency or nonaffiliated third party that maintains or otherwise possesses personal information, regardless of the form in which the personal information is maintained, shall implement, maintain, and update security procedures and practices, including taking any appropriate corrective action, to project and safeguard against security breaches." 2. The KPPA Access Control Policy, Section 5 states, "All KPPA data shall be classified in accordance with the KPPA Data Classification Policy, its access determined by the business owner, and access granted based on the Principle of Least Privilege."
Cause:	Procedures have not been established to ensure files related to NSF transactions are securely stored and accessible only to those who have a business need to access the files.
Effect:	Member banking information could be stolen and misused. Since there are no cameras in office pointed towards this particular bookshelf, it may not be possible to track down who accessed this information in the case of theft.
Recommendation:	The CFO should ensure files related to NSF transactions are stored electronically, with access limited to employees who have a business need to review the files.

Accounting Management Response:	We concur with the finding, and took immediate action as follows: the emails pertaining to NSF transactions are no longer being physically printed. They are now being saved to a secure restricted access folder. In addition, the prior emails, that were printed, are now stored in a secure office.
Implementation Date:	12/9/2022
Auditor Response:	We commend Accounting staff for taking immediate action to begin working on a resolution to this issue when it was brought to their attention in December 2022. The space in the Frankfort office that is utilized by Accounting is currently undergoing carpet replacement so all items have been removed from the area. Once everything is back in place, Internal Audit staff will confirm that hard copies of NSF files have been secured.

10. Wording in Statute is Outdated

Condition:	Kentucky Revised Statutes 61.706 references the Kentucky Retirement Systems. However, this may be a reference to the former Kentucky Retirement Systems and not the Kentucky Retirement Systems as defined by Regular Session 2020 House Bill 484.
Criteria:	Regular Session 2020 House Bill 2020 created a separate Board of Trustees for CERS and KRS. KPPA was established to serve as the administrator of the various plans.
Cause:	Since this statute is not a commonly referenced statute for KPPA staff, it was overlooked when updates referencing KPPA were made to statutes.
Effect:	It may be unclear as to which entity is to receive funds from the Unfunded Liability Trust Fund, which could lead to funds being unintentionally disbursed to the wrong plan.
Recommendation:	KPPA Executive Director of Legal Services should review Kentucky Revised Statutes 61.706 and determine if this statute should be updated to reference the Kentucky Public Pensions Authority.
Office of Legal Services Response:	Kentucky Revised Statutes 61.706 creates the Kentucky Retirement System Unfunded Liability Trust Fund. This fund is administered by the Finance and Administration Cabinet. The KPPA Office of Legal Services can make suggestions to the Finance and Administration Cabinet, but the ultimate decision on whether to propose amendments to this statute lies with the agency that administers it.
Implementation Date:	8/31/2023
Auditor Response::	Kentucky Revised Statutes 61.706 is a retirement related statute. Internal Audit recommends KPPA Office of Legal Services work with the Finance and Administration Cabinet to ensure the wording of this statute is accurate.

11. Inaccurate Amounts Reported on the Administrative Expense Spreadsheet

Condition:	The administrative expenses recorded in Great Plains are used to generate the financial statements. Administrative expenses are also recorded on a spreadsheet, which is presented to KPPA Executive management and the multiple Boards of Trustees. As of June 30, 2022, there was a difference of $2,940 in the total administrative expenses reported in Great Plains and reported on the Administrative Expense spreadsheet. After inquiry by Internal Audit staff on August 22, 2022, the Administrative Expense spreadsheet was updated to reflect changes to four of the line items. While the overall total for administrative expenses then matched between Great Plains and the Administrative Expense spreadsheet, there were still variances in seven individual line items:

	1. Account 111 - Salaries 2. Account 141A - Legal Hearing Officers 3. Account 141L - Legal Expense 4. Account 146 - Consulting Services-Actuary 5. Account 146A - Medical Reviewers 6. Account 381 - Dues and Subscriptions 7. Account 381I - Dues and Subscriptions-Investments While the variances may not be material to the financial statements, materiality is not a consideration when reviewing internal controls because without proper controls, a material variance could occur.
Criteria:	200 KAR 38:070 §2 states, "(2) Each fiscal officer shall develop and document internal controls to both prevent and detect abuse, unintentional errors, and the fraudulent disbursement of funds or use of state assets...(3) An internal control plan shall include...(c) Procedure that provides for the internal review of all transactions processed by the agency...The internal review shall include, but is not limited to, the following: (4) Review of transactions for appropriate accounting codes and accuracy...."
Cause:	1. The individual who reconciles the Administrative Expense spreadsheet to Great Plains is the same individual who enters the transactions into the Administrative Expenses spreadsheet. This individual can also enter transactions into eMARS. 2. The procedures to reconcile the Administrative Expense spreadsheet are not documented. 3. The Administrative Expense spreadsheet contains information for several fiscal years. The formulas in the Administrative Expense spreadsheet that are used to match to the amounts in Great Plains were not updated properly when additional information was added. As a result, the variances in these accounts were not caught by Accounting staff.
Effect:	The Boards of Trustees may not be provided with an accurate reflection of administrative expenses incurred for the year.
Recommendations:	1. An individual who is independent of the administrative expense process should review the reconciliation of the Administrative Expense spreadsheet to Great Plains and verify that the reconciliation is complete and accurate. This review should be documented. 2. The procedures to perform the reconciliation of the Administrative Expense spreadsheet should be documented. 3. The Administrative Expense spreadsheet should only contain information relevant to the current fiscal year. This would reduce the chances of the Administrative Expense spreadsheet becoming corrupt, which would cause data loss. It would also make it easier to ensure formulas are properly updated. a. Accounting staff should remove information related to prior fiscal years. Currently the spreadsheet contains information back to fiscal year since 2016, even though this information is retained elsewhere. b. Accounting staff should remove tabs that are no longer used.
Accounting Management Response:	We concur with the finding and have implemented a second review of the Administrative Expense Spreadsheet. In addition, we will review and enhance current controls where appropriate regarding the reconciliation of the Administrative Expense Spreadsheet to Great Plains. This will include the documentation of independent review of the reconciliation, presumably by the CFO, updated documentation of the procedures, and the determination of

	maintaining prior year data within the spreadsheet. This will be fully implemented by September 30, 2023.
Implementation Date:	9/30/2023
Auditor Response:	We appreciate the CFO's willingness to increase controls related to the review and reconciliation of the Administrative Review spreadsheet as well as staff's willingness to consider if the data maintained in the spreadsheet can be reduced.

12. Meeting minutes not uploaded timely – *Recurring Issue*

Condition:	The following meeting minutes were not posted to the KPPA website within 72 hours of the meeting minutes being approved: 1. CERS Finance Committee - February 24, 2022 2. KPPA - March 24, 2022 3. KERS Board of Trustees - April 12, 2022 4. CERS Board of Trustees - April 20, 2022 5. KPPA - April 28, 2022 6. CERS Finance Committee - June 2, 2022 7. KERS Board of Trustees - June 6, 2022 8. CERS Board of Trustees - June 14, 202 9. KPPA - June 16, 2022 10. CERS Board of Trustees - June 27, 2022
Criteria:	Kentucky Revised Statute 61.645 §19 states, "In order to improve public transparency regarding the administration of the systems, the board of trustees shall adopt a best practices model by posting the following information to the Kentucky Public Pensions Authority's Web site and shall make available to the public...(d) All board minutes or other materials that require adoption or ratification by the board of trustees. The items listed in this paragraph shall be posted within seventy-two (72) hours of adoption or ratification of the board...."
Cause:	1. The KPPA By-laws have not established a backup to sign minutes in the event the Chair is unavailable. 2. The KPPA Executive Staff Assistant was adjusting to her new role and the increased volume of meeting minutes. 3. There were times when the 72-hour deadline fell on a weekend or other non-business day.
Effect:	Meeting minutes are not available to the public by the date required in statute.
Recommendations:	1. The KPPA Executive Director should work with the CEOs of CERS and KRS as well as the KPPA Chair to determine if the CERS, KRS, and KPPA bylaws should be updated to include a process for allowing the Vice Chair to sign the meeting minutes in the event the Board Chair is unavailable. 2. The KPPA Executive Director should work with the Executive Staff Assistant to ensure all approved meeting minutes have been posted to the KPPA website. Note: There is currently proposed legislation to change the 72-hour rule to three business days, which should provide additional time to ensure the minutes are posted timely.
KPPA Executive Management Response:	We concur with the finding, as the onset of COVID required the Board and Committee meetings be conducted by video conferencing, reducing the availability of the Board Chair to immediately sign the approved meeting minutes. Further due to technology constraints, some Committee Chairs requested receipt of the approved meeting minutes by US Mail,

	causing further delay in timely posting to the website. The proposed change in legislation will provide additional time to post the meeting minutes. However, it may not provide enough time for those Committee and/or Board Chairs who wish to have the minutes sent by US Mail for signature. To accommodate their request, while meeting the 72-hour or, if approved, 3 business day deadline for posting the minutes to the website, steps have immediately been enacted to post an unsigned version of the approved minutes, until such time the minutes can be properly signed by all parties. The unsigned minutes will then be replaced with the signed minutes on the website. This has been immediately implemented as of February 7, 2023.
Implementation Date:	2/7/2023
Auditor Response:	Internal Audit agrees with the proposal to post unsigned minutes to the website until a signed copy is available. Internal Audit staff reviewed the KPPA website on February 15, 2023, and confrmed that all approved minutes have been posted to the KPPA website.

Appendix A: Segregation vs Unitization

Internal Audit staff started with ensuring the KPPA account structure at BNY Mellon was clear before testing any transactions because this understanding was the groundwork for determining what should be happening in the Chase accounts.

Definition of terms used:

A **unitized fund** is a type of investment fund structure that uses pooled money to invest with individually reported unit values for investors. Assets in the pool are managed to a specific objective, often with concentration in one stock. Investors are provided with a daily unitized value for their portion of the investment. Unitized funds are often used in employee benefit plans such as pensions. (Chen, 2022 June 22, Unitized Fund (investopedia.com))

Pooled funds are funds in a portfolio from many individual investors that are aggregated for the purposes of investment. Mutual funds, hedge funds, pension funds and ***unit*** investment trusts are all examples of professionally managed pooled funds. (Chen, 2022 March 26, Pooled Funds: Definition, Examples, Pros & Cons (Investopedia.com))

The accounts at BNY Mellon that pay out capital calls and receive dividends have been referred to as the pension and insurance cash accounts by KPPA staff. However, BNY Mellon representatives refer to these accounts as master trust accounts.

A **master trust** in an investment vehicle that collectively manages pooled investments. It can refer to the main fund where assets are pooled and collectively managed in a ***master-feeder structure***, also called a hub and spoke structure. Employers can use a master trust structure for pooling investments in an employee benefit plan. (Chen, 2022 April 25, Master Trust (Investopedia.com)).

A **master-feeder structure** is a device commonly used by hedge funds to pool taxable and tax-exempt capital raised from investors in the United States and overseas into a master fund. Separate investment vehicles, otherwise known as feeders, are established for each group of investors. Investors put capital into their respective ***feeder funds***, which ultimately invest assets into a ***centralized vehicle*** known as the master fund. The master fund is responsible for making all portfolio investments and conducting all trading activity. Management and performance fees are paid at the feeder-fund level. (Hayes, 2022 March 30, Master-Feeder Structure: Definition, How It Works, Pros & Cons (Investopedia.com))

A **feeder fund** is one of several sub-funds that put all of their investment capital into an overarching umbrella fund, known as a master fund, for which a single investment advisor handles all portfolio investments and trading. This two-tiered investment structure of a feeder fund and a master fund is commonly used by hedge funds as a means of assembling a larger portfolio account by pooling investment capital. ***Profits from the master fund are then split, or distributed, proportionately to the feeder funds based on the percentage of investment capital they have contributed to the master fund***. (Chen, 2020 March 26, Bank Fees: Everything to Know About How Banks Make Money (Investopedia.com))

In contrast to the fund structure described on the previous page, BNY Mellon representatives confirmed that the segregated structure is the account structure used by KPPA at BNY Mellon

Segregation refers to the separation of assets from a larger group or creating accounts for specific group, assets or individuals. Investors can expect to pay a slightly higher total expense ratio on segregated funds due to their more complex structure. Additionally, these fund offerings typically do not have aggressive fund objectives. Therefore, returns from the funds tend to be more modest. (Chen, 2022 April 8, Segregated Fund: Definition, How it Works, Examples (Investopedia.com)).

Commingled fund is a portfolio contesting of assets from several accounts that are blended together. Commingled funds exist to reduce the cost of managing the constituent accounts separately. Commingled funds are a type of ***pooled fund*** that is not publicly listed or available to individual retail investors. Instead, these are used in closed retirement plans, pension funds, insurance policies, and other institutional accounts. (Hayes, 2022 April 24, Commingled Fund: Definition, Purpose, How They Work, and Example (Investopedia.com))

By definition, KPPA's pension and insurance master trust accounts are commingled because these are pooled funds. Units owed by each plan are accounted for using unitized accounting.

Please refer to Figure 1 below for a simplified version of Unitized and Segregated account structure.

Internal Audit staff asked BNY Mellon representatives which of the cash flow models in Figure 1 best represents what is happening at the plan level (KERS, KHAZ, CERS, CHAZ, SPRS) for outgoing or incoming wires at the custodial bank. BNY Mellon representatives confirmed, in an email, that the segregated model is the current structure for these accounts because this is how the accounts were originally set up when the contract was enacted. However, BNY Mellon representatives stated in the email conversation that the unitization model can be accomplished by changing the template used by KPPA Accounting. A change to the unitization method would pull cash from the master trust unit cash accounts instead of the segregated plan cash accounts. BNY Mellon Cash Management and Accounting teams would then record units owned by each system in an accounting transaction (i.e., on paper) and not an actual movement of cash. It is recommended that the CIO discuss this option with BNY Mellon representatives (refer to finding #1 in the report). A switch to the unitization method would reduce the number of times cash is touched. Each interaction is an opportunity for error and/or fraud. As this process stands, there are twelve separate interactions for each incoming wire transaction.

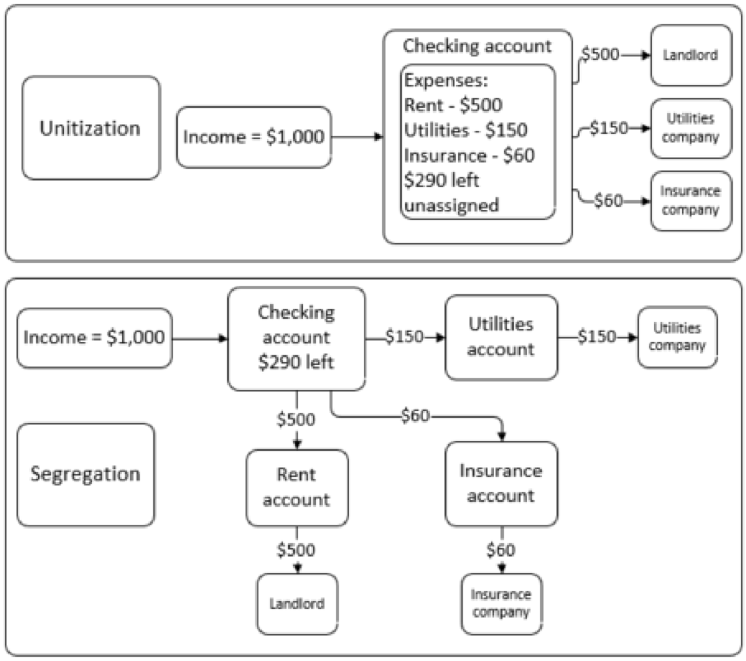
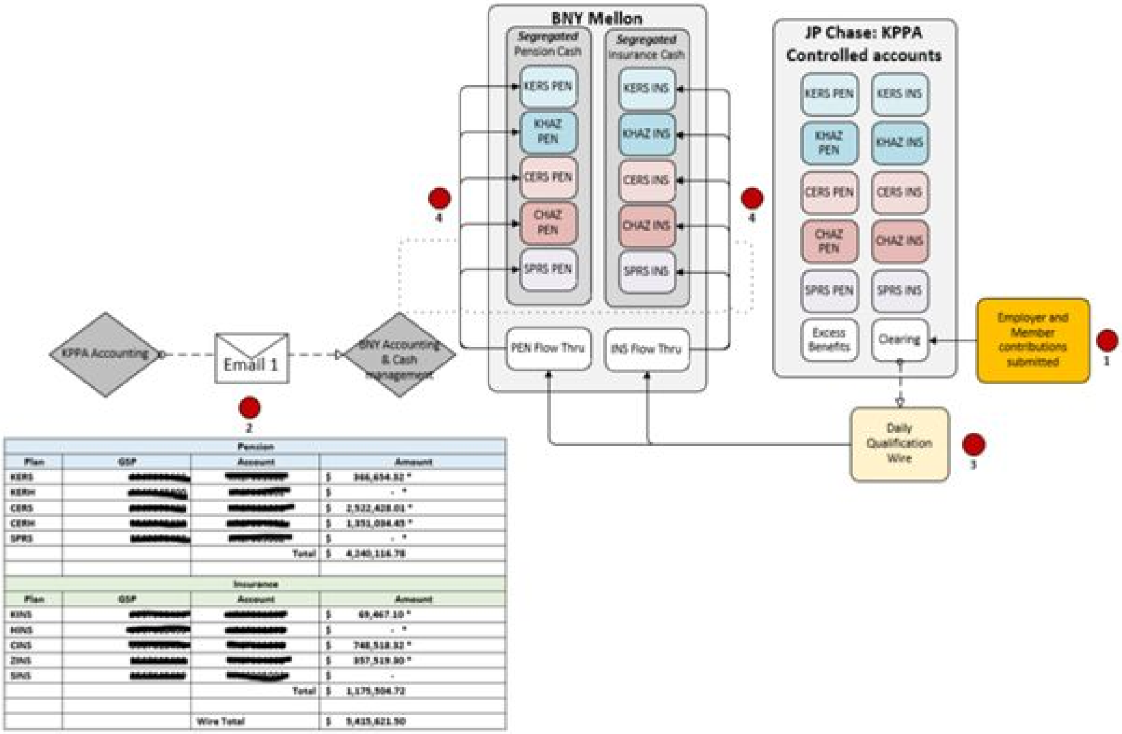


Figure 1: Simple example given to BNY and Chase representatives to confirm KPPA account structure.

For every transaction that moves from BNY Mellon to Chase or vice versa, the BNY Mellon Accounting team must manually move money from the pension or insurance master trust accounts to the five segregated cash accounts for each system. The daily qualification wire process is included as an example. See the cashflow map in Figure 2 for a visual of the cashflow and wire counts. The red dots represent the order of events, the dotted lines represent a process, and the solid lines represent movement of cash. Without counting the incoming wires or check submissions from employers, it takes two wires and ten transfers to complete the process. The daily qualification process is included in the cash flow diagrams to show that everything flowing through the Chase accounts is funded by member and employer contributions and to show the volume of wires and transfers used to complete each process associated with these contributions.



Pension			
Plan	GSP	Account	Amount
KERS	[redacted]	[redacted]	$ 366,654.32 *
KERH	[redacted]	[redacted]	$ - *
CERS	[redacted]	[redacted]	$ 2,522,428.01 *
CERH	[redacted]	[redacted]	$ 1,351,034.45 *
SPRS	[redacted]	[redacted]	$ - *
		Total	$ 4,240,116.78
Insurance			
Plan	GSP	Account	Amount
KINS	[redacted]	[redacted]	$ 69,467.10 *
HINS	[redacted]	[redacted]	$ - *
CINS	[redacted]	[redacted]	$ 748,518.32 *
ZINS	[redacted]	[redacted]	$ 357,519.30 *
SINS	[redacted]	[redacted]	$ -
		Total	$ 1,175,504.72
		Wire Total	$ 5,415,621.50

Figure 2: Daily qualification wire cash flow

For testing purposes in this audit, Internal Audit staff verified that transactions flowing in and out of the pension and insurance master trust accounts to the Chase plan accounts happened as directed in emails from KPPA Accounting to BNY Accounting and Cash Management teams. This enabled the Internal Audit staff to conclude that the BNY Mellon Accounting team moved the correct amount from the master trust pension and insurance accounts to the plan level segregated cash accounts and that KPPA Accounting staff correctly moved money out of or into the corresponding accounts at Chase.

Internal Audit staff spoke to Chase representatives about Chase's capability to unitize our accounts using the same graphic provided in Figure 2. Greg Mullins, Vice President of the Government Banking branch at J.P Morgan Chase stated:

> I've researched the question around the Bank's ability to unitize accounts and learned that this is a service that the Commercial Bank is unable to support. As a point of reference, the Commercial Bank provides the banking services for KPPA under the General Banking Master Agreement managed through the Commonwealth of Kentucky's Office of Financial Management. Unitized accounting is currently offered as part of our custodial banking capabilities (within J.P. Morgan's Corporate & Investment Bank). In case you are interested, we can schedule a discussion with representatives from this area to further discuss the opportunity and potential solutions.

Appendix B: Process Descriptions and Testing Methodologies

This appendix will review the various types of transactions that flow through the non-custodial accounts. For each transaction type a description of the process will be provided as well as summary of how the transactions were tested during the audit. Internal Audit staff noted various processes that are being recommended for a future audit.

The process(es) that BNY Mellon Accounting and Cash Management teams take to move funds across various accounts at BNY Mellon will be reviewed in depth during Phase 3 of the Plan Liquidity Audit (this audit is currently in process).

1: Recurring and Supplemental Payrolls (retiree benefits)

There are two types of retiree payrolls that run each month: recurring and supplemental.

Both payrolls are submitted to Finance and the State Treasurer through a check writer file uploaded to the state accounting system, eMARS. This file is sent to Chase from Finance. The process that creates this file is recommended for a future audit.

Recurring payrolls

- Covers new retirees and ongoing retiree payments. It usually runs the first week of the month payroll has a schedule, but it must run earlier than the 14th of the month in order to generate checks to be mailed on the 14th and EFT files to be sent to financial institutions prior to the 14th of every month. Checks in this payroll can be a direct deposit (EFT) to a member's account or a paper check mailed to the address on file.

Supplemental payrolls

- Covers various scenarios such as member account refund, recalculated checks, and survivor benefit payments. This payroll runs every two weeks. Payments in this payroll are only paper checks mailed to the address on file.

Occasionally, insurance checks are processed through Supplemental payroll only. These are reimbursements to members who over paid health insurance premiums.

Excess benefits are also written in these payroll files. These checks are for members with benefits exceeding the Internal Revenue Code Section 415 limit. Whatever is needed each month to cover excess benefits is moved from the five pension plan accounts at Chase to the singular Excess Benefit account at Chase through a journal voucher (JV) transfer in eMARS. The transfer amount needed is entered into KPPA's accounting systems Great Plains (GP) which creates a JV document that is uploaded to eMARS. Finance staff send the digital document to Chase. Staff at Chase then move the money according to the instructions in the digital document.

After the payroll has been balanced by KPPA's Retiree Payroll and Accounting divisions, a Graduate Accountant prepares the wires in Nexen (BNY Mellon) to move the funds from the plan accounts at BNY Mellon to the individual bank accounts at JP Morgan Chase. An email is provided from KPPA Accounting to KPPA Investment OPS and BNY Mellon cash team to notify them of the outgoing wire. The notification of the upcoming wire prompts the BNY Mellon Cash Management team to initiate a transfer to move cash from the Pension Master Trust account to the plan accounts *(figure 1).*

The hazardous accounts, KHAZ and CHAZ, are set up at Chase so that neither checks nor direct deposits can be withdrawn from these accounts. KERS and CERS pension cash accounts at Chase do not have to be reimbursed for the KHAZ and CHAZ benefits paid from these accounts because the amounts KHAZ and CHAZ are obligated to pay are transferred from the proper hazardous pension plan account at BNY Mellon.

The EFT portion of recurring payrolls leaves the Chase accounts on the same day the wires are received from BNY Mellon. Paper checks are added to the outstanding check balance to recognize the expense and are taken under consideration when reviewing the accounts during the monthly reconciliation process. Paper checks must be cashed within one year of being written, otherwise the check will be voided and placed in a status called ESCHEAT which is a process handled by Finance and will also be discussed later.

There are potentially 15 wires and transfers needed to complete the supplemental/recurring payroll process:

- Five transfers from BNY Mellon pension master trust account to plan accounts at BNY Mellon.
- Five wires from the plan accounts to a corresponding Chase account.
- Five transfers from pension accounts at Chase to the Excess Benefits account, if needed.

When the total wires/transfers from the daily qualification process are included (12) it potentially takes 27 wires and/or transfers to fund these payments (Daily qualification wire count from Appendix A).

Testing Methodology

Internal Audit staff took the following steps for all 12 recurring and 27 supplement payrolls that occurred in fiscal year 2022:

1. Verified the total amount needed for payroll by reviewing the Recurring and Supplemental payroll Register reports in LOB.
    a. Confirmed the amount on the LOB reports agreed to the email from KPPA Accounting to BNY Mellon.
    b. Ensured proper amount was transferred from BNY Mellon to Chase.
    c. Confirmed KERS and KHAZ totals were deposited correctly in the Chase KERS pension account. Confirmed that the accurate total for ETF payments left the Chase account by finding the matching transaction in eMARS.
    d. Confirmed CERS and CHAZ totals were deposited correctly in the Chase CERS pension account. Confirmed that the accurate total for ETF payments left the Chase account by finding the matching transaction in eMARS.
    e. Confirmed SPRS total was deposited correctly in the Chase SPRS pension account. Confirmed that the accurate total for ETF payments left The Chase account by finding the matching transaction in eMARS.
2. For payrolls that included excess benefits, the following steps were completed:
    a. Confirmed that the system funding the excess benefits had a withdrawal matching the Payroll Register report from LOB.
    b. Found the corresponding deposit in the Excess Benefit account. Confirmed that the accurate total for ETF payments left the Chase account by finding the matching transaction in eMARS.

c. Verified all checks written for these benefits were cashed during the fiscal year.
   i. Matched the total for each check recorded on the pay register to the checks cashed.
   ii. Verified all checks were accounted for by looking for a break in the check number sequence.

Accounting Staff,

Please prepare instructions in Workbench (profiles noted below) to BNY Mellon, instructing them to wire **$184,414,267.54** from the **Pension Accounts**, **July 14, 2021**, to Chase Bank per the following breakdown:

Instruction to BNY Mellon		
Pension - Recurring/Supplemental		
Account Number	**Amount**	**Profile ID**
KERS - [redacted]	$ 81,719,270.85	**KR2 WIRE OUT TO CHASE KERS***
KERH - [redacted]	$ 6,033,579.69	**KR2 WIRE OUT FROM KHAZ TO KERS***
CERS - [redacted]	$ 67,229,258.41	**KR2 WIRE OUT TO CHASE CERS***
CERH - [redacted]	$ 24,219,524.95	**KR2 WIRE OUT FROM CHAZ TO CERS***
SPRS - [redacted]	$ 5,212,633.64	**KR2 WIRE OUT TO CHASE SPRS***
Total	$ 184,414,267.54	

Figure 1: Email from KPPA accounting to BNY Cash Management and Accounting. This is email 1 in the cash flow graphic shown in figure 2.

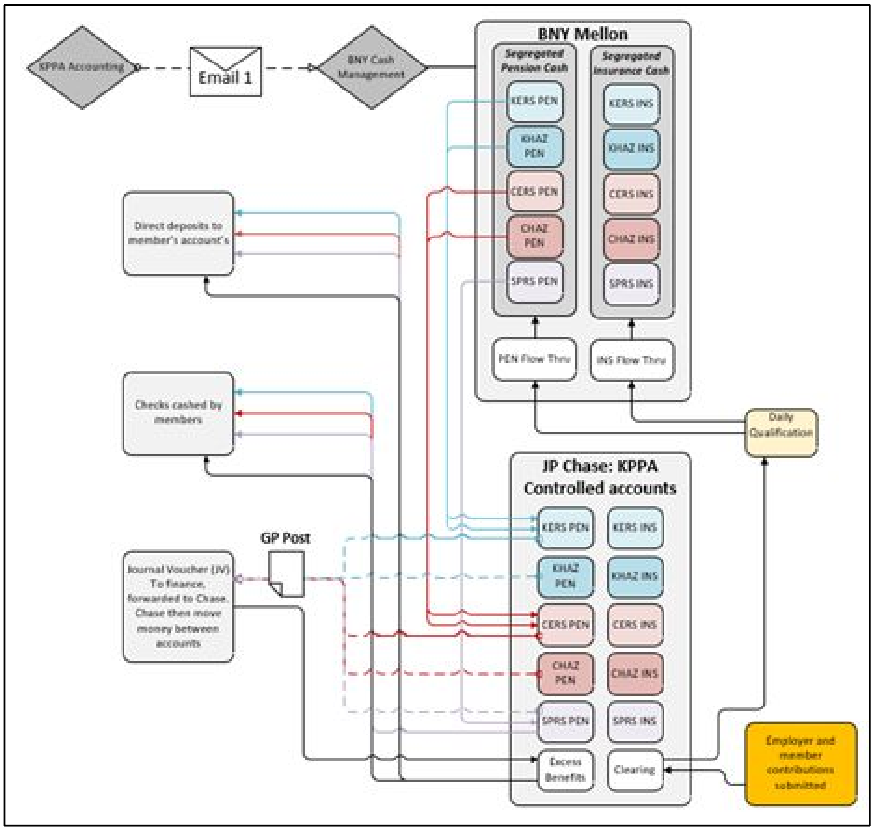


Figure 2: Retiree payroll cash flow

2: Cancelled checks, ESCHEATS, and accompanying re-issuances

Benefits issued in the retiree payroll process can be cancelled for various reasons such as, but not limited to, checks lost in the mail, death of retiree or beneficiary, incorrect banking information, re-calculation of benefits, and checks not cashed within one year of issuance (ESCHEAT). The processes involved in correcting these issues have been recommended for future audits.

Finance writes off checks that go into ESCHEAT status through an accounting entry that decreases the outstanding check balance used in the monthly reconciliation process and increases the balance of KPPA's five ESCHEAT accounts.

Cancelled and ESHCEAT checks are still due to the member and can be called upon at any time. Even if a member has passed, they are still due all benefits written prior to the confirmed date of death per KRS 61.630. Re-issuance of a check is trigged by a proper member or beneficiary request. This request is sent to the State Treasurer where it will be re-written from the Finance controlled General Account (GA) as a GA check number. These items can be identified on the report from the Finance cabinet and are accounted for during reconciliations by reducing the outstanding check balance. The Finance report shows these transactions in the "re-issued check" section of their report with the original check number and the GA number. The amount needed to fund the re-issued check is transferred to the Finance account from the appropriate KERS, CERS or SPRS pension cash accounts at Chase, whichever account issued the original check.

Testing Methodology

For fiscal year 2022, a total of 43,652 paper checks were written or cashed from all Chase Accounts. For each paper check written, Internal Audit staff took the following steps:

1. Compared the check number and paid amount in Chase to the Check Register Report from LOB.
    a. Reviewed the accompanying check picture and corrected check numbers in the testing spreadsheet for check numbers that were shown incorrectly in Chase.
    b. Confirmed that Chase made a correcting transaction for checks that were cashed twice or cashed for the wrong amount.
2. Reviewed eMARS to obtain the status of each outstanding check.
    a. If the check was marked as Cancelled or ESCHEAT and then re-issued with a GA check number, Internal Audit staff located the matching withdrawal in the corresponding Chase account to verify that the correct amount was withdrawn.
    b. If the check was marked as ESCHEAT and not re-issued, this was noted in the testing worksheet.
    c. If the check was less than a year old and still in "distributed" status, then this was marked as an outstanding check on the testing worksheet.

3: NSF from members

Member invoices are created for various reasons, such as, but not limited to members purchasing months of service, members paying health insurance premiums and member reimbursements due to KPPA for overpayments. Some invoices can be paid with paper checks from members, some withdrawals are automatically initiated by LOB, and others are paid by rolling over pre-tax dollars from another retirement account like an IRA or deferred compensation. The processes involving these invoices are recommended for future audits.

When an invoice is created for an amount that was overpaid to a member, Chase automatically credits the account that originally made the overpayment. If the invoice is unable to be paid due to insufficient funds in the member's account, the amount is supposed to be withdrawn from the cash account that received the credit. However, during testing it was determined that these withdrawals are all made from KERS pension account, rather than from the account that received the original credit (see finding: KERS Funds Spent to Cover Expenses of Other Plans).

Finance staff generate a report from Chase showing all NSFs and upload this file to eMARS to generate the document code used to track these transactions in eMARS. The same staff member at Finance then sends this file, via an encrypted email, to the KPPA Accounting Assistant Director, Cash Management Branch. At the time of the audit, the email and attached documents were printed in the KPPA Frankfort office and stored on a bookshelf in the open space occupied by Accounting staff. This process was changed effective 12/13/2022 (see finding: Member Banking Information is not Protected).

Testing Methodology

Internal Audit staff took the following steps to test the NSF items:

1. Sorted through printed emails to determine population size of NFS transactions that occurred during fiscal year 2022.

2. Created a database including member, amount, system credited when invoice was created, and system charged to cover the NSF.
3. Obtained back-up documentation not found in the printed files at the KPPA Frankfort office.
4. Ensured each person on the NSF report was a KPPA member or beneficiary, that there was an invoice recorded in LOB for the amount withdrawn, and that the member participated in the system covering the NSF.

4: KPPA Administrative Expenses

The KPPA Accounting division calculates the total administrative budget at the beginning of each fiscal year. During the scope of the audit, that total was divided by 24 in order to determine the amount to be wired from the BNY Mellon master trust pension account twice a month.

KPPA Accounting staff prepare and email a breakdown of the needed amount to BNY Mellon Cash Management and Accounting teams. KPPA Accounting staff request that plan specific amounts be moved from the master trust pension account to the segregated pension accounts (figure 3). KPPA Accounting then initiates a wire from the segregated cash accounts at BNY Mellon to the corresponding Chase accounts (figure 3). Finally, the money is transferred from the Chase accounts to the state General Fund. All administrative expenses are paid from the General Fund. A reconciliation of the General Fund is being conducted in a current audit.

In order to move money from BNY Mellon to the General Fund, there are 15 wires and transfers:

- Five transfers from BNY Mellon pension master trust account to plan accounts at BNY Mellon.
- Five wires from the BNY Mellon plan accounts to corresponding Chase accounts.
- Five transfers from Chase to the General Fund.

When the total wires/transfers from the daily qualification process are included (12), it takes 27 wires/transfers to fund these payments (Daily qualification wire count from Appendix A).

<u>Testing Methodology</u>

Internal Audit staff took the following steps for all 24 administrative transfers that occurred during fiscal year 2022:

1. Confirmed that the proper amount was transferred from the master trust pension account.
2. Confirmed that plan specific amounts were correctly deposited into and withdrawn from the proper Chase accounts.
3. Confirmed that the proper amount was transferred to the General Fund.
4. Recalculated the amount spent on KPPA administrative expenses during the fiscal year to confirm that any excess funds transferred from BNY Mellon were properly returned to BNY Mellon.
5. Compared the KPPA Administrative Expense spreadsheet to Great Plains to ensure that each expense was coded properly.

Accounting Staff,

Please prepare instructions in Workbench (profiles noted below) to BNY Mellon, instructing them to wire $2,000,230.00 from the **Pension Accounts, August 3, 2021** to Chase Bank per the following breakdown (**code as Administration Fees – 425**) :

Instruction to BNY Mellon		
Pension		
Account Number	Amount	Profile ID
KERS - [redacted]	$ 624,799.70*	KR2 WIRE OUT TO CHASE KERS
KERH - [redacted]	$ 66,812.80*	KR2 WIRE OUT TO CHASE KHAZ
CERS - [redacted]	$ 1,190,231.50*	KR2 WIRE OUT TO CHASE CERS
CERH - [redacted]	$ 104,863.40*	KR2 WIRE OUT TO CHASE CERH
SPRS - [redacted]	$ 13,522.60*	KR2 WIRE OUT TO CHASE SPRS
Total	$ 2,000,230.00	

Figure 3: Email from KPPA accounting to BNY Cash management and accounting for Admin expenses

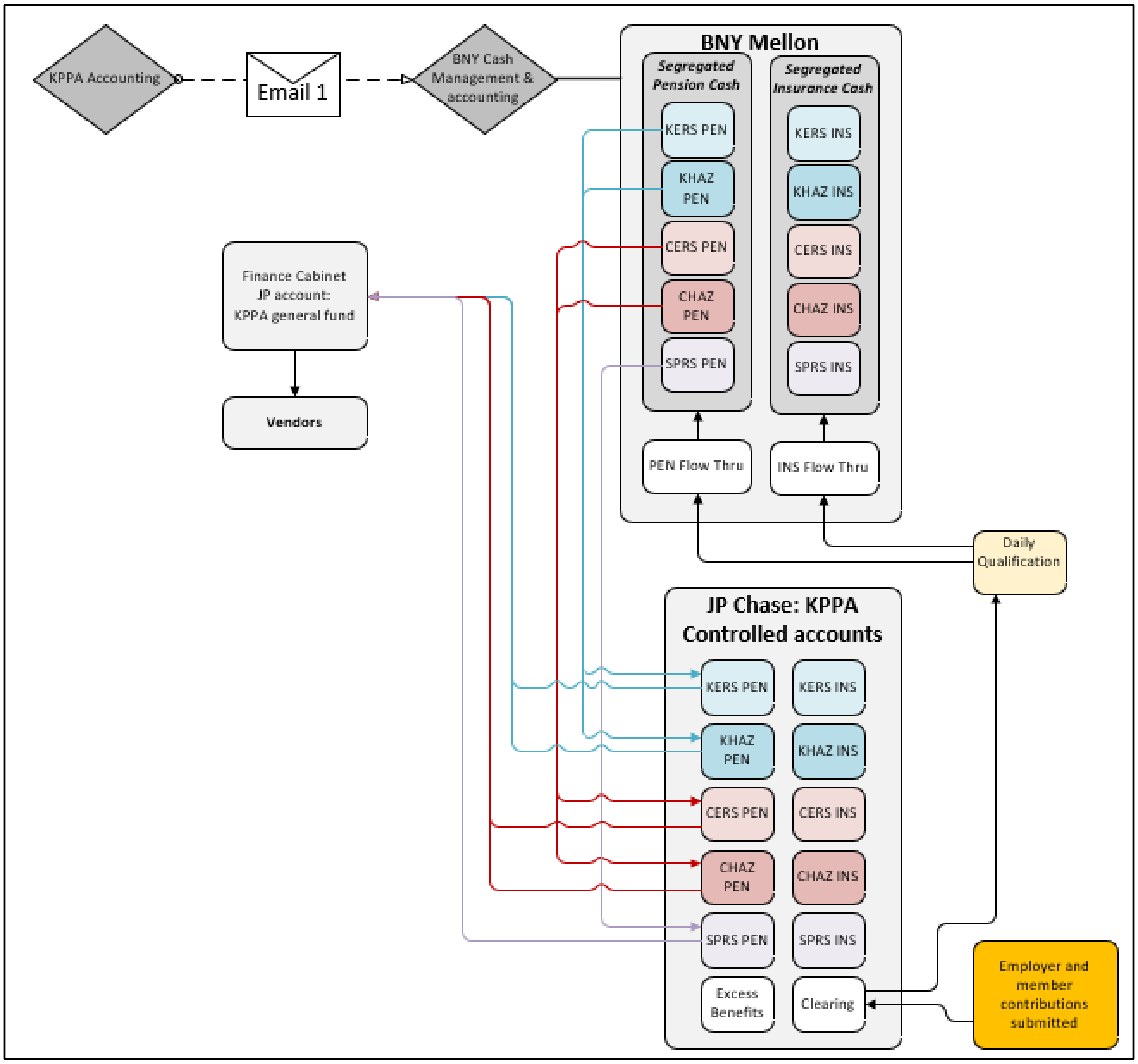


Figure 4: KPPA admin fee cash flow

5: Department of Employee Insurance (DEI) premiums and associated administrative fees

Once a month retiree insurance premiums and admin fees incurred by DEI are paid. These payments are for members who are under 65 and are not eligible for Medicare benefits. Payments for admin fees only come from the Insurance account, but the premium payments come from both the Insurance and Pension accounts at BNY (figure 8).

1. Accounting staff prepare three emails to BNY cash management and accounting groups to ask that plan specific amounts be moved from the master trust Pension and Insurance accounts to the segregated pension accounts (figures 5-7).
2. BNY cash management and accounting move money from the master trust Pension and Insurance accounts to the segregated plan accounts.
3. KPPA accounting wires the system specific amounts from the segregated plan accounts to the corresponding cash account at Chase.
4. The money is transferred from the Chase accounts directly to DEI.

To pay these benefits there are a total of 40 wires and transfers:

- 5 transfers from BNY Pension master trust account to plan accounts at BNY
- 10 transfers from BNY Insurance master trust account to plan accounts at BNY.
- 15 wires from the BNY plan accounts to Chase plan accounts.
- 10 transfers from Pension and Insurance accounts at Chase to DEI.

Adding the daily qualification process wire and transfer count (12) to ultimately fund these payments makes 52 wires and transfers (Daily qualification wire count from Appendix A).

<u>**Testing Methodology**</u>

Internal Audit staff took the following steps:

1. Confirmed that the total needed left the master trust pension account according to the email from KPPA Accounting.
2. Confirmed that plan specific amounts were deposited and withdrawn correctly from Chase accounts.
3. Confirmed that the totals arrived in the state's General Fund and that the overall total left correctly.

Accounting Staff,

Please prepare a letter of direction today to BNY Mellon, instructing them to wire **$203,664.56** from the **Insurance Account** **July 15, 2021**, to Chase Bank for Admin Fees per the following breakdown:

Instruction to BNY Mellon		
Insurance		
Account Number	Amount	Profile ID
KINS - [redacted]	$ 68,376.00	KRS KERS INS*
HINS [redacted]	$ 10,184.00	KRS KHAZ INS*
CINS [redacted]	$ 77,808.56	KRS CERS INS*
ZINS [redacted]	$ 41,799.64	KRS CHAZ INS*
SINS [redacted]	$ 5,496.36	KRS SPRS INS*
Total	$ 203,664.56	Note: Use total on Profile, BNY Mellon will breakdown per email

Figure 5: Admin fees paid only from Insurance.

Accounting Staff,

Please prepare instructions in Workbench (profiles noted below) to BNY Mellon, instructing them to wire **$19,390,126.83** from the **Insurance Accounts,** **July 15, 2021**, to Chase Bank per the following breakdown:

Instruction to BNY Mellon		
Insurance		
Account Number	Amount	Profile ID
KINS - [redacted]	$ 5,156,830.53	KRS KERS INS *
HINS - [redacted]	$ 1,287,904.58	KRS KHAZ INS*
CINS - [redacted]	$ 5,613,025.73	KRS CERS INS*
ZINS - [redacted]	$ 6,455,922.23	KRS CHAZ INS*
SINS - [redacted]	$ 876,443.76	KRS SPRS INS*
Total	$ 19,390,126.83	Note: Use total on Profile, BNY Mellon will breakdown per email

Figure 6: Insurance portion of premium payments.

Accounting Staff,

Please prepare instructions in Workbench (profiles noted below) to BNY Mellon, instructing them to wire **$4,096,958.76** from the **Pension Accounts, July 15, 2021**, to Chase Bank per the following breakdown:

Instruction to BNY Mellon		
	Pension	
Account Number	Amount	Profile ID
KERS - [redacted]	$ 1,679,479.19	KR2 WIRE OUT TO CHASE KERS*
KERH [redacted]	$ 105,540.00	KR2 WIRE OUT TO CHASE KHAZ*
CERS - [redacted]	$ 2,009,806.74	KR2 WIRE OUT TO CHASE CERS*
CERH [redacted]	$ 277,425.51	KR2 WIRE OUT TO CHASE CERH*
SPRS [redacted]	$ 24,707.32	KR2 WIRE OUT TO CHASE SPRS*
Total	$ 4,096,958.76	

Figure 7: Pension portion of premium payments.

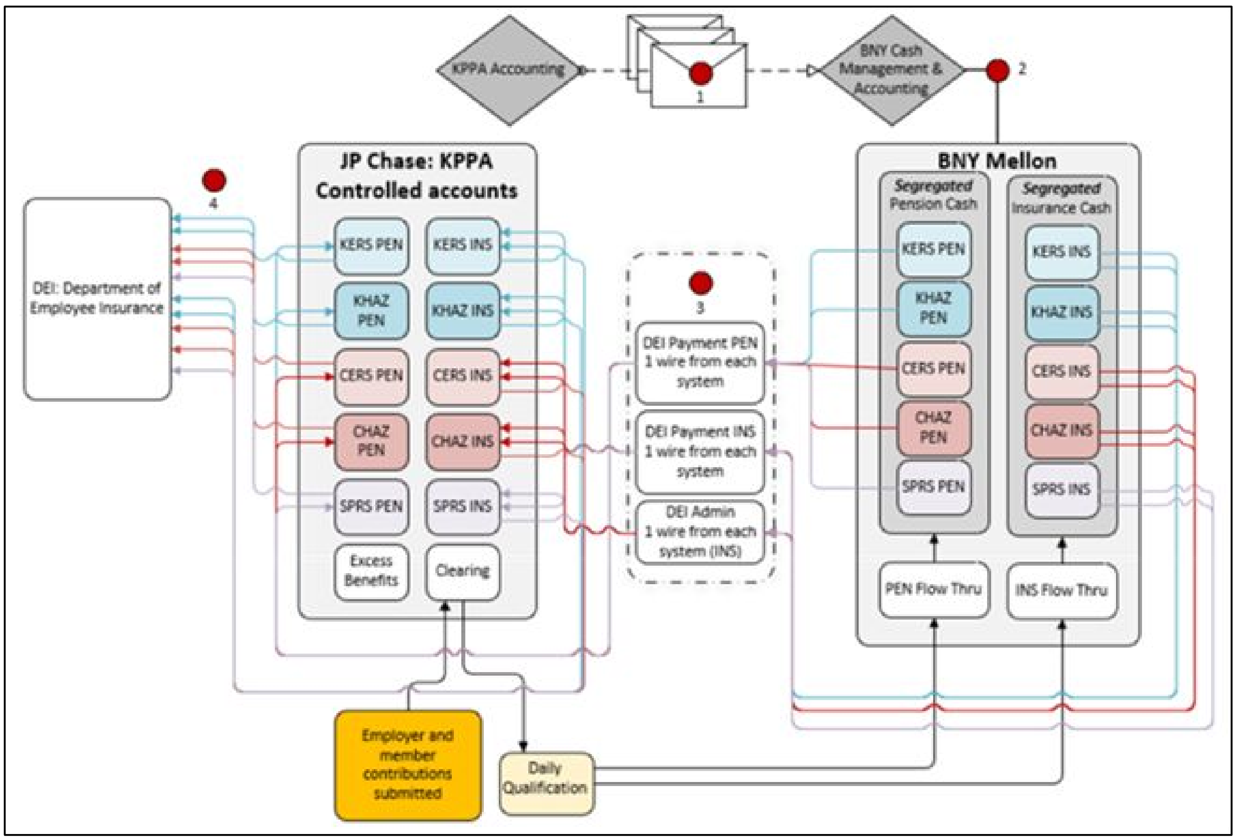


Figure 8: DEI Payment and Admin fee cash flow

6: Monthly Reconciliation procedures

Procedures for the monthly reconciliation compare activity at Chase against activity logged in GP. These two balances may differ because an expenses or deposit may be recorded in one system, but not yet logged in the other system. Figure 9 below shows the KERS pension reconciliation worksheet as an example.

1. The “pre-recon” balance is manually keyed in by the user (KPPA Accounting staff) from the GP balance as of the final day of the month.
2. Items in Chase that have not been recorded in GP are logged in the top section of the worksheet. The sum of deposits and expenses are populated in the corresponding cells of the rows labeled “2” below.
3. Items in GP that have not yet occurred in Chase are logged in the expense or deposit cells as a lump sum. There are no formulas in these cells.
4. The outstanding check total is calculated on the “Outstanding checks” tab in the reconciliation workbook (see figure 10). The outstanding check total is logged into GP to help reconcile GP to Chase.
    a. The total monthly retiree benefits written (ETFs and checks) are manually keyed into the reconciliation worksheet. The sum is show in the bottom section of the tab in the corresponding row labeled “I.”
    b. The total amount of checks cleared each day is manually keyed into a separate worksheet and then copied and pasted into this worksheet. The sum is show in the bottom section of this tab in the corresponding row labeled “II.”
    c. Monthly adjustments in this section are re-issued checks, ESCHEATS written off, a daily NSF total if needed, reimbursements for checks that should not have been cashed, or cancelled checks. The sum is show in the bottom section of this tab in the corresponding row labeled “III.” These monthly adjustments will not show up in GP as individual items because they are accounted for in the monthly reconciliation process.
5. The “Chase Balance” value is manually keyed in by the staff member completing the reconciliation. This balance is obtained from the Chase monthly statement, which states the ending balance for the given month.

6. The “completed by” and “verified by” rows are provided for staff to sign.

Monthly Reconciliation - Chase Bank to Great Plains

KERS ACCOUNT

Period Ending:

Date	Outstanding Chase Items	Chase Deposits	Chase Withdrawals
		$0.00	
			$0.00
TOTAL OUTSTANDING ITEMS		**$0.00**	**$0.00**

Pre-reconciled GP Balance	$398,952.30	1
Plus Outstanding Chase Deposits	$0.00	2
Less Outstanging Chase Withdrawals	$0.00	
Plus Outstanding GP Payments	$0.00	3
Less Outstanding GP Deposits	$0.00	
Post Reconciled GP Balance	**$398,952.30**	
Plus Outstanding Check Total - 2nd page	$532,919.60	4
GP Balance plus OC total	**$931,871.90**	
Chase Balance	**$931,871.90**	5
Difference	**$0.00**	

Completed By: ____________________

Verified BY: ____________________ 6

Figure 9: Monthly reconciliation excel worksheet

Date	Accounting Checkwriter Files
	$ 630,695.96
	$ 8,104,846.97
	$ 792,408.85
TOTAL	$ 9,527,951.78

I

Date	Monthly Adjustments
	$ (3,513.51)
	redeposit
	$ (4,000.00)
	redeposit
	$ (3,756.19)
	redeposit
	$ 103.03
	redeposit
TOTAL	**$ (11,166.67)**

III

Date	Chase Cleared Checks
07/01/21	$ (26,837.91)
07/02/21	$ (35,507.17)
07/06/21	$ (125,928.14)
07/07/21	$ (129,869.86)
07/08/21	$ (19,247.55)
07/09/21	$ (49,265.81)
07/12/21	$ (264,531.73)
07/13/21	$ (156,621.79)
07/14/21	$ (7,161,972.53)
07/15/21	$ (18,497.01)
07/16/21	$ (146,741.99)
07/19/21	$ (344,166.37)
07/20/21	$ (209,497.37)
07/21/21	$ (191,970.57)
07/22/21	$ (74,874.27)
07/23/21	$ (134,792.83)
07/26/21	$ (224,884.63)
07/27/21	$ (179,034.07)
07/28/21	$ (76,280.10)
07/29/21	$ (56,398.03)
07/30/21	$ (51,240.03)
TOTAL	($9,678,159.76)

II

Prior Month Outstanding Check Total	$ 694,294.25	4
Current Month Accting Checkwriter Files	$ 9,527,951.78	I
Current Month Chase Cleared Checks	($9,678,159.76)	II
Current Month Adjustments	($11,166.67)	III
New Outstanding Check Total	**$532,919.60**	4

Figure 10: End of month Outstanding check calculation

Testing Methodology

Internal Audit staff reviewed the monthly reconciliation worksheets for July 2021 for all the pension and insurance accounts. August reconciliations were also reviewed for KERS and CERS pension since these are the biggest and most active accounts. For each reconciliation, the following steps were completed:

1. Each line item was recalculated based on activity reported in the Chase bank statements, GP Bank Register, and eMARS reports (Finance).
2. If auditor work and accounting work matched, the line item was marked "agreed" and no further action was taken.

3. If auditor work and Accounting work did not match, the line item was marked “disagree” and KPPA Accounting staff was asked to explain how the line item was calculated in order to resolve the difference.
4. If Internal Audit staff then could verify Accounting’s explanation of the difference, no further action was taken. If the explanation could not be verified, then the issue was counted as a finding.

In addition to testing the monthly reconciliation process as described above, Internal Audit staff also attempted to trace every transaction that occurred in Chase to the source document. Figure 11 below is a summary of transactions that Internal Audit staff was able to trace to source documents:

- Deposits – 34.08% of all deposits by count, which was 99.17% by value.
- Withdrawals – 88.24% of all withdraws by count, which was 99.92% by value.

Total transactions				
Chase	Deposits		Withdrawals	
Plan	Count	Value	Count	Value
CHAZ PEN	132	$ 7,063,515.93	44	$ 7,122,235.84
CHAZ INS	67	$ 81,512,549.80	38	$ 81,544,100.00
CERS INS	175	$ 86,075,896.10	56	$ 85,945,770.03
CERS PEN	440	$1,220,630,982.68	130	$1,090,727,021.79
KHAZ PEN	88	$ 3,639,575.56	43	$ 3,659,386.07
KHAZ INS	54	$ 17,106,544.30	27	$ 17,140,234.02
KERS INS	128	$ 93,755,112.03	31	$ 85,242,264.64
KERS PEN	366	$1,150,815,433.81	183	$1,008,288,472.15
SPRS INS	31	$ 12,180,437.87	17	$ 12,178,776.73
SPRS PEN	83	$ 279,901,203.53	60	$ 272,840,475.32
Total	1564	$2,952,681,251.61	629	$2,664,688,736.59

Total explained in all tests				
Chase	Deposits		Withdrawals	
Plan	Count	Value	Count	Value
CHAZ PEN	37	$ 6,303,979.46	41	$ 7,077,652.94
CHAZ INS	30	$ 81,454,110.73	17	$ 81,244,282.96
CERS INS	28	$ 78,704,204.29	50	$ 85,911,691.60
CERS PEN	128	$1,213,817,384.52	114	$1,090,277,554.79
KHAZ PEN	40	$ 3,182,894.92	41	$ 3,658,833.17
KHAZ INS	28	$ 17,039,359.39	17	$ 17,078,325.46
KERS INS	27	$ 90,566,964.02	28	$ 85,172,913.25
KERS PEN	121	$1,145,048,477.71	171	$1,007,003,042.66
SPRS INS	26	$ 12,179,304.96	16	$ 12,178,738.73
SPRS PEN	68	$ 279,774,637.26	60	$ 272,840,475.32
Total	533	$2,928,071,317.26	555	$2,662,443,510.88

% Explained Overall				
Chase	Deposits		Withdrawals	
Plan	Count	Value	Count	Value
CHAZ PEN	28.03%	89.25%	93.18%	99.37%
CHAZ INS	44.78%	99.93%	44.74%	99.63%
CERS INS	16.00%	91.44%	89.29%	99.96%
CERS PEN	29.09%	99.44%	87.69%	99.96%
KHAZ PEN	45.45%	87.45%	95.35%	99.98%
KHAZ INS	51.85%	99.61%	62.96%	99.64%
KERS INS	21.09%	96.60%	90.32%	99.92%
KERS PEN	33.06%	99.50%	93.44%	99.87%
SPRS INS	83.87%	99.99%	94.12%	100%
SPRS PEN	81.93%	99.95%	100%	100%
Total	34.08%	99.17%	88.24%	99.92%

Figure 11: Total count and value of transactions that occurred compared against total count and value of transactions that could be traced to source documents.

The charts above include items that were not easily traced to a source document. These items were tested with the following steps:

1. Auditor took a judgmental sample of withdraws and deposits from the ten Pension and Insurance accounts that had not been verified at the time of the first Exit Conference with Accounting staff. The sample was selected by picking the first transaction that had two eMARS document codes associated to one Chase transaction.
2. Each transaction was first located in the eMARS reports.
   a. If the document code was “RMSLS,” then the last 5 digits from the code were entered in the "Maintain deposit" screen in LOB to verify that LOB has record of the deposit.
   b. If the document code was “GAX,” then Accounting staff was asked for email or invoice to support the transaction.
   c. If the document code was “ITA,” the auditor was able to locate back up in eMARS document catalog.
3. All general ledger transaction (GLTRX) items were filtered for in GP by value and transaction (TRX) date. The source document link was used to find more details about the transaction, such as a RMSLS code or explanation of the transaction.
   a. If a RMSLS code was provided, this was put into the "maintain deposit" screen of LOB.
   b. If a transaction description was provided, the auditor located the corresponding report in LOB.
   c. If no other information was provided, Accounting staff were asked for the supporting documentation.

After this additional testing, the remaining left un-tested represented the following:

- Deposits – 65.92% of deposits by count and 0.83% by value.
- Withdrawals – 11.76% of withdraws by count and 0.08% by value.

Total transactions				
Chase	Deposits		Withdrawals	
Plan	Count	Value	Count	Value
CHAZ PEN	132	$ 7,063,515.93	44	$ 7,122,235.84
CHAZ INS	67	$ 81,512,549.80	38	$ 81,544,100.00
CERS INS	175	$ 86,075,896.10	56	$ 85,945,770.03
CERS PEN	440	$1,220,630,982.68	130	$1,090,727,021.79
KHAZ PEN	88	$ 3,639,575.56	43	$ 3,659,386.07
KHAZ INS	54	$ 17,106,544.30	27	$ 17,140,234.02
KERS INS	128	$ 93,755,112.03	31	$ 85,242,264.64
KERS PEN	366	$1,150,815,433.81	183	$1,008,288,472.15
SPRS INS	31	$ 12,180,437.87	17	$ 12,178,776.73
SPRS PEN	83	$ 279,901,203.53	60	$ 272,840,475.32
Total	1564	$2,952,681,251.61	629	$2,664,688,736.59

Total remaining untested				
Chase	Deposits		Withdrawals	
Plan	Count	Value	Count	Value
CHAZ PEN	95	$ 759,536.47	3	$ 44,582.90
CHAZ INS	37	$ 58,439.07	21	$ 299,817.04
CERS INS	147	$ 7,371,691.81	6	$ 34,078.43
CERS PEN	312	$ 6,813,598.16	16	$ 449,467.00
KHAZ PEN	48	$ 456,680.64	2	$ 552.90
KHAZ INS	26	$ 67,184.91	10	$ 61,908.56
KERS INS	101	$ 3,188,148.01	3	$ 69,351.39
KERS PEN	245	$ 5,766,956.10	12	$ 1,285,429.49
SPRS INS	5	$ 1,132.91	1	$ 38.00
SPRS PEN	15	$ 126,566.27	0	$ -
Total	1031	$ 24,609,934.35	74	$ 2,245,225.71

% Untested				
Chase	Deposits		Withdrawals	
Plan	Count	Value	Count	Value
CHAZ PEN	71.97%	10.75%	6.82%	0.63%
CHAZ INS	55.22%	0.07%	55.26%	0.37%
CERS INS	84.00%	8.56%	10.71%	0.04%
CERS PEN	70.91%	0.56%	12.31%	0.04%
KHAZ PEN	54.55%	12.55%	4.65%	0.02%
KHAZ INS	48.15%	0.39%	37.04%	0.36%
KERS INS	78.91%	3.40%	9.68%	0.08%
KERS PEN	66.94%	0.50%	6.56%	0.13%
SPRS INS	16.13%	0.01%	5.88%	0.00%
SPRS PEN	18.07%	0.05%	0.00%	0.00%
Total	65.92%	0.83%	11.76%	0.08%

Figure 12: Total transactions that occurred compared against total count and value of transactions left untested.

Internal Audit staff did not pursue source documents for the remaining untested transactions because these transactions will be reviewed in future audits. It is possible that these transactions are reconciled to the source document by another KPPA division as was the case with many of the transactions reviewed in this audit.

7: Miscellaneous emails

There is no set procedure for the various miscellaneous emails tested in this section. Internal Audit staff found these emails by pulling all emails from KPPA Accounting Cash Management staff sent to KPPA Investment Operations staff notifying them of movement from Chase to BNY Mellon or vice versa.

Emails that did not fall into the tests described above were reviewed in this section and most of these emails are a result of Accounting determining how much is considered excessive funds.

<u>Testing Methodology</u>

Internal Audit staff took the following steps:

1. Categorized emails located on the Accounting drive based on type – DEI, Daily Qualification Wire, Humana, KPPA Administrative, and Recurring/Supplemental. The remaining emails were considered “Other Emails.” These are predominantly Add-Ins and Add-Outs.
    a. Add-in is defined as additional money sent to BNY Mellon from Chase. These should have a matching withdraw in the account that had too much money.
    b. Add-out is defined as additional money called back from BNY Mellon to Chase. These should have a matching deposit in the account that did not have enough money.
2. Retrieved the BNY Mellon Settled Cash Statements and compared the date indicated for the transfer to the total for each corresponding email. Transfers to and from the pension accounts showed up in the KR2 account while the transfers to and from the insurance accounts showed up on KR3.
3. Generated the monthly reports for each Chase Account. Verified that the amounts of the deposits and withdrawals matched what was indicated in the corresponding email. In the

cases of Add-Ins the auditor looked for a withdrawal in the corresponding account, while for Add-Outs a deposit was expected.

4. Located the Daily Finance reports from the Accounting shared drive. Verified that an eMARS document was created for the transaction. These typically occurred within a day of the transfer. Every deposit into a Chase account had a “Receipt Document,” indicated by a positive value. Likewise, every withdrawal from a Chase account had an “Expense Document,” indicated by a negative value.

8: Review accounts for excessive funds

Internal audit staff were not able to test the process used to determine the amount of funds to be transferred from Chase back to BNY Mellon. Currently, this is an undocumented, judgement call process.

Internal Audit staff measured the liquidity of these accounts by calculating the current ratio using with the end of month outstanding check balance as current liabilities and the cash balance at end of month from Chase bank statements as current assets for the pension and insurance accounts.

$$Current\ ratio = \frac{End\ of\ month\ outstanding\ check\ balance}{Historical\ account\ ending\ balalnce}$$

Research indicated that the ideal ratio for account balances is 1.5. The ideal remaining balance in each account was calculated using the following formula:

$$Ideal\ account\ ending\ balance = (1.5)(End\ of\ month\ outsanding\ check\ balance)$$

The ideal ending balance was then compared to the historical ending balance reported in Chase to determine the amount of funds that could potentially have been sent back to BNY Mellon. This calculation was completed for each month in scope for the Non-Hazardous accounts only because Hazardous accounts at Chase are not set up to write or receive checks. Since Hazardous accounts do not have liabilities like outstanding checks, all remaining balances within scope were considered excessive. These values were taken directly from Chase monthly bank statements (See finding: Excess Funds Remaining in Chase Accounts).

KENTUCKY PUBLIC PENSIONS AUTHORITY
David L. Eager, Executive Director
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kyret.ky.gov • Phone: 502-696-8800 • Fax: 502-696-8822

Kentucky Public Pensions Authority

TO: Members of the KRS Board of Trustees

FROM: Joint CERS & KRS Retiree Health Plan Committee

DATE: March 1, 2023

SUBJECT: Joint CERS & KRS Retiree Health Plan Committee Report

The Joint CERS & KRS Retiree Health Plan Committee met on Thursday, February 16, 2023, and reviewed an informational presentation from Humana regarding the following items:
:

- Benefit Enhancement Review
- Vanderbilt Contract Update
- Underwriting Update

Humana presented benefit enhancement options that could be included in the 2024 plan year renewal. Vision, hearing, dental and other benefit enhancements were presented. The rates that were provided were based on the 2023 pricing and may change for 2024.

GRS provided an actuarial analysis of the cost for potential benefit enhancements. They used an estimated financial cost of $5.00 increase in Medicare premiums as a basis for showing the impact. The increase in Unfunded Liability is approximately $4.5 million for SPRS, $9.5 million for KERS Haz, and $91.1 million for KERS Nonhaz for every $5 increase in premium. The increase to the normal cost rate (insurance only) is 6.66% for SPRS, 3.34% for KERS Haz and 1.86% for KERS Nonhaz. These estimated costs can be used to extrapolate different premium changes proportionately to the $5. For example, the increase in Unfunded Liability for KERS Nonhaz is $91.1 million for every $5, so the increase is approximately $45.5 million for every $2.50 increase in premium.

Humana stated that negotiations have resumed with Vanderbilt Medical Center, and they have submitted another contract proposal to them the week of February 13, 2023. Humana will continue to provide communication, including options for retirees should that become necessary.

The Centers for Medicare and Medicaid Services (CMS) released the Advanced Rate Notice for 2024. The notice indicates the expected impact of proposed policy changes on the Medicare Advantage (MA) plan payments relative to last year. There is a 60-day comment period. The Final Notice will be released on April 3, 2023.

KPPA staff presented Open Enrollment (October 1, 2022 – December 31, 2022) statistics. Some of the stats included were an increase in web enrollments of 18%, member email responses increased by 17% and the number of phone calls taken increased by 14% from the previous year. There was a decrease in the number of virtual visitors from 43 to 23 and an increase of in-person visitors from 0 to 57 which was expected due to in-person appointments not being offered in 2021. KPPA staff attended eight (8) in-person Benefit Fairs and Seminars with Humana and the Department of Employee Insurance (DEI) during October 2022 with 371 retirees participating. KPPA and Humana also hosted 2 webinars in November 2022 in which 55 retirees participated.

All presentations were for informational purposes only and no actions were taken.

KERS Kentucky Employees Retirement System

SPRS State Police Retirement System

Combining Statement of Fiduciary Net Position - Pension Funds

As of December 31, 2022, with Comparative Totals as of December 31, 2021 ($ in Thousands) (Unaudited)

ASSETS	KERS Nonhazardous	KERS Hazardous	SPRS	KRS TOTAL FY 2023	KRS TOTAL FY 2022	Percentage of Change	Note
CASH AND SHORT-TERM INVESTMENTS							
Cash Deposits	$524	$79	$3	$606	$276	119.30%	1
Short-term Investments	566,373	68,790	133,331	768,494	509,546	50.82%	2
Total Cash and Short-term Investments	**566,897**	**68,869**	**133,334**	**769,100**	**509,822**	**50.86%**	
RECEIVABLES							
Accounts Receivable	88,957	3,782	4,725	97,464	101,502	(3.98)%	
Accounts Receivable - Investments	36,547	9,193	6,044	51,784	51,280	0.98%	
Total Receivables	**125,503**	**12,975**	**10,769**	**149,247**	**152,782**	**(2.31)%**	
INVESTMENTS, AT FAIR VALUE							
Core Fixed Income	618,428	102,814	109,208	830,450	846,616	(1.91)%	
Public Equities	992,710	351,820	175,070	1,519,600	1,608,507	(5.53)%	
Private Equities	162,398	62,083	16,728	241,209	287,214	(16.02)%	3
Specialty Credit	589,771	175,695	91,189	856,655	725,750	18.04%	4
Derivatives	89	(53)	11	48	(547)	(108.69)%	5
Real Return	66,617	23,536	9,770	99,923	250,458	(60.10)%	6
Opportunistic	-	-	-	-	107,058	(100.00)%	7
Real Estate	171,510	47,179	20,454	239,143	201,905	18.44%	8
Total Investments, at Fair Value	**2,601,522**	**763,074**	**422,431**	**3,787,028**	**4,026,961**	**(5.96)%**	
Securities Lending Collateral Invested	80,195	21,184	14,067	115,445	131,690	(12.34)%	9
CAPITAL/INTANGIBLE ASSETS							
Capital Assets	929	91	11	1,031	1,031	0.00%	
Intangible Assets	5,920	494	100	6,513	6,513	0.00%	
Accumulated Depreciation	(929)	(91)	(11)	(1,031)	(1,031)	0.00%	
Accumulated Amortization	(5,852)	(491)	(100)	(6,444)	(6,277)	2.66%	
Total Capital Assets	**67**	**2**	**-**	**70**	**236**	**(70.59)%**	
Total Assets	**3,374,184**	**866,105**	**580,601**	**4,820,890**	**4,821,490**	**(0.01)%**	
LIABILITIES							
Accounts Payable	2,173	364	31	2,567	1,775	44.63%	10
Investment Accounts Payable	26,107	5,794	5,082	36,983	99,332	(62.77)%	11
Securities Lending Collateral	80,195	21,184	14,067	115,445	131,690	(12.34)%	12
Total Liabilities	**108,474**	**27,342**	**19,180**	**154,996**	**232,796**	**(33.42)%**	
Total Fiduciary Net Position Restricted for Pension Benefits	**$3,265,710**	**$838,763**	**$561,421**	**$4,665,894**	**$4,588,694**	**1.68%**	

NOTE - Variance Explanation ***Differences due to rounding.***

1) Variance is a result of continuous fluctuation of deposits and transactions that flow through the cash account.

2) Short Term Investments are primarily comprised of the cash on hand at the custodial bank, the balance is larger than normal due to additional General Fund appropriations for SPRS ($215M end of FY22) and KERS Non hazardous ($120M).

3) The majority of KRS pension funds private equity investments are in older funds that are in runoff status, and the remaining market value of those funds will keep declining as they continue making distributions. Since the KRS pension funds did not commit to any new private equity funds from 2011-2020, they have less contributions and appreciation from newer funds to offset the distributions from the older funds.

4) The increase in Specialty Credit is due to the merging of the Specialty Credit asset class and the Opportunistic asset class.

5) Variance is a result of hedging and arbitration of risk within the portfolios.

6) The decrease in Real Return is a result of the redemption of Putnam and continued liquidation of hedge funds.

7) The decrease in Opportunistic is due to the merging of the Opportunistic asset class with the Specialty Credit asset class.

8) The increase in Real Estate is due to additional funding and increasing market values for current managers.

9) The variance is a result of the demand of the Securities Lending Program.

10) The variance in Accounts Payable is due to an Increase in outstanding employer credit invoices.

11) The variance in Investment Accounts Payable is due to pending trades.

12) The variance is a result of the demand of the Securities Lending Program.

Combining Statement of Changes In Fiduciary Net Position - Pension Funds

For the six month period ending December 31, 2022, with Comparative Totals for the six month period ending December 31, 2021 ($ in Thousands) (Unaudited)

	KERS		SPRS	KRS Total		Percentage of	
ASSETS	Nonhazardous	Hazardous		FY 2023	FY 2022	Change	Note
Member Contributions	$51,311	$12,528	$3,312	$67,151	$57,513	16.76%	1
Employer Contributions	56,117	31,138	28,143	115,398	148,396	(22.24)%	2
Actuarially Accrued Liability Contributions (AALC)	449,281	-	-	449,281	456,444	(1.57)%	
General Fund Appropriation	120,000	-	-	120,000	-	100.00%	3
Pension Spiking Contributions	6	28	-	35	8	318.82%	4
Health Insurance Contributions (HB1)	(5)	(2)	(3)	(10)	8	(235.70)%	5
Employer Cessation Contributions	-	-	-	-	50,464	-100.00%	6
Total Contributions	**676,710**	**43,692**	**31,452**	**751,854**	**712,833**	**5.47%**	
INVESTMENT INCOME							
From Investing Activities							
Net Appreciation (Depreciation) in FV of Investments	(2,819)	7,641	2,019	6,841	122,297	(94.41)%	7
Interest/Dividends	46,136	12,139	8,234	66,509	52,380	26.97%	8
Total Investing Activities Income	43,317	19,780	10,253	73,350	174,676		
Less: Investment Expense	6,834	2,265	1,009	10,108	6,304	60.35%	9
Less: Performance Fees	(508)	50	47	(411)	12,685	(103.24)%	10
Net Income from Investing Activities	36,991	17,465	9,197	63,653	155,687		
From Securities Lending Activities							
Securities Lending Income	1,238	362	210	1,811	136		
Less: Securities Lending Borrower Rebates	1,039	307	178	1,524	(206)		
Less: Securities Lending Agent Fees	30	8	5	43	51		
Net Income from Securities Lending	169	47	27	244	290	(16.06)%	11
Net Investment Income	**37,160**	**17,512**	**9,224**	**63,897**	**155,978**	**(59.03)%**	
Total Additions	**713,870**	**61,205**	**40,676**	**815,751**	**868,810**	**(6.11)%**	
DEDUCTIONS							
Benefit Payments	512,089	39,103	31,948	583,141	582,780	0.06%	
Refunds	6,265	1,859	92	8,216	8,384	(2.00)%	
Administrative Expenses	6,548	716	141	7,406	6,555	12.98%	12
Total Deductions	**524,902**	**41,679**	**32,181**	**598,763**	**597,719**	**0.17%**	
Net Increase (Decrease) in Fiduciary Net Position Restricted for Pension Benefits	188,968	19,526	8,495	216,988	271,092		
Total Fiduciary Net Position Restricted for Pension Benefits							
Beginning of Period	**3,076,743**	**819,237**	**552,926**	**4,448,906**	**4,317,602**	**3.04%**	
End of Period	**$3,265,710**	**$838,763**	**$561,421**	**$4,665,894**	**$4,588,694**	**1.68%**	

NOTE - Variance Explanation ***Differences due to rounding.***

1) Member Contributions increased due to an increase in covered payroll.

2) Employer Contributions decreased due to the receipt of the 06/30/2021 payroll from PC001/KHRIS (at the 73.285% rate), paid and posted to 07/2021 (FY 2022).

3) General Fund Appropriation 2nd Quarter (KERS only): HB1 $67,500,000; HB604 $52,500,000;

4) Pension Spiking contributions increased due to an increase in KERS Hazardous.

5) Health Insurance Contributions continue to fluctuate in the Pension accounts due to Tier 2 and Tier 3 retiree health insurance system costs as well as corrections being processed to previous fiscal years.

6) Employer Cessation payment received from Kentucky Housing Corporation FY2022.

7)The decrease in Net Appreciation in Fair Value of Investments is due to unfavorable market conditions resulting in realized and/or unrealized losses across all asset classes.

8) The increase in income is the result of rising interest rates creating additional income for Core Fixed Income and Cash which the KRS plans hold a larger allocation.

9) The increase in Investment Expense is a result of increased market values in the Specialty Credit and Real Estate asset classes which have higher fees. While the over all FV of assets have declined, that decline has largely been in the Public Equity and Core Fixed Income asset classes which have much lower manager fees.

NOTE - Variance Explanation continued on next page.

10) The drop in performance fees is the result in less than favorable market conditions causing returns to drop, impacting those fees directly related to performance.

11) The variance is a result of the demand of the Securities Lending Program.

12) The Administrative Expense increased for KERS and KERH due to the Hybrid split being used for the entire fiscal year.

Combining Statement of Fiduciary Net Position - Insurance Funds
As of December 31, 2022, with Comparative Totals as of December 31, 2021 ($ in Thousands) (Unaudited)

	KERS		SPRS	KRS Total		Percentage of	
ASSETS	Nonhazardous	Hazardous		FY 2023	FY 2022	Change	Note
CASH AND SHORT-TERM INVESTMENTS							
Cash Deposits	$80	$42	$46	$168	$152	10.34%	1
Short-term Investments	171,185	24,365	8,574	204,124	186,423	9.50%	
Total Cash and Short-term Investments	**171,265**	**24,407**	**8,620**	**204,292**	**186,575**	**9.50%**	
RECEIVABLES							
Accounts Receivable	12,928	405	878	14,212	14,852	(4.31)%	
Investment Accounts Receivable	13,430	6,706	2,747	22,883	24,097	(5.04)%	
Total Receivables	**26,358**	**7,112**	**3,625**	**37,095**	**38,949**	**(4.76)%**	
INVESTMENTS, AT FAIR VALUE							
Core Fixed Income	152,627	66,862	26,238	245,728	270,650	(9.21)%	
Public Equities	563,581	248,842	98,711	911,134	1,054,564	(13.60)%	2
Private Equities	85,531	52,530	23,431	161,492	156,054	3.48%	
Specialty Credit	271,327	130,132	51,514	452,973	387,298	16.96%	3
Derivatives	(69)	14	(18)	(73)	(148)	(50.27)%	4
Real Return	29,082	16,889	6,301	52,272	128,748	(59.40)%	5
Opportunistic	-	-	-	-	68,252	(100.00)%	6
Real Estate	55,391	40,587	15,525	111,503	95,829	16.36%	7
Total Investments, at Fair Value	**1,157,471**	**555,856**	**221,702**	**1,935,029**	**2,161,249**	**(10.47)%**	
Securities Lending Collateral Invested	29,006	12,743	5,054	46,803	62,252	(24.82)%	8
Total Assets	**1,384,100**	**600,118**	**239,001**	**2,223,218**	**2,449,024**	**(9.22)%**	
LIABILITIES							
Accounts Payable	136	8	1	146	109	33.49%	9
Investment Accounts Payable	9,413	3,601	1,528	14,542	44,349	(67.21)%	10
Securities Lending Collateral	29,006	12,743	5,054	46,803	62,252	(24.82)%	11
Total Liabilities	**38,555**	**16,353**	**6,583**	**61,491**	**106,710**	**(42.38)%**	
Total Fiduciary Net Position Restricted for OPEB	**$1,345,545**	**$583,765**	**$232,418**	**$2,161,728**	**$2,342,314**	**(7.71)%**	

NOTE - Variance Explanation ***Differences due to rounding.***

1) Variance is a result of continuous fluctuation of deposits and transactions that flow through the cash account.
2) The decline in Public Equities is the result of large unrealized losses during the later part of FY22 that have not been recouped.
3) The increase in Specialty Credit is due to the merging of the Specialty Credit asset class and the Opportunistic asset class.
4) Variance is a result of hedging and arbitration of risk within the portfolios.
5) The decrease in Real Return is a result of the redemption of Putnam and continued liquidation of hedge funds.
6) The decline in Opportunistic is a result of the merging of the Opportunistic asset class with the Specialty Credit asset class.
7) The increase in Real Estate is due to additional funding and increasing market values for current managers.
8) Variance is a result of the demands of the Securities Lending Program.
9) The increase in Accounts Payable is due to an increase in outstanding employer credit invoices.
10) The variance in Investment Accounts Payable is due to pending trades.
11) Variance is a result of the demands of the Securities Lending Program.

Combining Statement of Changes In Fiduciary Net Position - Insurance Funds

For the six month period ending December 31, 2022, with Comparative Totals for the six month period ending December 31, 2021 ($ In Thousands) (Unaudited)

	KERS		SPRS	KRS Total		Percentage of	
	Nonhazardous	Hazardous		FY 2023	FY 2022	Change	Note
ADDITIONS							
Employer Contributions	$17,395	$3	$4,504	$21,902	$20,259	8.11%	
Actuarially Accrued Liability Contributions (AALC)	43,838	-	-	43,838	50,829	(13.75)%	1
Medicare Drug Reimbursement	1	-	-	1	-		
Insurance Premiums	80	2	-	83	92	(10.78)%	2
Humana Gain Share Payment	4,851	368	224	5,444	8,211	(33.70)%	3
Retired Re-employed Healthcare	2,717	657	-	3,374	3,101	8.79%	
Health Insurance Contributions (HB1)	3,981	753	169	4,902	3,924	24.94%	4
Employer Cessation Contributions	-	-	-	-	9,536	(100.00)%	5
Total Contributions	**72,863**	**1,783**	**4,897**	**79,543**	**95,952**	**(17.10)%**	
INVESTMENT INCOME							
From Investing Activities							
Net Appreciation (Depreciation) in FV of Investments	17,104	5,776	2,184	25,063	83,043	(69.82)%	6
Interest/Dividends	19,573	8,505	3,409	31,488	29,232	7.72%	
Total Investing Activities Income	36,678	14,281	5,592	56,551	112,276		
Less: Investment Expense	3,407	1,802	713	5,922	5,161	14.74%	7
Less: Performance Fees	1,093	(15)	(27)	1,051	8,678	(87.89)%	8
Net Income from Investing Activities	32,178	12,494	4,907	49,578	98,436		
From Securities Lending Activities							
Securities Lending Income	487	197	85	769	68		
Less: Securities Lending Borrower Rebates	408	167	71	646	(108)		
Less: Securities Lending Agent Fees	12	5	2	18	26		
Net Income from Securities Lending	67	26	12	105	150	(30.22)%	9
Net Investment Income	**32,244**	**12,520**	**4,918**	**49,683**	**98,586**	**(49.60)%**	
Total Additions	**105,108**	**14,304**	**9,815**	**129,226**	**194,539**	**(33.57)%**	
DEDUCTIONS							
Healthcare Premiums Subsidies	59,831	10,341	7,365	77,536	74,836	3.61%	
Administrative Expenses	392	62	37	491	514	(4.43)%	
Self-Funded Healthcare Costs	862	37	10	909	888	2.38%	
Excise Tax Insurance	-	-	-	-	3	(100.00)%	10
Total Deductions	**61,085**	**10,440**	**7,412**	**78,937**	**76,242**	**3.53%**	
Net Increase (Decrease) in Fiduciary Net Position Restricted for OPEB	44,023	3,863	2,403	50,289	118,297		
Total Fiduciary Net Position Restricted for OPEB							
Beginning of Period	**1,301,522**	**579,902**	**230,015**	**2,111,438**	**2,224,016**	**(5.06)%**	
End of Period	**$1,345,545**	**$583,765**	**$232,418**	**$2,161,728**	**$2,342,313**	**(7.71)%**	

NOTE - Variance Explanation ***Differences due to rounding***

1) AALC will fluctuate year to year based on the actuarial valuation.

2) Health Insurance Premiums decreased due to refunds processed to hazardous retirees for premiums paid for dependents that should have been covered by KPPA.

3) The Humana Gain Share payment will fluctuate year to year based on claims paid.

4) Health Insurance Contributions will continue to rise as Tier 2 and Tier 3 members increase.

5) Employer Cessation payment received from Kentucky Housing Corporation FY2022.

6) The decrease in Net Appreciation in Fair Value of Investments is due to unfavorable market conditions resulting in realized and unrealized losses across all asset classes.

7) The increase in Investment Expense is a result of increased market values in the Specialty Credit and Real Estate asset classes which have higher fees. While the over all FV of assets have declined, that decline has largely been in the Public Equity and Core Fixed Income asset classes which have much lower manager fees.

8) The drop in performance fees is the result in less than favorable market conditions causing returns to drop, impacting those fees directly related to performance.

9) Variance is a result of the demand of the Securities Lending Program.

10) The Excise Tax will fluctuate based on the timing of the posting of the payment.

Pension Funds Contribution Report

For the six month period ending December 31, 2022, with Comparative Totals for the six month period ending December 31, 2021
($ in Millions)

	Kentucky Employees Retirement System				State Police Retirement System	
	Nonhazardous		Hazardous			
	FY23	**FY22**	**FY23**	**FY22**	**FY23**	**FY22**
Member Contributions	$51.3	$45.0	$12.5	$10.1	$3.3	$2.4
Employer Contributions	56.1	87.7	31.2	30.2	28.1	30.5
Actuarially Accrued Liability Contributions	449.3	456.4	-	-	-	-
Employer Cessation Contributions	-	50.5	-	-	-	-
General Fund Appropriations	120.0	-	-	-	-	-
Net Investment Income	40.0	23.5	9.9	7.3	7.2	2.8
Total Inflows	**716.7**	**663.1**	**53.6**	**47.6**	**38.6**	**35.7**
Benefit Payments/Refund	518.4	518.2	41.0	40.8	32.0	32.1
Administrative Expenses	6.5	5.8	0.7	0.6	0.1	0.1
Total Outflows	**524.9**	**524.0**	**41.7**	**41.4**	**32.1**	**32.2**
NET Contributions	**191.8**	**139.1**	**11.9**	**6.2**	**6.5**	**3.5**
Realized Gain/(Loss)	(17.1)	74.4	(3.2)	27.6	(3.8)	9.1
Unrealized Gain/(Loss)	14.3	6.7	10.9	3.7	5.8	0.7
Change in Net Position	**189.0**	**220.2**	**19.6**	**37.5**	**8.5**	**13.3**
Beginning of Period	**3,076.7**	**3,085.0**	**819.2**	**874.9**	**552.9**	**357.7**
End of Period	**$3,265.7**	**$3,305.2**	**$838.8**	**$912.4**	**$561.4**	**$371.0**

Differences due to rounding.

Net Contributions*	$151.8	$115.6	$2.0	$(1.1)	$(0.7)	$0.7
Cash Flow as % of Assets	4.65%	3.50%	0.24%	(0.12)%	(0.13)%	0.18%
Net Investment Income	$40.0	$23.5	$9.9	$7.3	$7.2	$2.8
Yield as % of Assets	1.22%	0.71%	1.18%	0.80%	1.28%	0.76%

**Net Contributions are less Net Investment Income.*

Insurance Fund Contribution Report

For the six month period ending December 31, 2022, with Comparative Totals for the six month period ending December 31, 2021
($ in Millions)

	Kentucky Employees Retirement System				State Police Retirement System	
	Nonhazardous		Hazardous			
	FY23	**FY22**	**FY23**	**FY22**	**FY23**	**FY22**
Employer Contributions	$17.4	$15.9	$-	$-	$4.5	$4.4
Actuarially Accrued Liability Contributions	43.8	50.8	-	-	-	-
Employer Cessation Contributions	-	9.5	-	-	-	-
Insurance Premiums	0.1	0.1	-	-	-	-
Humana Gain Share	4.9	7.3	0.4	0.5	0.2	0.3
Retired Reemployed Healthcare	2.7	2.5	0.7	0.6	-	-
Health Insurance Contributions	4.0	3.2	0.7	0.6	0.2	0.1
Net Investment Income	15.1	9.6	6.7	4.4	2.7	1.6
Total Inflows	**88.0**	**98.9**	**8.5**	**6.1**	**7.6**	**6.4**
Healthcare Premiums	60.7	58.3	10.4	10.3	7.4	7.2
Administrative Expenses	0.4	0.4	-	-	-	-
Total Outflows	**61.1**	**58.7**	**10.4**	**10.3**	**7.4**	**7.2**
NET Contributions	**26.9**	**40.2**	**(1.9)**	**(4.2)**	**0.2**	**(0.8)**
Realized Gain/(Loss)	(8.5)	30.6	(1.8)	18.9	(0.7)	8.0
Unrealized Gain/(Loss)	25.6	15.1	7.6	7.6	2.9	2.8
Change in Net Position	**44.0**	**85.9**	**3.9**	**22.3**	**2.4**	**10.0**
Beginning of Period	**1,301.5**	**1,353.1**	**579.9**	**624.9**	**230.0**	**246.0**
End of Period	**$1,345.5**	**$1,439.0**	**$583.8**	**$647.2**	**$232.4**	**$256.0**

Differences due to rounding.

Net Contributions*	$11.8	$30.6	$(8.6)	$(8.6)	$(2.5)	$(2.4)
Cash Flow as % of Assets	0.88%	2.13%	(1.48)%	(1.32)%	(1.09)%	(0.95)%
Net Investment Income	$15.1	$9.6	$6.7	$4.4	$2.7	$1.6
Yield as % of Assets	1.13%	0.67%	1.16%	0.68%	1.18%	0.63%

**Net Contributions are less Net Investment Income.*

KPPA ADMINISTRATIVE BUDGET FY 2022-2023
BUDGET-TO-ACTUAL ANALYSIS
FOR THE SIX MONTH PERIOD ENDING DECEMBER 31, 2022, WITH COMPARATIVE TOTALS FOR THE SIX MONTH PERIOD ENDING DECEMBER 31, 2021

Account Name	Budgeted	FY 2023 Expense	Remaining	Percent Remaining	FY 2022 Expense	Percent Difference
PERSONNEL						
Staff						
Salaries/Wages	$17,000,000	$8,154,730	$8,845,270	52.03%	$8,048,638	1.32%
Wages (Overtime)	285,000	115,112	169,888	59.61%	107,186	7.39%
Emp Paid Retirement	14,865,100	6,069,879	8,795,221	59.17%	6,422,459	(5.49)%
Emp Paid Health Ins	2,700,000	1,112,428	1,587,572	58.80%	1,296,865	(14.22)%
Emp Paid Sick Leave	115,000	135,844	(20,844)	(18.13)%	800	16,880.50%
Adoption Assistance Benefit	8,000	-	8,000	100.00%	-	0.00%
Workers Compensation	75,000	11,116	63,884	85.18%	75,163	(85.21)%
Unemployment	8,000	5,534	2,466	30.83%	-	100.00%
Other Personnel	1,273,448	576,338	697,110	54.74%	573,531	0.49%
Employee Training	18,000	5,361	12,639	70.22%	4,843	10.70%
Bonds	-	-	-	100.00%	41	(100.00)%
Staff Subtotal	**36,347,548**	**16,186,341**	**20,161,207**	**55.47%**	**16,529,526**	**(2.08)%**
LEGAL & AUDITING SERVICES						
Legal Hearing Officers	100,000	76,516	23,484	23.48%	32,314	136.79%
Legal (Stoll, Keenon)	150,000	51,775	98,225	65.48%	60,445	(14.34)%
Frost Brown (Tax Advisor)	80,000	100,066	(20,066)	(25.08)%	1,464	6,735.11%
Reinhart	25,000	139	24,861	99.44%	-	0.00%
Ice Miller	300,000	81,920	218,080	72.69%	21,533	280.44%
Johnson, Bowman, Branco LLC	150,000	69,895	80,105	53.40%	43,225	61.70%
Dentons Bingham & Greenebaum	150,000	33,291	116,709	77.81%	-	100.00%
Legal Expense	25,000	23	24,977	99.91%	-	100.00%
Auditing	200,000	77,808	122,192	61.10%	85,655	(9.16)%
Total Legal & Auditing Services	**1,180,000**	**491,433**	**688,567**	**58.35%**	**244,636**	**100.88%**
CONSULTING SERVICES						
Medical Reviewers	1,800,000	660,075	1,139,925	63.33%	625,666	5.50%
Escrow for Actuary Fees	-	(28,866)	28,866	0.00%	-	(100.00)%
Total Consulting Services	**1,800,000**	**631,209**	**1,168,791**	**64.93%**	**625,666**	**0.89%**
CONTRACTUAL SERVICES						
Miscellaneous Contracts	100,000	11,700	88,300	88.30%	12,079	(3.14)%
Human Resources Consulting	8,000	-	8,000	100.00%	5,794	(100.00)%
Actuarial Services	500,000	134,300	365,700	73.14%	147,747	(9.10)%
Facility Security Charges	80,000	21,701	58,299	72.87%	38,862	(44.16)%
Tuition Assistance	8,000	-	8,000	100.00%	-	0.00%
Contractual Subtotal	**696,000**	**167,701**	**528,299**	**75.91%**	**204,482**	**(17.99)%**
PERSONNEL SUBTOTAL	**$40,023,548**	**$17,476,684**	**$22,546,864**	**56.33%**	**$17,604,310**	**(0.72)%**
OPERATIONAL						
Natural Gas	35,000	10,149	24,851	71.00%	7,144	42.06%
Electric	125,000	58,288	66,712	53.37%	55,442	5.13%
Rent-Non State Building	56,000	25,321	30,679	54.78%	25,321	0.00%
Building Rental - PPW	1,000,000	481,016	518,984	51.90%	481,016	0.00%
Copier Rental	67,000	40,745	26,255	39.19%	31,247	30.40%
Rental Carpool	5,500	2,144	3,356	61.02%	1,940	10.52%
Vehicle/Equip. Maint.	1,000	-	1,000	100.00%	249	(100.00)%
Postage	420,000	92,536	327,464	77.97%	150,771	(38.62)%
Freight	200	41	159	79.28%	155	(73.55)%
Printing (State)	12,000	795	11,205	93.38%	4,548	(82.52)%
Printing (non-state)	105,000	24,911	80,089	76.28%	30,002	(16.97)%
Insurance	12,000	5,572	6,428	53.57%	5,422	2.77%
Garbage Collection	6,000	3,161	2,839	47.31%	2,647	19.42%
Conference Expense	35,000	7,415	27,585	78.81%	7,352	0.86%
Conference Exp. Investment	-	64	(64)	0.00%	-	100.00%
Conference Exp. Audit	2,000	639	1,361	68.05%	-	100.00%
MARS Usage	50,000	13,550	36,450	72.90%	13,550	0.00%

KPPA ADMINISTRATIVE BUDGET 2022-23
BUDGET-TO-ACTUAL ANALYSIS

FOR THE SIX MONTH PERIOD ENDING DECEMBER 31, 2022, WITH COMPARATIVE TOTALS FOR THE SIX MONTH PERIOD ENDING DECEMBER 31, 2021

Account Name	Budgeted	FY 2023 Expense	Remaining	Percent Remaining	FY 2022 Expense	Percent Difference
COVID-19 Expenses	12,000	-	12,000	100.00%	6,171	(100.00)%
Office Supplies	75,000	55,759	19,241	25.66%	25,767	116.40%
Furniture & Office Equipment	20,000	204	19,796	98.98%	-	100.00%
Travel (In-State)	15,000	7,627	7,373	49.15%	3,611	111.22%
Travel (In-State) Investment	1,000	-	1,000	100.00%	-	0.00%
Travel (In-State) Audit	500	-	500	100.00%	-	0.00%
Travel (Out of State)	75,000	16,534	58,466	77.95%	382	4,228.27%
Travel (Out of State) Investment	100,000	10,578	89,422	89.42%	-	100.00%
Travel (Out of State) Audit	500	1,077	(577)	(115.40)%	-	100.00%
Dues & Subscriptions	70,000	35,132	34,868	49.81%	25,176	39.55%
Dues & Subscriptions Invest	17,000	4,177	12,823	75.43%	7,613	(45.13)%
Dues & Subscriptions Audit	1,500	100	1,400	93.33%	50	100.00%
Miscellaneous	70,000	20,399	49,601	70.86%	31,063	(34.33)%
Miscellaneous Investment	-	-	-	0.00%	-	0.00%
Miscellaneous Audit	200	-	200	100.00%	-	0.00%
COT Charges	25,000	9,022	15,978	63.91%	9,850	(8.41)%
Telephone - Wireless	7,000	2,556	4,444	63.48%	2,817	(9.27)%
Telephone - Other	150,000	47,665	102,335	68.22%	62,180	(23.34)%
Telephone - Video Conference	-	4,836	(4,836)	0.00%	-	100.00%
Computer Equip./Software	3,500,000	1,029,994	2,470,006	70.57%	1,397,212	(26.28)%
Comp. Equip./Software Invest	-	-	-	0.00%	-	0.00%
Comp. Equip/Software Audit	3,000	24,407	(21,407)	(713.56)%	-	100.00%
OPERATIONAL SUBTOTAL	**$6,074,400**	**$2,036,414**	**$4,037,986**	**66.48%**	**$2,390,398**	**(14.81)%**
SUB-TOTAL	**$46,097,948**	**$19,513,098**	**$26,584,850**	**57.67%**	**$19,994,708**	**(2.41)%**
Reserve	**4,086,552**	**-**	**4,086,552**	**100.00%**	**-**	**0.00%**
TOTAL	**$50,184,500**	**$19,513,098**	**$30,671,402**	**61.12%**	**$19,994,708**	**(2.41)%**

Differences due to rounding

Plan	Budgeted	FY 2023 Expense	% of Total KPPA FY 2023 Expense
CERS Nonhazardous	**$28,896,235**	**$11,235,642**	**57.58%**
CERS Hazardous	**2,559,410**	**995,168**	**5.10%**
KERS Nonhazardous	**16,543,320**	**6,432,493**	**32.965%**
KERS Hazardous	**1,824,207**	**709,301**	**3.635%**
SPRS	**361,328**	**140,494**	**0.720%**
TOTAL	**$50,184,500**	**$19,513,098**	

JP MORGAN CHASE CREDIT EARNINGS AND FEES
FOR THE SIX MONTH PERIOD ENDING DECEMBER 31, 2022

	Earnings	Fees	Net Earnings
June-22	5,289	(5,906)	(616)
July-22	8,921	(5,814)	3,107
August-22	17,621	(6,185)	11,436
September-22	17,026	(6,033)	10,993
October-22	24,574	(6,031)	18,543
November-22	59,589	(5,070)	54,519
December-22	10,556	(6,884)	3,673
Total	**$143,576**	**$(41,922)**	**$101,654**

KERS Kentucky Employees Retirement System

SPRS State Police Retirement System

KRS Outstanding Invoices by Type and Employer

Invoice Type	12/31/2022	9/30/2022	Change H/(L)
Actuarially Accrued Liability Contribution	$2,267,851	$2,391,476	(5)%
Employer Free Military and Decompression Service	185,451	71,628	159%
Member Pension Spiking Refund	(17,748)	(16,766)	6%
Monthly Reporting Invoice	(270,825)	(304,716)	(11)%
Penalty – Monthly Reporting	22,000	17,000	29%
Reinstatement	9,003	2,245	301%
Total	**2,195,733**	**2,160,867**	
Health Insurance Reimbursement	753,140	588,228	28%
Omitted Employer	281,518	270,677	4%
Employer Pension Spiking*	215,875	188,633	14%
Standard Sick Leave	3,609,915	2,980,718	21%
USERRA Protected Military	319,086	319,086	0%
Total	**5,179,534**	**4,347,341**	19%
Grand Total	**$7,375,267**	**$6,508,208**	13%

**Pension Spiking invoices on this report are Employer Pension Spiking. By statute these invoices are due 12 months from the invoice date. Employer Pension Spiking is in effect only for retirements prior to July 1, 2018, therefore, unless there has been a recently created invoice for a backdated retirement, all of these invoices are greater than 12 months old.*

Employer Name (Top Ten)	12/31/2022	9/30/2022	Change H/(L)
Kentucky State Police	$3,498,911	$2,976,590	18%
Kentucky River Community Care Inc.	2,175,323	1,813,480	20%
Department of Military Affairs	249,656	130,294	92%
Commonwealth Office of Technology	153,637	10,525	1360%
Seven County Services, Inc.	135,523	125,817	8%
Dept. for Behavioral Health Dev. Intell. Disabilities	117,901	147,221	(20)%
Judicial Department Admin. Office of the Courts	78,325	49,297	59%
Department of Parks	68,178	116,532	(41)%
Office of the Inspector General	66,551	18,822	254%
Attorney General	$53,498	$-	100%

	Total Unpaid Balance	Invoice Count
KERS	$4,092,764	1,026
KERH	480,746	47
SPRS	2,651,553	50
Grand Total:	**$7,225,063**	**1,123**

KERS Kentucky Employees Retirement System

SPRS State Police Retirement System

KENTUCKY PUBLIC PENSIONS AUTHORITY

Penalty Invoices Report
From: 10/1/2022 To: 12/31/2022
Note: Delinquent Interest amounts are included in the totals for the invoice

	Invoice Amount	Invoice Remaining Balance	Delinquent Interest	Invoice Status Date	Invoice Due Date	Invoice Status	Employer Classification	Comments
	$1,000	$-	$-	10/11/2022	9/15/2022	CANC	County Attorneys	Employer in good standing
	1,000	-	-	12/5/2022	12/2/2022	CANC	Master Commissioner	Employer in good standing
Total	**$2,000**	**$-**	**$-**					
	$1,000	$1,000	$-	11/28/2022	12/28/2022	CRTD	County Attorneys	
	1,000	1,000	-	12/7/2022	1/6/2023	CRTD	County Attorneys	
	1,000	1,000	-	12/12/2022	1/11/2023	CRTD	Universities	
	1,000	1,000	-	12/21/2022	1/20/2023	CRTD	County Attorneys	
	1,000	1,000	-	12/21/2022	1/20/2023	CRTD	Non-P1 State Agencies	
Total	**$5,000**	**$5,000**	**$-**					
	$1,000	$-	$-	10/5/2022	5/20/2021	PAID	Non-P1 State Agencies	
	1,000	-	-	10/5/2022	6/17/2021	PAID	Non-P1 State Agencies	
	1,000	-	-	11/7/2022	11/27/2022	PAID	Universities	
	1,000	-	-	11/7/2022	11/27/2022	PAID	Universities	
	1,000	-	-	11/7/2022	11/27/2022	PAID	Universities	
Total	**$5,000**	**$-**	**$-**					

Notes:

Invoice Status:

CANC - Cancelled

CRTD - Created

PAID - Paid

Kentucky Retirement Systems

Investment Review and Update

Quarter Ending: December 31, 2022

Kentucky Retirement Systems

Economic and Market Update

Quarter Ending: December 31, 2022

Wilshire

Asset Class Performance

Asset Class Returns - Best to Worst

2017	2018	2019	2020	2021	2022 YTD	Annualized 5-Year as of 12/22
Emrg Mrkts 37.7%	T-Bills 1.9%	U.S. Equity 31.0%	U.S. Equity 20.8%	REITs 46.2%	Commodities 16.1%	U.S. Equity 9.0%
Developed 25.6%	Core Bond 0.0%	REITs 25.8%	Emrg Mrkts 18.7%	Commodities 27.1%	T-Bills 1.3%	Commodities 6.4%
U.S. Equity 21.0%	U.S. TIPS -1.3%	Developed 22.7%	U.S. TIPS 11.0%	U.S. Equity 26.7%	High Yield -11.2%	REITs 3.4%
High Yield 7.5%	High Yield -2.1%	Emrg Mrkts 18.9%	Developed 8.3%	Developed 11.8%	U.S. TIPS -11.8%	High Yield 2.3%
REITs 4.2%	REITs -4.8%	High Yield 14.3%	Core Bond 7.5%	U.S. TIPS 6.0%	Core Bond -13.0%	U.S. TIPS 2.1%
Core Bond 3.6%	U.S. Equity -5.3%	Core Bond 8.7%	High Yield 7.1%	High Yield 5.3%	Developed -14.0%	Developed 2.0%
U.S. TIPS 3.0%	Commodities -11.2%	U.S. TIPS 8.4%	T-Bills 0.7%	T-Bills 0.0%	U.S. Equity -19.0%	T-Bills 1.2%
Commodities 1.7%	Developed -13.4%	Commodities 7.7%	Commodities -3.1%	Core Bond -1.5%	Emrg Mrkts -19.7%	Core Bond 0.0%
T-Bills 0.8%	Emrg Mrkts -14.2%	T-Bills 2.3%	REITs -7.9%	Emrg Mrkts -2.2%	REITs -26.8%	Emrg Mrkts -1.0%

Data Sources: Bloomberg

Note: Developed asset class is developed equity markets ex-U.S., ex-Canada

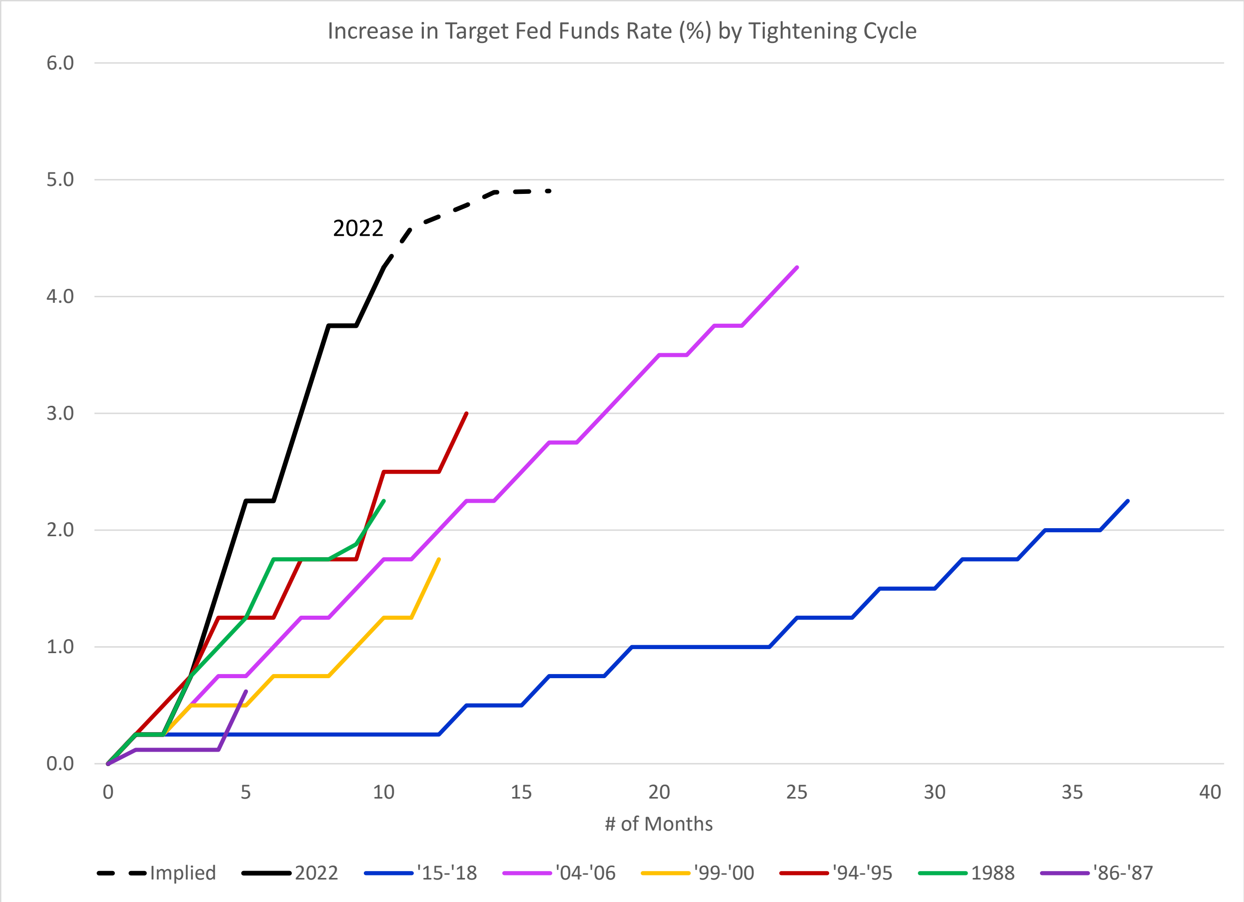
Wilshire

December 2022 Asset Class Assumptions

	Equity						Fixed Income							Real Assets					
	US Stock	Dev ex-US Stock	Emg Stock	Global ex-US Stock	Global Stock	Private Equity	Cash	Core Bond	LT Core Bond	TIPS	High Yield	Private Credit	Dev ex-US Bond (Hdg)	Real Estate US RES	Real Estate Global RES	Real Estate Private RE	Cmdty	Real Assets	US CPI
Compound Return (%)	6.50	7.25	7.50	7.60	7.05	9.90	4.00	4.90	4.90	3.95	6.55	8.85	3.05	5.65	5.80	6.20	6.25	6.65	2.25
Expected Risk (%)	17.00	18.00	26.00	19.10	17.10	29.00	0.75	4.70	9.80	6.00	10.00	12.75	4.00	17.50	16.45	14.00	16.00	12.35	1.75
Cash Yield (%)	1.75	3.25	2.80	3.10	2.25	0.00	4.00	5.10	5.25	4.40	9.65	5.10	3.75	3.95	3.95	2.25	4.00	3.15	0.00
Growth Exposure	8.00	8.00	8.00	8.00	8.00	14.00	0.00	-0.95	-2.40	-3.00	4.00	5.10	-1.00	6.00	6.00	3.50	0.00	2.70	0.00
Inflation Exposure	-3.00	0.00	5.00	1.45	-1.30	-3.75	0.00	-2.50	-6.80	2.50	-1.00	-1.50	-3.00	1.00	1.80	1.00	12.00	5.25	1.00
Correlations																			
US Stock	1.00																		
Dev ex-US Stock (USD)	0.81	1.00																	
Emerging Mkt Stock	0.74	0.74	1.00																
Global ex-US Stock	0.84	0.95	0.89	1.00															
Global Stock	0.95	0.91	0.84	0.94	1.00														
Private Equity	0.72	0.63	0.61	0.67	0.73	1.00													
Cash Equivalents	-0.05	-0.09	-0.05	-0.08	-0.06	0.00	1.00												
Core Bond	0.28	0.13	0.00	0.08	0.20	0.30	0.18	1.00											
LT Core Bond	0.31	0.15	0.01	0.11	0.24	0.31	0.11	0.94	1.00										
TIPS	-0.05	0.00	0.15	0.06	-0.01	-0.03	0.20	0.60	0.48	1.00									
High Yield Bond	0.54	0.39	0.49	0.46	0.53	0.31	-0.10	0.24	0.32	0.05	1.00								
Private Credit	0.68	0.55	0.58	0.60	0.68	0.44	0.00	0.24	0.30	0.00	0.76	1.00							
Dev ex-US Bond (Hdg)	0.16	0.25	-0.01	0.16	0.17	0.26	0.10	0.68	0.66	0.39	0.26	0.22	1.00						
US RE Securities	0.58	0.47	0.44	0.49	0.57	0.49	-0.05	0.17	0.22	0.10	0.56	0.62	0.05	1.00					
Global RE Securities	0.64	0.57	0.54	0.60	0.65	0.55	-0.05	0.17	0.21	0.11	0.61	0.68	0.04	0.96	1.00				
Private Real Estate	0.55	0.45	0.45	0.49	0.54	0.50	-0.05	0.19	0.25	0.09	0.58	0.63	0.05	0.79	0.78	1.00			
Commodities	0.25	0.34	0.39	0.38	0.32	0.28	0.00	-0.03	-0.03	0.25	0.29	0.29	-0.10	0.25	0.28	0.25	1.00		
Real Assets	0.62	0.63	0.65	0.69	0.67	0.57	-0.03	0.22	0.24	0.30	0.64	0.69	0.04	0.78	0.84	0.76	0.64	1.00	
Inflation (CPI)	-0.10	-0.15	-0.13	-0.15	-0.13	-0.10	0.10	-0.12	-0.12	0.15	-0.08	0.00	-0.08	0.05	0.04	0.05	0.44	0.22	1.00

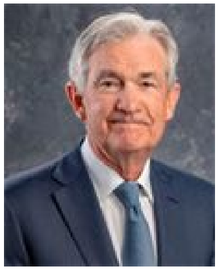
Wilshire

The Shift to Tightening: Most Aggressive in Modern Era: Will "Bring Some Pain"



Data Source: Bloomberg

*"While **higher interest rates, slower growth, and softer labor market conditions** will bring down inflation, **they will also bring some pain** to households and businesses. **These are the unfortunate costs of reducing inflation**. But a failure to restore price stability would mean far greater pain."*



Jerome Powell

August 2022, Jackson Hole

Wilshire

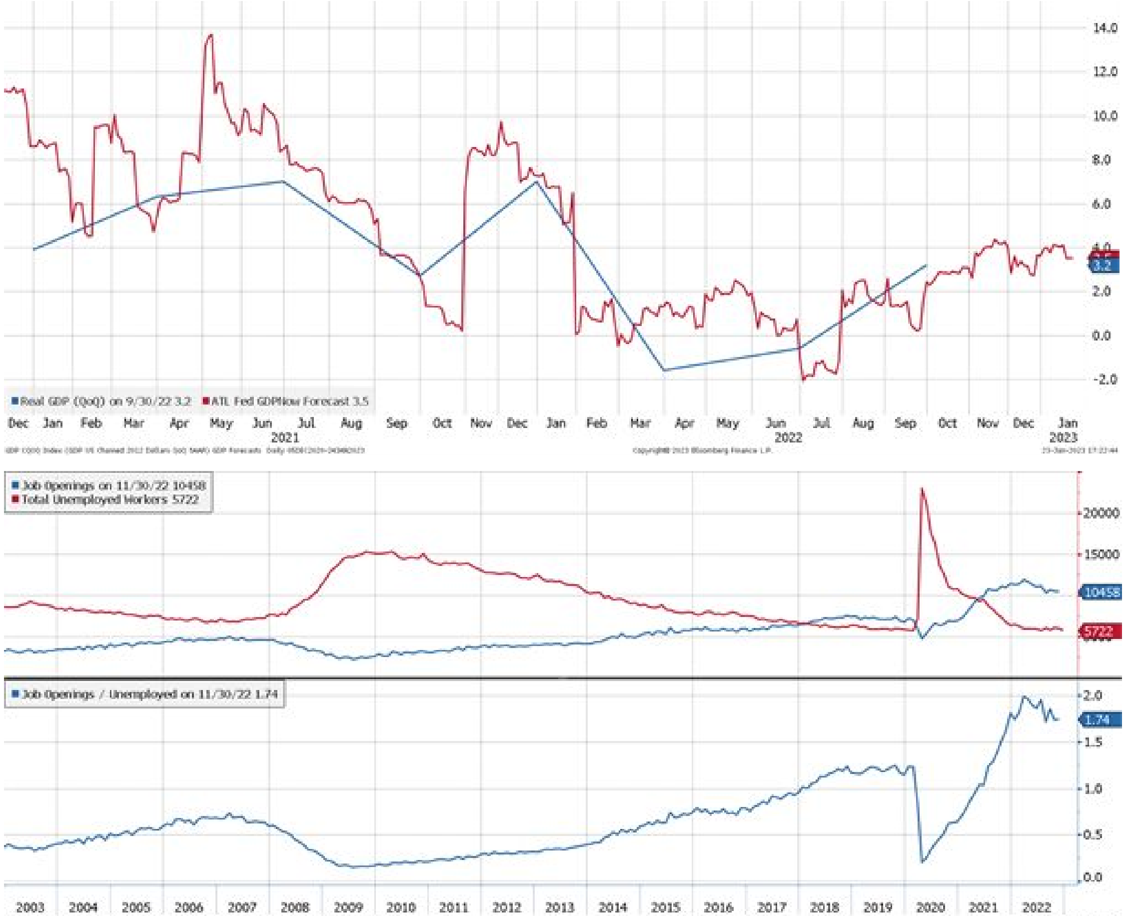
The Fed's Dashboard: Realized & Expected Inflation

Data Source: Bloomberg

- Realized inflation has begun to ease off extreme levels
  - CPI 6.5% v. 9.1% in June 2022
  - Core CPI stabilizing ~5%
  - Wage inflation remains elevated (~6%)
- Inflation expectations remain well-anchored
  - Expectational anchoring at higher levels would make the Fed's job even more challenging
  - These expectations are likely at the heart of the divergence between market and Fed outlooks (i.e., the Fed would likely pause now if they believed these expectations would be realized)

Wilshire

The Fed’s Dashboard: Economic Growth & Labor Market



Data Source: Bloomberg

The market seems a bit more confident in the prospects of a “soft landing” as inflation has subsided in recent months

- However, lots more liquidity to be drained
- Powell’s “Sully” Sullenberger moment…

“We’re going to be in the Hudson”

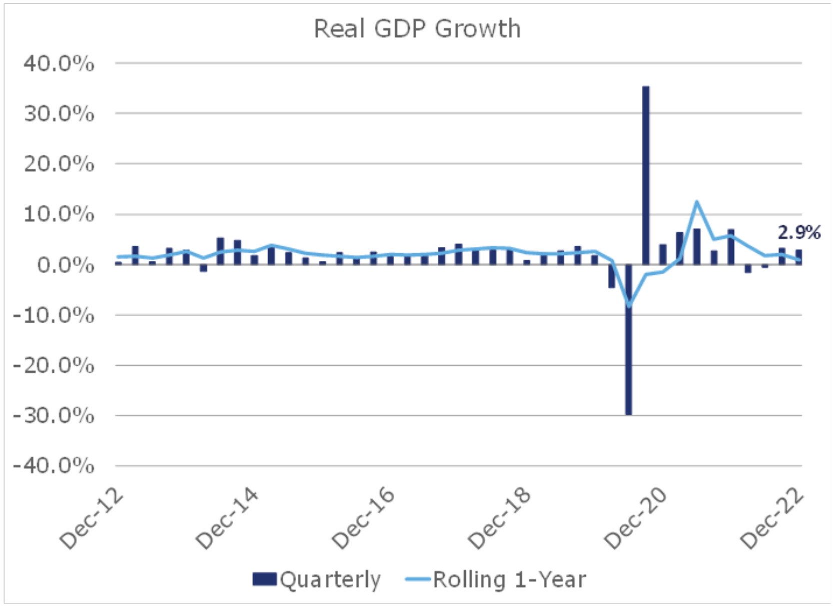
Chesley Burnett "Sully" Sullenberger III
Pilot of US Airways 1549, January 15, 2009

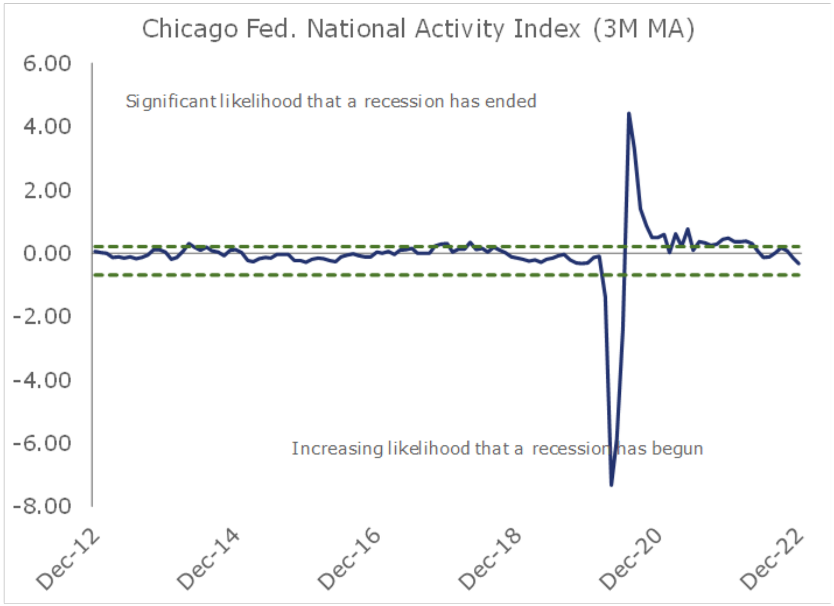
Labor markets remain tight

- Difficult to see inflation pressures return to Fed target without these tensions reversing
- Recent jobs reports remain strong (good news for economic resilience but challenges the market’s benign inflation expectations)

Wilshire

Economic Growth



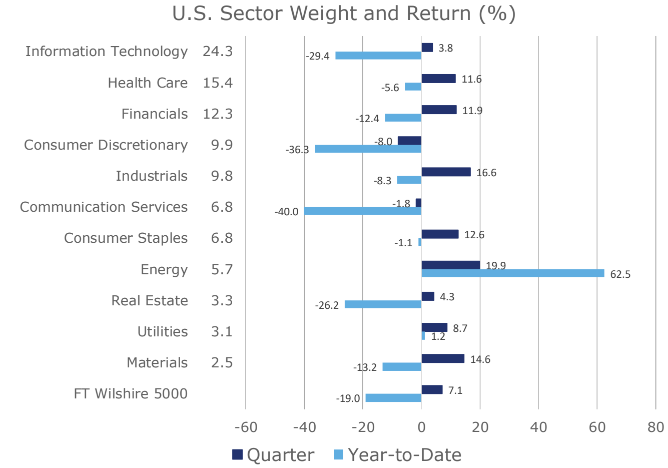


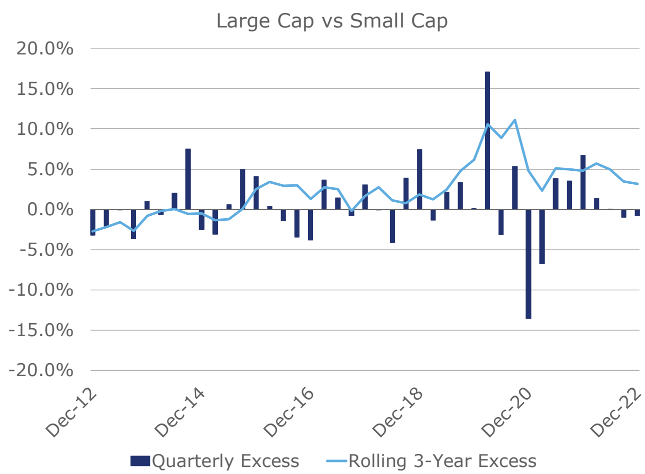
Data Source: Bloomberg

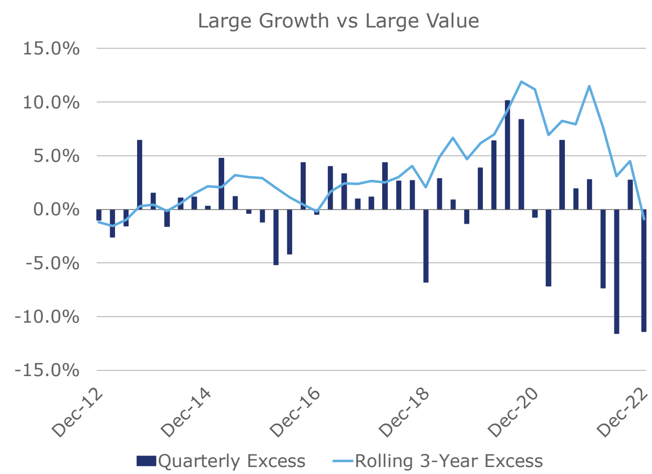
Wilshire

U.S. Equity Market

As of 12/30/2022	Quarter	YTD	1 Year	3 Year	5 Year	10 Year
FT Wilshire 5000	7.1	-19.0	-19.0	7.4	9.0	12.3
Wilshire U.S. Large Cap	7.1	-19.0	-19.0	7.7	9.4	12.6
Wilshire U.S. Small Cap	7.9	-18.7	-18.7	4.4	5.1	9.7
Wilshire U.S. Large Growth	0.8	-29.5	-29.5	7.1	10.0	13.6
Wilshire U.S. Large Value	13.8	-5.5	-5.5	8.1	8.7	11.5
Wilshire U.S. Small Growth	7.1	-23.1	-23.1	3.2	5.1	9.9
Wilshire U.S. Small Value	8.7	-14.2	-14.2	5.6	5.0	9.3
Wilshire REIT Index	4.0	-26.8	-26.8	-0.5	3.4	6.3
MSCI USA Min. Vol. Index	9.8	-9.2	-9.2	5.1	8.6	11.9
FTSE RAFI U.S. 1000 Index	12.5	-7.4	-7.4	9.6	9.1	12.2







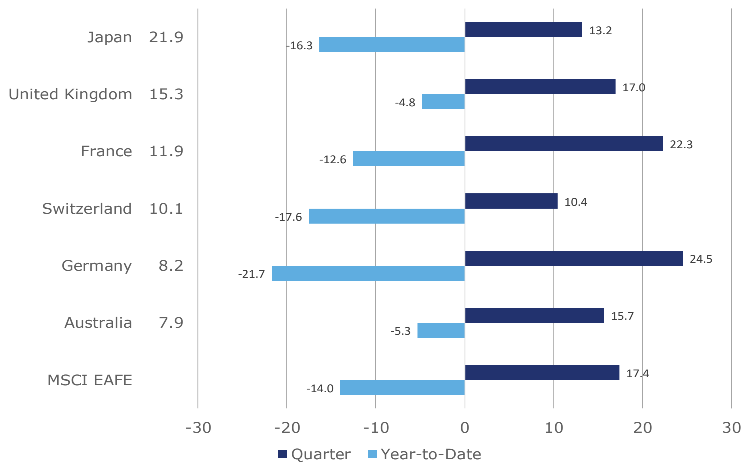
Data Sources: Bloomberg, Wilshire Atlas

Wilshire

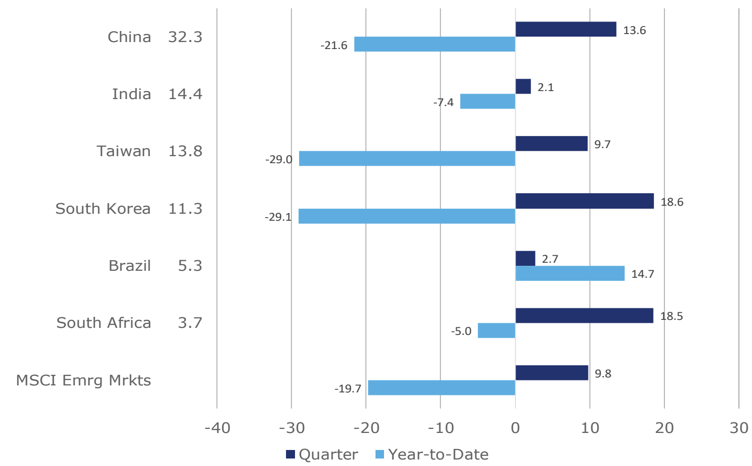
Non-U.S. Equity Market

As of 12/30/2022	Quarter	YTD	1 Year	3 Year	5 Year	10 Year
MSCI ACWI ex-US ($G)	14.4	-15.6	-15.6	0.5	1.4	4.3
MSCI EAFE ($G)	17.4	-14.0	-14.0	1.3	2.0	5.2
MSCI Emerging Markets ($G)	9.8	-19.7	-19.7	-2.3	-1.0	1.8
MSCI Frontier Markets ($G)	9.2	-17.8	-17.8	-5.7	-3.8	0.2
MSCI ACWI ex-US Growth ($G)	12.9	-22.8	-22.8	-0.1	1.8	5.0
MSCI ACWI ex-US Value ($G)	15.7	-8.7	-8.7	0.8	0.6	3.6
MSCI ACWI ex-US Small ($G)	13.4	-19.6	-19.6	1.5	1.1	5.6
MSCI ACWI Minimum Volatility	8.6	-9.8	-9.8	2.2	5.2	8.4
MSCI EAFE Minimum Volatility	12.5	-14.6	-14.6	-2.6	0.6	5.1
FTSE RAFI Developed ex-US	18.3	-9.0	-9.0	2.7	1.7	4.9
MSCI EAFE LC (G)	8.8	-6.5	-6.5	4.1	4.3	8.1
MSCI Emerging Markets LC (G)	6.7	-15.2	-15.2	0.5	1.7	5.0

Developed Markets Weight and Return (%)



Emerging Markets Weight and Return (%)



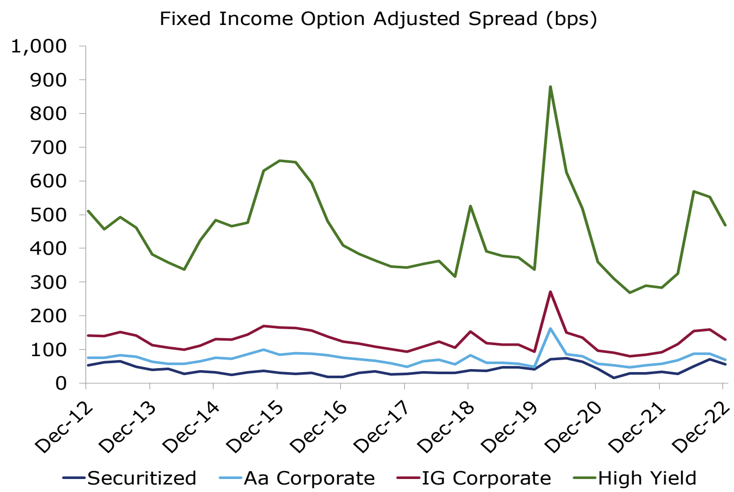
Data Sources: Bloomberg

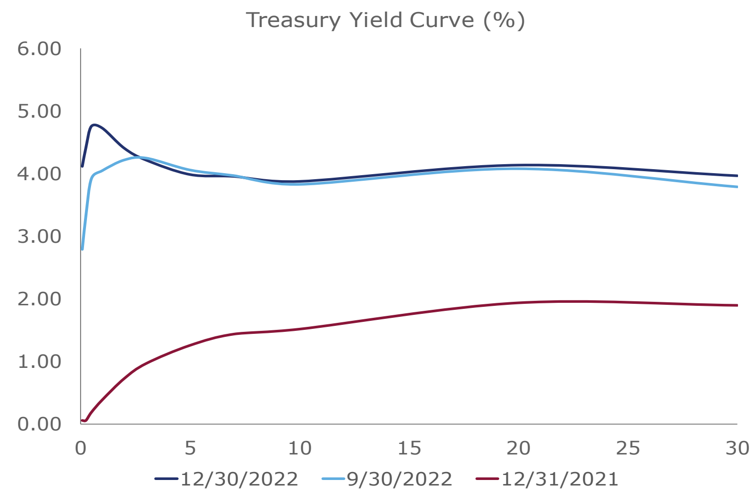
Wilshire

U.S. Fixed Income

As of 12/30/2022	YTW	DUR.	QTR	YTD	1 YR	3 YR	5 YR	10 YR
Bloomberg Aggregate	4.7	6.2	1.9	-13.0	-13.0	-2.7	0.0	1.1
Bloomberg Treasury	4.2	6.1	0.7	-12.5	-12.5	-2.6	-0.1	0.6
Bloomberg Gov't-Rel.	4.8	5.2	1.9	-11.1	-11.1	-2.4	0.3	1.1
Bloomberg Securitized	4.8	5.7	2.0	-11.7	-11.7	-3.1	-0.4	0.8
Bloomberg Corporate	5.4	7.1	3.6	-15.8	-15.8	-2.9	0.5	2.0
Bloomberg LT Gov't/Credit	4.9	14.3	2.6	-27.1	-27.1	-6.2	-1.2	1.6
Bloomberg LT Treasury	4.1	16.2	-0.6	-29.3	-29.3	-7.4	-2.2	0.6
Bloomberg LT Gov't-Rel.	5.5	11.6	4.2	-22.7	-22.7	-5.9	-0.8	1.6
Bloomberg LT Corporate	5.6	13.0	5.4	-25.6	-25.6	-5.7	-0.8	2.2
Bloomberg U.S. TIPS *	3.8	7.6	2.0	-11.8	-11.8	1.2	2.1	1.1
Bloomberg High Yield	9.0	3.9	4.2	-11.2	-11.2	0.0	2.3	4.0
S&P/LSTA Leveraged Loan	9.1	0.3	2.7	-0.6	-0.6	2.5	3.3	3.7
Treasury Bills	4.4	0.3	0.9	1.3	1.3	0.7	1.2	0.8

* Yield and Duration statistics are for a proxy index based on similar maturity, the Bloomberg Barclays U.S. Treasury 7-10 Year Index



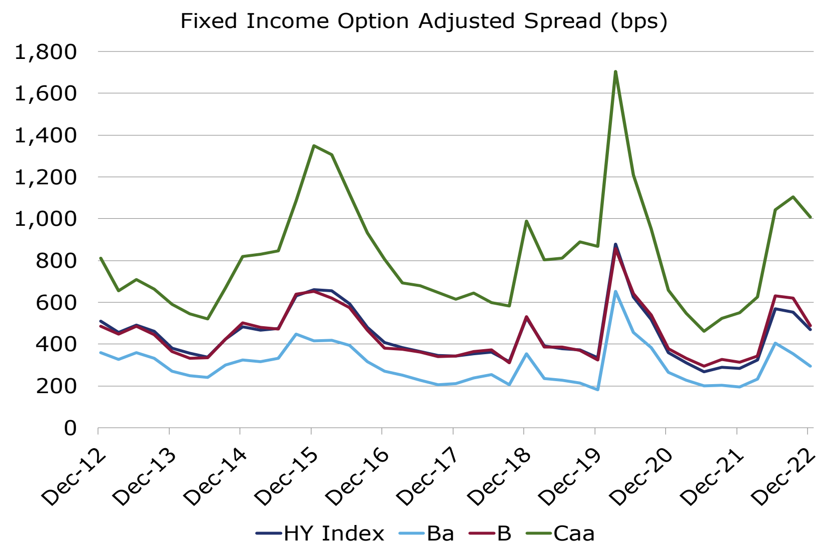


Data Sources: Bloomberg

Wilshire

High Yield Bond Market

As of 12/31/2022		YTW	QTR	YTD	1 YR	3 YR	5 YR	10 YR
Bloomberg High Yield		9.0	4.2	-11.2	-11.2	0.0	2.3	4.0
S&P LSTA Leveraged Loan		9.1	3.8	-0.6	-0.6	1.9	3.1	3.2
High Yield Quality Distribution	**Weight**							
Ba U.S. High Yield	49.9%	7.2	4.3	-10.8	-10.8	0.9	3.0	4.4
B U.S. High Yield	38.6%	9.2	4.9	-10.3	-10.3	-0.5	2.2	3.6
Caa U.S. High Yield	10.7%	14.3	0.5	-16.3	-16.3	-2.4	-0.4	3.5
Ca to D U.S. High Yield	0.7%	36.3	13.8	-10.4	-10.4	1.1	0.4	-5.0

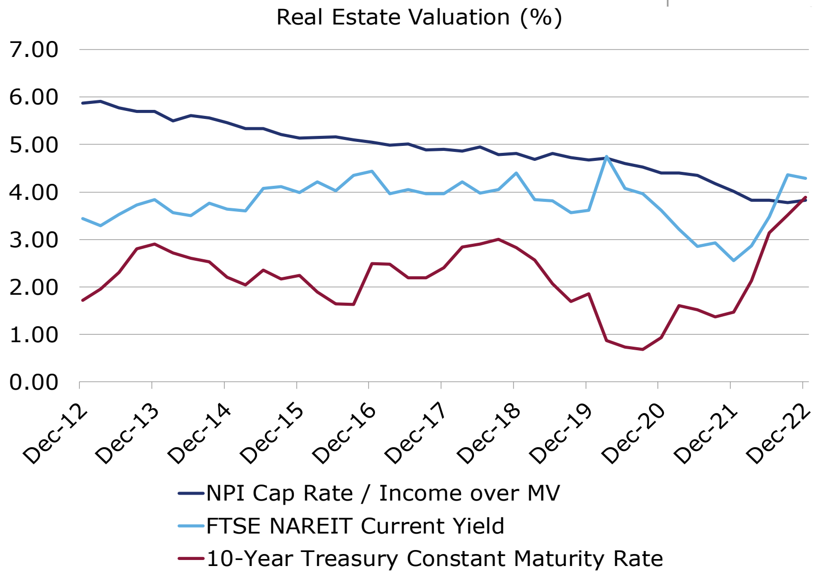


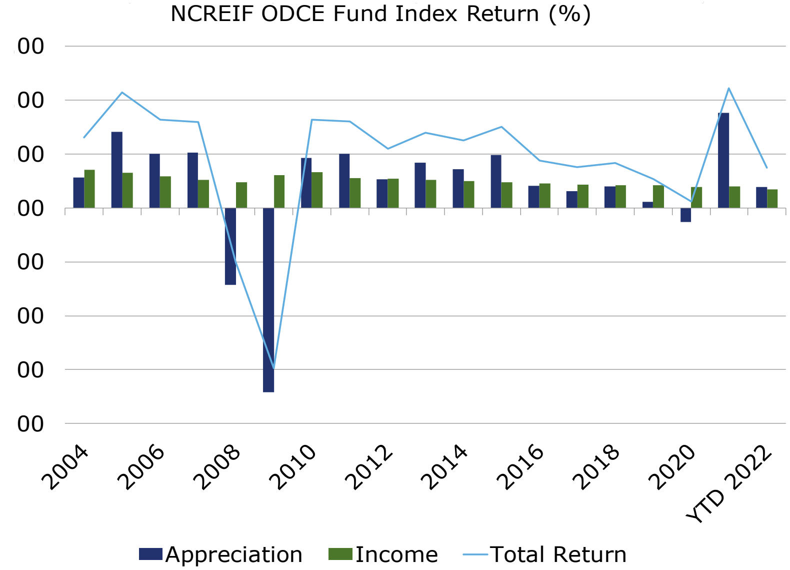
Data Sources: Bloomberg

Wilshire

Real Assets

As of 12/30/2022	Quarter	YTD	1 Year	3 Year	5 Year	10 Year
Bloomberg U.S. TIPS	2.0	-11.8	-11.8	1.2	2.1	1.1
Bloomberg Commodity Index	2.2	16.1	16.1	12.7	6.4	-1.3
Bloomberg Gold Index	9.5	-0.7	-0.7	4.7	5.7	0.0
Wilshire Global RESI Index	6.4	-24.9	-24.9	-2.7	1.6	4.8
NCREIF ODCE Fund Index	-5.0	7.5	7.5	9.9	8.7	10.1
NCREIF Timberland Index	4.9	12.9	12.9	7.5	5.4	5.8
FTSE Global Core Infrastructure 50/50	9.2	-4.1	-4.1	2.3	5.5	7.9
Alerian Midstream Energy	8.4	21.5	21.5	8.8	6.8	n.a.
Bitcoin	-14.9	-64.3	-64.3	32.2	3.3	103.6

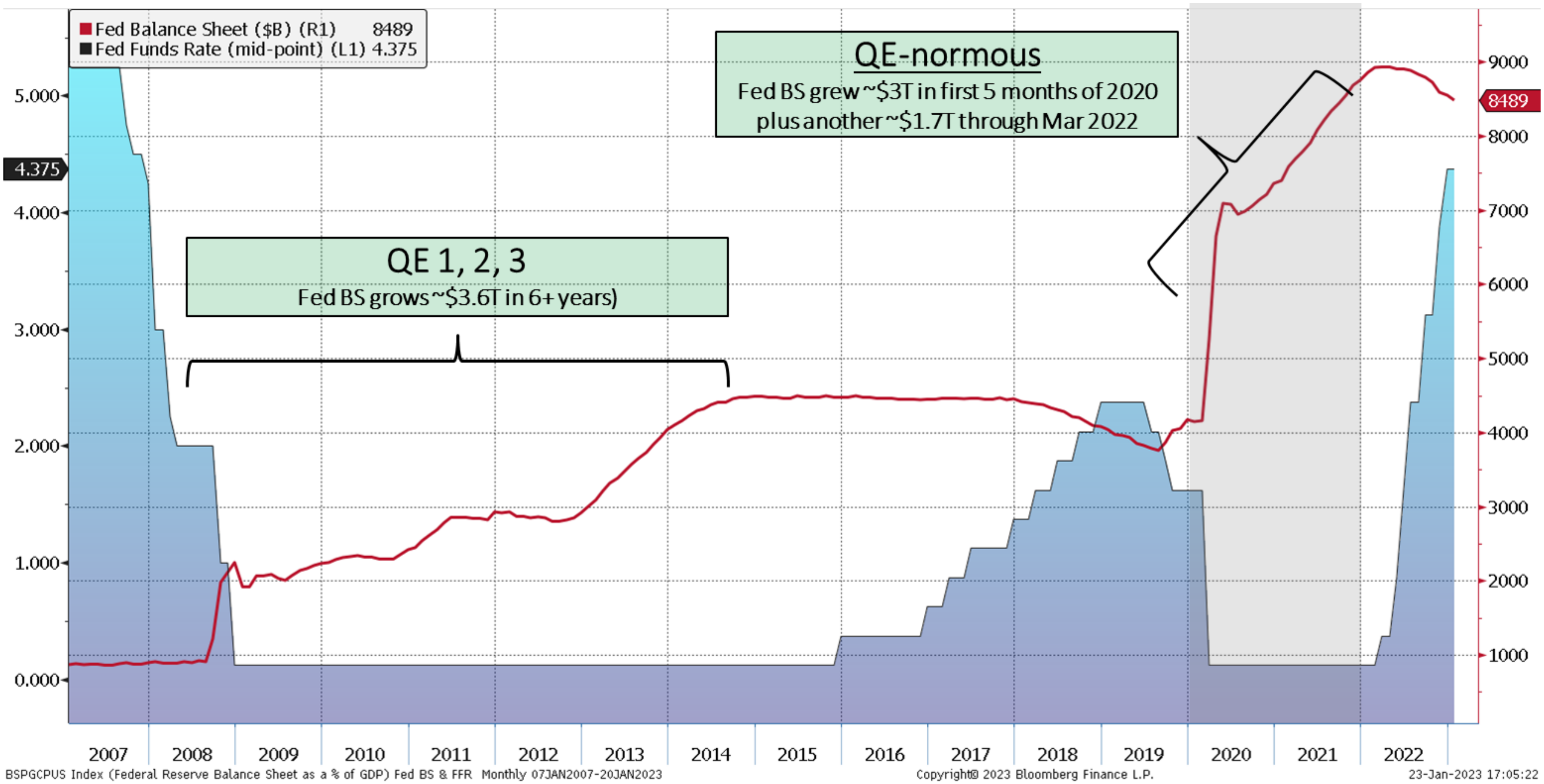




Data Sources: Bloomberg

Wilshire

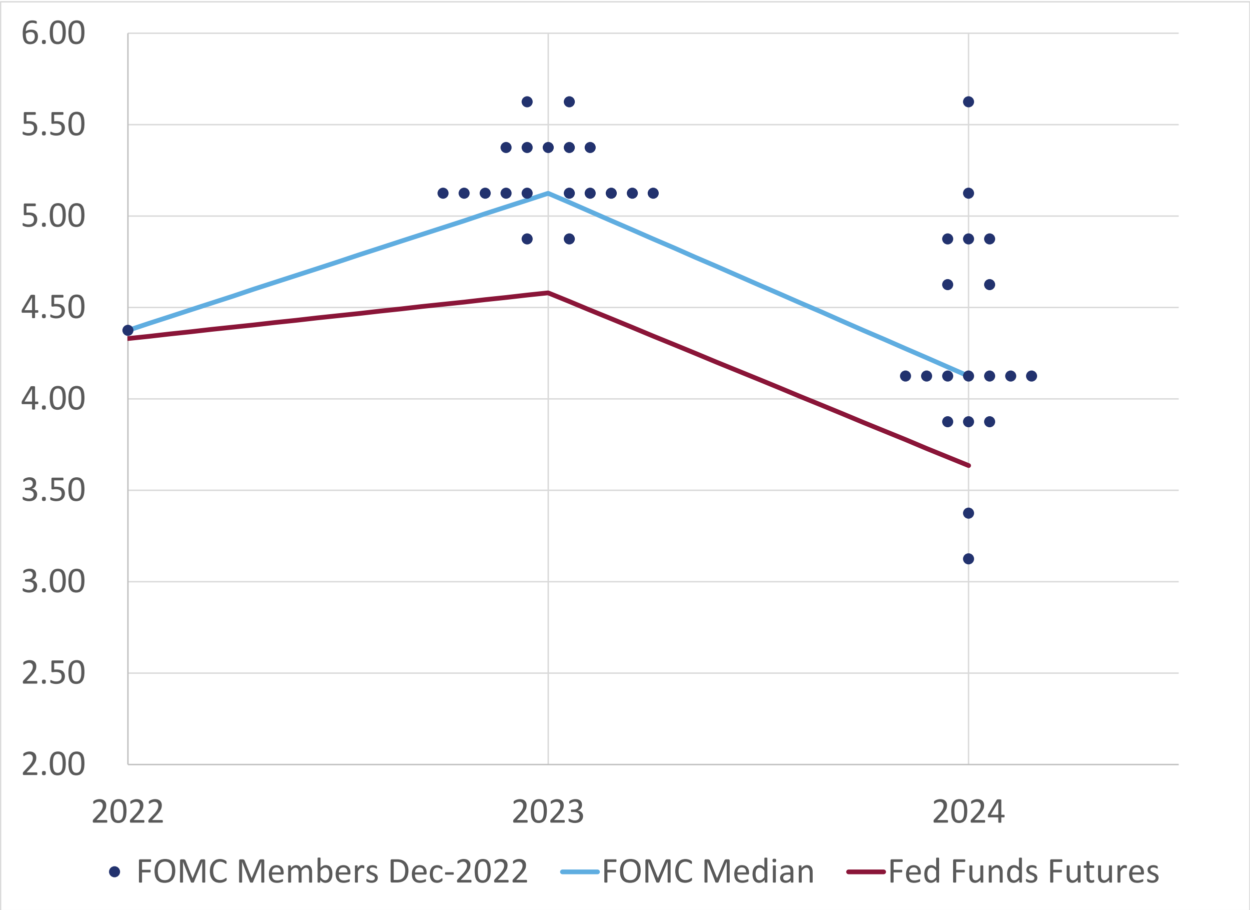
The Fed: Zero Rates & QE to $8T and Beyond…



Data Source: Bloomberg

Wilshire

The Fed Outlook vs. Market Consensus

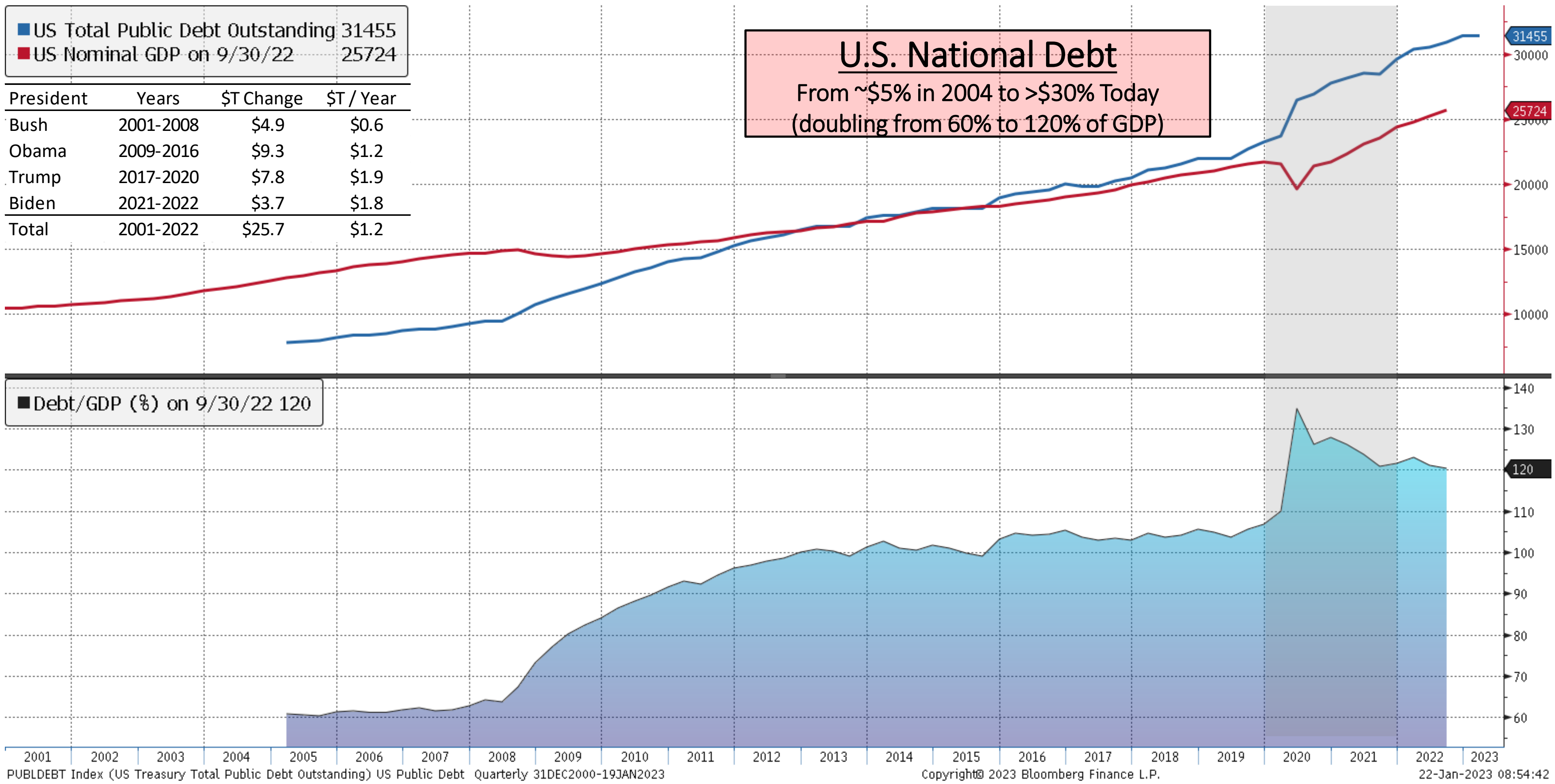


Data Source: Bloomberg

- The market's Dec 2023 implied Fed Funds Rate is below every FOMC member's forecast
- Why the divergence: A Fed credibility issue or just a difference in view?
- How might this play out?
  - What if the Fed's wrong?
  - What if the market is wrong?

Wilshire

A Secular Explosion in National Debt: "We're Not in Kansas Anymore"

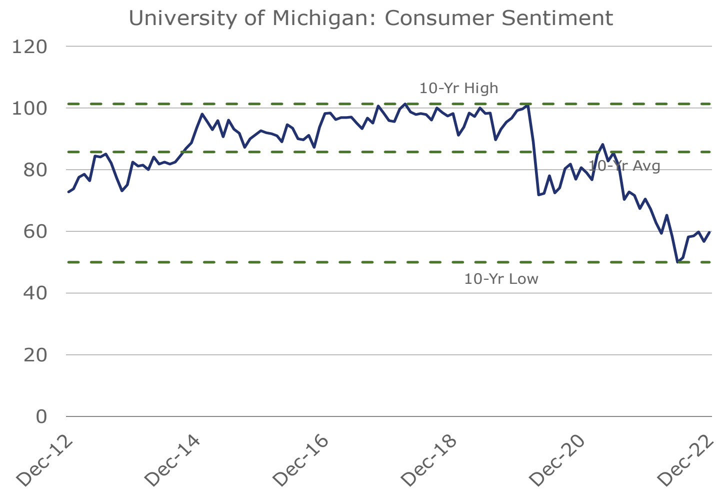


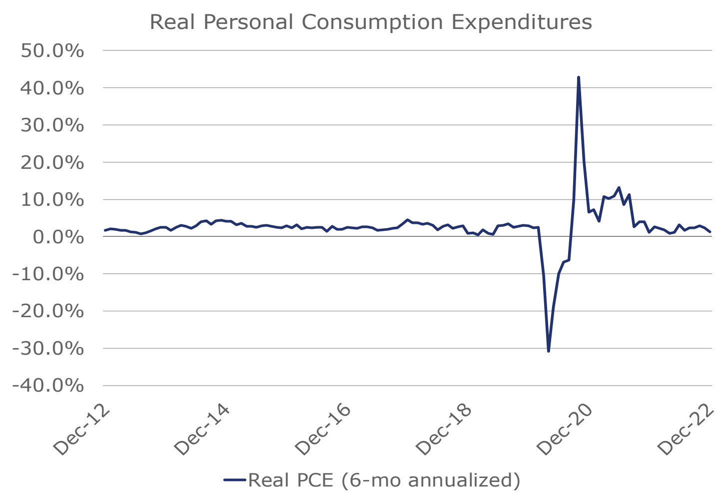
President	Years	$T Change	$T / Year
Bush	2001-2008	$4.9	$0.6
Obama	2009-2016	$9.3	$1.2
Trump	2017-2020	$7.8	$1.9
Biden	2021-2022	$3.7	$1.8
Total	2001-2022	$25.7	$1.2

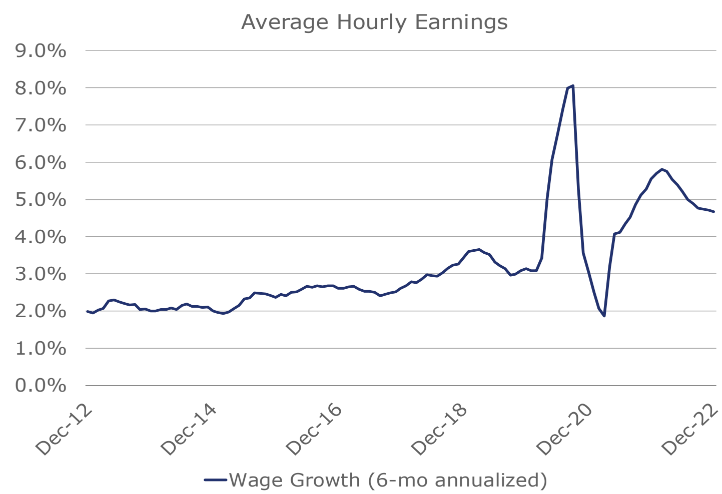
Data Source: Bloomberg

Wilshire

Consumer Activity



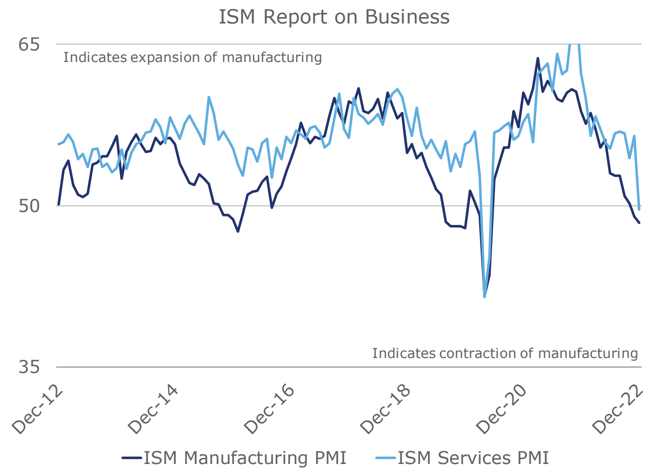


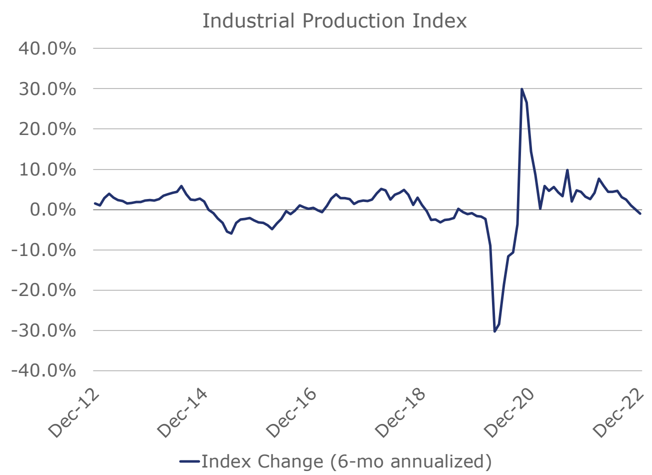


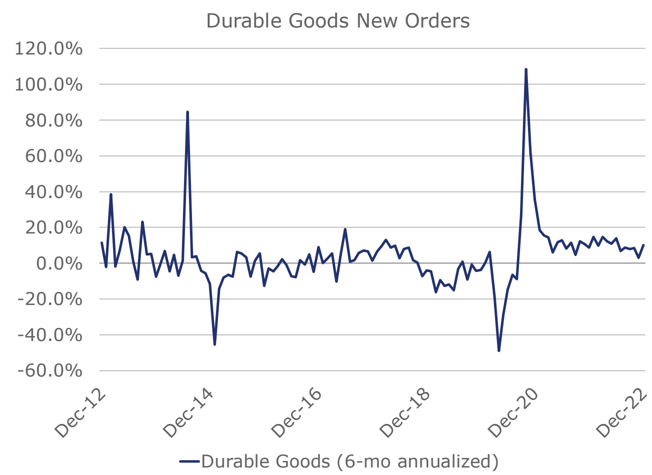
Data Source: Bloomberg

Wilshire

Business Activity



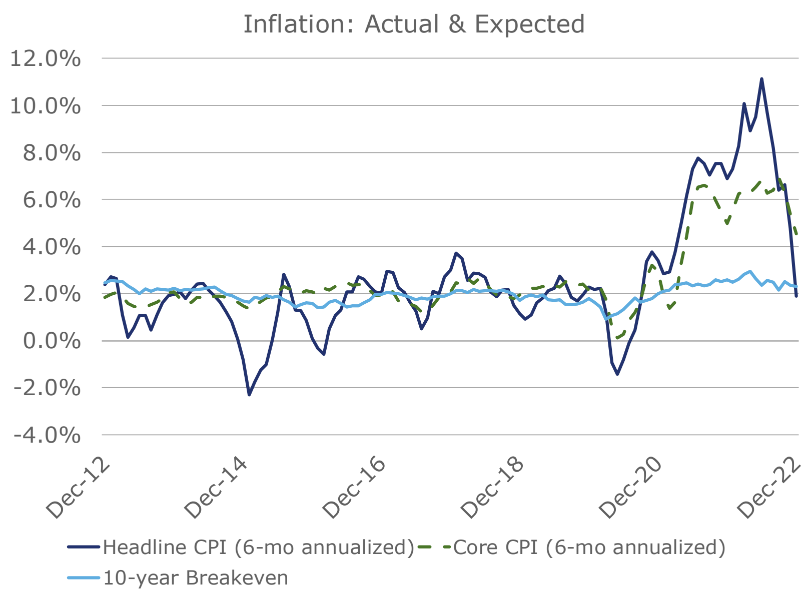


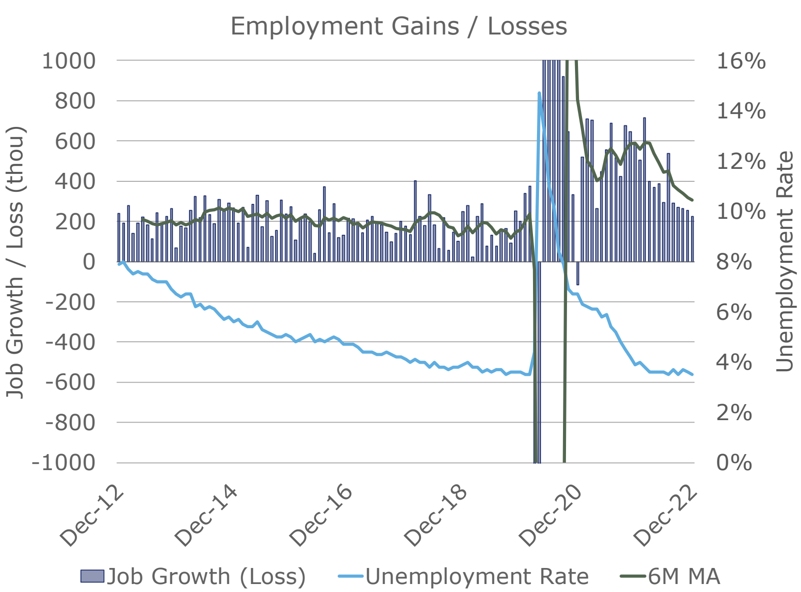


Data Source: Bloomberg

Wilshire

Inflation and Employment

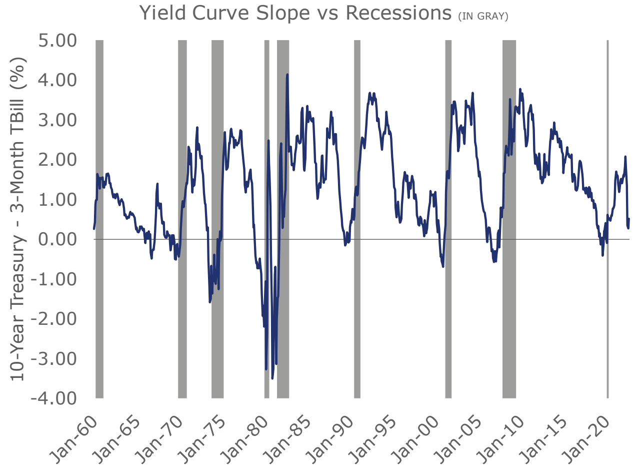


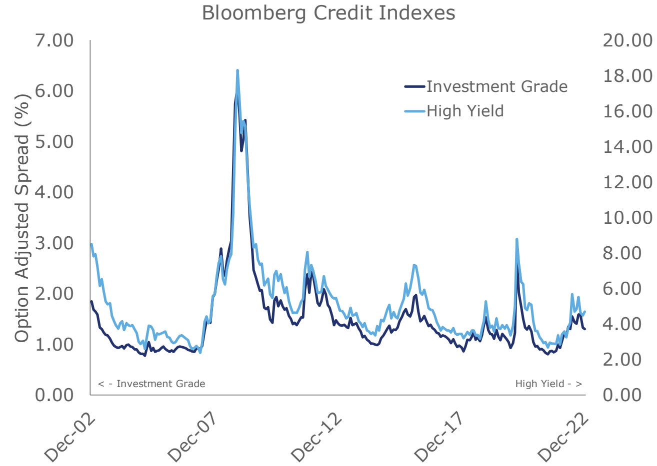


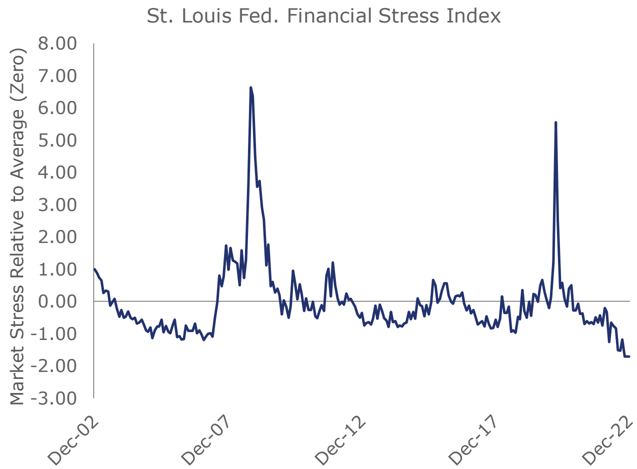
Data Source: Bloomberg

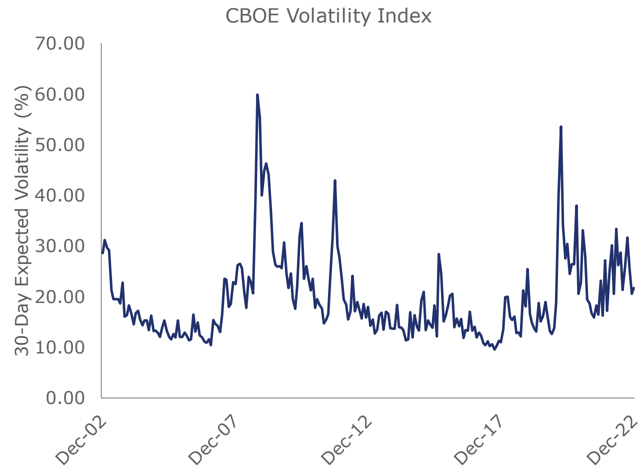
Wilshire

Risk Monitor









Data Sources: Bloomberg

Kentucky Retirement Systems

Performance and Asset Allocations

Quarter Ending: December 31, 2022

December 2022	KPPA MONTHLY PERFORMANCE UPDATE	KERS/KERS-H/SPRS

What's going on in the marketplace?

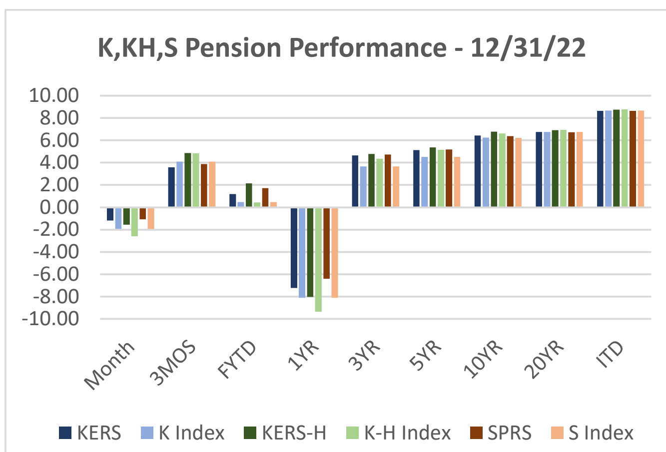
The story for 2022 was one of lower highs and lower lows with persistent volatility. The 12-month period was macro-driven as decades high inflation levels and aggressive Fed tightening were the central storylines with the regime transitioning from historically easy monetary policy to one of rapid tightening across the world. The unprecedented pace of the policy shift caused a repricing of risk assets as the "everything bubble" burst, best explained by a collapse of multiples with the formerly high-flying growth sectors of the market hit especially hard.

The 2022 calendar year marked the worst performance of the traditional 60/40 equity/fixed income portfolio in the last 80 years. From an equity style perspective, there was nowhere to hide; however, large cap value held up relatively well, falling 'only' -7.5% for the year. The large cap growth segment of the market got hit hardest, losing -29.1%, primarily due to weakness in high multiple large cap technology names. From a sector perspective, the information technology, consumer discretionary, and communication services sector all fell more than 30% during the year. Utilities and consumer staples remained relatively flat. The only sector to experience meaningful positive performance was the energy sector which was up roughly 60%. From a factor perspective, quality as defined by operating margin, return on equity, return on invested capital, and future cash flow growth led the market. Companies with higher leverage and limited liquidity were punished.

The high levels of inflation and the actions of global central banks to combat it were the central narrative of 2022. While the balance of data is beginning to indicate that inflation may have peeked and could soon start to roll over, the full potential of the damage to markets and the economy remains uncertain. The probability that the Fed may be near the end of their hiking cycle is rising as goods and commodity inflation has begun to abate. However, stickier pockets like wages and housing are likely to remain elevated, and as such price normalization across the economy is likely to take longer than once hoped. The balance may be that inflation remains elevated for longer than markets currently anticipate, and rates remain higher for longer than markets are pricing.

Volatility is likely to remain elevated in 2023 as the likelihood of a global recession is considered a certainty by many market participants, with only the depth and duration seemingly being debated. While 2022 performance was driven by a risk derating (multiple compression), 2023 is likely to be driven by earnings, which are likely to be weaker in response to a slowing global economy.

The KPPA Pension Trust portfolio fell -1.62% during the month of December, providing 100bps of downside protection versus a blended benchmark. The KRS Pension Composite produced a -1.24% return during the month. The KERS and SPRS Pension portfolios returned -1.18% and -1.08% respectively, while their benchmark fell -1.94%. The KERS-H Pension portfolio declined -1.56% versus its benchmark return of -2.60%. All three funds outperformed their respective benchmarks with similar drivers of attribution. All three plans benefitted from strong selection in the Fixed Income allocation (both in the Core and Specialty Credit spaces), and solid relative performance from the public equity allocation, more specifically from the U.S. Equity allocation. The overweight to Fixed Income was additive in terms of



relative performance, most notably in the KERS and KERS-H plans. All three plans were helped by their overweight cash positions during a volatile market period. Partially offsetting positive relative outperformance, was the underweight to both the Real Return and Real Estate allocations.

For the fiscal year-to-date, the KPPA Pension Trust portfolio gained 2.05%, outperforming the benchmark return of 0.36% while the KRS Pension Composite returned 1.43%. The KERS and SPRS Pension portfolios returned 1.19% and 1.73%, against a benchmark return of 0.47%. The KERS-H Pension portfolio gained 2.15% while its benchmark returned 0.43%. All three funds outperformed due to similar attribution drivers. Relative outperformance was driven by solid performance in the Private Equity, Core Fixed Income, and Public Equities portfolios, most notably within the international strategies. The portfolios benefitted from their overweights to cash during a volatile period. The underweights to Real Estate and Real Return partially offset relative outperformance for all three plans.

Global equity markets were weaker during the month of December, as evidenced by the MSCI ACWI Index returning -3.94%. Domestic markets were significantly weaker than their Non-US market counterparts (R3000: -5.86% versus MSCI ACWI Ex-US: -0.62%). This brought the fiscal year return for global equity markets to 2.28%.

US equity markets fell -5.86% during the month (Russell 3000), while the KPPA portfolio fared slightly better, returning -5.43%. All market segments were significantly weaker; with value holding up better than growth (R3000V: -7.58% versus R3000G: -4.18%). Despite the negative absolute return, individual strategies provided positive relative performance.

For the first two quarters of the fiscal year, the KPPA US Equity portfolio gained 2.96% compared with its benchmark return of 2.40%. During the period, mid-caps significantly outperformed both their small and large cap counterparts (MC: 8.05% versus R2000: 3.91% versus SP500: 2.31%). Value significantly outperformed growth (5.95% versus -1.13%) during the period. The KPPA portfolio's relative outperformance has been driven by its slight overweight down market cap and tilt value.

NonUS equity markets returned -0.62% (MSCI ACWI Ex-US) during the month. Developed markets returned -0.45% (MSCI World Ex-US) during the period while emerging markets fell -1.45% (MSCI EM). The KPPA portfolio lost -0.70% during the month, trailing the index by 8bps. Relative underperformance was driven by stock selection, as most individual mandates struggled.

Fiscal year-to-date, Non-US markets rose 3.09%%. Developed markets significantly outperformed their emerging market counterparts (5.66% versus -2.99%). The KPPA portfolio returned 4.65%, thanks to strong relative performance amongst the individual strategies, in particular the relative value and emerging market mandates.

The specialty credit portfolio outperformed its benchmark during the month, returning 0.53% versus -0.10%. The High Yield market declined (-0.62%) as spreads reversed in a continuation of the risk-off sentiment and rates rose. The leveraged loan segment of the market held up better as the Morningstar LSTA Leveraged Loan Index gained 0.42% during the month as quality outperformed better combined with less sensitive rate profile. During the first half of the fiscal year, the portfolio underperformed its benchmark, gaining 2.30% versus 3.85%. Individual strategy relative performance has been mixed fiscal year to date, especially with private market pricing playing catch-up, but continues to produce strong relative performance over longer periods.

The core fixed income portfolio gained 38bps compared to the Bloomberg Aggregate Index return of -0.45%. Relative outperformance was attributable to positioning within the allocation; the portfolios remain underweight overall duration given rising rates and elevated volatility. Both shorter-term and intermediate credit market segments held up better. For the fiscal year, the portfolio returned -0.54% compared to the benchmark return of -2.97%.

The private equity allocation fell -1.97% during the month, bringing the fiscal year return to -5.99%. Trailing public marks have significantly affected the overall performance of the portfolio, the 1-year return crossed into negative territory, now at -0.21% as of 12/31/22.

The real return portfolio fell -1.34% during the month, compared to its benchmark return of 0.15%. As with several of the previous month, performance was driven by the MLP portion of the portfolio (approximately 40% of the allocation); the investment was down -4.81%. For the fiscal year, the portfolio has returned 7.70%, bringing the 1-year return to 6.73%.

Real estate remained relatively flat during the month, falling 8bps. The latest quarter performance of 1.15% brought the 1-year return to 18.74% versus 20.96%. The portfolio has benefitted from recent strength in industrial, multi-family, student housing, and storage properties.

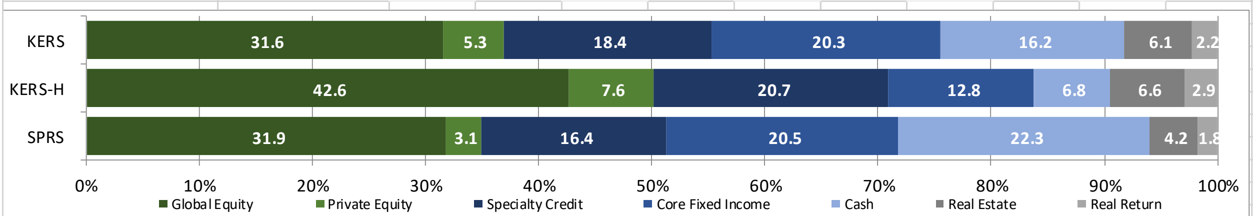
The cash portfolio returned 0.30% during the month compared with the 3-month T-bill's 0.34%. This brought the fiscal year return to 1.42% (versus 1.33%).

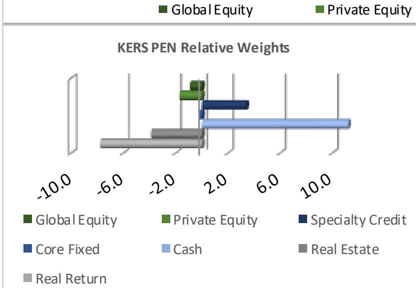
KERS, KERS-HAZ, & SPRS - PENSION FUND - PLAN NET RETURNS - 12/31/22

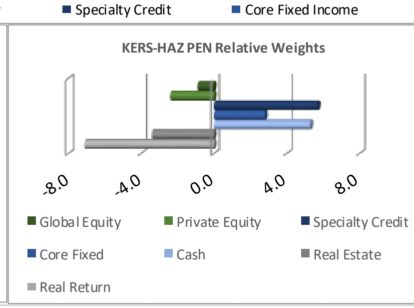
Plan	Market Value	Month	3 Months	Fiscal YTD	1 Year	3 Years	5 Years	10 Years	20 Years	30 Years	ITD
KERS	**3,178,335,341.70**	**-1.18**	**3.59**	**1.19**	**-7.22**	**4.65**	**5.14**	**6.43**	**6.75**	**7.45**	**8.65**
KY Ret. KERS Plan IPS Index		-1.94	4.09	0.47	-8.11	3.65	4.52	6.25	6.76	7.41	8.68
KERS- H	**835,263,424.75**	**-1.56**	**4.87**	**2.15**	**-8.04**	**4.78**	**5.36**	**6.77**	**6.92**	**7.57**	**8.74**
KY Ret. KERS Haz Plan IPS Index		-2.60	4.83	0.43	-9.35	4.35	5.15	6.62	6.94	7.53	8.77
SPRS	**556,724,007.90**	**-1.08**	**3.88**	**1.73**	**-6.40**	**4.72**	**5.18**	**6.38**	**6.73**	**7.44**	**8.64**
KY Ret. SPRS Plan IPS Index		-1.94	4.09	0.47	-8.11	3.65	4.52	6.22	6.74	7.40	8.67

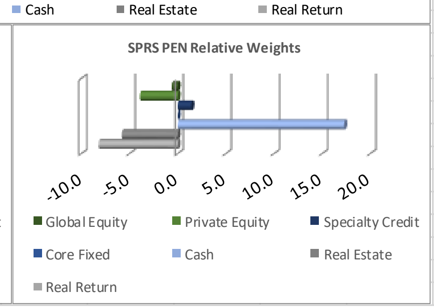
KPPA PENSION FUND UNIT - NET RETURNS - 12/31/22 - PROXY PLAN ASSET PERFORMANCE

Structure		Month	QTD	Fiscal YTD	1 Year	3 Years	5 Years	10 Years	20 Years	30 Years	ITD
PUBLIC EQUITY		**-3.51**	**10.58**	**3.70**	**-18.39**	**3.75**	**4.99**	**7.89**	**7.79**	**8.31**	**9.98**
MSCI ACWI		-3.94	9.76	2.28	-18.42	3.44	4.71	7.67	7.74	8.12	9.81
PRIVATE EQUITY		**-1.97**	**-4.17**	**-5.99**	**-0.21**	**15.53**	**14.20**	**13.59**	**12.67**		**11.87**
Russell 3000 + 3%(Qtr Lag)		-8.74	-3.54	-18.49	-14.63	10.76	11.65	14.71	11.91		11.33
SPECIALTY CREDIT		**0.53**	**1.96**	**2.30**	**0.00**	**4.52**	**5.06**				**5.34**
50% BB US HY / 50% SP LSTA Leveraged Loan		-0.10	3.45	3.85	-5.95	1.33	2.84				3.00
CORE FIXED INCOME		**0.38**	**1.47**	**-0.54**	**-5.85**	**0.12**	**1.69**				**2.33**
Bloomberg Barclays US Aggregate		-0.45	1.87	-2.97	-13.01	-2.71	0.02				1.38
CASH		**0.30**	**0.86**	**1.42**	**1.62**	**0.77**	**1.40**	**1.03**	**1.63**	**2.70**	**3.30**
Citigroup Treasury Bill-3 Month		0.34	0.87	1.33	1.50	0.71	1.25	0.74	1.22	2.30	2.89
REAL ESTATE		**-0.08**	**1.15**	**3.90**	**18.74**	**14.58**	**12.96**	**11.24**	**8.45**	**6.76**	**6.91**
NCREIF NFI-ODCE Net 1 Qtr in Arrears Index^		0.31	0.31	4.87	20.96	11.38	9.26	9.91	7.78	7.85	6.80
REAL RETURN		**-1.34**	**4.88**	**7.70**	**6.73**	**6.60**	**5.39**	**3.71**			**4.63**
US CPI +3%		0.15	1.25	3.32	7.97	7.00	5.63	3.96			4.00







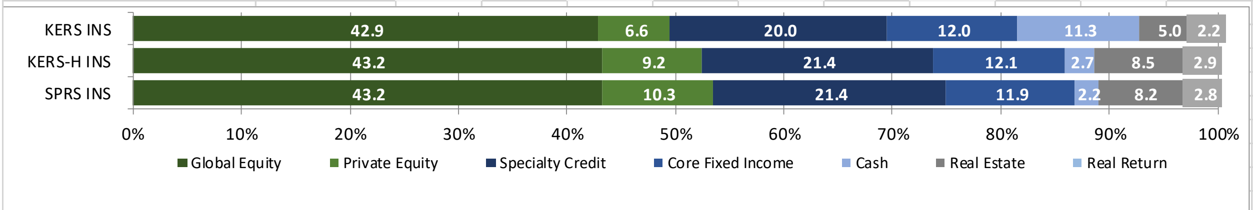


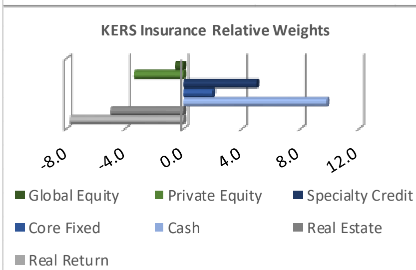
KERS INS, KERS-HAZ INS, SPRS INS - INSURANCE FUND - PLAN NET RETURNS - 12/31/22

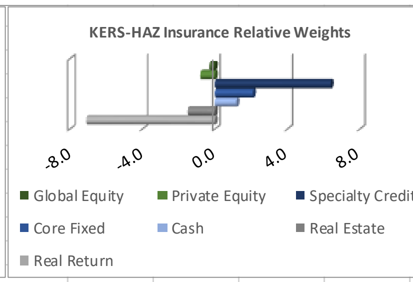
Plan	Market Value	Month	3 Months	Fiscal YTD	1 Year	3 Years	5 Years	10 Years	20 Years	30 Years	ITD
KERS INS	**1,332,672,899.88**	**-1.55**	**4.92**	**2.50**	**-7.57**	**4.90**	**5.16**	**6.43**	**6.64**	**6.66**	**7.16**
KY Ins. KERS Plan IPS Index		-2.60	4.83	0.43	-9.31	4.26	5.05	6.60	7.07	7.00	7.45
KERS - H INS	**583,326,425.34**	**-1.59**	**4.85**	**2.18**	**-7.09**	**5.03**	**5.50**	**6.78**	**6.81**	**6.78**	**7.26**
KY Ins. KERS Haz Plan IPS Index		-2.60	4.83	0.43	-9.31	4.09	4.99	6.59	7.06	7.00	7.45
SPRS INS	**231,494,396.52**	**-1.58**	**4.90**	**2.16**	**-7.19**	**5.27**	**5.75**	**6.94**	**6.89**	**6.83**	**7.30**
KY Ins. SPRS Plan IPS Index		-2.60	4.83	0.43	-9.31	4.09	4.99	6.60	7.07	7.00	7.45

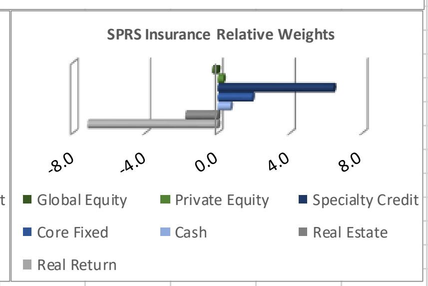
KPPA INSURANCE FUND UNIT - NET RETURNS - 12/31/22 - PROXY PLAN ASSET PERFORMANCE

Structure		Month	QTD	Fiscal YTD	1 Year	3 Years	5 Years	10 Years	20 Years	30 Years	ITD
PUBLIC EQUITY		**-3.50**	**10.57**	**3.67**	**-18.28**	**3.77**	**4.96**	**7.95**	**7.70**		**8.27**
MSCI ACWI		-3.94	9.76	2.28	-18.42	3.41	4.67	7.63	7.40		8.05
PRIVATE EQUITY		**-1.92**	**-2.45**	**-2.55**	**6.51**	**15.25**	**14.22**	**14.73**	**12.06**		**11.00**
Russell 3000 + 3%(Qtr Lag)		-8.74	-3.54	-18.49	-14.63	10.76	11.65	14.71	11.61		10.88
SPECIALTY CREDIT		**0.59**	**2.21**	**2.45**	**0.49**	**4.52**	**4.97**				**5.19**
50% BB US HY / 50% SP LSTA Leveraged Loan		-0.10	3.45	3.85	-5.95	1.33	2.84				3.00
CORE FIXED INCOME		**0.36**	**1.50**	**-0.62**	**-6.20**	**-0.13**	**1.52**				**2.03**
Bloomberg Barclays US Aggregate		-0.45	1.87	-2.97	-13.01	-2.71	0.02				1.38
CASH		**0.29**	**0.84**	**1.39**	**1.60**	**0.72**	**1.26**	**0.85**	**1.47**		**2.43**
Citigroup Treasury Bill-3 Month		0.34	0.87	1.33	1.50	0.71	1.25	0.74	1.22		2.31
REAL ESTATE		**-0.10**	**1.18**	**3.82**	**18.44**	**14.44**	**12.93**	**11.10**			**10.52**
NCREIF NFI-ODCE Net 1 Qtr in Arrears Index^		0.31	0.31	4.87	20.96	11.38	9.26	9.91			7.10
REAL RETURN		**-0.94**	**4.12**	**6.41**	**5.01**	**6.40**	**5.31**	**3.51**			**4.41**
US CPI +3%		0.15	1.25	3.32	6.69	6.96	5.64	4.02			4.05









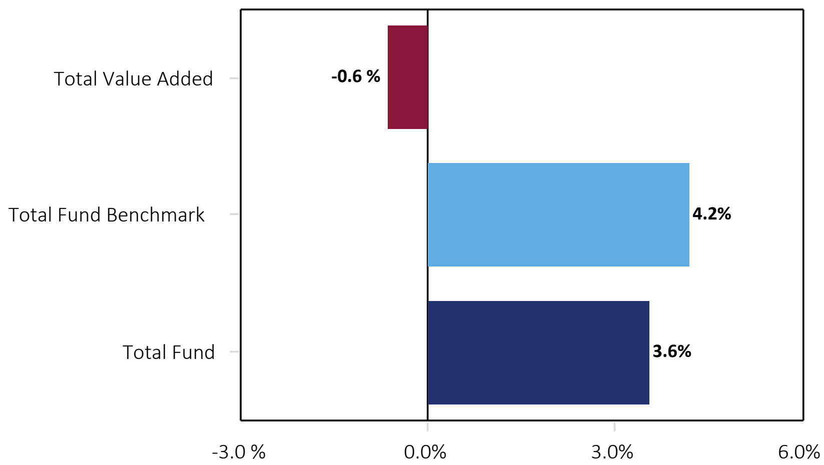
Wilshire

Total Fund Attribution

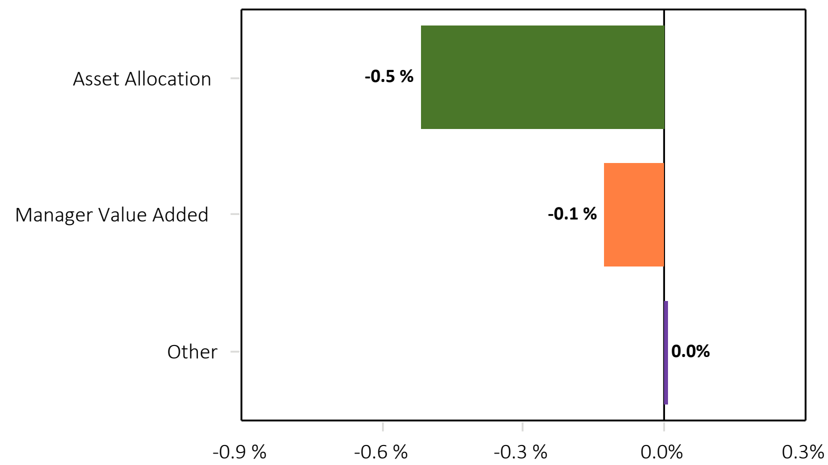
KERS Pension Plan

Periods Ended 1 Quarter Ending December 31, 2022

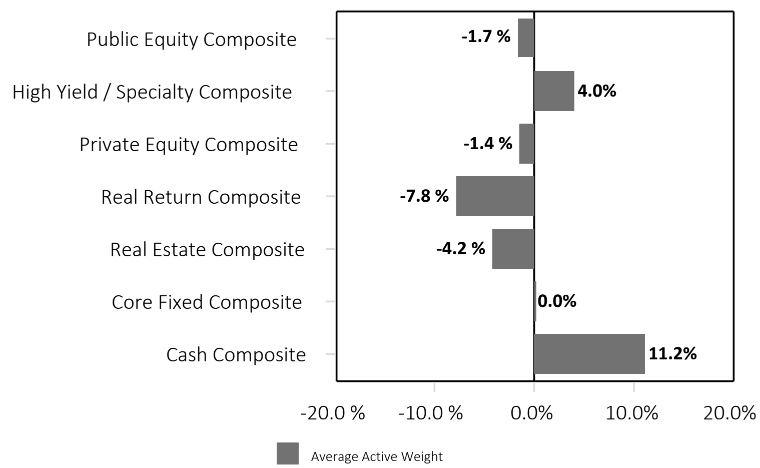
Total Fund Performance



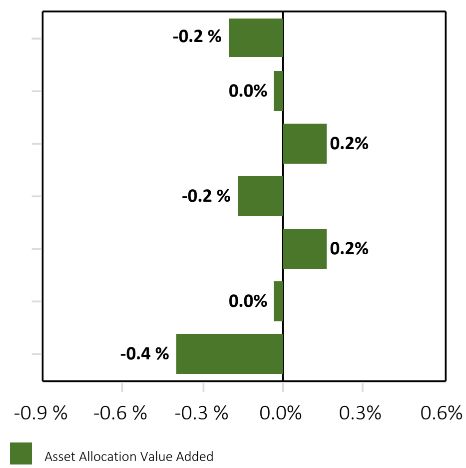
Total Value Added:-0.6 %



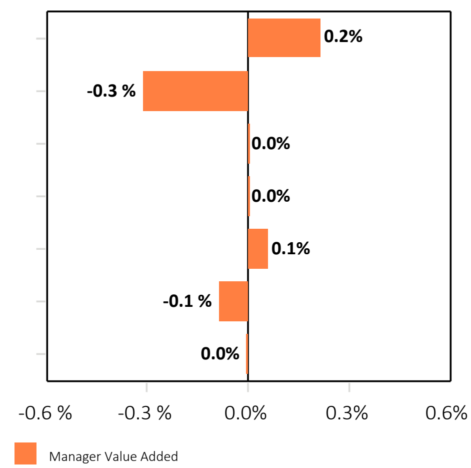
Total Asset Allocation:-0.5 %



Asset Allocation Value Added:-0.5 %



Total Manager Value Added:-0.1 %



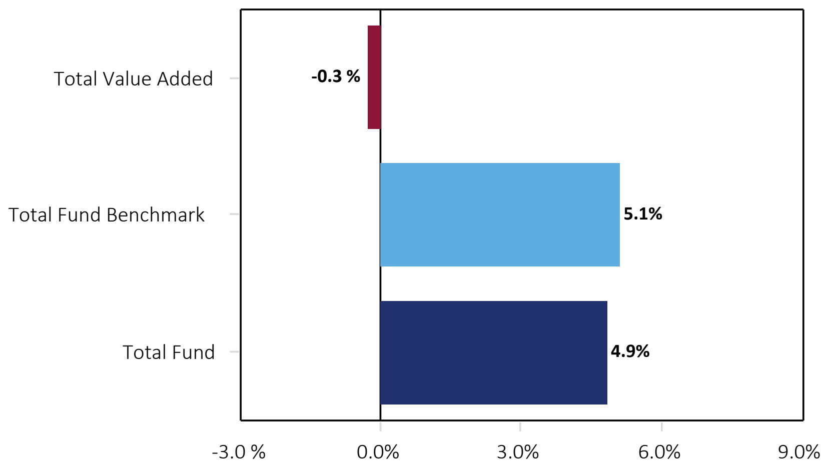
Wilshire

Total Fund Attribution

KERS (H) Pension Plan

Periods Ended 1 Quarter Ending December 31, 2022

Total Fund Performance



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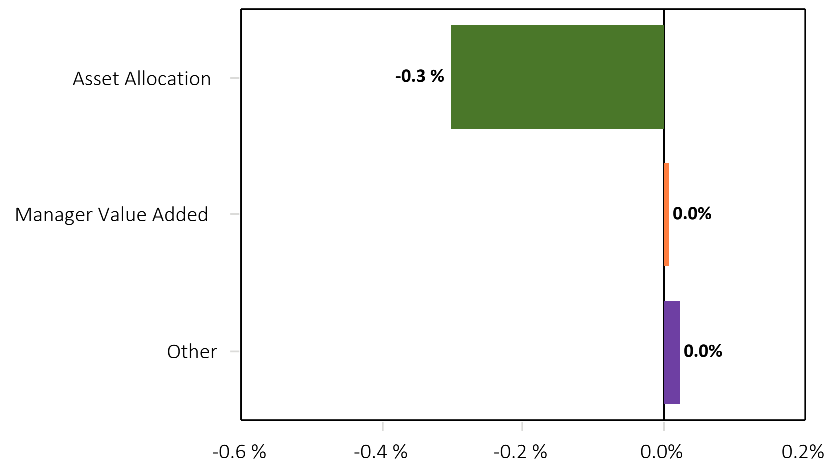

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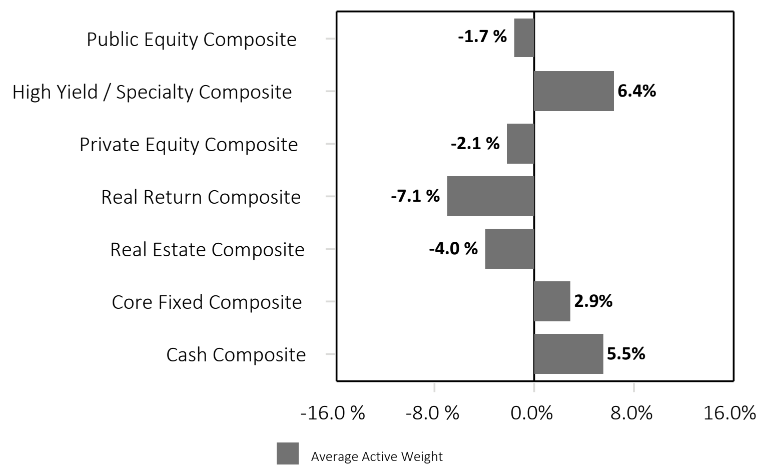
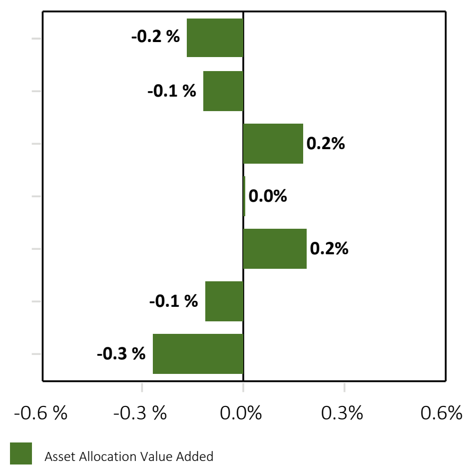
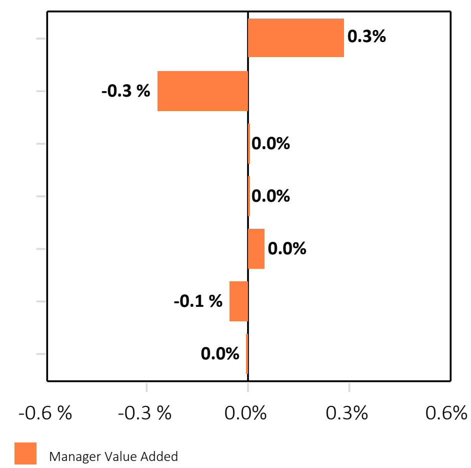


Asset Allocation Value Added:-0.3 %



Total Manager Value Added:0.0%



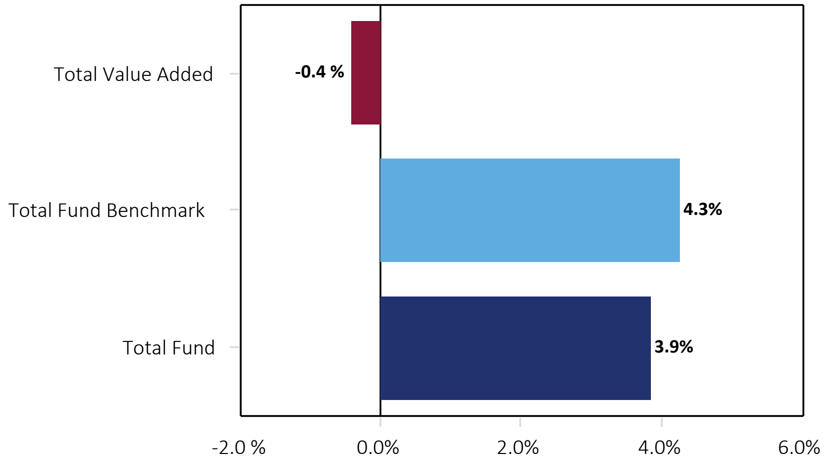
Wilshire

Total Fund Attribution

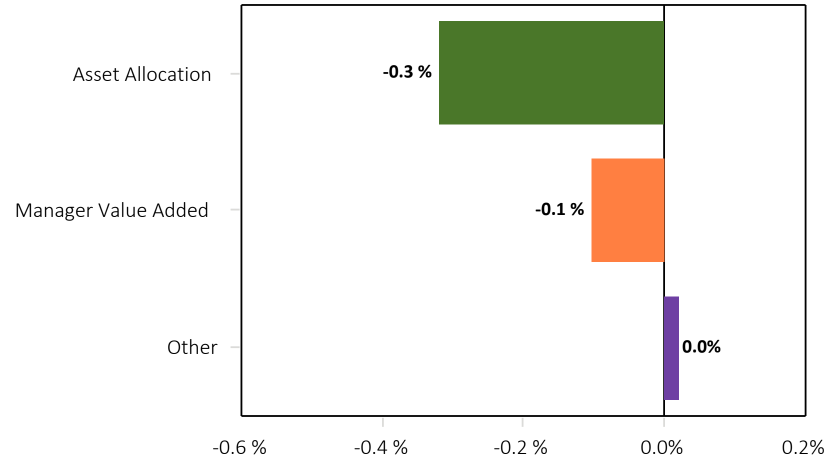
SPRS Pension Plan

Periods Ended 1 Quarter Ending December 31, 2022

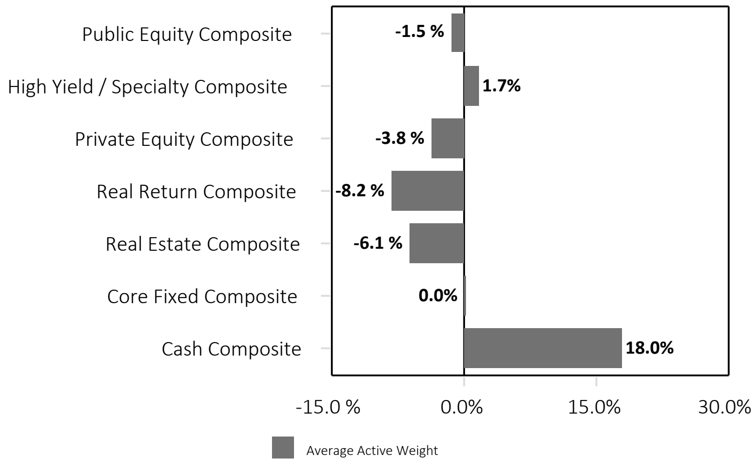
Total Fund Performance



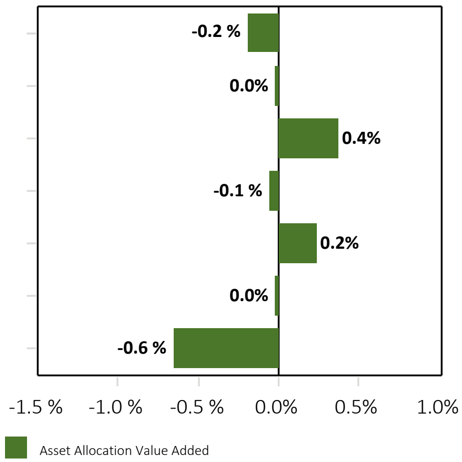
Total Value Added:-0.4 %



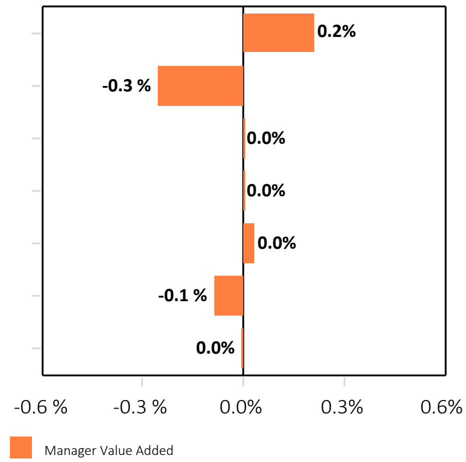
Total Asset Allocation:-0.3 %



Asset Allocation Value Added:-0.3 %



Total Manager Value Added:-0.1 %



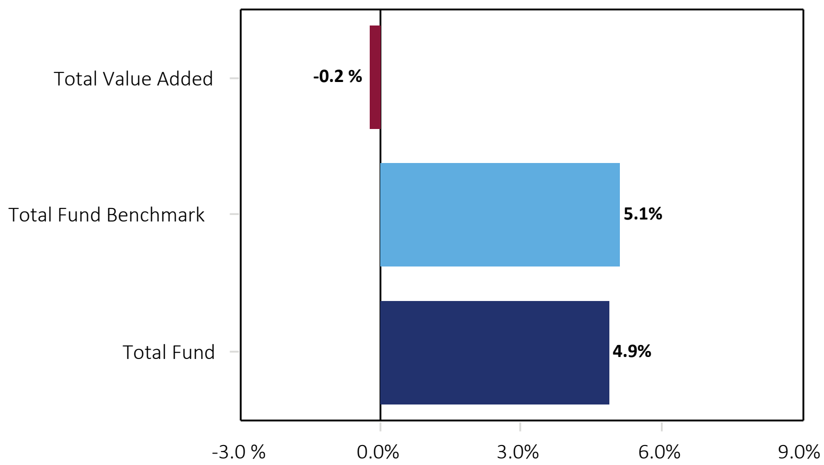
Wilshire

Total Fund Attribution

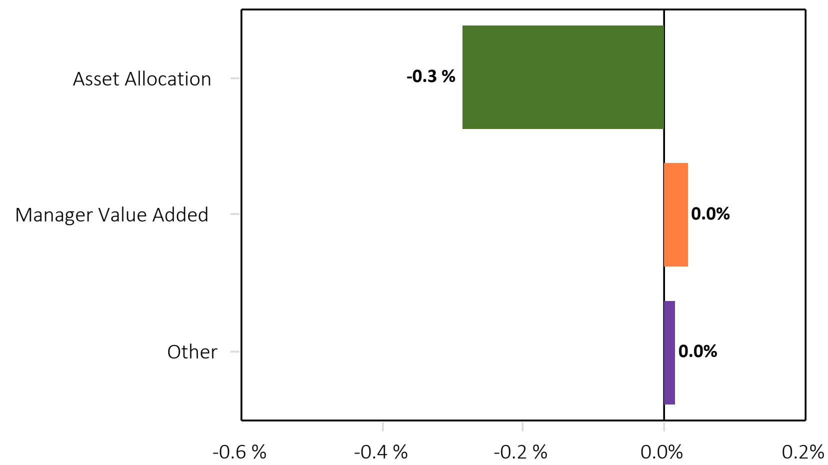
KERS Insurance Plan

Periods Ended 1 Quarter Ending December 31, 2022

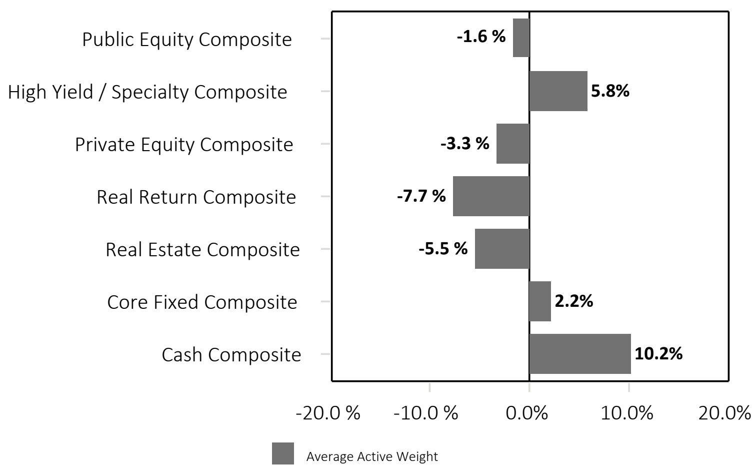
Total Fund Performance



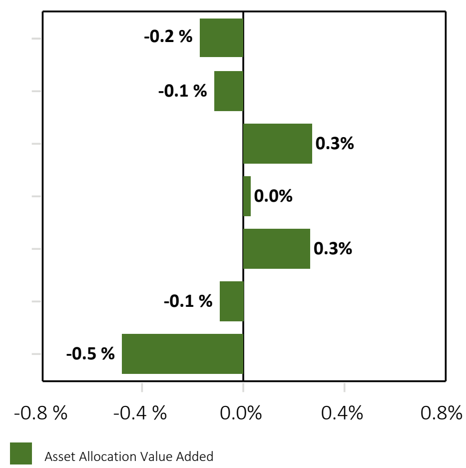
Total Value Added:-0.2 %



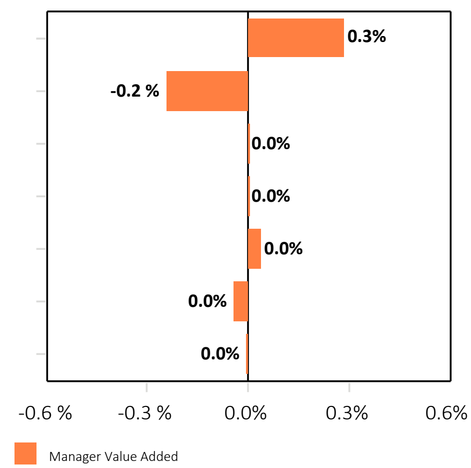
Total Asset Allocation:-0.3 %



Asset Allocation Value Added:-0.3 %



Total Manager Value Added:0.0%



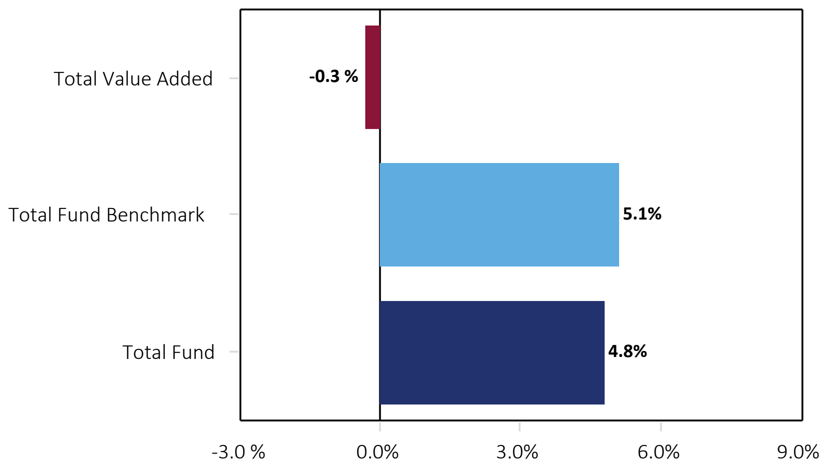
Wilshire

Total Fund Attribution

KERS (H) Insurance Plan

Periods Ended 1 Quarter Ending December 31, 2022

Total Fund Performance



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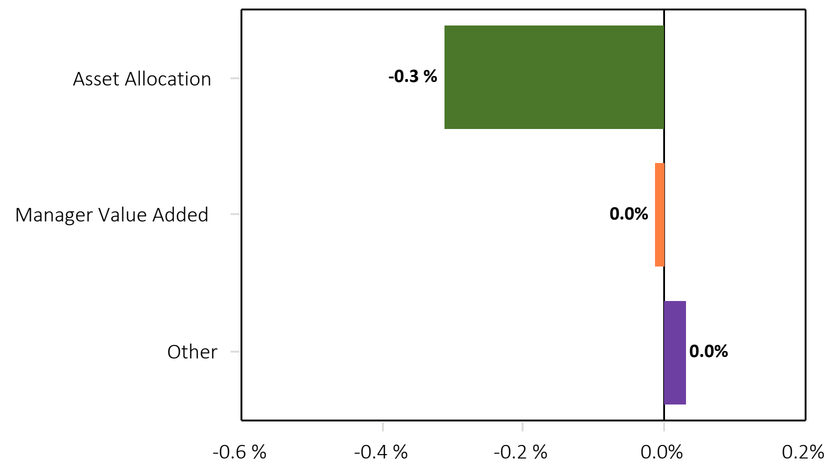

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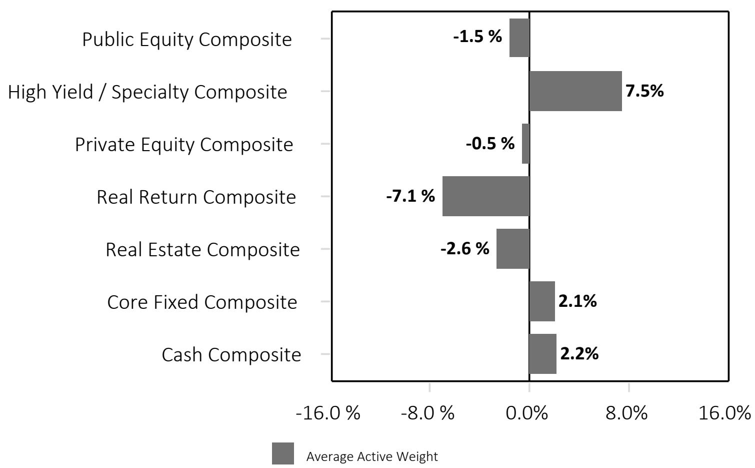
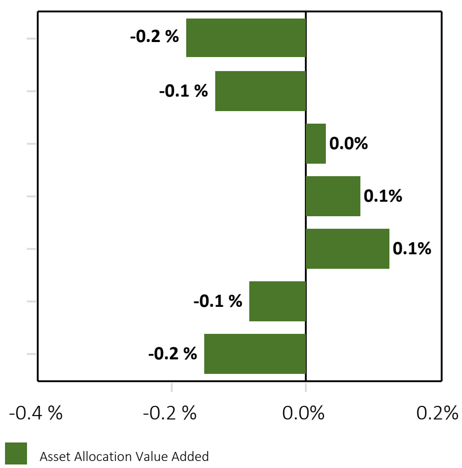


Asset Allocation Value Added:-0.3 %



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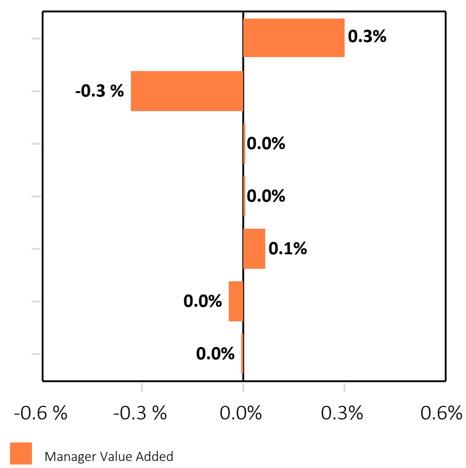


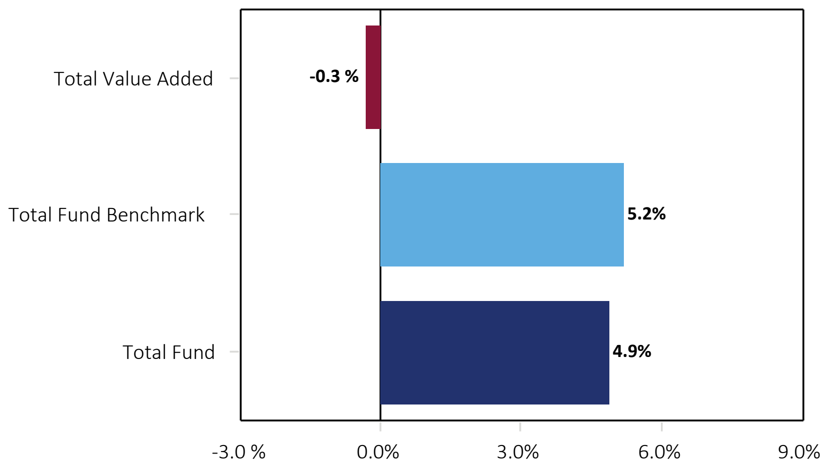
Wilshire

Total Fund Attribution

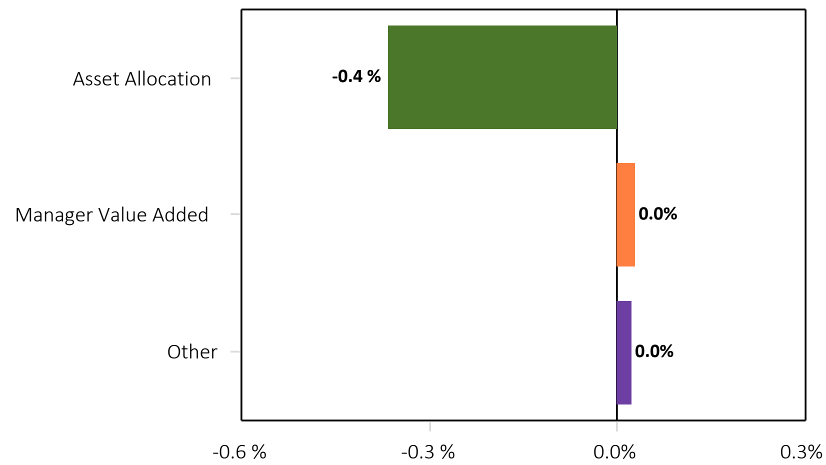
SPRS Insurance Plan

Periods Ended 1 Quarter Ending December 31, 2022

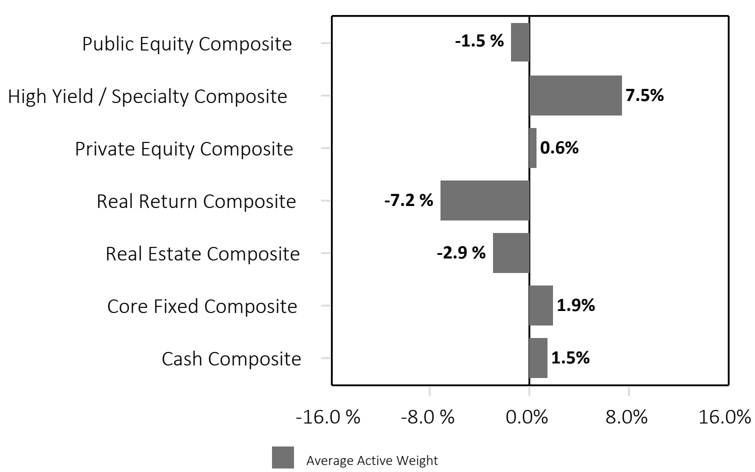
Total Fund Performance



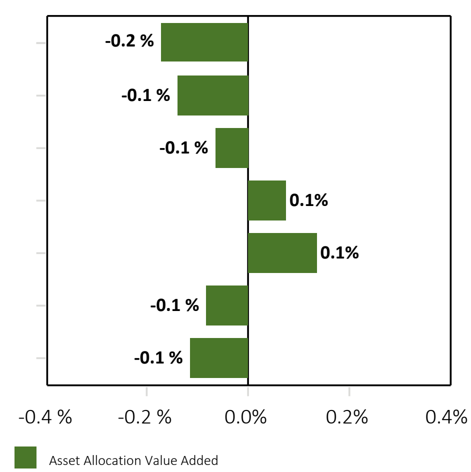
Total Value Added:-0.3 %



Total Asset Allocation:-0.4 %



Asset Allocation Value Added:-0.4 %



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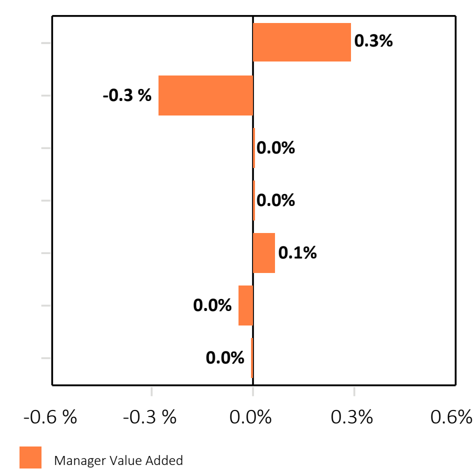

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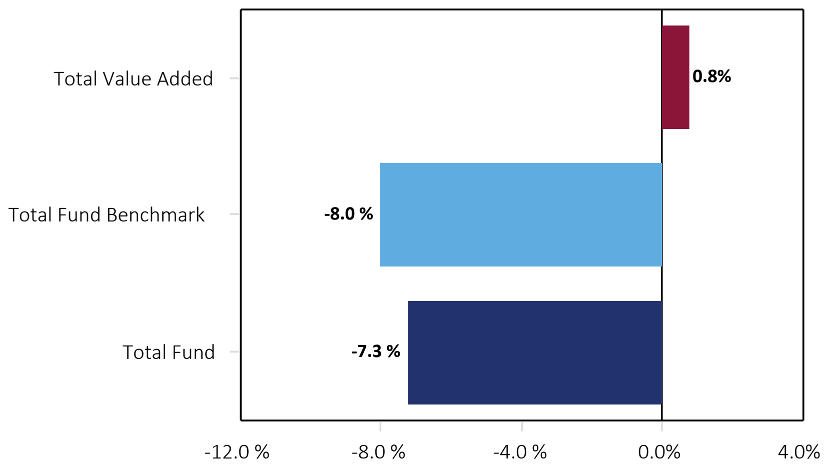
Wilshire

Total Fund Attribution

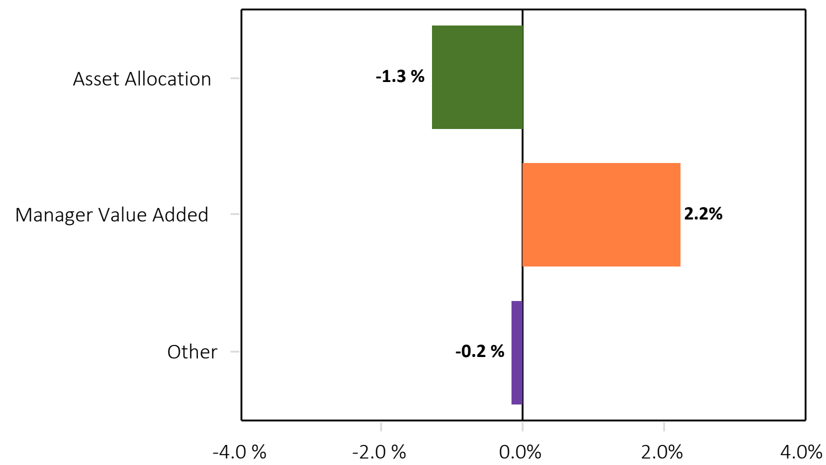
KERS Pension Plan

Periods Ended 1 Year Ending December 31, 2022

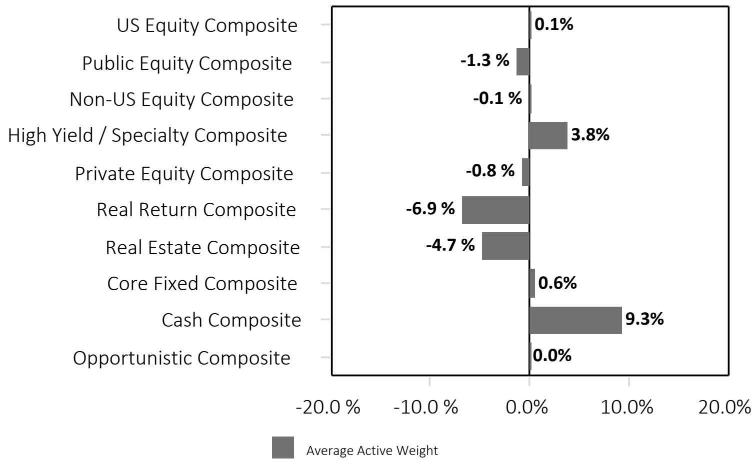
Total Fund Performance



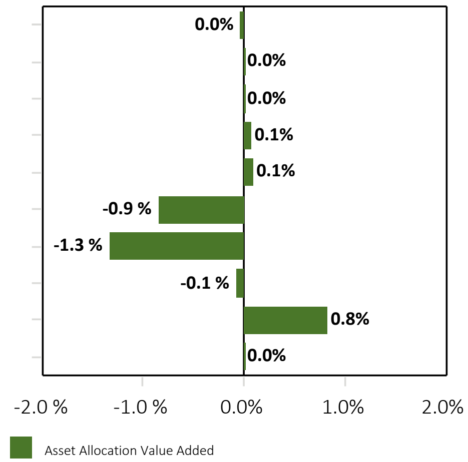
Total Value Added:0.8%



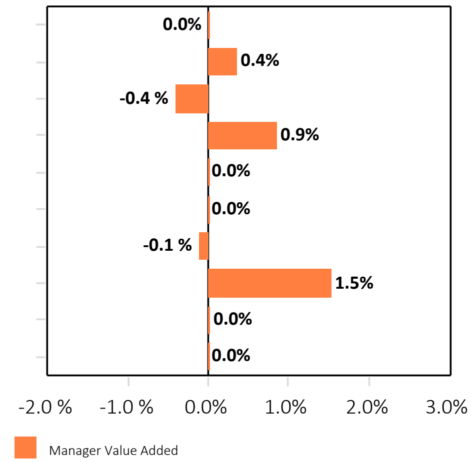
Total Asset Allocation:-1.3 %



Asset Allocation Value Added:-1.3 %



Total Manager Value Added:2.2%



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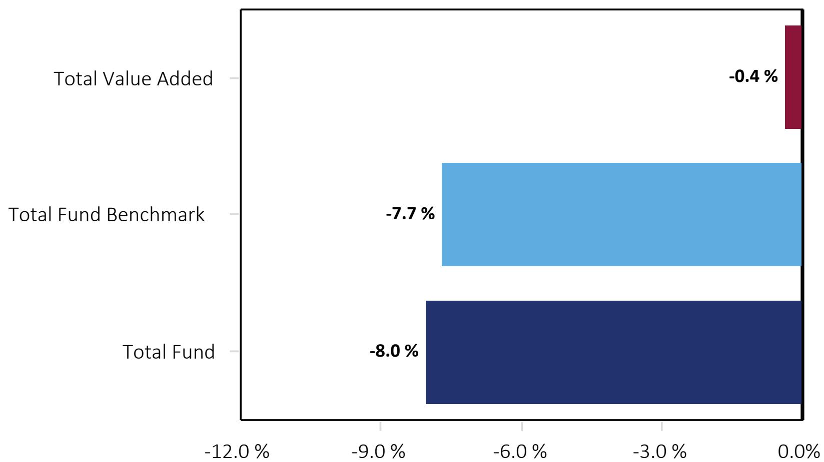
Wilshire

Total Fund Attribution

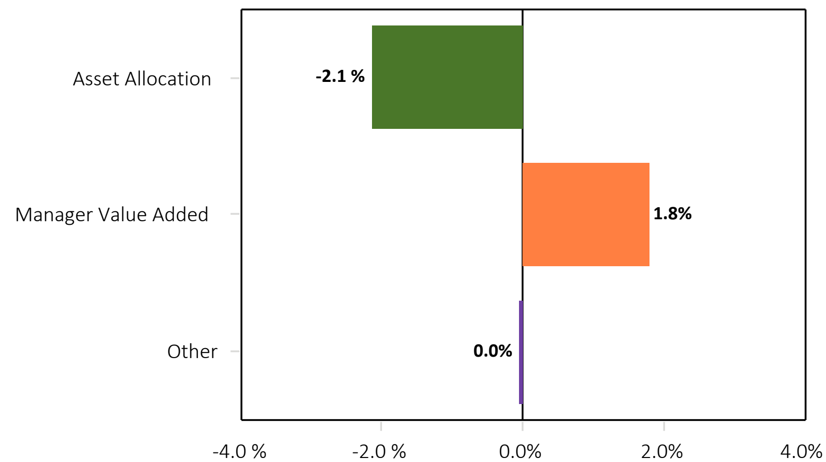
KERS (H) Pension Plan

Periods Ended 1 Year Ending December 31, 2022

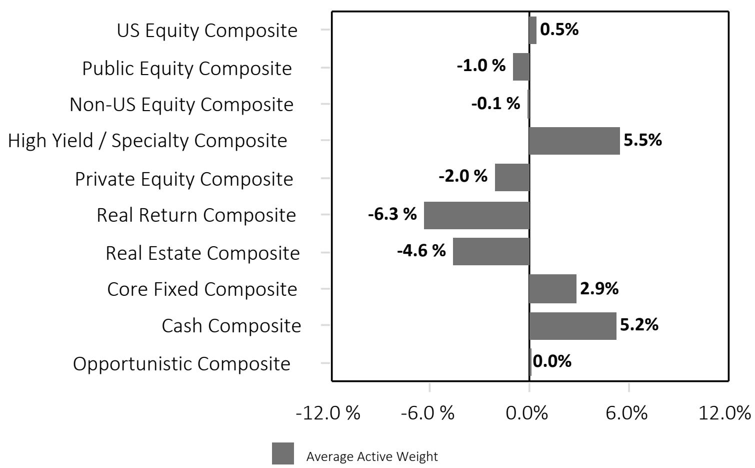
Total Fund Performance



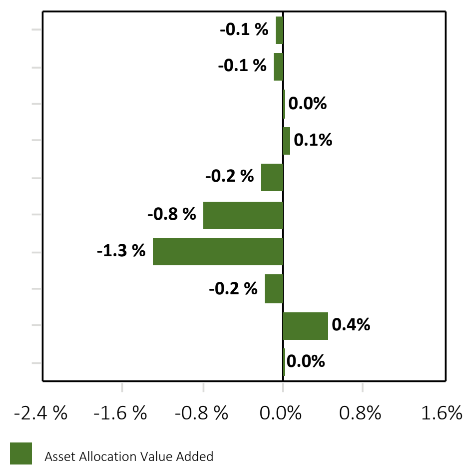
Total Value Added:-0.4 %



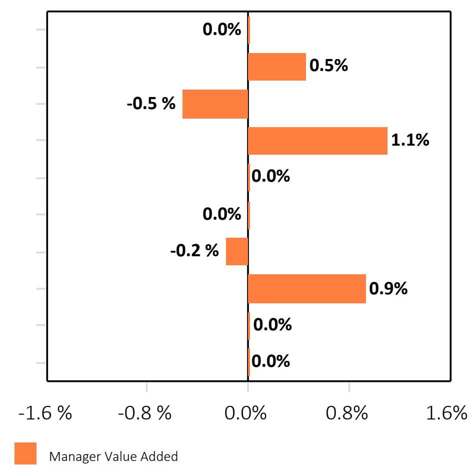
Total Asset Allocation:-2.1 %



Asset Allocation Value Added:-2.1 %



Total Manager Value Added:1.8%



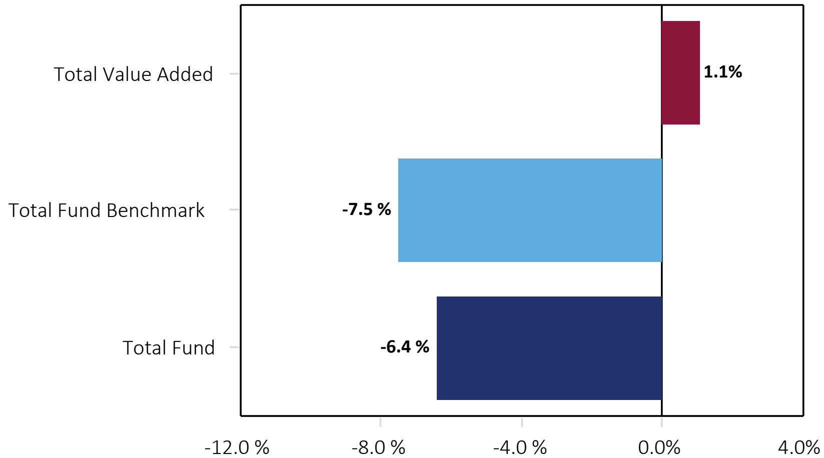
Wilshire

Total Fund Attribution

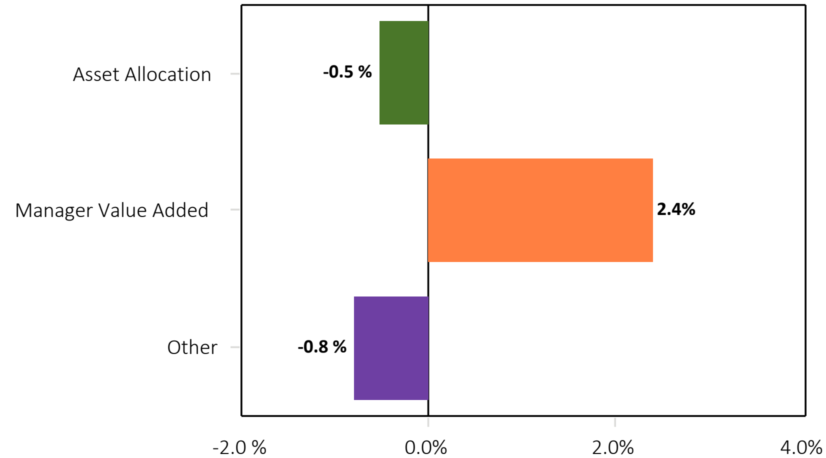
SPRS Pension Plan

Periods Ended 1 Year Ending December 31, 2022

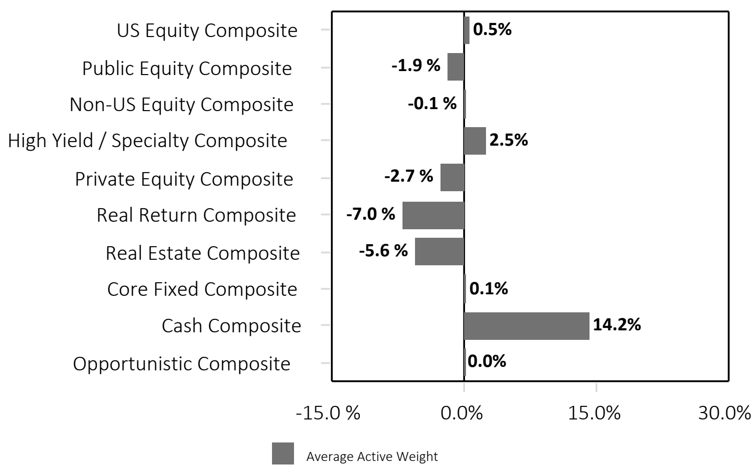
Total Fund Performance



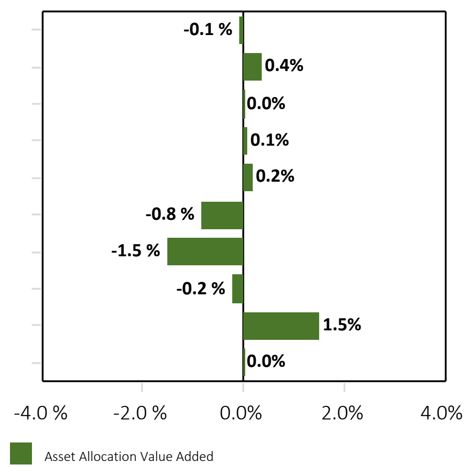
Total Value Added:1.1%



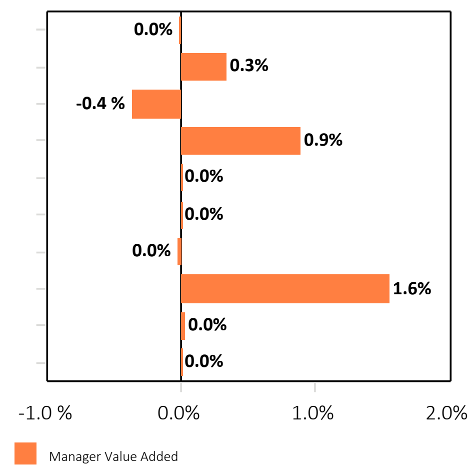
Total Asset Allocation:-0.5 %



Asset Allocation Value Added:-0.5 %



Total Manager Value Added:2.4%



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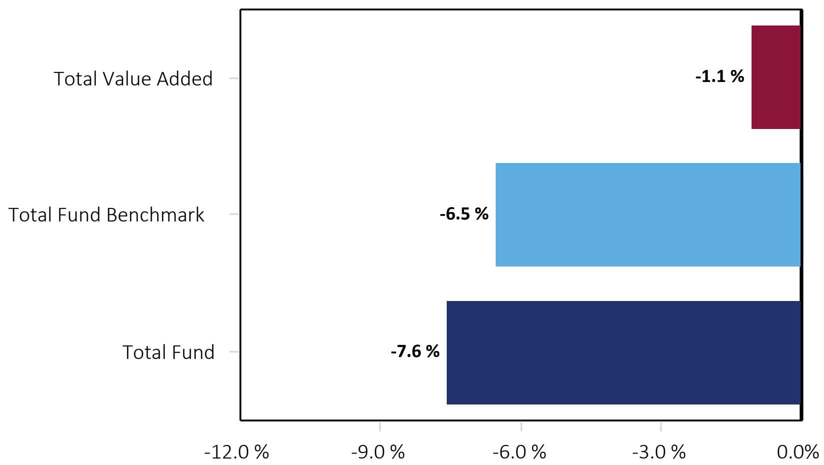
Total Fund Attribution

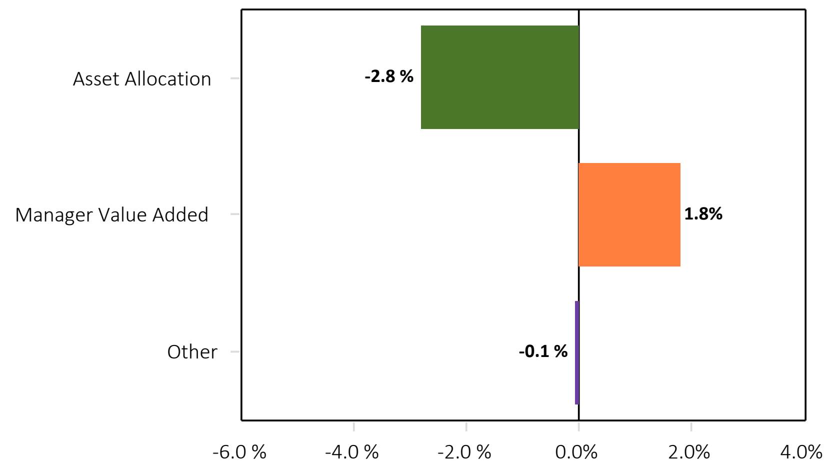
KERS Insurance Plan

Periods Ended 1 Year Ending December 31, 2022

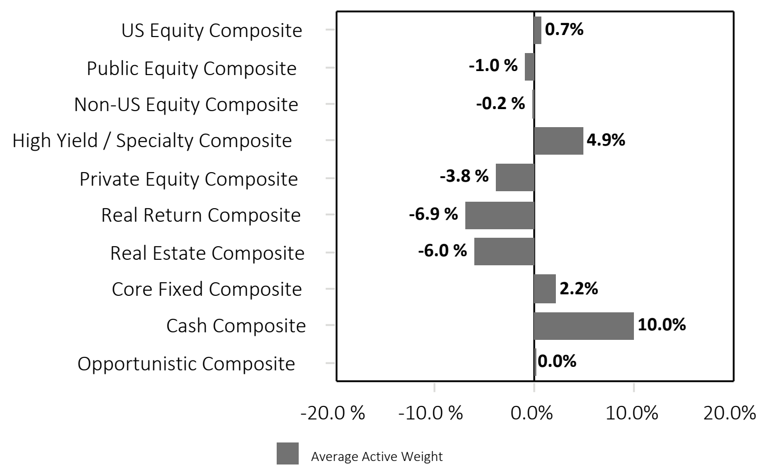
Total Fund Performance



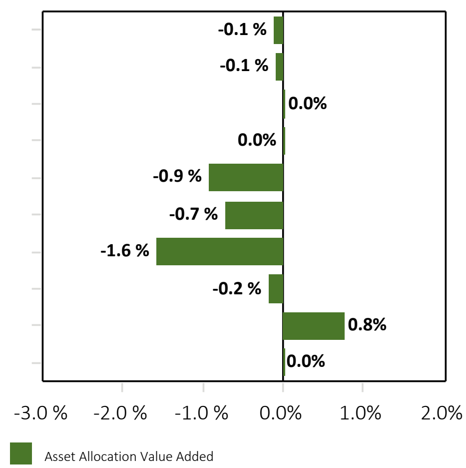
Total Value Added:-1.1 %



Total Asset Allocation:-2.8 %



Asset Allocation Value Added:-2.8 %



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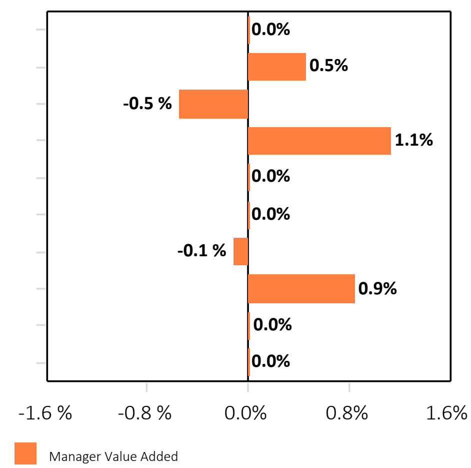


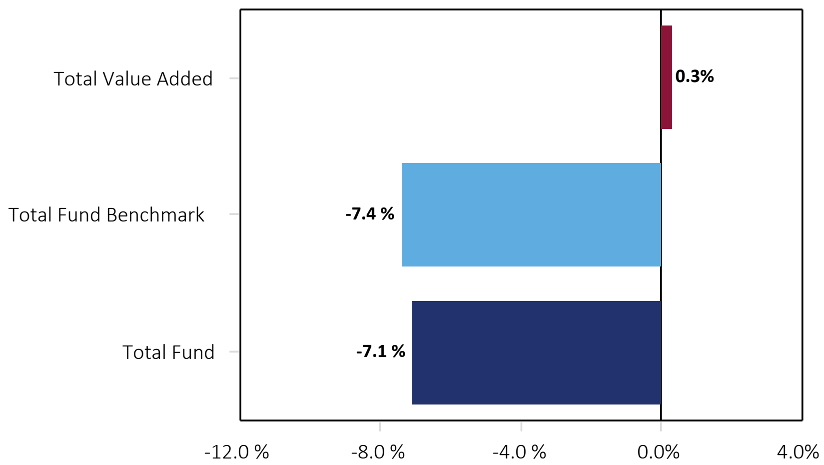
Wilshire

Total Fund Attribution

KERS (H) Insurance Plan

Periods Ended 1 Year Ending December 31, 2022

Total Fund Performance



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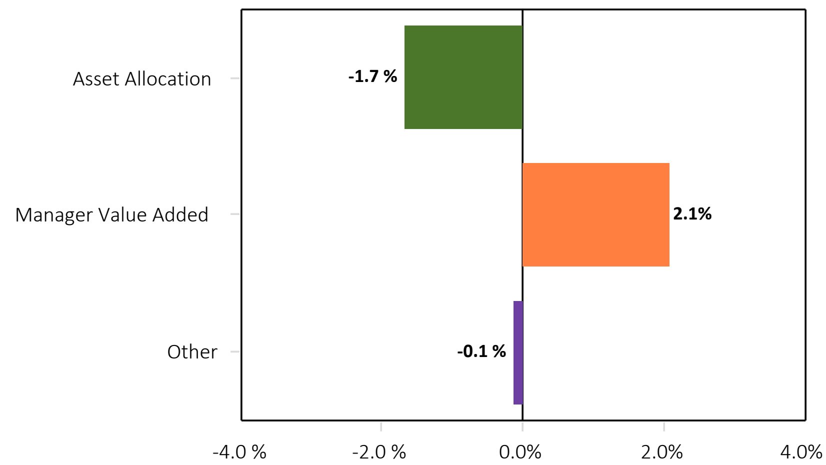
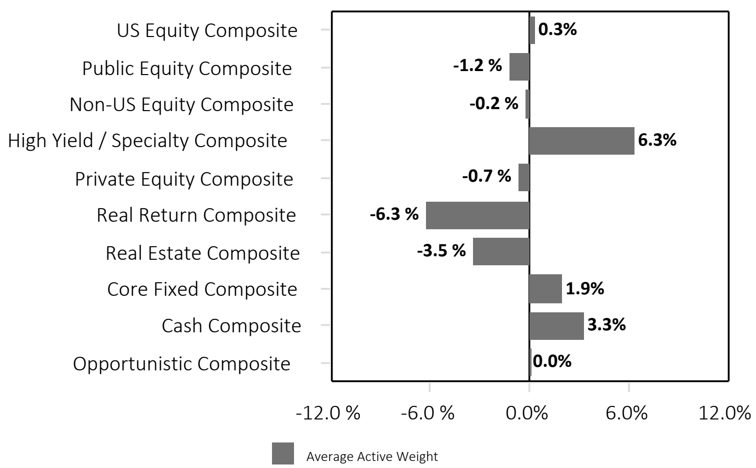
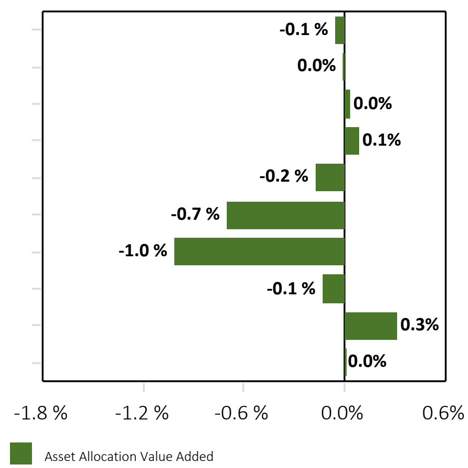


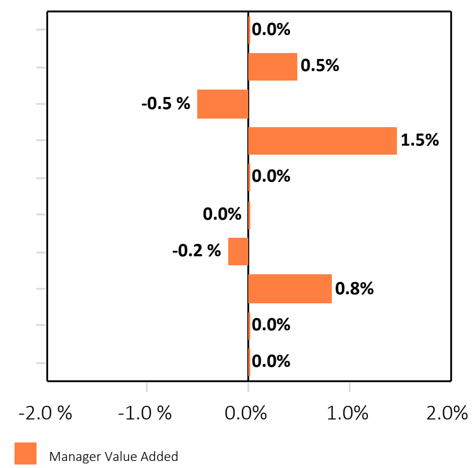
Total Asset Allocation:-1.7 %



Asset Allocation Value Added:-1.7 %



Total Manager Value Added:2.1%



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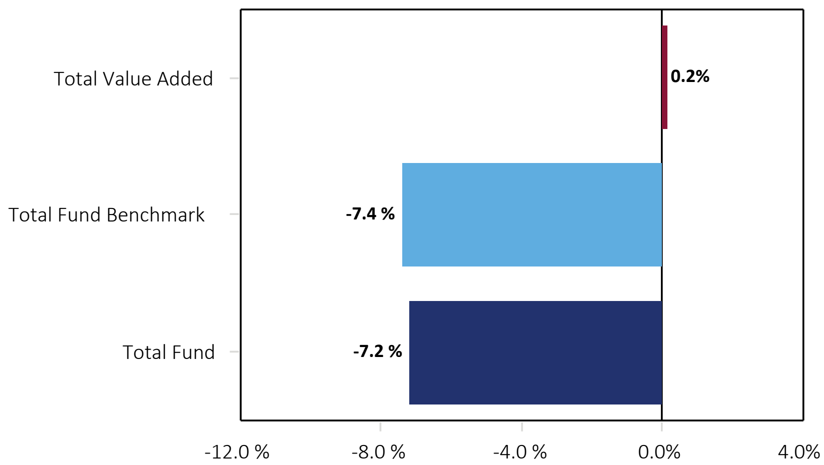
Wilshire

Total Fund Attribution

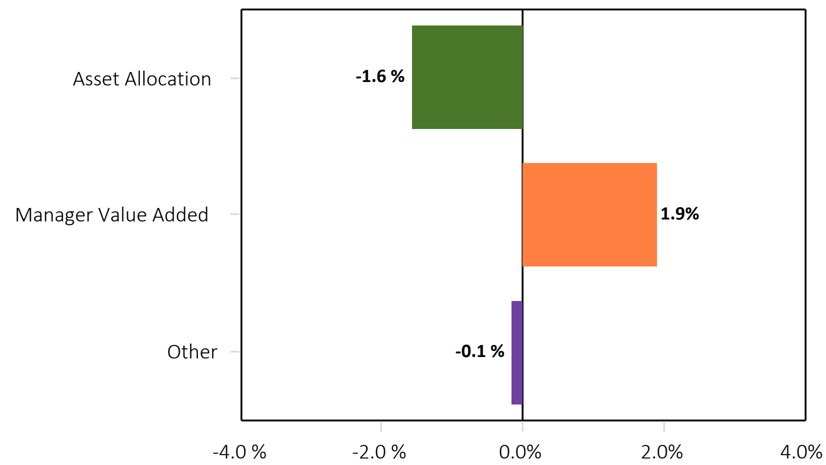
SPRS Insurance Plan

Periods Ended 1 Year Ending December 31, 2022

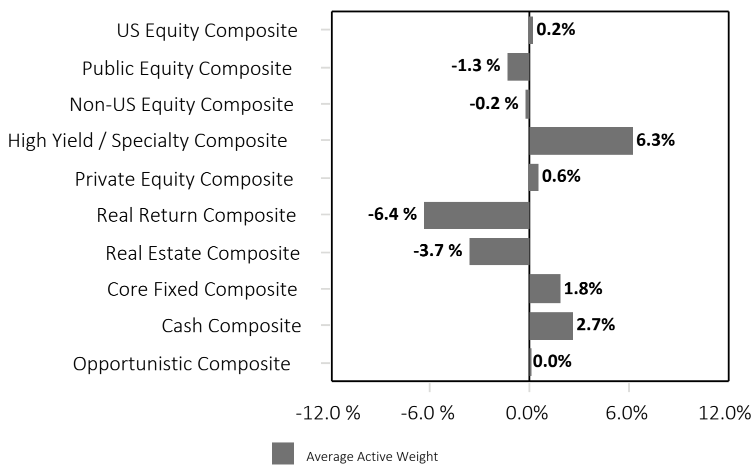
Total Fund Performance



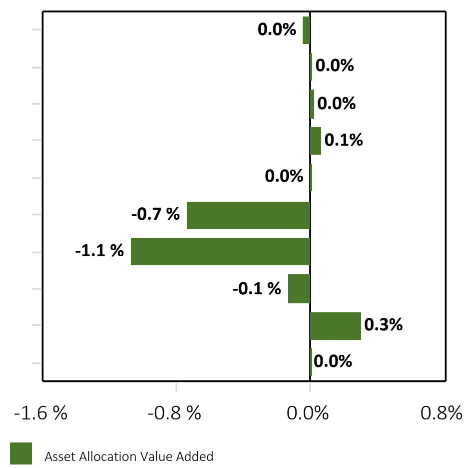
Total Value Added:0.2%



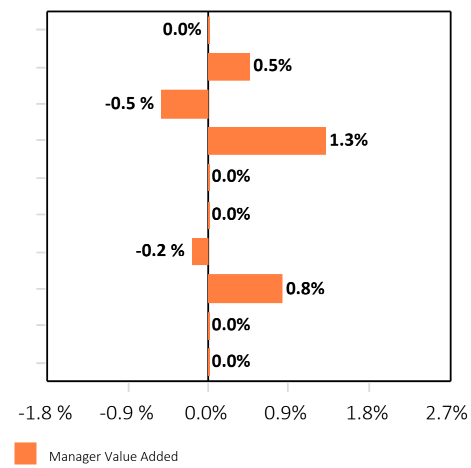
Total Asset Allocation:-1.6 %



Asset Allocation Value Added:-1.6 %



Total Manager Value Added:1.9%

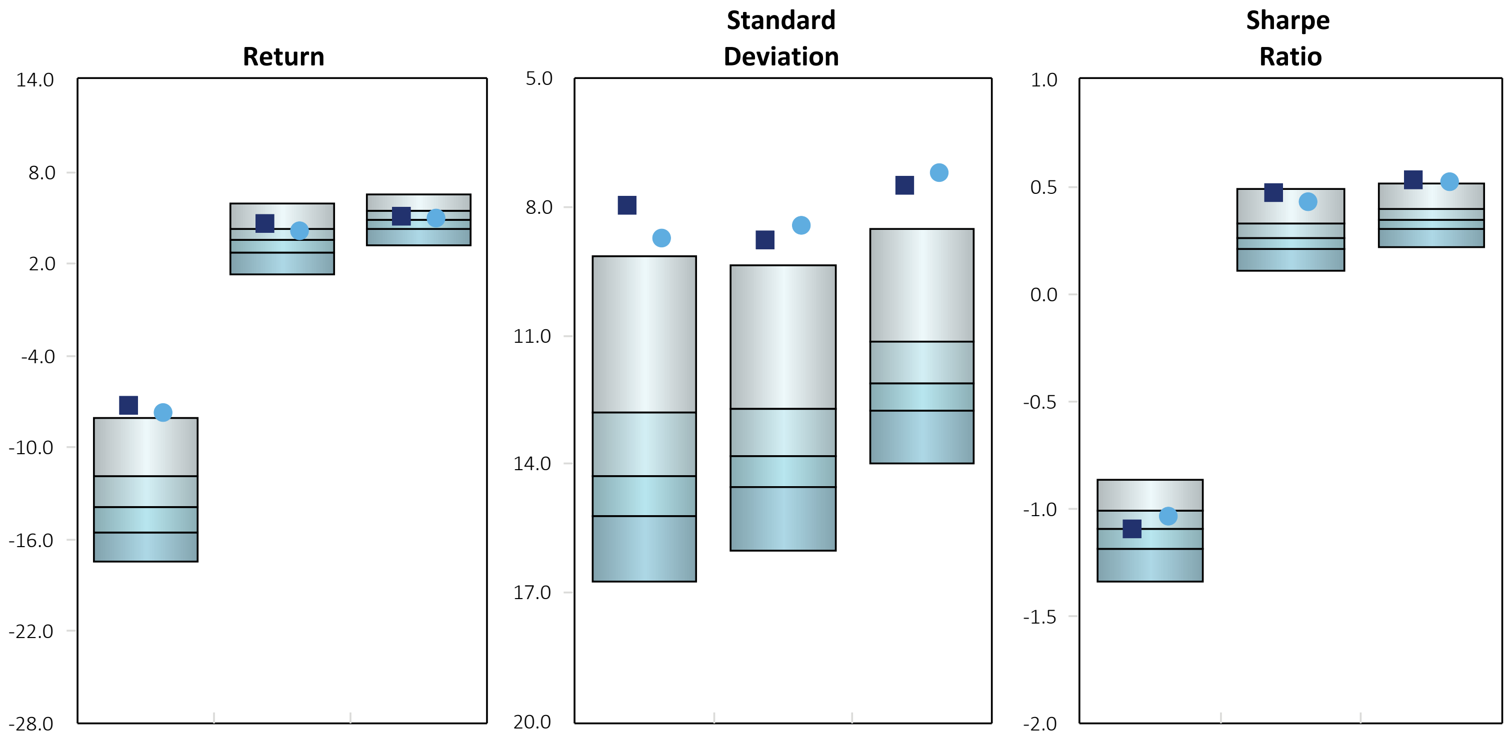


Wilshire

Plan Sponsor Peer Group Analysis - Multi Statistics

KERS Pension Plan vs All Public Plans-Total Fund

Periods Ended December 31, 2022



	Return 1 Year	Return 3 Years	Return 5 Years	Standard Deviation 1 Year	Standard Deviation 3 Years	Standard Deviation 5 Years	Sharpe Ratio 1 Year	Sharpe Ratio 3 Years	Sharpe Ratio 5 Years
■ KERS Pension Plan	-7.25 (4)	4.67 (19)	5.14 (39)	7.98 (3)	8.77 (3)	7.52 (2)	-1.09 (49)	0.48 (7)	0.53 (5)
● KERS Pension IPS Index	-7.67 (5)	4.12 (32)	4.93 (49)	8.75 (4)	8.45 (2)	7.21 (2)	-1.04 (32)	0.43 (9)	0.52 (5)
5th Percentile	-8.08	5.92	6.51	9.15	9.38	8.52	-0.87	0.49	0.51
1st Quartile	-11.88	4.33	5.50	12.78	12.72	11.16	-1.00	0.33	0.40
Median	-13.92	3.53	4.90	14.29	13.82	12.12	-1.10	0.26	0.35
3rd Quartile	-15.49	2.71	4.25	15.20	14.55	12.73	-1.19	0.21	0.31
95th Percentile	-17.47	1.29	3.20	16.75	16.03	13.98	-1.34	0.11	0.22

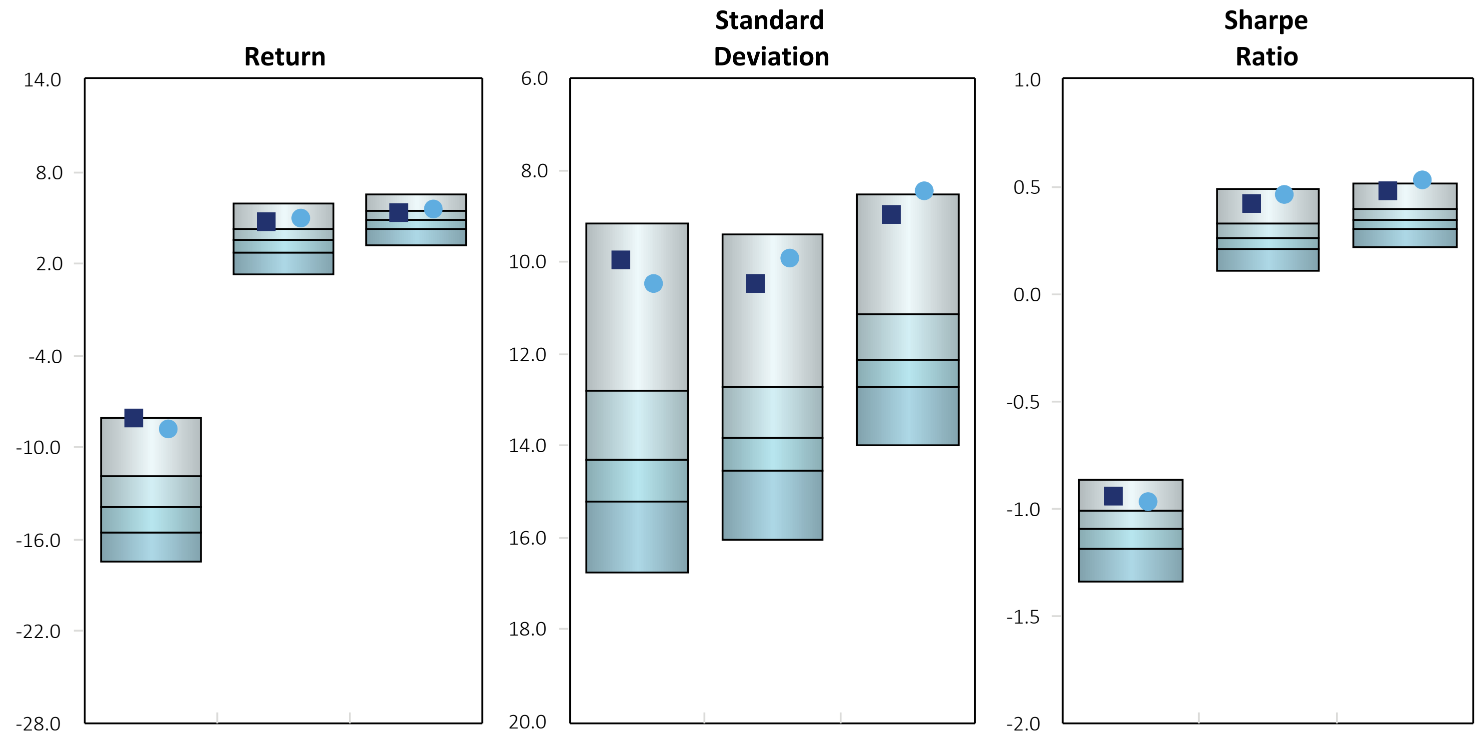
Parentheses contain percentile rankings.
Calculation based on monthly periodicity.

Wilshire

Plan Sponsor Peer Group Analysis - Multi Statistics

KERS (H) Pension Plan vs All Public Plans-Total Fund

Periods Ended December 31, 2022



	Return 1 Year	Return 3 Years	Return 5 Years	Standard Deviation 1 Year	Standard Deviation 3 Years	Standard Deviation 5 Years	Sharpe Ratio 1 Year	Sharpe Ratio 3 Years	Sharpe Ratio 5 Years
■ KERS (H) Pension Plan	-8.04 (5)	4.78 (17)	5.36 (31)	9.94 (7)	10.47 (7)	8.98 (6)	-0.94 (12)	0.43 (9)	0.48 (8)
● KERS (H) Pension IPS Index	-8.80 (6)	5.02 (12)	5.61 (23)	10.48 (9)	9.92 (6)	8.43 (4)	-0.96 (16)	0.47 (7)	0.54 (5)
5th Percentile	-8.08	5.92	6.51	9.15	9.38	8.52	-0.87	0.49	0.51
1st Quartile	-11.88	4.33	5.50	12.78	12.72	11.16	-1.00	0.33	0.40
Median	-13.92	3.53	4.90	14.29	13.82	12.12	-1.10	0.26	0.35
3rd Quartile	-15.49	2.71	4.25	15.20	14.55	12.73	-1.19	0.21	0.31
95th Percentile	-17.47	1.29	3.20	16.75	16.03	13.98	-1.34	0.11	0.22

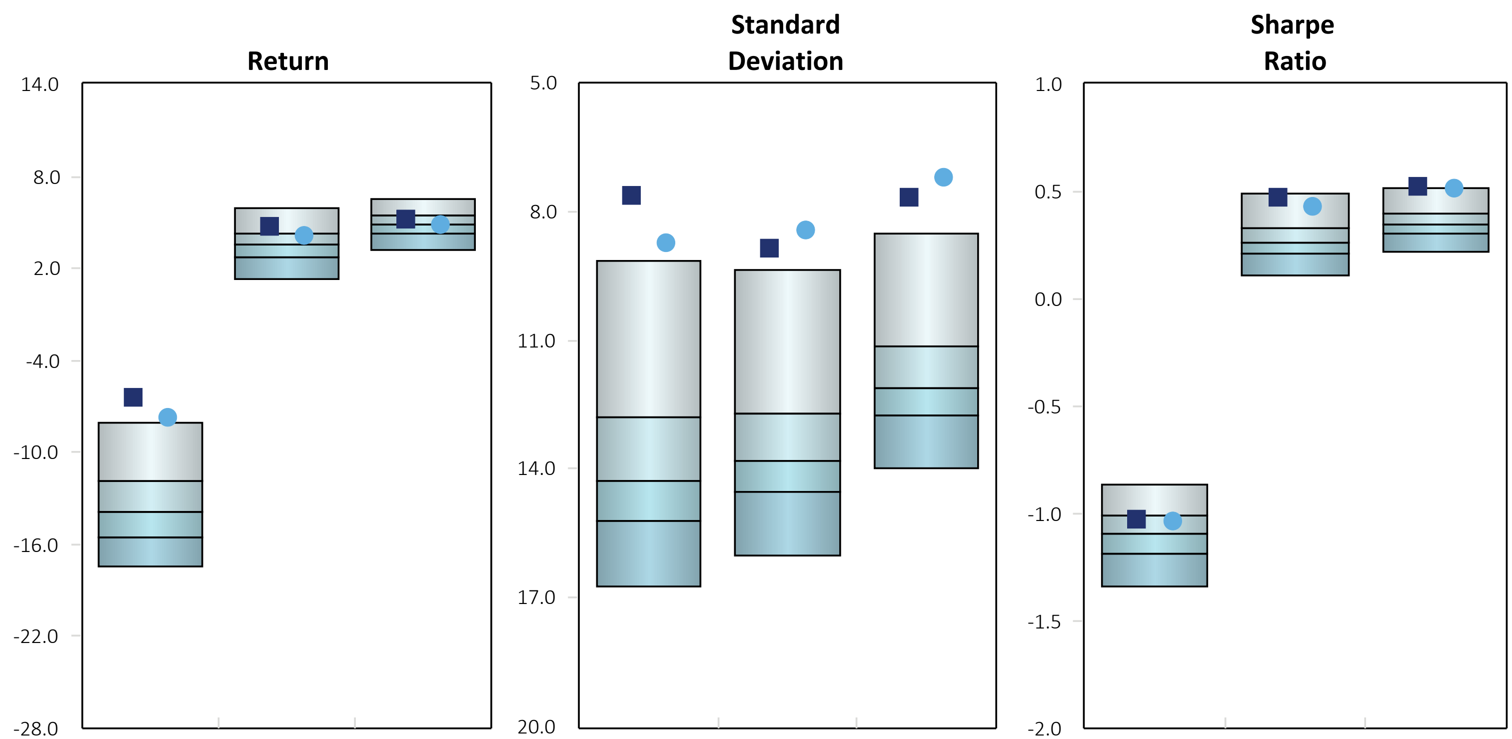
Parentheses contain percentile rankings.
Calculation based on monthly periodicity.

Wilshire

Plan Sponsor Peer Group Analysis - Multi Statistics

SPRS Pension Plan vs All Public Plans-Total Fund

Periods Ended December 31, 2022



	Return 1 Year	Return 3 Years	Return 5 Years	Standard Deviation 1 Year	Standard Deviation 3 Years	Standard Deviation 5 Years	Sharpe Ratio 1 Year	Sharpe Ratio 3 Years	Sharpe Ratio 5 Years
■ SPRS Pension Plan	-6.41 (3)	4.72 (18)	5.18 (38)	7.61 (3)	8.87 (3)	7.65 (2)	-1.03 (30)	0.48 (6)	0.53 (5)
● SPRS Pension IPS Index	-7.67 (5)	4.12 (32)	4.87 (52)	8.75 (4)	8.45 (2)	7.20 (2)	-1.04 (32)	0.43 (9)	0.52 (5)
5th Percentile	-8.08	5.92	6.51	9.15	9.38	8.52	-0.87	0.49	0.51
1st Quartile	-11.88	4.33	5.50	12.78	12.72	11.16	-1.00	0.33	0.40
Median	-13.92	3.53	4.90	14.29	13.82	12.12	-1.10	0.26	0.35
3rd Quartile	-15.49	2.71	4.25	15.20	14.55	12.73	-1.19	0.21	0.31
95th Percentile	-17.47	1.29	3.20	16.75	16.03	13.98	-1.34	0.11	0.22

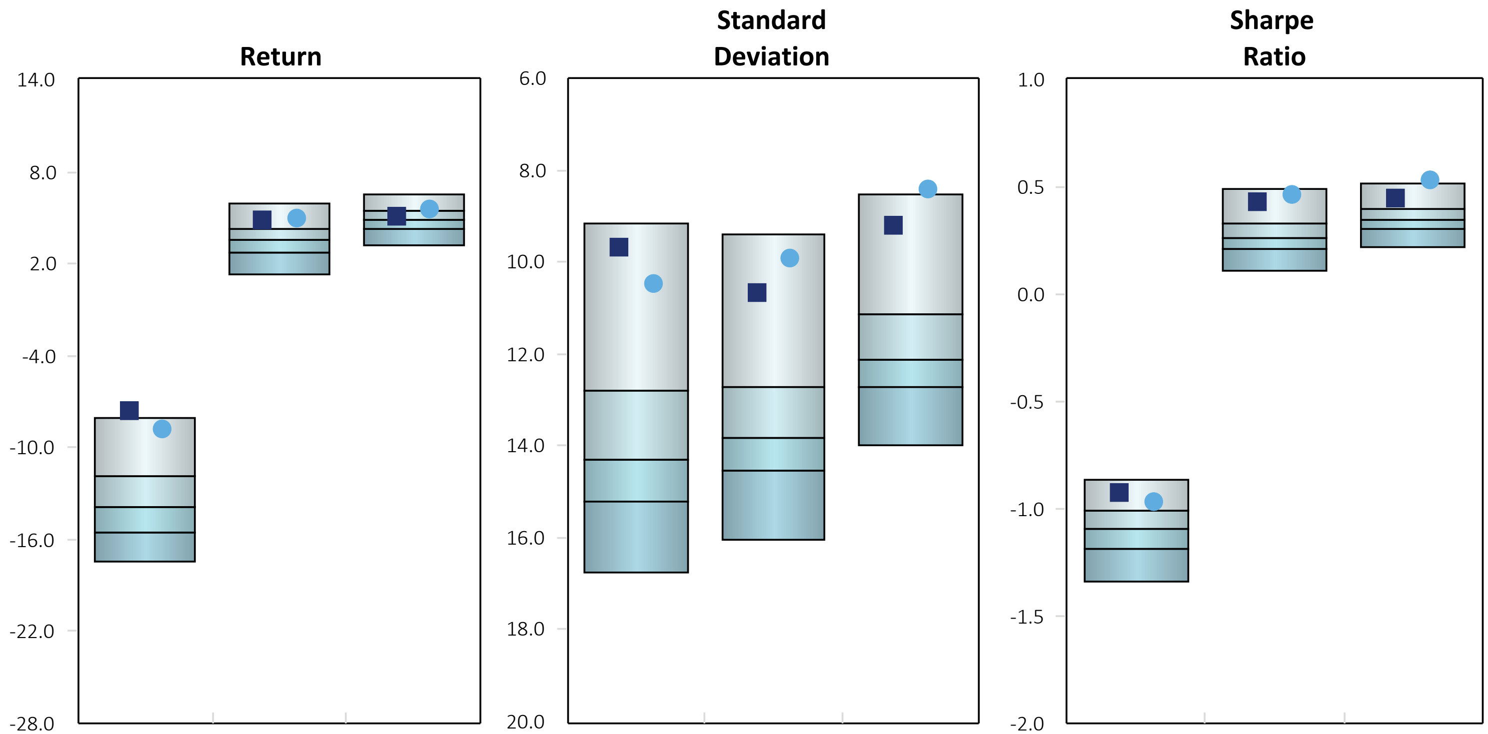
Parentheses contain percentile rankings.
Calculation based on monthly periodicity.

Wilshire

Plan Sponsor Peer Group Analysis - Multi Statistics

KERS Insurance Plan vs All Public Plans-Total Fund

Periods Ended December 31, 2022



	Return 1 Year	Return 3 Years	Return 5 Years	Standard Deviation 1 Year	Standard Deviation 3 Years	Standard Deviation 5 Years	Sharpe Ratio 1 Year	Sharpe Ratio 3 Years	Sharpe Ratio 5 Years
■ KERS Insurance Plan	-7.59 (5)	4.88 (14)	5.15 (39)	9.67 (6)	10.66 (8)	9.21 (7)	-0.92 (9)	0.43 (9)	0.45 (12)
● KERS Insurance IPS Index	-8.80 (6)	5.02 (12)	5.60 (23)	10.48 (9)	9.92 (6)	8.43 (4)	-0.96 (16)	0.47 (7)	0.54 (5)
5th Percentile	-8.08	5.92	6.51	9.15	9.38	8.52	-0.87	0.49	0.51
1st Quartile	-11.88	4.33	5.50	12.78	12.72	11.16	-1.00	0.33	0.40
Median	-13.92	3.53	4.90	14.29	13.82	12.12	-1.10	0.26	0.35
3rd Quartile	-15.49	2.71	4.25	15.20	14.55	12.73	-1.19	0.21	0.31
95th Percentile	-17.47	1.29	3.20	16.75	16.03	13.98	-1.34	0.11	0.22

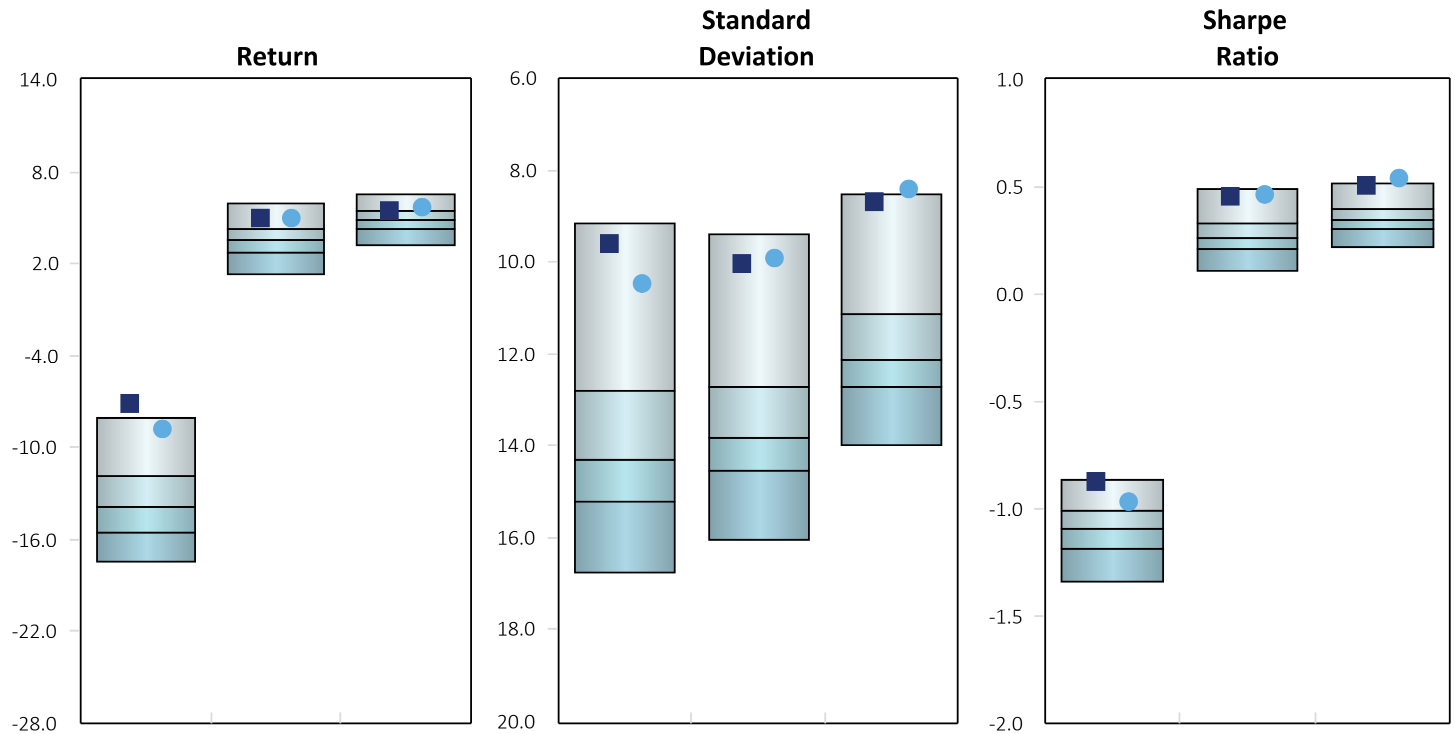
Parentheses contain percentile rankings.
Calculation based on monthly periodicity.

Wilshire

Plan Sponsor Peer Group Analysis - Multi Statistics

KERS (H) Insurance Plan vs All Public Plans-Total Fund

Periods Ended December 31, 2022



	Return 1 Year	Return 3 Years	Return 5 Years	Standard Deviation 1 Year	Standard Deviation 3 Years	Standard Deviation 5 Years	Sharpe Ratio 1 Year	Sharpe Ratio 3 Years	Sharpe Ratio 5 Years
■ KERS (H) Insurance Plan	-7.11 (4)	5.00 (13)	5.49 (26)	9.58 (6)	10.05 (6)	8.69 (5)	-0.87 (6)	0.46 (7)	0.51 (6)
● KERS (H) Insurance IPS Index	-8.80 (6)	5.02 (12)	5.66 (21)	10.48 (9)	9.92 (6)	8.43 (4)	-0.96 (16)	0.47 (7)	0.54 (5)
5th Percentile	-8.08	5.92	6.51	9.15	9.38	8.52	-0.87	0.49	0.51
1st Quartile	-11.88	4.33	5.50	12.78	12.72	11.16	-1.00	0.33	0.40
Median	-13.92	3.53	4.90	14.29	13.82	12.12	-1.10	0.26	0.35
3rd Quartile	-15.49	2.71	4.25	15.20	14.55	12.73	-1.19	0.21	0.31
95th Percentile	-17.47	1.29	3.20	16.75	16.03	13.98	-1.34	0.11	0.22

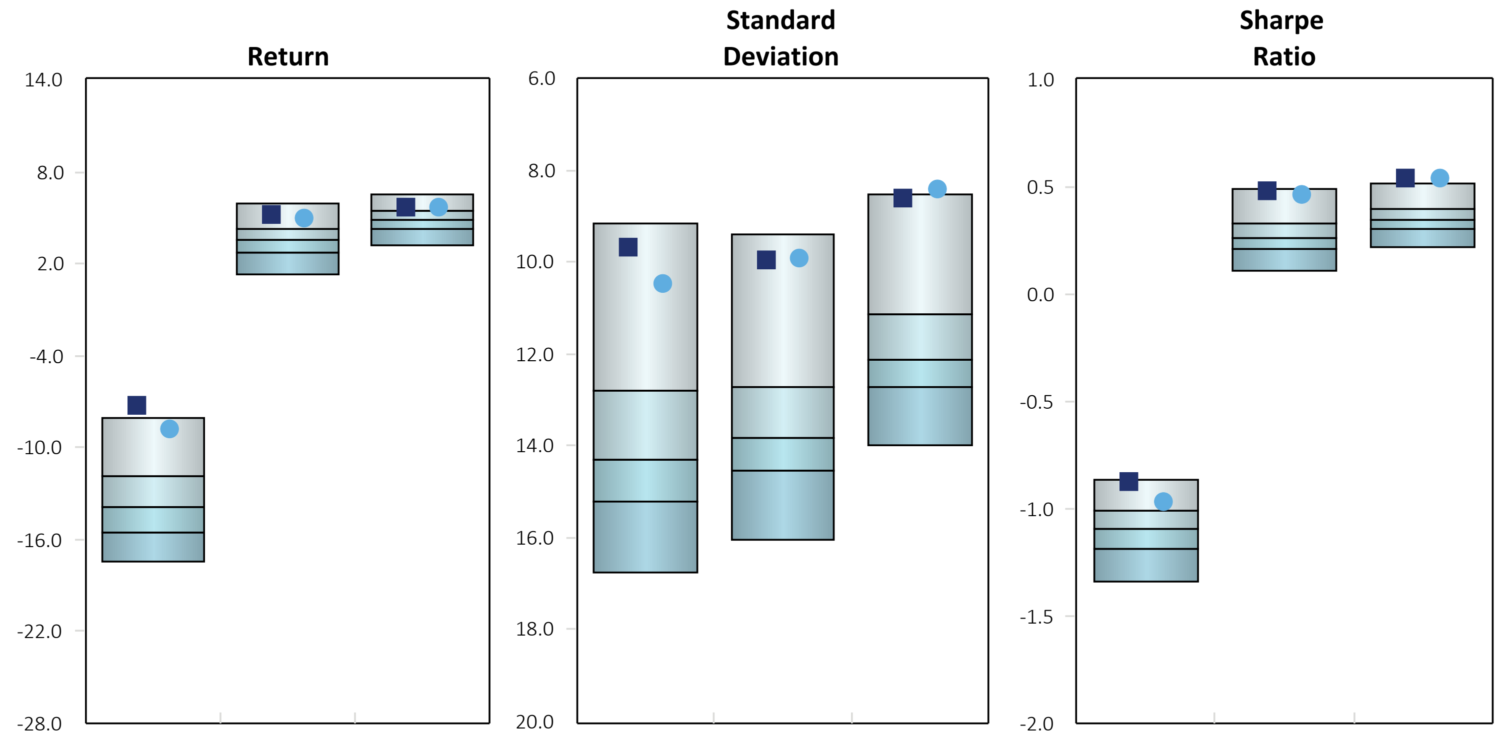
Parentheses contain percentile rankings.
Calculation based on monthly periodicity.

Wilshire

Plan Sponsor Peer Group Analysis - Multi Statistics

SPRS Insurance Plan vs All Public Plans-Total Fund

Periods Ended December 31, 2022



	Return 1 Year	Return 3 Years	Return 5 Years	Standard Deviation 1 Year	Standard Deviation 3 Years	Standard Deviation 5 Years	Sharpe Ratio 1 Year	Sharpe Ratio 3 Years	Sharpe Ratio 5 Years
■ SPRS Insurance Plan	-7.21 (4)	5.26 (10)	5.73 (17)	9.69 (6)	9.97 (6)	8.61 (5)	-0.88 (6)	0.49 (6)	0.54 (5)
● SPRS Insurance IPS Index	-8.80 (6)	5.02 (12)	5.66 (20)	10.48 (9)	9.92 (6)	8.43 (4)	-0.96 (16)	0.47 (7)	0.54 (5)
5th Percentile	-8.08	5.92	6.51	9.15	9.38	8.52	-0.87	0.49	0.51
1st Quartile	-11.88	4.33	5.50	12.78	12.72	11.16	-1.00	0.33	0.40
Median	-13.92	3.53	4.90	14.29	13.82	12.12	-1.10	0.26	0.35
3rd Quartile	-15.49	2.71	4.25	15.20	14.55	12.73	-1.19	0.21	0.31
95th Percentile	-17.47	1.29	3.20	16.75	16.03	13.98	-1.34	0.11	0.22

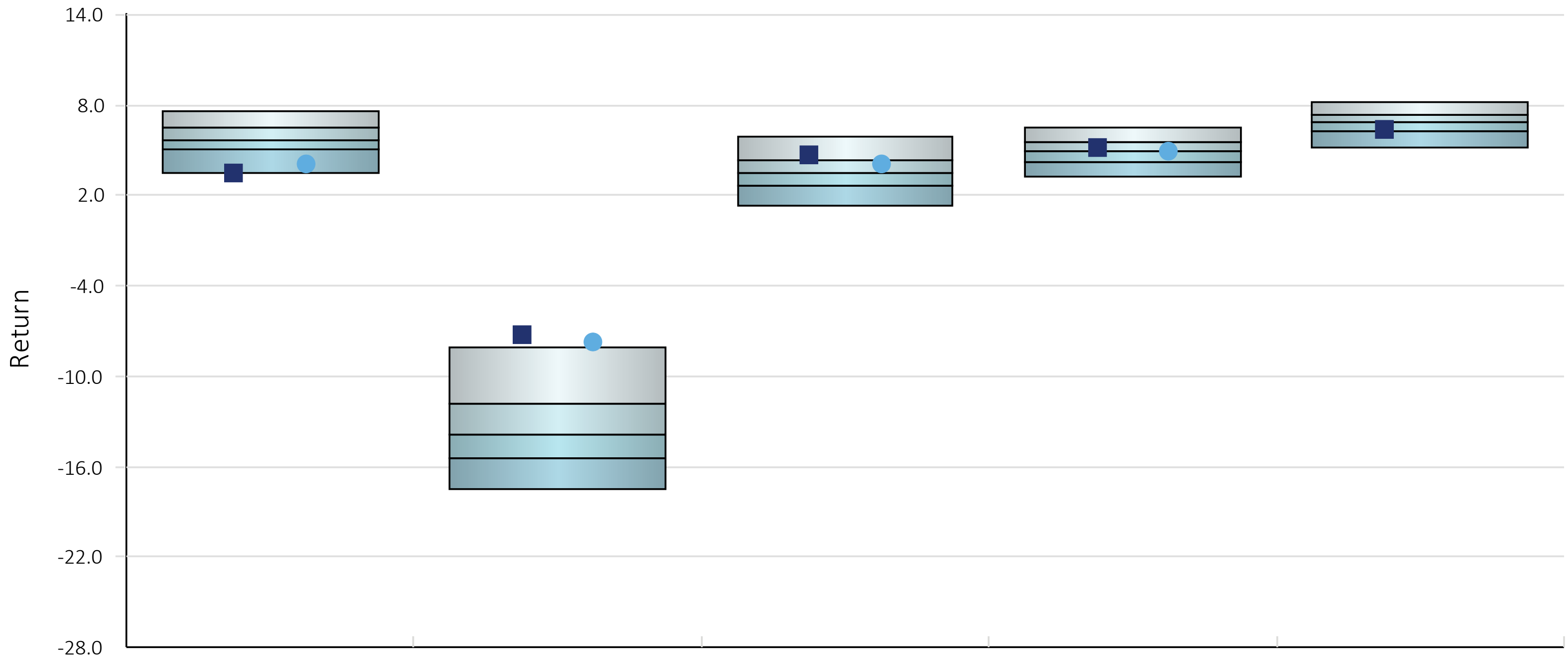
Parentheses contain percentile rankings.
Calculation based on monthly periodicity.

Wilshire

Plan Sponsor Peer Group Analysis

KERS Pension Plan vs All Public Plans-Total Fund

Periods Ended December 31, 2022



	QTD	1 Year	3 Years	5 Years	10 Years
■ KERS Pension Plan	3.56 (95)	-7.25 (4)	4.67 (19)	5.14 (39)	6.43 (70)
● KERS Pension IPS Index	4.08 (92)	-7.67 (5)	4.12 (32)	4.93 (49)	
5th Percentile	7.55	-8.08	5.92	6.51	8.17
1st Quartile	6.48	-11.88	4.33	5.50	7.40
Median	5.72	-13.92	3.53	4.90	6.84
3rd Quartile	5.02	-15.49	2.71	4.25	6.28
95th Percentile	3.44	-17.47	1.29	3.20	5.19
Population	532	524	511	488	395

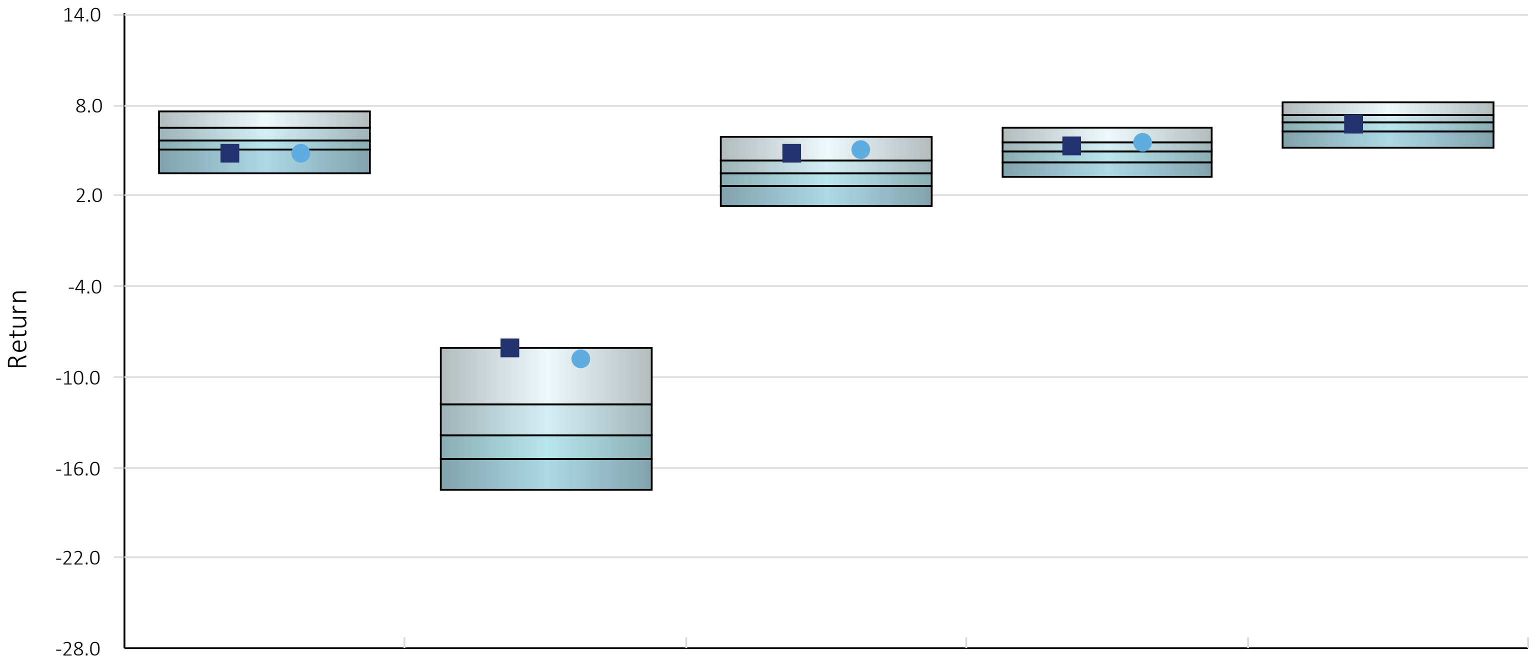
Parentheses contain percentile rankings.
Calculation based on monthly periodicity.

Wilshire

Plan Sponsor Peer Group Analysis

KERS (H) Pension Plan vs All Public Plans-Total Fund

Periods Ended December 31, 2022



	QTD	1 Year	3 Years	5 Years	10 Years
KERS (H) Pension Plan	4.87 (79)	-8.04 (5)	4.78 (17)	5.36 (31)	6.77 (55)
KERS (H) Pension IPS Index	4.81 (80)	-8.80 (6)	5.02 (12)	5.61 (23)	
5th Percentile	7.55	-8.08	5.92	6.51	8.17
1st Quartile	6.48	-11.88	4.33	5.50	7.40
Median	5.72	-13.92	3.53	4.90	6.84
3rd Quartile	5.02	-15.49	2.71	4.25	6.28
95th Percentile	3.44	-17.47	1.29	3.20	5.19
Population	532	524	511	488	395

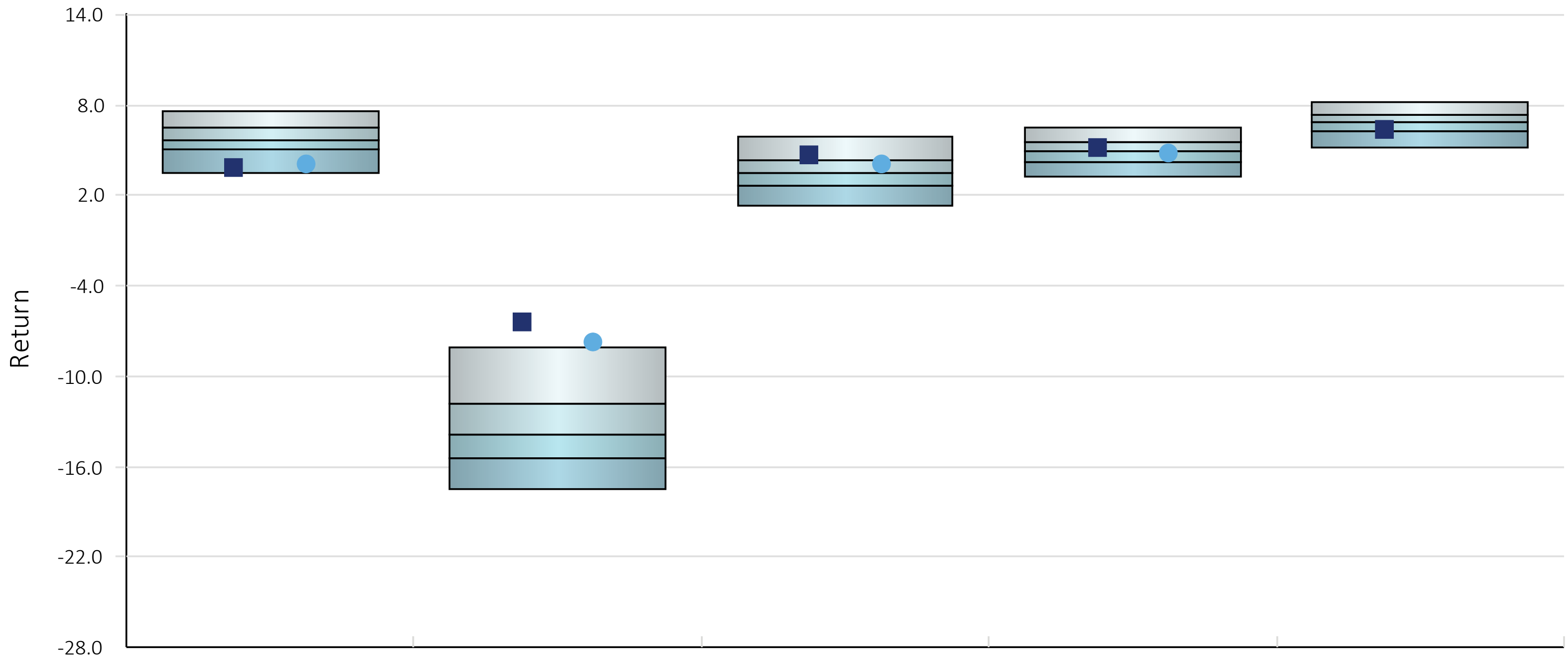
Parentheses contain percentile rankings.
Calculation based on monthly periodicity.

Wilshire

Plan Sponsor Peer Group Analysis

SPRS Pension Plan vs All Public Plans-Total Fund

Periods Ended December 31, 2022



	QTD	1 Year	3 Years	5 Years	10 Years
SPRS Pension Plan	3.87 (92)	-6.41 (3)	4.72 (18)	5.18 (38)	6.38 (73)
SPRS Pension IPS Index	4.08 (92)	-7.67 (5)	4.12 (32)	4.87 (52)	
5th Percentile	7.55	-8.08	5.92	6.51	8.17
1st Quartile	6.48	-11.88	4.33	5.50	7.40
Median	5.72	-13.92	3.53	4.90	6.84
3rd Quartile	5.02	-15.49	2.71	4.25	6.28
95th Percentile	3.44	-17.47	1.29	3.20	5.19
Population	532	524	511	488	395

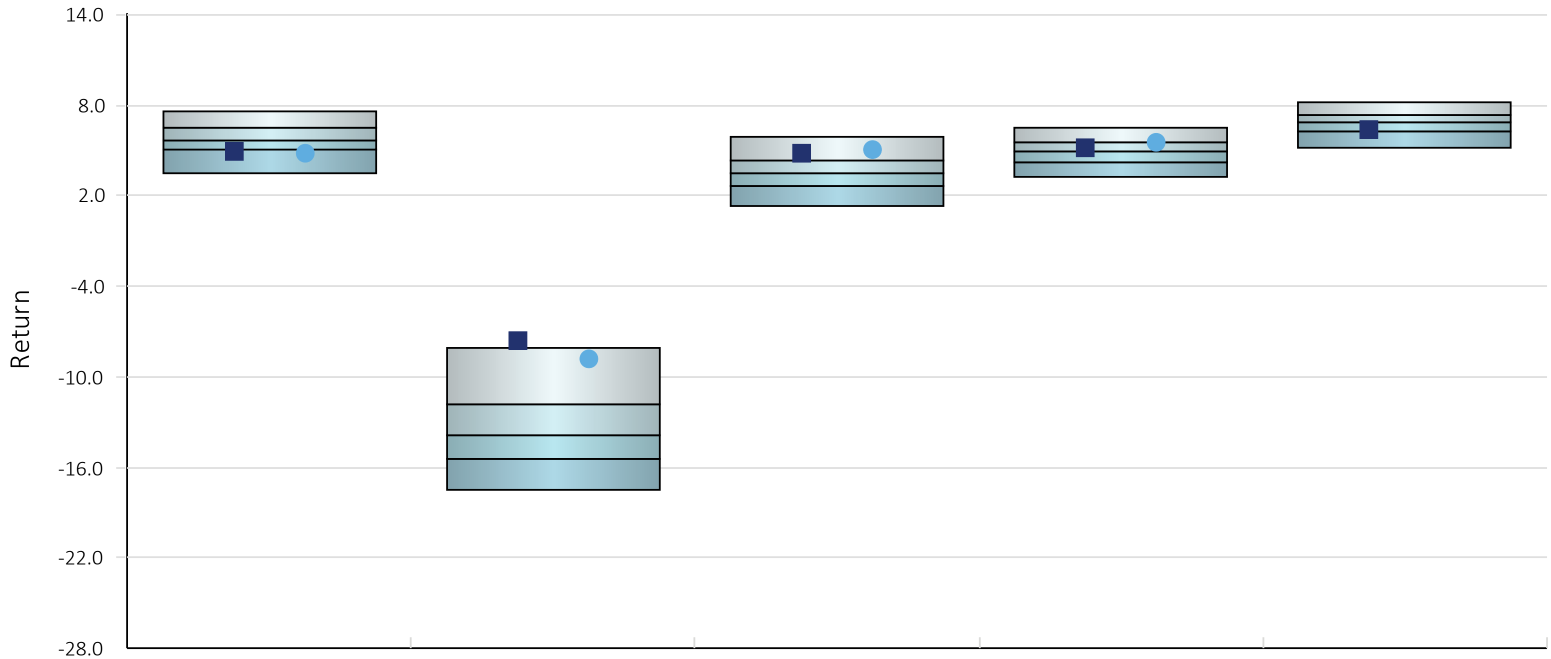
Parentheses contain percentile rankings.
Calculation based on monthly periodicity.

Wilshire

Plan Sponsor Peer Group Analysis

KERS Insurance Plan vs All Public Plans-Total Fund

Periods Ended December 31, 2022



	QTD	1 Year	3 Years	5 Years	10 Years
KERS Insurance Plan	4.90 (79)	-7.59 (5)	4.88 (14)	5.15 (39)	6.43 (70)
KERS Insurance IPS Index	4.81 (80)	-8.80 (6)	5.02 (12)	5.60 (23)	
5th Percentile	7.55	-8.08	5.92	6.51	8.17
1st Quartile	6.48	-11.88	4.33	5.50	7.40
Median	5.72	-13.92	3.53	4.90	6.84
3rd Quartile	5.02	-15.49	2.71	4.25	6.28
95th Percentile	3.44	-17.47	1.29	3.20	5.19
Population	532	524	511	488	395

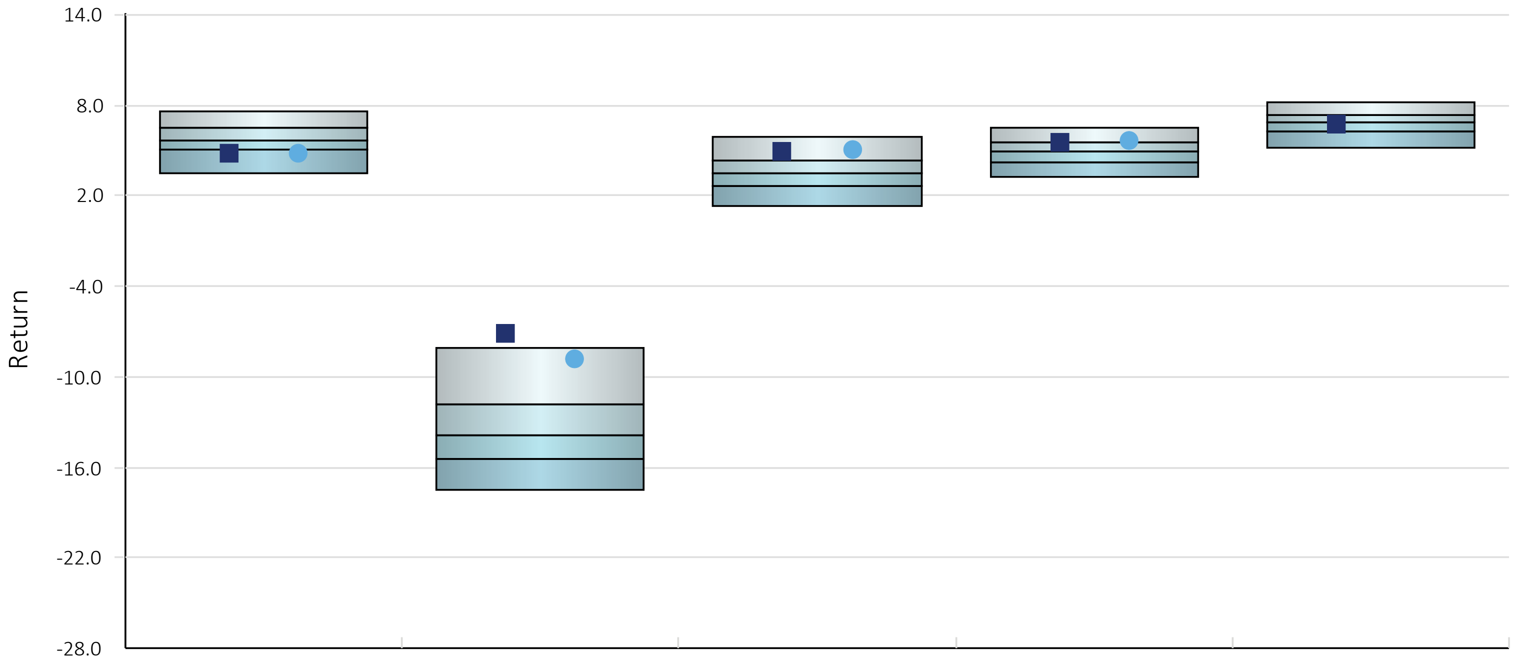
Parentheses contain percentile rankings.
Calculation based on monthly periodicity.

Wilshire

Plan Sponsor Peer Group Analysis

KERS (H) Insurance Plan vs All Public Plans-Total Fund

Periods Ended December 31, 2022



	QTD	1 Year	3 Years	5 Years	10 Years
■ KERS (H) Insurance Plan	4.83 (80)	-7.11 (4)	5.00 (13)	5.49 (26)	6.77 (54)
● KERS (H) Insurance IPS Index	4.81 (80)	-8.80 (6)	5.02 (12)	5.66 (21)	
5th Percentile	7.55	-8.08	5.92	6.51	8.17
1st Quartile	6.48	-11.88	4.33	5.50	7.40
Median	5.72	-13.92	3.53	4.90	6.84
3rd Quartile	5.02	-15.49	2.71	4.25	6.28
95th Percentile	3.44	-17.47	1.29	3.20	5.19
Population	532	524	511	488	395

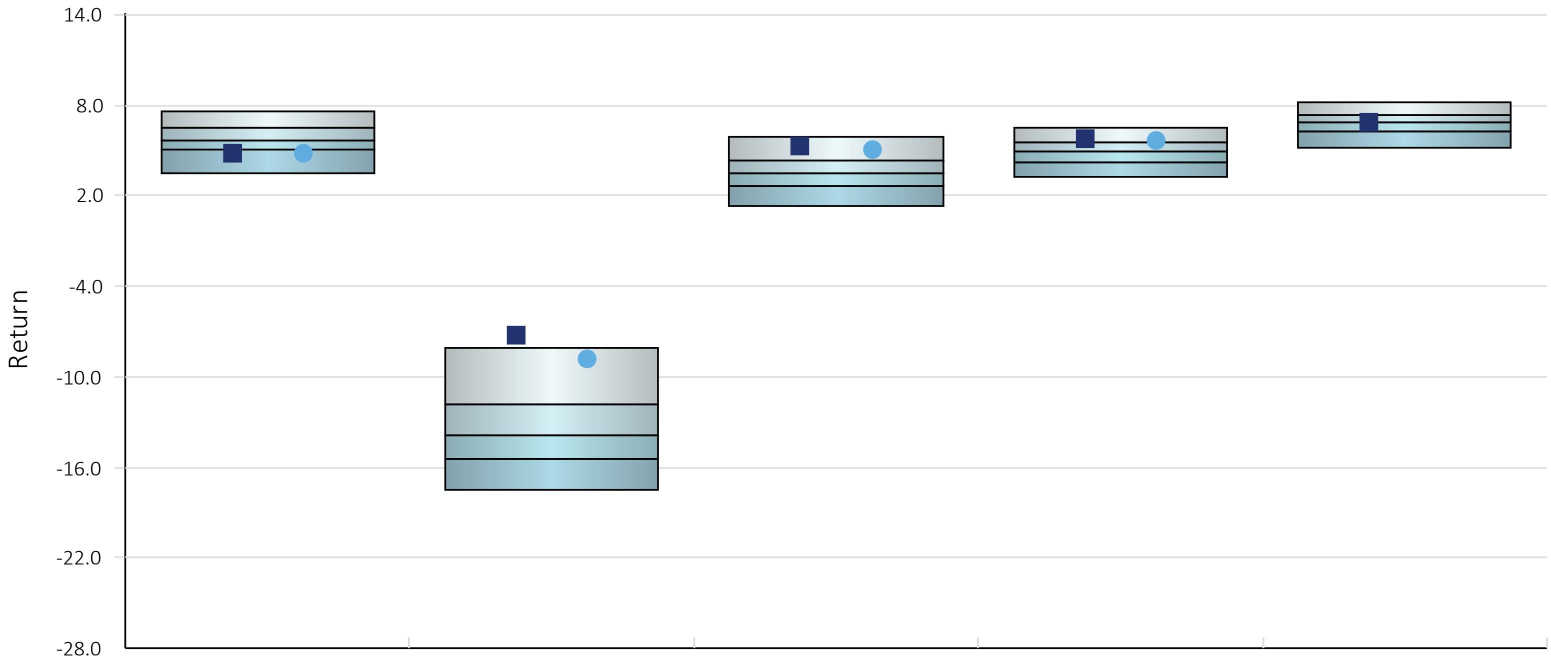
Parentheses contain percentile rankings.
Calculation based on monthly periodicity.

Wilshire

Plan Sponsor Peer Group Analysis

SPRS Insurance Plan vs All Public Plans-Total Fund

Periods Ended December 31, 2022



	QTD	1 Year	3 Years	5 Years	10 Years
■ SPRS Insurance Plan	4.87 (79)	-7.21 (4)	5.26 (10)	5.73 (17)	6.93 (45)
● SPRS Insurance IPS Index	4.81 (80)	-8.80 (6)	5.02 (12)	5.66 (20)	
5th Percentile	7.55	-8.08	5.92	6.51	8.17
1st Quartile	6.48	-11.88	4.33	5.50	7.40
Median	5.72	-13.92	3.53	4.90	6.84
3rd Quartile	5.02	-15.49	2.71	4.25	6.28
95th Percentile	3.44	-17.47	1.29	3.20	5.19
Population	532	524	511	488	395

Parentheses contain percentile rankings.
Calculation based on monthly periodicity.

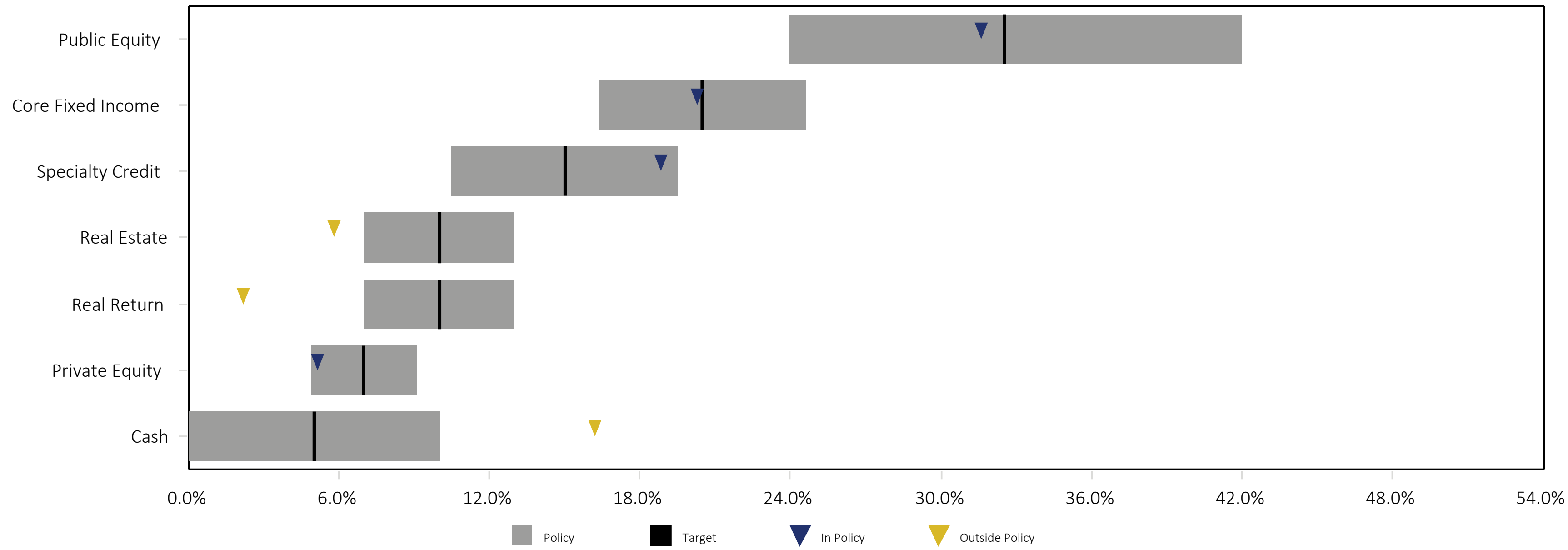
Wilshire

Asset Allocation Compliance

KERS Pension Plan

Periods Ended As of December 31, 2022

Executive Summary



	Asset Allocation $	Asset Allocation (%)	Minimum Allocation (%)	Maximum Allocation (%)	Target Allocation (%)	Target Rebalance $
Public Equity	1,005,532,940	31.64	24.00	42.00	32.50	27,426,046
Core Fixed Income	645,246,363	20.30	16.40	24.60	20.50	6,312,382
Specialty Credit	597,664,904	18.80	10.50	19.50	15.00	-120,914,603
Real Estate	184,585,622	5.81	7.00	13.00	10.00	133,247,912
Real Return	68,725,411	2.16	7.00	13.00	10.00	249,108,123
Private Equity	162,397,892	5.11	4.90	9.10	7.00	60,085,582
Cash	514,182,209	16.18	0.00	10.00	5.00	-355,265,441
Total Fund	3,178,335,341	100.00			100.00	

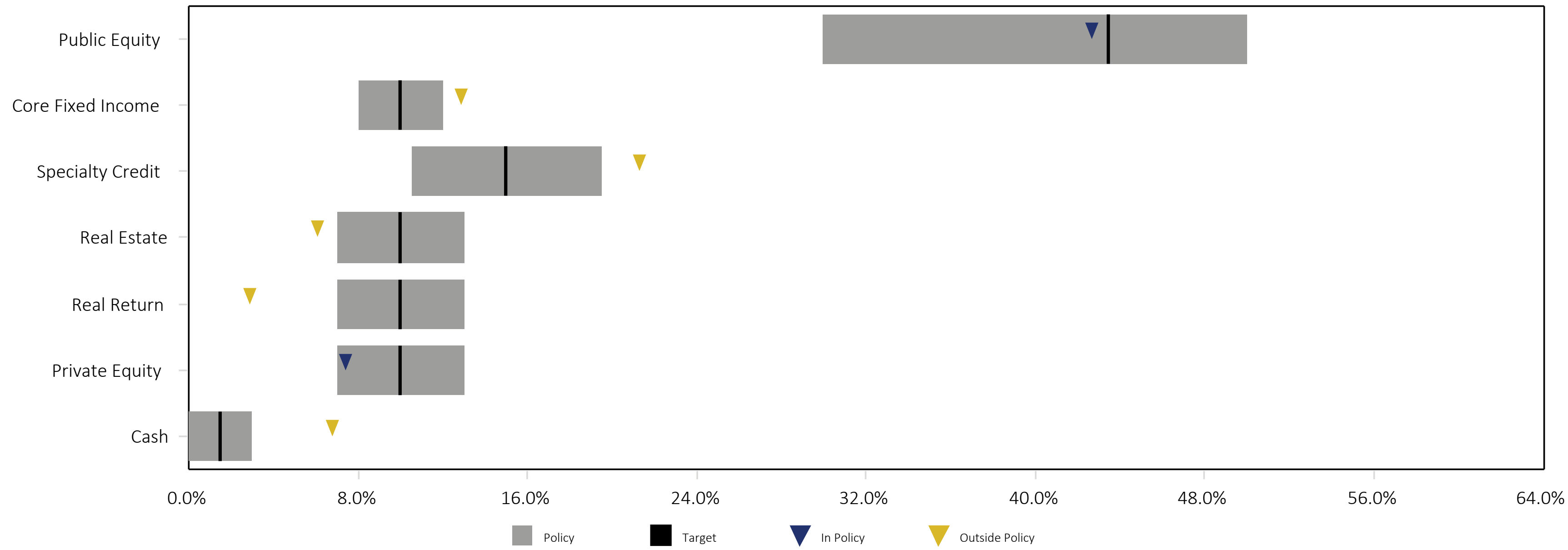
Wilshire

Asset Allocation Compliance

KERS (H) Pension Plan

Periods Ended As of December 31, 2022

Executive Summary



	Asset Allocation $	Asset Allocation (%)	Minimum Allocation (%)	Maximum Allocation (%)	Target Allocation (%)	Target Rebalance $
Public Equity	356,357,539	42.66	30.00	50.00	43.50	6,982,051
Core Fixed Income	107,272,871	12.84	8.00	12.00	10.00	-23,746,528
Specialty Credit	178,277,966	21.34	10.50	19.50	15.00	-52,988,453
Real Estate	50,756,037	6.08	7.00	13.00	10.00	32,770,306
Real Return	24,066,153	2.88	7.00	13.00	10.00	59,460,190
Private Equity	62,082,995	7.43	7.00	13.00	10.00	21,443,348
Cash	56,449,865	6.76	0.00	3.00	1.50	-43,920,914
Total Fund	835,263,425	100.00			100.00	

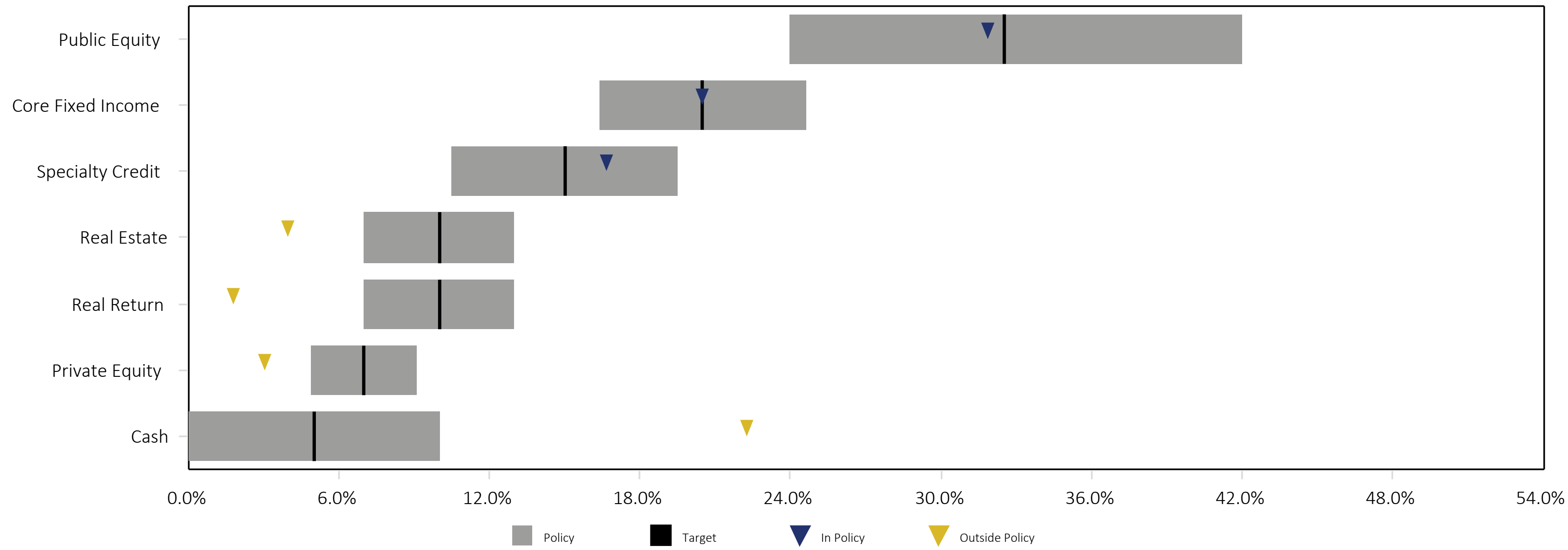
Wilshire

Asset Allocation Compliance

SPRS Pension Plan

Periods Ended As of December 31, 2022

Executive Summary



	Asset Allocation $	Asset Allocation (%)	Minimum Allocation (%)	Maximum Allocation (%)	Target Allocation (%)	Target Rebalance $
Public Equity	177,399,670	31.86	24.00	42.00	32.50	3,535,632
Core Fixed Income	113,943,714	20.47	16.40	24.60	20.50	184,707
Specialty Credit	92,751,055	16.66	10.50	19.50	15.00	-9,242,454
Real Estate	21,965,963	3.95	7.00	13.00	10.00	33,706,438
Real Return	9,982,749	1.79	7.00	13.00	10.00	45,689,652
Private Equity	16,728,373	3.00	4.90	9.10	7.00	22,242,307
Cash	123,952,483	22.26	0.00	10.00	5.00	-96,116,283
Total Fund	556,724,008	100.00			100.00	

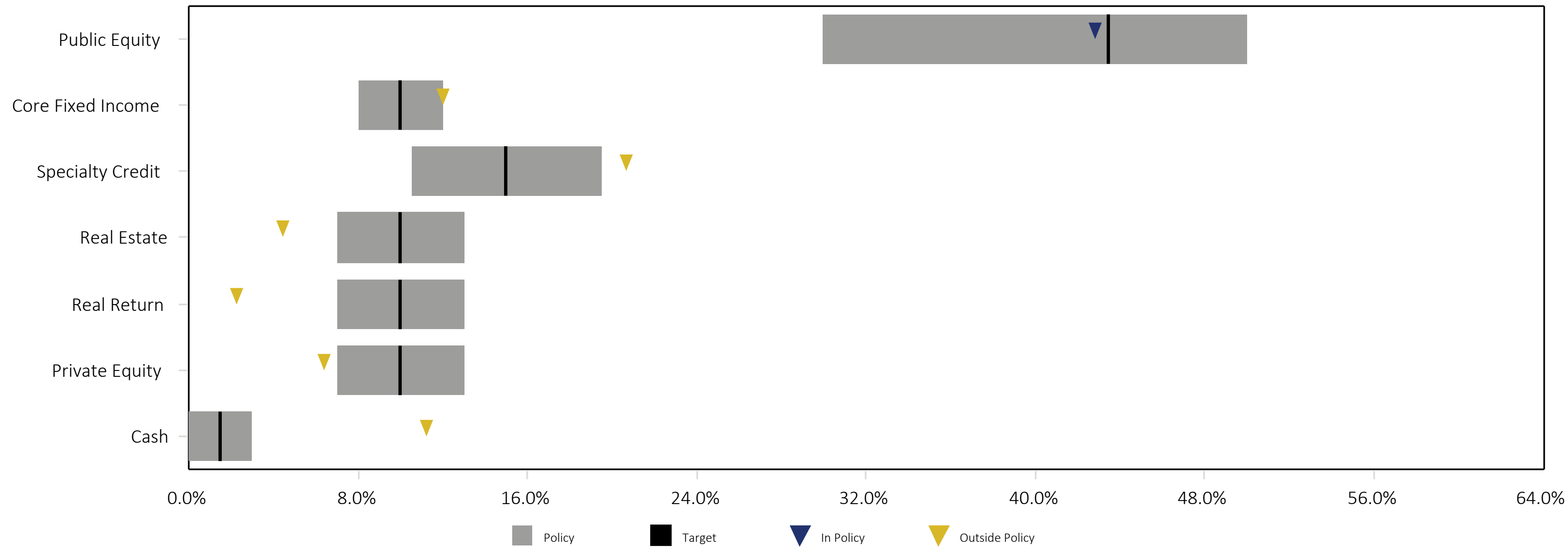
Wilshire

Asset Allocation Compliance

KERS Insurance Plan

Periods Ended As of December 31, 2022

Executive Summary



	Asset Allocation $	Asset Allocation (%)	Minimum Allocation (%)	Maximum Allocation (%)	Target Allocation (%)	Target Rebalance $
Public Equity	571,418,351	42.88	30.00	50.00	43.50	8,294,359
Core Fixed Income	160,651,882	12.05	8.00	12.00	10.00	-27,384,593
Specialty Credit	275,219,068	20.65	10.50	19.50	15.00	-75,318,133
Real Estate	59,651,375	4.48	7.00	13.00	10.00	73,615,915
Real Return	29,995,193	2.25	7.00	13.00	10.00	103,272,097
Private Equity	85,530,831	6.42	7.00	13.00	10.00	47,736,459
Cash	150,206,198	11.27	0.00	3.00	1.50	-130,216,105
Total Fund	1,332,672,898	100.00			100.00	

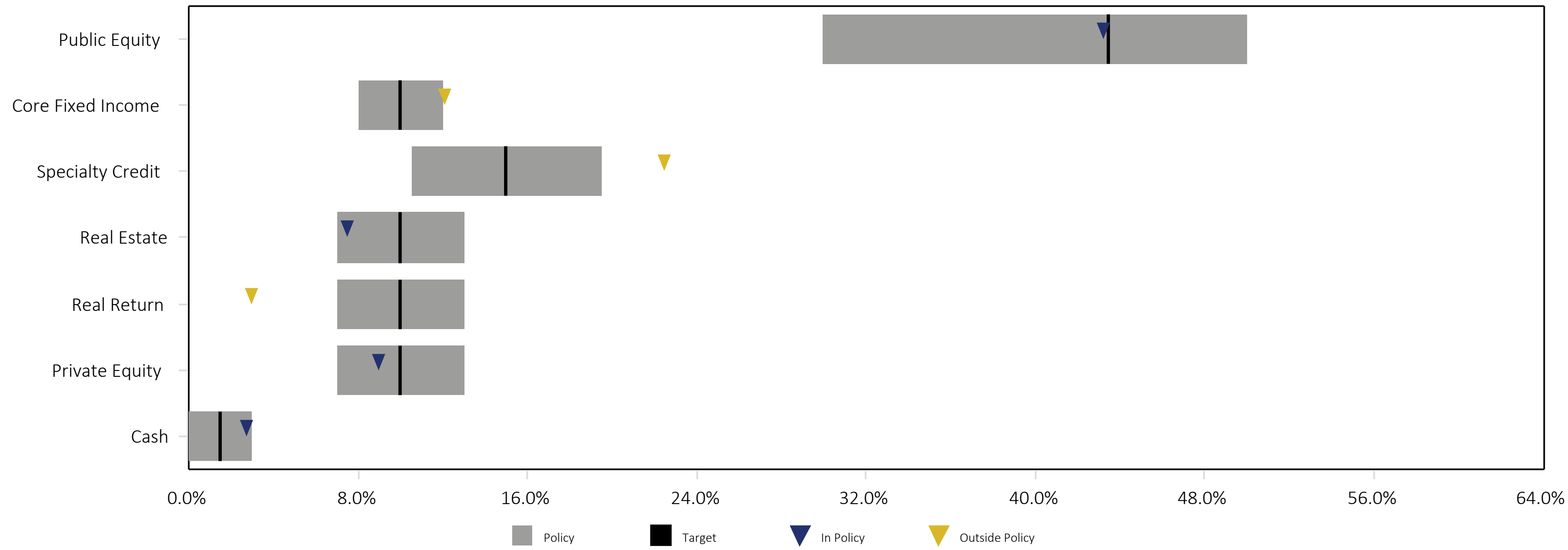
Wilshire

Asset Allocation Compliance

KERS (H) Insurance Plan

Periods Ended As of December 31, 2022

Executive Summary



	Asset Allocation $	Asset Allocation (%)	Minimum Allocation (%)	Maximum Allocation (%)	Target Allocation (%)	Target Rebalance $
Public Equity	252,152,995	43.23	30.00	50.00	43.50	1,593,999
Core Fixed Income	70,377,950	12.06	8.00	12.00	10.00	-12,045,308
Specialty Credit	131,259,118	22.50	10.50	19.50	15.00	-43,760,155
Real Estate	43,772,991	7.50	7.00	13.00	10.00	14,559,652
Real Return	17,322,924	2.97	7.00	13.00	10.00	41,009,718
Private Equity	52,530,454	9.01	7.00	13.00	10.00	5,802,188
Cash	15,909,991	2.73	0.00	3.00	1.50	-7,160,095
Total Fund	583,326,424	100.00			100.00	

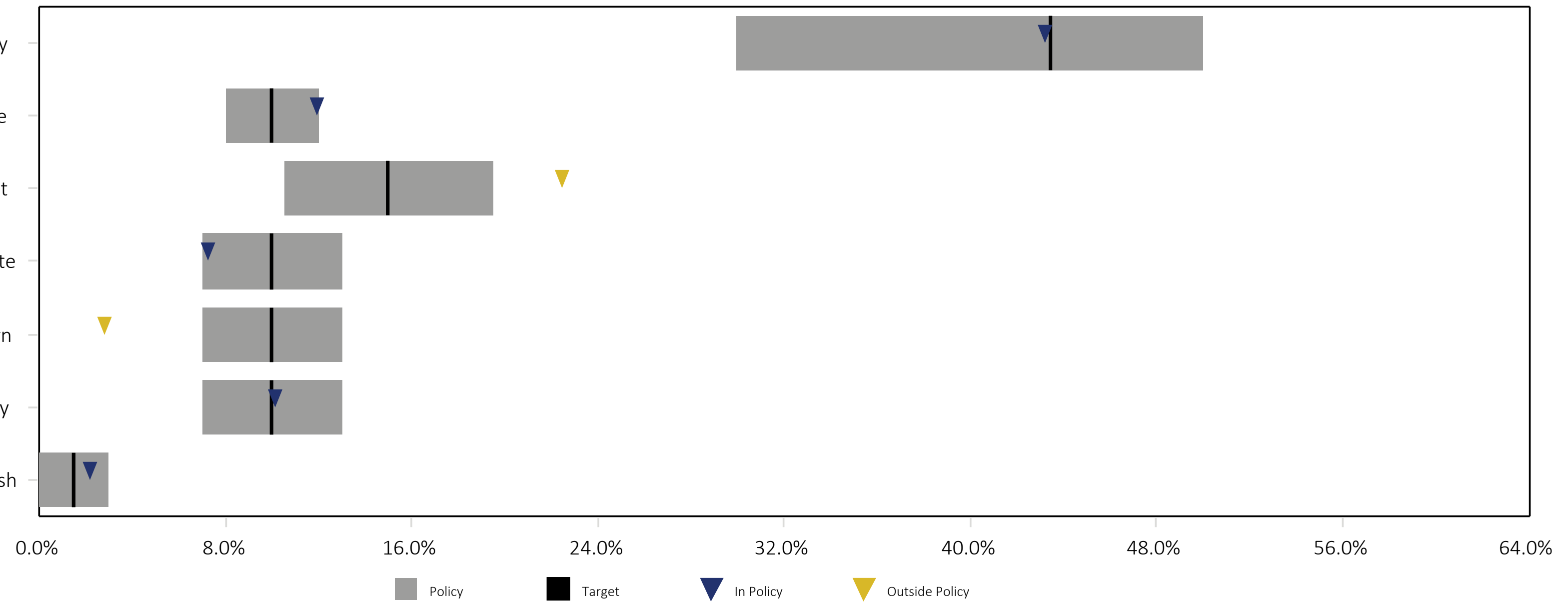
Wilshire

Asset Allocation Compliance

SPRS Insurance Plan

Periods Ended As of December 31, 2022

Executive Summary



	Asset Allocation $	Asset Allocation (%)	Minimum Allocation (%)	Maximum Allocation (%)	Target Allocation (%)	Target Rebalance $
Public Equity	100,043,812	43.22	30.00	50.00	43.50	656,250
Core Fixed Income	27,617,659	11.93	8.00	12.00	10.00	-4,468,220
Specialty Credit	52,113,157	22.51	10.50	19.50	15.00	-17,388,998
Real Estate	16,742,992	7.23	7.00	13.00	10.00	6,406,448
Real Return	6,470,027	2.79	7.00	13.00	10.00	16,679,413
Private Equity	23,430,873	10.12	7.00	13.00	10.00	-281,433
Cash	5,075,876	2.19	0.00	3.00	1.50	-1,603,460
Total Fund	231,494,396	100.00			100.00	

Wilshire

Asset Allocation & Performance

Total Fund

Periods Ended December 31, 2022

	Market Value $	Performance (%) net of fees									
		QTD	FYTD	1 Year	3 Years	5 Years	10 Years	20 Years	30 Years	Since Inception	Inception Date
KERS Pension Plan	**3,178,335,341**	**3.56**	**1.16**	**-7.25**	**4.67**	**5.14**	**6.43**	**6.75**	**7.46**	**8.65**	**4/1/1984**
KERS Pension IPS Index		4.08	0.34	-7.67	4.12	4.93					
Value Added		-0.52	0.82	0.42	0.55	0.21					
KERS Pension Attribution Index		4.20	1.28	-8.05	4.02						
Value Added		-0.64	-0.12	0.80	0.65						
Assumed Rate 5.25%		1.29	2.59	5.25	5.25	5.25					
Value Added		2.27	-1.43	-12.50	-0.58	-0.11					
KERS Insurance Plan	**1,332,672,898**	**4.90**	**2.48**	**-7.59**	**4.88**	**5.15**	**6.43**	**6.64**	**6.66**	**7.16**	**4/1/1987**
KERS Insurance IPS Index		4.81	0.27	-8.80	5.02	5.60					
Value Added		0.09	2.21	1.21	-0.14	-0.45					
KERS Insurance Attribution Index		5.14	2.77	-6.52	5.47						
Value Added		-0.24	-0.29	-1.07	-0.59						
Assumed Rate 6.25%		1.53	3.08	6.25	6.25	6.25					
Value Added		3.37	-0.60	-13.84	-1.37	-1.10					
KERS (H) Pension Plan	**835,263,425**	**4.87**	**2.14**	**-8.04**	**4.78**	**5.36**	**6.77**	**6.92**	**7.57**	**8.74**	**4/1/1984**
KERS (H) Pension IPS Index		4.81	0.27	-8.80	5.02	5.61					
Value Added		0.06	1.87	0.76	-0.24	-0.25					
KERS (H) Pension Attribution Index		5.14	2.18	-7.68	5.05						
Value Added		-0.27	-0.04	-0.36	-0.27						
Assumed Rate 6.25%		1.53	3.08	6.25	6.25	6.25					
Value Added		3.34	-0.94	-14.29	-1.47	-0.89					

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Wilshire

Asset Allocation & Performance

Total Fund

Periods Ended December 31, 2022

	Market Value $	Performance (%) net of fees									
		QTD	FYTD	1 Year	3 Years	5 Years	10 Years	20 Years	30 Years	Since Inception	Inception Date
KERS (H) Insurance Plan	**583,326,424**	**4.83**	**2.16**	**-7.11**	**5.00**	**5.49**	**6.77**	**6.81**	**6.77**	**7.25**	**4/1/1987**
KERS (H) Insurance IPS Index		4.81	0.27	-8.80	5.02	5.66					
Value Added		0.02	1.89	1.69	-0.02	-0.17					
KERS (H) Insurance Attribution Index		5.13	2.26	-7.41	4.98						
Value Added		-0.30	-0.10	0.30	0.02						
Assumed Rate 6.25%		1.53	3.08	6.25	6.25	6.25					
Value Added		3.30	-0.92	-13.36	-1.25	-0.76					
SPRS Pension Plan	**556,724,008**	**3.87**	**1.72**	**-6.41**	**4.72**	**5.18**	**6.38**	**6.73**	**7.44**	**8.64**	**4/1/1984**
SPRS Pension IPS Index		4.08	0.34	-7.67	4.12	4.87					
Value Added		-0.21	1.38	1.26	0.60	0.31					
SPRS Pension Attribution Index		4.27	1.52	-7.50	4.03						
Value Added		-0.40	0.20	1.09	0.69						
Assumed Rate 5.25%		1.29	2.59	5.25	5.25	5.25					
Value Added		2.58	-0.87	-11.66	-0.53	-0.07					
SPRS Insurance Plan	**231,494,396**	**4.87**	**2.13**	**-7.21**	**5.26**	**5.73**	**6.93**	**6.89**	**6.83**	**7.30**	**4/1/1987**
SPRS Insurance IPS Index		4.81	0.27	-8.80	5.02	5.66					
Value Added		0.06	1.86	1.59	0.24	0.07					
SPRS Insurance Attribution Index		5.19	2.31	-7.39	5.02						
Value Added		-0.32	-0.18	0.18	0.24						
Assumed Rate 6.25%		1.53	3.08	6.25	6.25	6.25					
Value Added		3.34	-0.95	-13.46	-0.99	-0.52					

Wilshire

Asset Allocation & Performance

Pension Plan Accounts

Periods Ended December 31, 2022

	Performance (%) net of fees							
	1 Month	QTD	FYTD	1 Year	3 Years	5 Years	Since Inception	Inception Date
Public Equity	**-3.51**	**10.54**	**3.66**	**-18.46**			**-14.04**	**12/1/2021**
Public Equity Policy Index	-3.24	10.73	2.89	-17.76			-13.41	
Value Added	-0.27	-0.19	0.77	-0.70			-0.63	
US Equity Composite	**-5.43**	**7.53**	**2.97**	**-18.24**	**7.07**	**8.55**	**11.05**	**4/1/1984**
Russell 3000 Index	-5.86	7.18	2.40	-19.21	7.07	8.79	10.94	
Value Added	0.43	0.35	0.57	0.97	0.00	-0.24	0.11	
S&P 500 Index	**-5.72**	**7.55**	**2.28**	**-17.96**	**8.01**	**9.70**	**7.92**	**7/1/2001**
S&P 500 Index	-5.76	7.56	2.31	-18.11	7.66	9.42	7.54	
Value Added	0.04	-0.01	-0.03	0.15	0.35	0.28	0.38	
Scientific Beta	**-4.02**	**11.05**	**4.99**	**-12.90**	**6.22**	**7.73**	**9.67**	**7/1/2016**
S&P 500 Index	-5.76	7.56	2.31	-18.11	7.66	9.42	11.77	
Value Added	1.74	3.49	2.68	5.21	-1.44	-1.69	-2.10	
River Road FAV	**-3.45**	**11.84**	**4.71**	**-16.64**	**-1.16**	**5.08**	**8.44**	**7/1/2016**
Russell 3000 Value Index	-4.18	12.18	5.95	-7.98	5.88	6.50	8.77	
Value Added	0.73	-0.34	-1.24	-8.66	-7.04	-1.42	-0.33	
Westfield Capital	**-6.93**	**0.98**	**-1.85**	**-27.94**	**6.31**	**10.72**	**11.91**	**7/1/2011**
Russell 3000 Growth Index	-7.58	2.31	-1.13	-28.97	7.32	10.45	12.79	
Value Added	0.65	-1.33	-0.72	1.03	-1.01	0.27	-0.88	
Internal US Mid Cap	**-5.38**	**11.04**	**8.46**	**-12.76**	**7.74**	**7.34**	**9.10**	**8/1/2014**
S&P MidCap 400 Index	-5.54	10.78	8.05	-13.06	7.23	6.71	8.75	
Value Added	0.16	0.26	0.41	0.30	0.51	0.63	0.35	
NTGI Structured	**-5.75**	**9.25**	**5.74**	**-15.78**	**5.83**	**6.48**	**9.56**	**10/1/1999**
Russell 2000 Index	-6.49	6.23	3.91	-20.44	3.10	4.13	7.70	
Value Added	0.74	3.02	1.83	4.66	2.73	2.35	1.86	

 Pension Plan composite used for representative manager returns. Individual plan results may vary slightly due to cash flows.

Wilshire

Asset Allocation & Performance

Pension Plan Accounts

Periods Ended December 31, 2022

	Performance (%) net of fees							
	1 Month	QTD	FYTD	1 Year	3 Years	5 Years	Since Inception	Inception Date
Next Century Growth	**-3.09**	**-4.52**	**4.52**	**-29.39**	**22.73**		**24.40**	11/1/2019
Russell Microcap Growth Index	-4.21	2.69	4.90	-29.76	-0.24		4.25	
Value Added	1.12	-7.21	-0.38	0.37	22.97		20.15	
Non-US Equity Composite	**-0.70**	**15.11**	**4.62**	**-18.57**	**0.30**	**1.64**	**3.17**	7/1/2000
MSCI ACWI ex US IMI (10/17)	-0.62	14.15	3.09	-16.58	0.20	0.85	3.18	
Value Added	-0.08	0.96	1.53	-1.99	0.10	0.79	-0.01	
BlackRock World Ex US	**-0.48**	**16.34**	**5.75**	**-13.79**	**1.71**	**1.81**	**5.84**	7/1/2009
MSCI World ex US (11/19)	-0.48	16.18	5.50	-14.29	1.27	1.45	5.57	
Value Added	0.00	0.16	0.25	0.50	0.44	0.36	0.27	
American Century	**-1.05**	**13.87**	**5.03**	**-26.25**	**2.30**	**4.62**	**4.92**	7/1/2014
MSCI ACWI ex US IMI (10/17)	-0.62	14.15	3.09	-16.58	0.20	0.85	2.28	
Value Added	-0.43	-0.28	1.94	-9.67	2.10	3.77	2.64	
Franklin Templeton	**-3.40**	**12.10**	**3.80**	**-30.93**	**-4.75**	**-0.06**	**3.21**	7/1/2014
MSCI ACWI ex US IMI (10/17)	-0.62	14.15	3.09	-16.58	0.20	0.85	2.28	
Value Added	-2.78	-2.05	0.71	-14.35	-4.95	-0.91	0.93	
Lazard Asset Mgmt	**-0.78**	**13.96**	**2.86**	**-15.73**	**-0.32**	**1.29**	**2.89**	7/1/2014
MSCI ACWI ex US IMI (10/17)	-0.62	14.15	3.09	-16.58	0.20	0.85	2.28	
Value Added	-0.16	-0.19	-0.23	0.85	-0.52	0.44	0.61	
LSV Asset Mgmt	**1.36**	**19.70**	**6.57**	**-9.81**	**0.22**	**1.00**	**2.41**	7/1/2014
MSCI ACWI ex US IMI (10/17)	-0.62	14.15	3.09	-16.58	0.20	0.85	2.28	
Value Added	1.98	5.55	3.48	6.77	0.02	0.15	0.13	
Axiom	**-0.60**	**9.28**	**0.88**	**-33.07**			**-28.08**	12/1/2021
MSCI AC World ex USA Small Cap (Net)	0.17	13.31	3.83	-19.97			-15.42	
Value Added	-0.77	-4.03	-2.95	-13.10			-12.66	

 Pension Plan composite used for representative manager returns. Individual plan results may vary slightly due to cash flows.

Wilshire

Asset Allocation & Performance

Pension Plan Accounts

Periods Ended December 31, 2022

	Performance (%) net of fees							
	1 Month	QTD	FYTD	1 Year	3 Years	5 Years	Since Inception	Inception Date
JP Morgan Emerging Markets	**-1.47**	**12.16**	**0.26**	**-27.56**	**-1.99**		**-0.13**	11/1/2019
MSCI Emerging Markets IMI Index	-1.30	9.60	-2.04	-19.46	-1.45		0.82	
Value Added	-0.17	2.56	2.30	-8.10	-0.54		-0.95	
Pzena Emerging Markets	**-0.29**	**13.19**	**4.43**	**-7.10**	**2.38**		**4.32**	11/1/2019
MSCI Emerging Markets (Net)	-1.41	9.70	-2.99	-20.09	-2.69		-0.36	
Value Added	1.12	3.49	7.42	12.99	5.07		4.68	
Private Equity Composite	**-1.97**	**-4.17**	**-5.99**	**-0.21**	**15.57**	**14.23**	**11.88**	7/1/2002
Russell 3000 +3% 1 Quarter Lag	-9.05	-3.76	-19.24	-15.16	10.93	11.87	11.16	
Value Added	7.08	-0.41	13.25	14.95	4.64	2.36	0.72	
Core Fixed Composite	**0.38**	**1.44**	**-0.56**	**-5.87**	**0.11**		**2.04**	10/1/2018
Blmbg. U.S. Aggregate Index	-0.45	1.87	-2.97	-13.01	-2.71		0.41	
Value Added	0.83	-0.43	2.41	7.14	2.82		1.63	
Loomis Sayles Intmd	**0.08**	**1.82**	**-2.13**	**-9.58**	**-1.39**		**0.42**	2/1/2019
Blmbg. U.S. Intermediate Aggregate Index	-0.26	1.72	-2.19	-9.51	-1.93		-0.06	
Value Added	0.34	0.10	0.06	-0.07	0.54		0.48	
Lord Abbett	**0.51**	**1.28**	**0.08**	**-4.16**	**-0.10**		**1.42**	10/1/2018
ICE BofA 1-3 Year U.S. Corporate Index	0.30	1.39	0.08	-4.07	-0.03		1.42	
Value Added	0.21	-0.11	0.00	-0.09	-0.07		0.00	
NISA	**-0.11**	**2.01**	**-2.82**	**-12.64**	**-2.21**	**0.35**	**2.82**	2/1/2009
Blmbg. U.S. Aggregate Index	-0.45	1.87	-2.97	-13.01	-2.71	0.02	2.56	
Value Added	0.34	0.14	0.15	0.37	0.50	0.33	0.26	

 Pension Plan composite used for representative manager returns. Individual plan results may vary slightly due to cash flows.

Wilshire

Asset Allocation & Performance

Pension Plan Accounts

Periods Ended December 31, 2022

	Performance (%) net of fees							
	1 Month	QTD	FYTD	1 Year	3 Years	5 Years	Since Inception	Inception Date
High Yield / Specialty Credit Composite	**0.53**	**1.98**	**2.31**	**0.01**	**4.53**		**5.16**	**10/1/2018**
Policy Index	-0.09	3.46	3.86	-5.94	1.34		2.57	
Value Added	0.62	-1.48	-1.55	5.95	3.19		2.59	
Adams St SPC II A	**2.67**	**2.67**	**3.24**	**17.87**			**15.12**	**6/1/2020**
Adams St SPC II B	**1.80**	**1.80**	**4.13**	**1.03**			**9.66**	**6/1/2020**
Arrowmark	**1.07**	**3.69**	**5.45**	**8.73**	**8.81**		**9.20**	**6/1/2018**
Morningstar LSTA US Leveraged Loan	0.44	2.74	4.14	-0.60	2.55		3.16	
Value Added	0.63	0.95	1.31	9.33	6.26		6.04	
Blue Torch	**3.38**	**3.38**	**6.35**	**12.71**			**9.51**	**8/1/2020**
BSP Coinvestment	**0.56**	**0.56**	**2.26**	**5.61**	**6.65**		**6.12**	**10/1/2019**
Morningstar LSTA US Leveraged Loan	0.44	2.74	4.14	-0.60	2.55		2.89	
Value Added	0.12	-2.18	-1.88	6.21	4.10		3.23	
BSP Private Credit	**1.80**	**1.80**	**0.77**	**4.32**	**7.21**		**5.65**	**2/1/2018**
Morningstar LSTA US Leveraged Loan	0.44	2.74	4.14	-0.60	2.55		3.16	
Value Added	1.36	-0.94	-3.37	4.92	4.66		2.49	
Capital Springs	**1.41**	**1.41**	**0.86**	**5.93**			**8.26**	**2/1/2020**
Morningstar LSTA US Leveraged Loan	0.44	2.74	4.14	-0.60			2.43	
Value Added	0.97	-1.33	-3.28	6.53			5.83	
Cerberus Capital Mgmt	**0.87**	**2.44**	**4.34**	**10.42**	**11.88**	**10.88**	**9.70**	**9/1/2014**
Morningstar LSTA US Leveraged Loan	0.44	2.74	4.14	-0.60	2.55	3.31	3.44	
Value Added	0.43	-0.30	0.20	11.02	9.33	7.57	6.26	
Columbia	**-0.77**	**4.22**	**4.12**	**-9.83**	**0.01**	**2.68**	**5.25**	**11/1/2011**
Blmbg. U.S. Corp: High Yield Index	-0.62	4.17	3.50	-11.19	0.05	2.31	5.01	
Value Added	-0.15	0.05	0.62	1.36	-0.04	0.37	0.24	

Pension Plan composite used for representative manager returns. Individual plan results may vary slightly due to cash flows.

Wilshire

Asset Allocation & Performance

Pension Plan Accounts

Periods Ended December 31, 2022

	Performance (%) net of fees							
	1 Month	QTD	FYTD	1 Year	3 Years	5 Years	Since Inception	Inception Date
Manulife Asset Mgmt	**0.10**	**4.04**	**2.39**	**-8.45**	**1.26**	**2.35**	**3.46**	12/1/2011
Policy Index	-0.34	2.24	-2.31	-12.99	-2.54	0.18	0.83	
Value Added	0.44	1.80	4.70	4.54	3.80	2.17	2.63	
Marathon Bluegrass	**-0.40**	**-1.99**	**-4.98**	**-5.33**	**4.70**	**4.55**	**5.65**	1/1/2016
Blmbg. U.S. Corp: High Yield Index	-0.62	4.17	3.50	-11.19	0.05	2.31	5.05	
Value Added	0.22	-6.16	-8.48	5.86	4.65	2.24	0.60	
Shenkman Capital	**0.22**	**3.09**	**3.99**	**-0.99**	**2.09**	**3.23**	**4.11**	10/1/2010
Morningstar LSTA US Leveraged Loan	0.44	2.74	4.14	-0.60	2.55	3.31	4.16	
Value Added	-0.22	0.35	-0.15	-0.39	-0.46	-0.08	-0.05	
Waterfall	**-0.63**	**-0.95**	**2.97**	**0.84**	**2.60**	**4.80**	**9.29**	2/1/2010
Policy Index	-0.10	2.42	2.86	-6.65	0.59	2.11	4.15	
Value Added	-0.53	-3.37	0.11	7.49	2.01	2.69	5.14	
White Oak Yield Spectrum	**1.28**	**1.28**	**2.47**	**5.78**	**5.81**		**5.33**	3/1/2018
Morningstar LSTA US Leveraged Loan	0.44	2.74	4.14	-0.60	2.55		3.18	
Value Added	0.84	-1.46	-1.67	6.38	3.26		2.15	
H/2 Credit Partner	**0.00**	**0.00**	**0.00**	**5.07**	**2.04**	**1.36**	**4.22**	7/1/2011
Mesa West Core Lend	**1.88**	**1.88**	**2.96**	**5.88**	**5.56**	**6.55**	**6.56**	5/1/2013
Mesa West IV	**0.71**	**0.71**	**-1.66**	**1.83**	**6.16**	**6.74**	**5.83**	3/1/2017
Cash Composite	**0.30**	**0.86**	**1.42**	**1.62**	**0.78**	**1.41**	**3.30**	1/1/1988
FTSE 3 Month T-Bill	0.34	0.87	1.33	1.50	0.71	1.25	2.89	
Value Added	-0.04	-0.01	0.09	0.12	0.07	0.16	0.41	

 Pension Plan composite used for representative manager returns. Individual plan results may vary slightly due to cash flows.

Wilshire

Asset Allocation & Performance

Pension Plan Accounts

Periods Ended December 31, 2022

	Performance (%) net of fees							
	1 Month	QTD	FYTD	1 Year	3 Years	5 Years	Since Inception	Inception Date
Real Estate Composite	-0.08	1.19	3.94	18.81	14.63	12.51	6.84	7/1/1984
NCREIF ODCE NOF 1 Quarter Lag	0.31	0.31	4.87	20.96	11.38	9.26		
Value Added	-0.39	0.88	-0.93	-2.15	3.25	3.25		
Baring	3.07	8.33	-1.53	10.19	14.96		18.87	1/1/2019
Barings Euro RE II	-0.81	4.37	-1.14	-0.50			-15.14	12/1/2020
Divcowest IV	-0.83	-0.83	-0.20	20.04	13.14	16.10	18.58	3/1/2014
Fundamental Partners III	-1.07	-1.07	-0.18	14.35	18.28	15.40	14.17	5/1/2017
Greenfield Acq VI	-2.70	-2.70	-14.94	-25.21	-43.18	-38.48	-17.05	12/1/2012
Greenfield Acq VII	8.31	8.31	13.16	33.56	22.84	19.62	16.18	7/1/2014
Harrison Street	0.00	2.14	8.46	14.23	8.61	8.06	8.47	5/1/2012
Lubert Adler VII	0.53	0.53	0.18	10.14	-2.57	1.91	-0.55	7/1/2014
Lubert Adler VII B	2.07	2.07	5.19	20.20	25.18	18.12	15.46	7/1/2017
Patron Capital	-5.62	-0.80	-4.40	1.55	5.19	10.10	4.23	8/1/2016
Prologis Targeted US	0.00	0.06	5.86	34.64	26.37	22.33	19.34	10/1/2014
Rubenstein PF II	-5.18	-5.18	-11.02	-7.59	-5.01	0.52	6.58	7/1/2013
Stockbridge Sm/Mkts	0.00	0.64	0.64	21.11	13.36	11.22	10.49	5/1/2014
Walton St RE VI	2.71	2.71	6.05	17.70	4.92	4.21	-11.58	5/1/2009
Walton St RE VII	-2.16	-2.16	3.95	4.50	-1.16	-0.66	5.89	7/1/2013

Pension Plan composite used for representative manager returns. Individual plan results may vary slightly due to cash flows.

Wilshire

Asset Allocation & Performance

Pension Plan Accounts

Periods Ended December 31, 2022

	Performance (%) net of fees							
	1 Month	QTD	FYTD	1 Year	3 Years	5 Years	Since Inception	Inception Date
Real Return Composite	-1.33	4.90	7.72	6.76	6.59	5.39	4.63	7/1/2011
US CPI + 3%	0.17	1.20	2.45	9.61	8.05	6.88	5.56	
Value Added	-1.50	3.70	5.27	-2.85	-1.46	-1.49	-0.93	
Putnam	0.21	0.24	-0.48	-6.11			8.86	7/1/2020
Policy Index	-3.11	6.24	1.14	-15.86			3.93	
Value Added	3.32	-6.00	-1.62	9.75			4.93	
Tortoise Capital	-4.81	10.57	19.52	32.84	10.06	4.62	9.28	8/1/2009
Alerian MLP Index	-4.70	10.11	18.97	30.92	9.38	4.08	6.52	
Value Added	-0.11	0.46	0.55	1.92	0.68	0.54	2.76	
Amerra AGRI Fund II	3.67	3.67	8.94	21.47	10.42	8.07	6.63	12/1/2012
Amerra AGRI Holdings	-2.33	-2.33	-3.68	-2.63	-2.57	-2.14	-1.67	8/1/2015
BTG Pactual	7.28	7.28	6.66	17.91	6.79	3.05	-2.00	12/1/2014
IFM Infrastructure	1.56	1.56	2.29	4.48	4.17		4.40	7/1/2019
Magnetar MTP EOF II	3.08	3.08	7.97	204.11	71.24	42.04	26.95	8/1/2015
Oberland Capital	1.74	1.74	4.30	8.40	14.07		13.38	8/1/2018
Taurus Mine Finance	8.31	8.31	27.09	82.96	18.14	16.49	15.61	4/1/2015
TPF II	-1.27	-1.27	-2.73	32.93	5.40	5.72	-0.52	10/1/2008
Blackstone Strat Opp	-0.13	-3.00	-2.61	0.84	-4.46	-3.01	-2.47	8/1/2017
Luxor Capital	-0.45	3.45	3.33	3.77	-2.16	0.13	-0.02	4/1/2014
Myriad Opportunities	0.00	-6.78	-7.05	-47.05	-23.31	-16.31	-10.00	5/1/2016
Pine River	-1.26	-1.18	3.88	-9.92	-0.90	4.39	2.61	5/1/2014
PRISMA Capital	0.20	0.20	-0.58	-0.81	-0.10	0.69	2.36	9/1/2011

 Pension Plan composite used for representative manager returns. Individual plan results may vary slightly due to cash flows.

Wilshire

Asset Allocation & Performance

Pension Plan Accounts

Periods Ended December 31, 2022

	Performance (%) net of fees							
	1 Month	QTD	FYTD	1 Year	3 Years	5 Years	Since Inception	Inception Date
SRS Partners US	0.00	0.00	0.00	0.00	5.94	6.28	8.32	8/1/2017
Tricadia Select	0.00	0.00	0.00	0.00	0.00	-4.16	-4.68	9/1/2017

Pension Plan composite used for representative manager returns. Individual plan results may vary slightly due to cash flows.

Kentucky Public Pensions Authority

KERS, KERS-Hazardous, & SPRS Unit Holdings

Quarter Ending: December 31, 2022

Kentucky Public Pensions Authority
Pension: KERS, KERS-H, & SPRS Unit Holdings
Quarter Ended December 31, 2022

UNIT OF PARTICIPATION	KERS		KERS-H		SPRS	
	Shares/Par	Base Market Value	Shares/Par	Base Market Value	Shares/Par	Base Market Value
Grand Total	20,950,339.028	3,181,076,552.72	4,960,890.426	835,725,513.41	3,868,434.602	556,940,139.93
KRS ABSOLUTE RETURN UNIT	149,641.052	18,137,376.44	39,042.229	4,732,148.00	16,199.058	1,963,421.19
KRS ADAMS STREET A1 UNIT	174,327.349	24,274,060.22	51,841.053	7,218,562.38	21,617.485	3,010,107.91
KRS ADAMS STREET B1 UNIT	178,148.240	22,040,633.15	52,977.307	6,554,391.94	22,091.295	2,733,151.50
KRS AMERRA AGRI UNIT	-	-	28,023.378	2,531,460.63	14,178.361	1,280,786.45
KRS AMERRA UNIT	-	-	7,456.869	1,400,094.42	3,772.782	708,373.85
KRS ARROWMARK UNIT	405,599.625	80,347,474.71	125,747.662	24,910,050.38	50,099.456	9,924,478.54
KRS BLACKROCK UNIT	688,147.351	105,588,319.34	243,181.056	37,313,344.24	98,831.528	15,164,564.57
KRS BLUE TORCH UNIT	157,476.048	23,194,435.78	47,314.490	6,968,887.74	19,521.195	2,875,250.61
KRS BNYM CUSTODY FEE UNIT	-120,213.111	-120,213.11	-31,587.238	-31,587.24	-21,141.370	-21,141.37
KRS BTG UNIT	-	-	17,210.185	1,391,243.97	7,965.109	643,886.74
KRS CASH UNIT	5,255,286.759	514,371,318.47	577,196.855	56,494,254.44	1,267,402.048	124,049,417.73
KRS DIVCOWEST IV UNIT	-	-	151.575	83,648.79	54.514	30,084.31
KRS DOMESTIC EQUITY UNIT	662,460.554	157,004,137.70	233,038.157	55,230,390.20	110,192.981	26,115,900.57
KRS GLOBAL FIXED UNIT	272,116.345	35,020,968.96	133,310.820	17,156,904.30	55,825.490	7,184,657.55
KRS GREENFIELD UNIT	-	-	265.191	3,470.17	95.376	1,248.05
KRS GREENFIELD VII UNIT	-	-	682.060	209,082.93	245.303	75,196.71
KRS HARRISON UNIT	229,149.436	52,536,342.56	56,783.798	13,018,635.85	27,092.529	6,211,415.61
KRS IFM INFRAST DEBT UNIT	76,151.743	10,613,978.92	23,454.145	3,269,023.02	9,091.447	1,267,159.79
KRS INTERNAL EQUITY UNIT	1,544,679.289	432,084,808.60	549,308.650	153,655,146.79	276,759.695	77,416,497.19
KRS INTERNATIONAL EQUITY UNIT	1,992,500.044	310,900,375.99	706,087.036	110,174,514.49	376,308.850	58,717,470.70
KRS L-A VII UNIT	-	-	13,032.050	1,240,495.64	4,685.431	445,997.12
KRS LIQUID CORE FIXED UNIT	5,249,708.742	645,208,460.32	872,769.470	107,266,569.18	927,043.292	113,937,020.98
KRS LIQUID CREDIT FIXED UNIT	10,020.517	0.76	3,470.982	0.26	1,638.453	0.12
KRS LIQUID HY FI UNIT	873,365.873	131,113,280.50	191,184.378	28,701,385.93	141,723.481	21,276,112.44
KRS MAGNETAR MTP UNIT	159.328	81,966.58	28.401	14,610.95	14.098	7,252.74
KRS MESA WEST CORE UNIT	30,939.768	5,710,393.52	18,362.356	3,389,045.41	5,427.457	1,001,717.77
KRS MESA WEST IV UNIT	34,892.283	3,417,232.64	9,544.948	934,800.05	4,034.654	395,140.42
KRS MULTI SECTOR CREDIT FI	787,166.869	127,729,984.65	132,990.502	21,579,763.39	71,068.687	11,531,992.33
KRS OBERLAND UNIT	-	-	5,446.564	389,106.97	-	-
KRS PE 2010 UNIT	491,486.841	149,699,295.84	62,155.282	18,931,538.29	32,350.617	9,853,497.96
KRS PE 2011 UNIT	-	-	15,471.114	4,677,934.74	-	-
KRS PE 2012 A UNIT	-	-	803.733	511,030.81	120.702	76,744.94
KRS PE 2012 B UNIT	-	-	5,071.521	743,202.65	761.621	111,611.24
KRS PE 2013 UNIT	0.008	2.92	24,239.167	8,845,025.23	7,641.327	2,788,368.52
KRS PE 2014 UNIT	-	-	20,674.295	3,397,481.97	6,517.509	1,071,045.92
KRS PE 2015 UNIT	-	-	14,973.763	3,756,931.95	4,720.447	1,184,364.82
KRS PE 2016 UNIT	-	-	29,994.724	7,817,365.31	-	-
KRS PE 2017 UNIT	-	-	15,510.882	2,397,086.50	-	-
KRS PE 2018 UNIT	-	-	18,114.114	3,267,154.35	-	-
KRS PE 2019 UNIT	-	-	17,964.870	4,017,097.78	-	-
KRS PE 2021 UNIT	141,596.042	17,734,533.56	40,709.715	5,098,785.23	16,290.438	2,040,334.71
KRS PERIMETER PARK UNIT	19,205.499	1,879,916.69	15,740.350	1,540,733.03	3,731.088	365,214.91
KRS POST-2015 REAL ESTATE UNIT	220,507.026	34,069,052.39	60,320.726	9,319,748.27	25,497.601	3,939,462.25
KRS PRIVATE CREDIT FI UNIT	399,294.039	74,905,369.19	143,418.483	26,904,519.90	37,067.321	6,953,625.88
KRS PROLOGIS UNIT	246,066.872	63,820,709.54	67,312.722	17,458,447.96	28,453.125	7,379,695.66
KRS REAL RETURN UNIT	231,710.554	39,670,883.12	58,037.817	9,936,584.31	23,175.383	3,967,829.23
KRS RUBENSTEIN PF II UNIT	-	-	4,735.076	912,716.87	1,702.973	328,259.18
KRS SHENKMAN UNIT	152,606.993	23,528,196.27	126,254.954	19,465,368.39	58,716.342	9,052,597.08
KRS STOCKBRIDGE UNIT	123,246.396	29,058,175.24	24,535.920	5,784,908.01	11,887.258	2,802,694.74
KRS TAURUS UNIT	-	-	761.634	215,523.71	240.104	67,943.53
KRS TPF II UNIT	255.889	27,500.86	39.538	4,249.22	18.128	1,948.25
KRS WALTON VI UNIT	22,864.485	3,946,871.24	4,997.614	862,688.97	1,657.353	286,092.55
KRS WALTON VII UNIT	-	-	3,196.765	561,655.78	1,149.716	201,999.41
KRS WATERFALL UNIT	249,774.280	43,480,709.16	77,540.718	13,498,288.96	94,896.864	16,519,647.03

Kentucky Public Pensions Authority						
Insurance: KERS INS, KERS-H INS, & SPRS INS Unit Holdings						
Quarter Ended December 31, 2022						
UNIT OF PARTICIPATION	KERS INS		KERS-H INS		SPRS INS	
	Shares/Par	Base Market Value	Shares/Par	Base Market Value	Shares/Par	Base Market Value
Grand Total	**10,307,150.532**	**1,333,435,825.11**	**4,865,856.526**	**583,875,689.13**	**1,794,051.529**	**231,714,467.92**
KR3 ARROWMARK UNIT	198,111.345	39,666,697.65	123,155.934	24,658,805.87	45,477.526	9,105,704.04
KRS INS PE 2014 UNIT	-	-	13,393.882	2,204,849.46	8,335.534	1,372,163.62
KRS INS ABSOLUTE RETURN UNIT	53,389.102	6,474,080.02	35,451.472	4,298,923.52	13,294.494	1,612,119.60
KRS INS ADAMS STREET A1 UNIT	72,427.642	10,085,124.22	38,963.478	5,425,435.71	15,050.855	2,095,743.26
KRS INS ADAMS STREET B1 UNIT	74,015.103	9,157,203.54	39,817.475	4,926,247.59	15,380.742	1,902,916.83
KRS INS AMERRA AGRI UNIT	32,461.227	2,932,620.03	26,322.951	2,378,074.41	9,893.719	893,820.76
KRS INS AMERRA UNIT	6,443.202	1,214,834.26	5,224.818	985,113.91	1,963.795	370,263.95
KRS INS BLACKROCK UNIT	735,968.976	45,083,495.17	408,777.073	25,040,592.47	154,203.321	9,446,083.88
KRS INS BLUE TORCH UNIT	66,616.664	9,811,879.11	35,017.303	5,157,651.60	13,564.966	1,997,965.65
KRS INS BNYM CUSTODY FEE UNIT	-71,583.946	-71,583.95	-31,659.436	-31,659.44	-12,533.039	-12,533.04
KRS INS BTG UNIT	20,001.053	1,616,853.32	13,560.021	1,096,170.54	5,144.451	415,869.24
KRS INS CASH UNIT	1,452,557.440	150,244,742.81	154,152.856	15,944,743.78	49,193.853	5,088,348.03
KRS INS DB PRIVATE EQ UNIT	8,272.330	2,776,429.15	6,867.415	2,304,899.73	1,537.665	516,084.09
KRS INS DIVCOWEST IV UNIT	157.933	87,654.64	118.367	65,695.05	44.583	24,744.08
KRS INS DOMESTIC EQUITY UNIT	393,666.898	93,254,211.44	170,289.749	40,339,272.47	68,932.448	16,329,137.94
KRS INS GLOBAL FIXED UNIT	171,904.490	21,711,202.05	7,405.298	935,274.70	38,965.867	4,921,313.06
KRS INS GREENFIELD UNIT	277.542	3,614.60	208.010	2,709.04	78.297	1,019.71
KRS INS GREENFIELD VII UNIT	709.345	217,457.20	531.634	162,978.01	200.109	61,345.53
KRS INS HARRISON UNIT	77,338.977	17,340,226.56	56,020.957	12,560,498.26	21,455.354	4,810,520.05
KRS INS IFM INFRAST DEBT UNIT	33,735.504	4,643,451.59	18,982.226	2,612,768.07	6,395.139	880,245.29
KRS INS INTERNAL EQUITY UNIT	849,561.558	238,198,053.62	377,610.376	105,873,501.15	148,394.468	41,606,488.80
KRS INS INTL EQ UNIT	1,263,836.009	194,941,814.61	524,584.620	80,915,148.02	211,800.383	32,669,389.62
KRS INS L-A-VII UNIT	13,548.550	1,289,967.48	10,154.240	966,792.71	3,824.578	364,140.91
KRS INS LIQUID CORE FIXED UNIT	1,319,606.062	160,636,805.86	578,089.522	70,371,345.65	226,853.429	27,615,067.32
KRS INS LIQUID CREDIT FIXED UN	1,738,367.727	1.74	1,337,212.672	1.34	401,179.551	0.40
KRS INS LIQUID HY FI UNIT	240,019.167	35,080,323.46	106,005.447	15,493,368.37	41,245.701	6,028,320.78
KRS INS MAGNETAR MTP	28.007	14,514.76	22.063	11,434.25	8.389	4,347.64
KRS INS MESA WEST CORE UNIT	32,110.702	5,801,854.79	27,534.291	4,974,975.57	10,315.876	1,863,902.40
KRS INS MESA WEST IV UNIT	10,669.816	1,009,802.21	7,979.816	755,217.88	3,050.668	288,718.31
KRS INS MULTI SECTOR CREDIT FI	212,837.305	33,929,871.88	127,352.658	20,302,171.04	43,970.794	7,009,689.43
KRS INS OBERLAND UNIT	15,552.965	1,147,511.23	4,394.532	324,232.38	1,028.773	75,903.76
KRS INS PE 2010 UNIT	37,525.967	11,228,680.72	17,874.043	5,348,347.77	7,948.694	2,378,442.29
KRS INS PE 2011 UNIT	-	-	18,725.962	5,830,199.28	8,917.113	2,776,281.71
KRS INS PE 2012 A UNIT	-	-	434.734	277,324.53	270.552	172,589.92
KRS INS PE 2012 B UNIT	-	-	3,507.405	516,394.99	2,165.695	318,855.12
KRS INS PE 2013 UNIT	-	-	19,090.033	6,912,468.44	11,880.461	4,301,894.70
KRS INS PE 2015 UNIT	-	-	12,553.757	3,129,664.98	7,812.689	1,947,711.68
KRS INS PE 2016 UNIT	89,495.870	23,323,941.64	54,582.650	14,225,042.37	21,144.643	5,510,605.34
KRS INS PE 2017 UNIT	46,530.955	7,151,948.45	28,378.898	4,361,922.41	10,993.539	1,689,740.18
KRS INS PE 2018 UNIT	57,915.947	10,747,728.29	16,364.268	3,036,792.37	3,830.896	710,916.97
KRS INS PE 2019 UNIT	107,482.187	24,033,923.63	7,677.301	1,716,709.26	3,070.921	686,683.84
KRS INS PE 2021 UNIT	66,720.120	8,410,524.29	31,447.424	3,964,161.39	12,320.212	1,553,046.40
KRS INS POST-2015 REAL ESTATE	71,280.315	10,973,958.40	53,309.619	8,207,280.53	20,380.162	3,137,627.13
KRS INS PRIVATE CREDIT FI UNIT	211,317.698	39,006,121.45	127,602.736	23,553,577.69	45,940.030	8,479,850.04
KRS INS PROLOGIS UNIT	46,483.481	19,191,352.18	34,764.411	14,352,971.00	13,290.350	5,487,106.00
KRS INS REAL RETURN UNIT	68,588.635	11,769,983.98	31,363.109	5,381,989.17	12,242.317	2,100,812.69
KRS INS RUBENSTEIN PF II UNIT	4,991.951	956,421.95	3,741.344	716,814.64	1,409.174	269,987.62
KRS INS SHENKMAN UNIT	287,676.041	43,942,368.84	69,066.460	10,549,866.61	24,045.638	3,672,958.97
KRS INS STOCKBRIDGE UNIT	38,327.097	8,997,492.14	27,034.753	6,346,553.66	10,358.286	2,431,663.35
KRS INS TAURUS UNIT	-	-	407.094	115,423.70	253.351	71,832.82
KRS INS TPF II UNIT	17.081	1,835.66	9.178	986.34	3.998	429.66
KRS INS WALTON VI UNIT	1,735.306	297,761.62	992.318	170,272.11	424.189	72,786.70
KRS INS WALTON VII UNIT	3,329.973	585,059.52	2,495.727	438,486.69	939.400	165,047.86
KRS INS WATERFALL UNIT	145,123.213	24,516,007.30	80,891.582	13,665,206.09	26,156.930	4,418,751.99

Kentucky Public Pensions Authority

Security Litigation Report

Quarter Ending: December 31, 2022

Claims Filed during the Quarter (pg 3):
19
Proceeds Received during the Quarter (pg 4):
$144,900.41

Kentucky Retirement Systems
Quarterly Securities Litigation Report
Quarter Ended 12/31/22

Total Claims Filed	
No Claim on File	9
Fiscal Year 1997	1
Fiscal Year 1998	2
Fiscal Year 1999	5
Fiscal Year 2000	9
Fiscal Year 2001	8
Fiscal Year 2002	33
Fiscal Year 2003	45
Fiscal Year 2004	38
Fiscal Year 2005	89
Fiscal Year 2006	150
Fiscal Year 2007	70
Fiscal Year 2008	73
Fiscal Year 2009	85
Fiscal Year 2010	65
Fiscal Year 2011	69
Fiscal Year 2012	54
Fiscal Year 2013	48
Fiscal Year 2014	65
Fiscal Year 2015	80
Fiscal Year 2016	224
Fiscal Year 2017	140
Fiscal Year 2018	74
Fiscal Year 2019	55
Fiscal Year 2020	42
Fiscal Year 2021	43
Fiscal Year 2022	49
Fiscal Year 2023	32
Total Filed	**1,657**

Proceeds Received	
Fiscal Year 1998	$67,682
Fiscal Year 1999	$233,370
Fiscal Year 2000	$303,918
Fiscal Year 2001	$415,502
Fiscal Year 2002	$387,318
Fiscal Year 2003	$519,059
Fiscal Year 2004	$1,080,920
Fiscal Year 2005	$1,645,440
Fiscal Year 2006	$797,535
Fiscal Year 2007	$5,398,363
Fiscal Year 2008	$5,402,336
Fiscal Year 2009	$3,504,682
Fiscal Year 2010	$2,776,544
Fiscal Year 2011	$1,292,484
Fiscal Year 2012	$468,657
Fiscal Year 2013	$1,070,427
Fiscal Year 2014	$308,704
Fiscal Year 2015	$23,639,565
Fiscal Year 2016	$2,417,957
Fiscal Year 2017	$1,886,532
Fiscal Year 2018	$2,247,966
Fiscal Year 2019	$1,702,272
Fiscal Year 2020	$1,743,474
Fiscal Year 2021	$286,420
Fiscal Year 2022	$616,557
Fiscal Year 2023	$186,186
Total Proceeds	**$60,399,872**

Class Action Name	TNT Status Code	Status as of Date	Class Period Start Date	Class Period End Date	Class Account Id	Claimed Account Name
BANK OZK, Securities Litigation	FILED	10/4/2022	2/19/2016	10/18/2018	956588	KRS NTGI STRUCTURED
BANK OZK, Securities Litigation	FILED	10/4/2022	2/19/2016	10/18/2018	956765	KRS INS NTGI STRUCTURED
BENEFITFOCUS, INC., Securities Litigation	FILED	12/19/2022	2/26/2019	11/5/2020	956765	KRS INS NTGI STRUCTURED
BENEFITFOCUS, INC., Securities Litigation	FILED	12/19/2022	2/26/2019	11/5/2020	956588	KRS NTGI STRUCTURED
BOFI HOLDINGS, INC., Securities Litigation (15CV02324GPCKSC)	FILED	11/24/2022	9/4/2013	10/13/2015	KR3F1002002	NTGI STRUCTURED
BOFI HOLDINGS, INC., Securities Litigation (15CV02324GPCKSC)	FILED	11/24/2022	9/4/2013	10/13/2015	KR2F1002002	NTGI STRUCTURED
COVETRUS, INC., Securities Litigation	FILED	12/1/2022	2/8/2019	8/12/2019	956596	KRS KRS INTERNAL EQUITY
COVETRUS, INC., Securities Litigation	FILED	12/1/2022	2/8/2019	8/12/2019	956774	KRS INS S P 500 INDEX
COVETRUS, INC., Securities Litigation	FILED	12/1/2022	2/8/2019	8/12/2019	956599	KRS S P 500 INDEX
COVETRUS, INC., Securities Litigation	FILED	12/1/2022	2/8/2019	8/12/2019	956588	KRS NTGI STRUCTURED
COVETRUS, INC., Securities Litigation	FILED	12/1/2022	2/8/2019	8/12/2019	956772	KRS INS KRS INTERNAL EQUITY
COVETRUS, INC., Securities Litigation	FILED	12/1/2022	2/8/2019	8/12/2019	956765	KRS INS NTGI STRUCTURED
EVOLENT HEALTH, INC., Securities Litigation	FILED	12/14/2022	1/10/2018	5/28/2019	956588	KRS NTGI STRUCTURED
EVOLENT HEALTH, INC., Securities Litigation	FILED	12/14/2022	1/10/2018	5/28/2019	956765	KRS INS NTGI STRUCTURED
Facebook Fair Fund	FILED	10/18/2022	1/28/2016	3/19/2018	KR2F1011002	KRS INTERNAL EQUITY
Facebook Fair Fund	FILED	11/24/2022	1/28/2016	3/19/2018	956591	KRS WESTFIELD CAPITAL
Facebook Fair Fund	FILED	11/24/2022	1/28/2016	3/19/2018	956599	KRS S P 500 INDEX
Facebook Fair Fund	FILED	11/24/2022	1/28/2016	3/19/2018	956774	KRS INS S P 500 INDEX
Facebook Fair Fund	FILED	11/24/2022	1/28/2016	3/19/2018	956596	KRS KRS INTERNAL EQUITY
Facebook Fair Fund	FILED	11/24/2022	1/28/2016	3/19/2018	956768	KRS INS WESTFIELD CAPITAL
Facebook Fair Fund	FILED	10/18/2022	1/28/2016	3/19/2018	KR2F1006002	WESTFIELD CAPITAL
Facebook Fair Fund	FILED	10/18/2022	1/28/2016	3/19/2018	KR3F1011002	KRS INTERNAL EQUITY
Facebook Fair Fund	FILED	11/24/2022	1/28/2016	3/19/2018	956772	KRS INS KRS INTERNAL EQUITY
Facebook Fair Fund	FILED	10/18/2022	1/28/2016	3/19/2018	KR3F1006002	WESTFIELD CAPITAL
Facebook Fair Fund	FILED	10/18/2022	1/28/2016	3/19/2018	KR2F1902002	S&P 500 INDEX
FLUOR CORPORATION, Securities Litigation (18CV01338)	FILED	10/14/2022	8/14/2013	2/14/2020	956596	KRS KRS INTERNAL EQUITY
FLUOR CORPORATION, Securities Litigation (18CV01338)	FILED	10/14/2022	8/14/2013	2/14/2020	956772	KRS INS KRS INTERNAL EQUITY
FLUOR CORPORATION, Securities Litigation (18CV01338)	FILED	10/11/2022	8/14/2013	2/14/2020	956599	KRS S P 500 INDEX
General Electric Company Fair Fund	FILED	12/13/2022	10/16/2015	1/16/2018	956596	KRS KRS INTERNAL EQUITY
General Electric Company Fair Fund	FILED	12/13/2022	10/16/2015	1/16/2018	956591	KRS WESTFIELD CAPITAL
General Electric Company Fair Fund	FILED	12/13/2022	10/16/2015	1/16/2018	956597	KRS RIVER ROAD FAV
General Electric Company Fair Fund	FILED	10/12/2022	10/16/2015	1/16/2018	KR3F1006002	WESTFIELD CAPITAL
General Electric Company Fair Fund	FILED	10/12/2022	10/16/2015	1/16/2018	KR2F1902002	S&P 500 INDEX
General Electric Company Fair Fund	FILED	10/12/2022	10/16/2015	1/16/2018	KR3F1011002	KRS INTERNAL EQUITY
General Electric Company Fair Fund	FILED	10/12/2022	10/16/2015	1/16/2018	KR2F1006002	WESTFIELD CAPITAL
General Electric Company Fair Fund	FILED	12/13/2022	10/16/2015	1/16/2018	956768	KRS INS WESTFIELD CAPITAL
General Electric Company Fair Fund	FILED	12/13/2022	10/16/2015	1/16/2018	956772	KRS INS KRS INTERNAL EQUITY
General Electric Company Fair Fund	FILED	10/12/2022	10/16/2015	1/16/2018	KR2F1011002	KRS INTERNAL EQUITY
General Electric Company Fair Fund	FILED	12/13/2022	10/16/2015	1/16/2018	956599	KRS S P 500 INDEX
General Electric Company Fair Fund	FILED	12/13/2022	10/16/2015	1/16/2018	956774	KRS INS S P 500 INDEX
General Electric Company Fair Fund	FILED	12/13/2022	10/16/2015	1/16/2018	956592	KRS RIVER ROAD
General Electric Company Fair Fund	FILED	12/13/2022	10/16/2015	1/16/2018	956769	KRS INS RIVER ROAD
General Electric Company Fair Fund	FILED	12/13/2022	10/16/2015	1/16/2018	909181	KRS INS RIVER ROAD FAV
GROUPON, INC Securities Litigation	FILED	12/2/2022	7/30/2019	2/18/2020	956765	KRS INS NTGI STRUCTURED
GROUPON, INC Securities Litigation	FILED	12/2/2022	7/30/2019	2/18/2020	956588	KRS NTGI STRUCTURED
HARMAN INTERNATIONAL INDUSTRIES, INC., Securities Litigation (17CV00246)	FILED	11/7/2022	1/10/2017	3/12/2017	KR3F1902002	S&P 500 INDEX
HARMAN INTERNATIONAL INDUSTRIES, INC., Securities Litigation (17CV00246)	FILED	11/7/2022	1/10/2017	3/12/2017	KR2F1902002	S&P 500 INDEX
INOVIO PHARMACEUTICALS, INC Securities Litigation	FILED	12/15/2022	2/14/2020	8/10/2020	956765	KRS INS NTGI STRUCTURED
INOVIO PHARMACEUTICALS, INC Securities Litigation	FILED	12/15/2022	2/14/2020	8/10/2020	956588	KRS NTGI STRUCTURED
INTRUSION INC., Security Litigation	FILED	12/6/2022	10/14/2020	8/26/2021	956588	KRS NTGI STRUCTURED
MALLINCKRODT PLC, Securities Litigation	FILED	10/28/2022	10/6/2015	11/6/2017	KR3F1011002	KRS INTERNAL EQUITY
MALLINCKRODT PLC, Securities Litigation	FILED	10/27/2022	10/6/2015	11/6/2017	956599	KRS S P 500 INDEX
MALLINCKRODT PLC, Securities Litigation	FILED	10/27/2022	10/6/2015	11/6/2017	KR2F1011002	KRS INTERNAL EQUITY
SEALED AIR CORPORATION, Securities Litigation	FILED	12/19/2022	11/17/2014	6/20/2019	956596	KRS KRS INTERNAL EQUITY
SEALED AIR CORPORATION, Securities Litigation	FILED	12/19/2022	11/17/2014	6/20/2019	956772	KRS INS KRS INTERNAL EQUITY
SEALED AIR CORPORATION, Securities Litigation	FILED	12/19/2022	11/17/2014	6/20/2019	956599	KRS S P 500 INDEX
TWITTER, INC., Securities Litigation	FILED	1/10/2023	2/6/2015	7/28/2015	KR2F4290002	INST VEN PTRN XII
TWITTER, INC., Securities Litigation	FILED	1/10/2023	2/6/2015	7/28/2015	KR3F4290002	INST VEN PTRN XII
UNITI GROUP INC. SECURITIES LITIGATION	FILED	11/29/2022	4/24/2015	6/24/2019	956592	KRS RIVER ROAD
UNITI GROUP INC. SECURITIES LITIGATION	FILED	11/29/2022	4/24/2015	6/24/2019	956769	KRS INS RIVER ROAD
UNITI GROUP INC. SECURITIES LITIGATION	FILED	11/7/2022	4/24/2015	6/24/2019	KR3F1007002	RIVER ROAD
UNITI GROUP INC. SECURITIES LITIGATION	FILED	11/29/2022	4/24/2015	6/24/2019	956773	KRS INS TRANSITION
UNITI GROUP INC. SECURITIES LITIGATION	FILED	11/29/2022	4/24/2015	6/24/2019	KR3F3506002	NUVEEN REAL ASSET
UNITI GROUP INC. SECURITIES LITIGATION	FILED	11/29/2022	4/24/2015	6/24/2019	956598	KRS TRANSITION
UNITI GROUP INC. SECURITIES LITIGATION	FILED	11/7/2022	4/24/2015	6/24/2019	KR2F1007002	RIVER ROAD
UNITI GROUP INC. SECURITIES LITIGATION	FILED	11/29/2022	4/24/2015	6/24/2019	KR2F3506002	NUVEEN REAL ASSET
Vanda Pharms Inc. Securities Litigation	FILED	12/19/2022	11/4/2015	2/11/2019	956588	KRS NTGI STRUCTURED
Vanda Pharms Inc. Securities Litigation	FILED	12/19/2022	11/4/2015	2/11/2019	956765	KRS INS NTGI STRUCTURED
VENATOR MATERIALS PLC, Securities Litigation	FILED	11/24/2022	8/2/2017	10/29/2018	956766	KRS INS SYSTEMATIC
VENATOR MATERIALS PLC, Securities Litigation	FILED	11/24/2022	8/2/2017	10/29/2018	956589	KRS SYSTEMATIC
WALGREEN COMPANY Securities Litigation (15CV03187)	FILED	10/21/2022	4/17/2014	8/5/2014	KR2F1902002	S&P 500 INDEX
WALGREEN COMPANY Securities Litigation (15CV03187)	FILED	10/21/2022	4/17/2014	8/5/2014	KR3F1902002	S&P 500 INDEX

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Transaction Detail
Reported By Transaction Category

Report ID: IACS0008
Base Currency: USD
Status: FINAL

KR2G00000000 - TOTAL FUND
9/30/2022 - 12/31/2022

Trans Code / Link Ref	Shares/Par / Security Id	Description / Broker / Transaction No./Client Ref No.	Trade Date / C. Settle Date / Reported Date	Price Local/Base	Cost Local/Base	Amount Local/Base	Net Gain/Loss Local/Base
CLASS ACTIONS							
CASH & CASH EQUIVALENTS							
U.S. DOLLAR							
CD	0.000	24213CenturyLink Inc. (2017) (	10/5/2022	0.000000	264.84	264.84	264.84
	NA9123459	D Minn) Distribution 1ST DISTR		0.000000	264.84	264.84	264.84
		20221006S000140 / 000000000000	10/5/2022			Gain/Loss Local Amounts: 264.84 Long	
		KR2F10110002 : KRS INTERNAL EQUITY				Gain/Loss Base Amounts: 264.84 Long	
CD	0.000	24213CenturyLink Inc. (2017) (	10/5/2022	0.000000	14.72	14.72	14.72
	NA9123459	D Minn) Distribution 1ST DISTR		0.000000	14.72	14.72	14.72
		20221006S000170 / 000000000000	10/5/2022			Gain/Loss Local Amounts: 14.72 Long	
		KR2F19020002 : S&P 500 INDEX				Gain/Loss Base Amounts: 14.72 Long	
CD	0.000	3-16-CV-05479-JSTWELLS FARGO &	10/6/2022	0.000000	106.84	106.84	106.84
	NA9123459	COMPANY (2016) Distribution 3		0.000000	106.84	106.84	106.84
		20221006S000190 / 000000001111	10/6/2022			Gain/Loss Local Amounts: 106.84 Long	
		KR2F19020002 : S&P 500 INDEX				Gain/Loss Base Amounts: 106.84 Long	
CD	0.000	1-18-cv-04253ROCKWELL MEDICAL,	10/6/2022	0.000000	19.32	19.32	19.32
	NA9123459	INC. (2018) Distribution 2ND		0.000000	19.32	19.32	19.32
		20221006S000320 / 000000000000	10/6/2022			Gain/Loss Local Amounts: 19.32 Long	
		KR2F10020002 : NTGI STRUCTURED				Gain/Loss Base Amounts: 19.32 Long	
CD	0.000	23548Wells Fargo & Company (SE	10/11/2022	0.000000	61,122.58	61,122.58	61,122.58
	NA9123459	C) Distribution 1ST DISTRIBUTI		0.000000	61,122.58	61,122.58	61,122.58
		20221011S000010 / 000000000008	10/11/2022			Gain/Loss Local Amounts: 61,122.58 Long	
		KR2F19010002 : STATE STREET TRANSIT				Gain/Loss Base Amounts: 61,122.58 Long	
CD	0.000	23548Wells Fargo & Company (SE	10/11/2022	0.000000	9,995.62	9,995.62	9,995.62
	NA9123459	C) Distribution 1ST DISTRIBUTI		0.000000	9,995.62	9,995.62	9,995.62
		20221011S000020 / 000000000008	10/11/2022			Gain/Loss Local Amounts: 9,995.62 Long	
		KR2F10120002 : RIVER ROAD FAV				Gain/Loss Base Amounts: 9,995.62 Long	

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Transaction Detail
Reported By Transaction Category

Report ID: IACS0008
Base Currency: USD
Status: FINAL

KR2G00000000 - TOTAL FUND **9/30/2022 - 12/31/2022**

Trans Code / Link Ref	Shares/Par / Security Id	Description / Broker / Transaction No./Client Ref No.	Trade Date / C. Settle Date / Reported Date	Price Local/Base	Cost Local/Base	Amount Local/Base	Net Gain/Loss Local/Base
CD	0.000	23548Wells Fargo & Company (SE	10/11/2022	0.000000	10,061.94	10,061.94	10,061.94
	NA9123459	C) Distribution 1ST DISTRIBUTI		0.000000	10,061.94	10,061.94	10,061.94
		20221011S000060 / 000000000008	10/11/2022			Gain/Loss Local Amounts: 10,061.94 Long	
		KR2F10110002 : KRS INTERNAL EQUITY				Gain/Loss Base Amounts: 10,061.94 Long	
CD	0.000	23033RTI SURGICAL HOLDINGS, IN	10/20/2022	0.000000	206.14	206.14	206.14
	NA9123459	C. Distribution 1ST DISTRIBUTI		0.000000	206.14	206.14	206.14
		20221020S000250 / 000000000080	10/20/2022			Gain/Loss Local Amounts: 206.14 Long	
		KR2F10020002 : NTGI STRUCTURED				Gain/Loss Base Amounts: 206.14 Long	
CD	0.000	A-13-686890-BParametric Sound	10/21/2022	0.000000	12.34	12.34	12.34
	NA9123459	Corporation (Nevada District C		0.000000	12.34	12.34	12.34
		20221021S000280 / 000000000000	10/21/2022			Gain/Loss Local Amounts: 12.34 Long	
		KR2F10020002 : NTGI STRUCTURED				Gain/Loss Base Amounts: 12.34 Long	
CD	0.000	22050ACLARIS THERAPEUTICS, INC	10/27/2022	0.000000	122.69	122.69	122.69
	NA9123459	. Distribution 1ST DISTRIBUTIO		0.000000	122.69	122.69	122.69
		20221028S000350 / 000000000087	10/27/2022			Gain/Loss Local Amounts: 122.69 Long	
		KR2F10020002 : NTGI STRUCTURED				Gain/Loss Base Amounts: 122.69 Long	
CD	0.000	3535COMMUNITY HEALTH SYSTEMS,	11/1/2022	0.000000	2,020.24	2,020.24	2,020.24
	NA9123459	INC. (2011) Distribution 1ST D		0.000000	2,020.24	2,020.24	2,020.24
		20221101S005150 / 000000000007	11/1/2022			Gain/Loss Local Amounts: 2,020.24 Long	
		KR2F19020002 : S&P 500 INDEX				Gain/Loss Base Amounts: 2,020.24 Long	
CD	0.000	19893SYMANTEC CORPORATION (201	11/9/2022	0.000000	489.77	489.77	489.77
	NA9123459	8) Distribution 1ST DISTRIBUTI		0.000000	489.77	489.77	489.77
		20221109S000150 / 000000000000	11/9/2022			Gain/Loss Local Amounts: 489.77 Long	
		KR2F10110002 : KRS INTERNAL EQUITY				Gain/Loss Base Amounts: 489.77 Long	
CD	0.000	19893SYMANTEC CORPORATION (201	11/9/2022	0.000000	217.47	217.47	217.47
	NA9123459	8) Distribution 1ST DISTRIBUTI		0.000000	217.47	217.47	217.47
		20221109S000250 / 000000000000	11/9/2022			Gain/Loss Local Amounts: 217.47 Long	
		KR2F19020002 : S&P 500 INDEX				Gain/Loss Base Amounts: 217.47 Long	

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Transaction Detail
Reported By Transaction Category

Report ID: IACS0008
Base Currency: USD
Status: FINAL

KR2G00000000 - TOTAL FUND

9/30/2022 - 12/31/2022

Trans Code / Link Ref	Shares/Par / Security Id	Description / Broker / Transaction No./Client Ref No.	Trade Date / C. Settle Date / Reported Date	Price Local/Base	Cost Local/Base	Amount Local/Base	Net Gain/Loss Local/Base
CD	0.000	05-2367 (SRC) (CLW)MERCK & CO	11/10/2022	0.000000	390.31	390.31	390.31
	NA9123459	INC. SECURITIES, DERIVATIVE &		0.000000	390.31	390.31	390.31
		20221110S000230 / 000000000010	11/10/2022			Gain/Loss Local Amounts: 390.31 Long	
		KR2F19020002 : S&P 500 INDEX				Gain/Loss Base Amounts: 390.31 Long	
CD	0.000	BIG LOTS SEC LIT	11/9/2022	0.000000	22.16	22.16	22.16
	NA9123459	20221111S000010 / 0B70525DD023		0.000000	22.16	22.16	22.16
		KR2F90010002 : CASH ACCOUNT KR2	11/9/2022			Gain/Loss Local Amounts: 22.16 Long	
						Gain/Loss Base Amounts: 22.16 Long	
CD	0.000	BIG LOTS SEC LIT	11/9/2022	0.000000	360.58	360.58	360.58
	NA9123459	20221111S000020 / 0B70525DD023		0.000000	360.58	360.58	360.58
		KR2F90010002 : CASH ACCOUNT KR2	11/9/2022			Gain/Loss Local Amounts: 360.58 Long	
						Gain/Loss Base Amounts: 360.58 Long	
CD	0.000	BIG LOTS SEC LIT	11/9/2022	0.000000	330.19	330.19	330.19
	NA9123459	20221111S000030 / 0B70525DD023		0.000000	330.19	330.19	330.19
		KR2F90010002 : CASH ACCOUNT KR2	11/9/2022			Gain/Loss Local Amounts: 330.19 Long	
						Gain/Loss Base Amounts: 330.19 Long	
CD	0.000	3-18-cv-05704-RSLIMPINJ, INC.	11/16/2022	0.000000	183.40	183.40	183.40
	NA9123459	(W.D. WASH.) Distribution 2ND		0.000000	183.40	183.40	183.40
		20221116S000150 / 000000000084	11/16/2022			Gain/Loss Local Amounts: 183.40 Long	
		KR2F10020002 : NTGI STRUCTURED				Gain/Loss Base Amounts: 183.40 Long	
CD	0.000	COMMUNITY SYSTEMS HEALTH (2011	11/18/2022	0.000000	993.12	993.12	993.12
	NA9123459	) SEC LIT		0.000000	993.12	993.12	993.12
		20221121S000080 / F75569409F5B	11/18/2022			Gain/Loss Local Amounts: 993.12 Long	
		KR2F90010002 : CASH ACCOUNT KR2				Gain/Loss Base Amounts: 993.12 Long	
CD	0.000	CITIGROUP INC (VOL FA CAP) SEC	11/29/2022	0.000000	514.96	514.96	514.96
	NA9123459	FAIR FUND		0.000000	514.96	514.96	514.96
		20221201S000470 / 6EA9A7F1B881	11/29/2022			Gain/Loss Local Amounts: 514.96 Long	
		KR2F19020002 : S&P 500 INDEX				Gain/Loss Base Amounts: 514.96 Long	

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Transaction Detail
Reported By Transaction Category

Report ID: IACS0008
Base Currency: USD
Status: FINAL

KR2G00000000 - TOTAL FUND
9/30/2022 - 12/31/2022

Trans Code / Link Ref	Shares/Par / Security Id	Description / Broker / Transaction No./Client Ref No.	Trade Date / C. Settle Date / Reported Date	Price Local/Base	Cost Local/Base	Amount Local/Base	Net Gain/Loss Local/Base
CD	0.000	20584CITI SPONSORED AMERICAN D	12/16/2022	0.000000	18.49	18.49	18.49
	NA9123459	EPOSITARY RECEIPTS (CITIBANK N		0.000000	18.49	18.49	18.49
		20221216S000020 / 000000000009	12/16/2022			Gain/Loss Local Amounts: 18.49 Long	
		KR2F20050002 : AMERICAN CENTURY				Gain/Loss Base Amounts: 18.49 Long	
CD	0.000	3-17-CV-2616-MBSSCANA Corporat	12/19/2022	0.000000	1,259.77	1,259.77	1,259.77
	NA9123459	ion (2017)(D.S.C) Distribution		0.000000	1,259.77	1,259.77	1,259.77
		20221219S000070 / 000000000000	12/19/2022			Gain/Loss Local Amounts: 1,259.77 Long	
		KR2F19020002 : S&P 500 INDEX				Gain/Loss Base Amounts: 1,259.77 Long	
CD	0.000	CITI SPONSORED ADRS CITIBANK	12/16/2022	0.000000	345.77	345.77	345.77
	NA9123459	20221221S000030 / 04A3D22F6BC1		0.000000	345.77	345.77	345.77
		KR2F90010002 : CASH ACCOUNT KR2	12/16/2022			Gain/Loss Local Amounts: 345.77 Long	
						Gain/Loss Base Amounts: 345.77 Long	
CD	0.000	CITIGROUP INC (VOL FA CAP) SEC	11/30/2022	0.000000	93.32	93.32	93.32
	NA9123459	FAIR FUND		0.000000	93.32	93.32	93.32
		20230110A000010	12/1/2022			Gain/Loss Local Amounts: 93.32 Long	
		KR2F90010002 : CASH ACCOUNT KR2				Gain/Loss Base Amounts: 93.32 Long	

	Cost	Amount	Net Gain/Loss
TOTAL U.S. DOLLAR CASH & CASH EQUIVALENTS:	**89,166.58**	**89,166.58**	**89,166.58**
	89,166.58	**89,166.58**	**89,166.58**
TOTAL CASH & CASH EQUIVALENTS CLASS ACTIONS:	**89,166.58**	**89,166.58**	**89,166.58**
TOTAL CLASS ACTIONS:	**89,166.58**	**89,166.58**	**89,166.58**
TOTAL TRANSACTIONS BASE:	**89,166.58**	**89,166.58**	**89,166.58**

BNY MELLON

Transaction Detail
Reported By Transaction Category

Report ID: IACS0008
Base Currency: USD
Status: REVISED

KR3G00000000 - TOTAL FUND
9/30/2022 - 12/31/2022

Trans Code / Link Ref	Shares/Par / Security Id	Description / Broker / Transaction No./Client Ref No.	Trade Date / C. Settle Date / Reported Date	Price Local/Base	Cost Local/Base	Amount Local/Base	Net Gain/Loss Local/Base
CLASS ACTIONS							
CASH & CASH EQUIVALENTS							
U.S. DOLLAR							
CD	0.000	23548Wells Fargo & Company (SE	10/11/2022	0.000000	4,478.61	4,478.61	4,478.61
	NA9123459	C) Distribution 1ST DISTRIBUTI		0.000000	4,478.61	4,478.61	4,478.61
		20221011S000020 / 000000000008	10/11/2022			Gain/Loss Local Amounts: 4,478.61 Long	
		KR3F10120002 : RIVER ROAD FAV				Gain/Loss Base Amounts: 4,478.61 Long	
CD	0.000	23548Wells Fargo & Company (SE	10/11/2022	0.000000	50,385.34	50,385.34	50,385.34
	NA9123459	C) Distribution 1ST DISTRIBUTI		0.000000	50,385.34	50,385.34	50,385.34
		20221011S000060 / 000000000008	10/11/2022			Gain/Loss Local Amounts: 50,385.34 Long	
		KR3F10110002 : KRS INTERNAL EQUITY				Gain/Loss Base Amounts: 50,385.34 Long	
CD	0.000	23033RTI SURGICAL HOLDINGS, IN	10/20/2022	0.000000	80.36	80.36	80.36
	NA9123459	C. Distribution 1ST DISTRIBUTI		0.000000	80.36	80.36	80.36
		20221020S000250 / 000000000080	10/20/2022			Gain/Loss Local Amounts: 80.36 Long	
		KR3F10020002 : NTGI STRUCTURED				Gain/Loss Base Amounts: 80.36 Long	
CD	0.000	22050ACLARIS THERAPEUTICS, INC	10/27/2022	0.000000	45.44	45.44	45.44
	NA9123459	. Distribution 1ST DISTRIBUTIO		0.000000	45.44	45.44	45.44
		20221028S000360 / 000000000087	10/27/2022			Gain/Loss Local Amounts: 45.44 Long	
		KR3F10020002 : NTGI STRUCTURED				Gain/Loss Base Amounts: 45.44 Long	
CD	0.000	19893SYMANTEC CORPORATION (201	11/9/2022	0.000000	106.36	106.36	106.36
	NA9123459	8) Distribution 1ST DISTRIBUTI		0.000000	106.36	106.36	106.36
		20221109S000150 / 000000000000	11/9/2022			Gain/Loss Local Amounts: 106.36 Long	
		KR3F10110002 : KRS INTERNAL EQUITY				Gain/Loss Base Amounts: 106.36 Long	
CD	0.000	19893SYMANTEC CORPORATION (201	11/9/2022	0.000000	93.95	93.95	93.95
	NA9123459	8) Distribution 1ST DISTRIBUTI		0.000000	93.95	93.95	93.95
		20221109S000250 / 000000000000	11/9/2022			Gain/Loss Local Amounts: 93.95 Long	
		KR3F19020002 : S&P 500 INDEX				Gain/Loss Base Amounts: 93.95 Long	

BNY MELLON

Transaction Detail
Reported By Transaction Category
9/30/2022 - 12/31/2022

Report ID: IACS0008
Base Currency: USD
Status: REVISED

KR3G00000000 - TOTAL FUND

Trans Code / Link Ref	Shares/Par / Security Id	Description / Broker / Transaction No./Client Ref No.	Trade Date / C. Settle Date / Reported Date	Price Local/Base	Cost Local/Base	Amount Local/Base	Net Gain/Loss Local/Base
CD	0.000	05-2367 (SRC) (CLW)MERCK & CO	11/10/2022	0.000000	137.56	137.56	137.56
	NA9123459	INC. SECURITIES, DERIVATIVE &		0.000000	137.56	137.56	137.56
		20221110S000230 / 000000000010	11/10/2022			Gain/Loss Local Amounts: 137.56 Long	
		KR3F19020002 : S&P 500 INDEX				Gain/Loss Base Amounts: 137.56 Long	
CD	0.000	BIG LOTS SEC LIT	11/9/2022	0.000000	71.36	71.36	71.36
	NA9123459	20221111S000010 / 0B70525DD023		0.000000	71.36	71.36	71.36
		KR3F90010002 : CASH ACCOUNT KR3	11/9/2022			Gain/Loss Local Amounts: 71.36 Long	
						Gain/Loss Base Amounts: 71.36 Long	
CD	0.000	BIG LOTS SEC LIT	11/9/2022	0.000000	143.27	143.27	143.27
	NA9123459	20221111S000020 / 0B70525DD023		0.000000	143.27	143.27	143.27
		KR3F90010002 : CASH ACCOUNT KR3	11/9/2022			Gain/Loss Local Amounts: 143.27 Long	
						Gain/Loss Base Amounts: 143.27 Long	
CD	0.000	18935Tivity Health, Inc. Distr	11/16/2022	0.000000	164.45	164.45	164.45
	NA9123459	ibution 1ST DISTRIBUTION PROCE		0.000000	164.45	164.45	164.45
		20221116S000160 / 000000000000	11/16/2022			Gain/Loss Local Amounts: 164.45 Long	
		KR3F10020002 : NTGI STRUCTURED				Gain/Loss Base Amounts: 164.45 Long	
CD	0.000	MERICK AND CO SEC LIT	11/18/2022	0.000000	6.95	6.95	6.95
	NA9123459	20221122S000100 / F75569409F5B		0.000000	6.95	6.95	6.95
		KR3F19020002 : S&P 500 INDEX	11/18/2022			Gain/Loss Local Amounts: 6.95 Long	
						Gain/Loss Base Amounts: 6.95 Long	
CD	0.000	20584CITI SPONSORED AMERICAN D	12/16/2022	0.000000	6.22	6.22	6.22
	NA9123459	EPOSITARY RECEIPTS (CITIBANK N		0.000000	6.22	6.22	6.22
		20221216S000020 / 000000000009	12/16/2022			Gain/Loss Local Amounts: 6.22 Long	
		KR3F20050002 : AMERICAN CENTURY				Gain/Loss Base Amounts: 6.22 Long	
CD	0.000	20584CITI SPONSORED AMERICAN D	12/16/2022	0.000000	5.50	5.50	5.50
	NA9123459	EPOSITARY RECEIPTS (CITIBANK N		0.000000	5.50	5.50	5.50
		20221216S000040 / 000000000009	12/16/2022			Gain/Loss Local Amounts: 5.50 Long	
		KR3F90010002 : CASH ACCOUNT KR3				Gain/Loss Base Amounts: 5.50 Long	

BNY MELLON

Transaction Detail
Reported By Transaction Category

Report ID: IACS0008
Base Currency: USD
Status: REVISED

KR3G00000000 - TOTAL FUND
9/30/2022 - 12/31/2022

Trans Code / Link Ref	Shares/Par / Security Id	Description / Broker / Transaction No./Client Ref No.	Trade Date / C. Settle Date / Reported Date	Price Local/Base	Cost Local/Base	Amount Local/Base	Net Gain/Loss Local/Base
CD	0.000	CITI SPONSORED ADRS CITIBANK	12/16/2022	0.000000	8.46	8.46	8.46
	NA9123459	20221221S000030 / 04A3D22F6BC1		0.000000	8.46	8.46	8.46
		KR3F90010002 : CASH ACCOUNT KR3	12/16/2022			Gain/Loss Local Amounts: 8.46 Long	
						Gain/Loss Base Amounts: 8.46 Long	

	Cost	Amount	Net Gain/Loss
TOTAL U.S. DOLLAR CASH & CASH EQUIVALENTS:	**55,733.83**	**55,733.83**	**55,733.83**
	55,733.83	**55,733.83**	**55,733.83**
TOTAL CASH & CASH EQUIVALENTS CLASS ACTIONS:	**55,733.83**	**55,733.83**	**55,733.83**
TOTAL CLASS ACTIONS:	**55,733.83**	**55,733.83**	**55,733.83**
TOTAL TRANSACTIONS BASE:	**55,733.83**	**55,733.83**	**55,733.83**

Kentucky Retirement Systems

Capital Calls and Distributions

Quarter Ending: December 31, 2022

Kentucky Public Pensions Authority
Capital Calls and Distributions
For the quarter ending December 31, 2022

		Kentucky Employees Retirement System					Kentucky Employees Hazardous Retirement System					State Police Employees Retirement System				
Pension Funds Managers	Total Pension Funds Commitments	Commitment	Beginning Valuation	Period Contributions	Period Distributions	Ending Valuation	Commitment	Beginning Valuation	Period Contributions	Period Distributions	Ending Valuation	Commitment	Beginning Valuation	Period Contributions	Period Distributions	Ending Valuation
Adams Street SPC II A1	175,000,000	31,747,734	25,141,506	11,974,335	12,151,272	24,964,569	9,441,066	7,476,521	3,560,899	3,613,516	7,423,904	3,936,882	3,117,676	1,484,879	1,506,820	3,095,735
Adams Street SPC II B1	175,000,000	31,747,734	20,388,306	7,329,940	5,263,744	22,454,503	9,441,067	6,063,027	2,179,760	1,565,320	6,677,467	3,936,882	2,528,254	908,950	652,731	2,784,473
AMERRA Agri Fund II, LP	40,100,000	0	0	0	0	0	2,477,739	1,451,462	0	0	1,451,462	1,253,605	734,363	0	0	734,363
AMERRA-KRS Agri Holding Company, LP	65,000,000	0	0	0	0	0	4,016,284	2,261,259	250,368	37,065	2,474,562	2,032,029	1,144,078	126,673	18,753	1,251,999
Arcano KRS Fund I, L.P.	36,000,000	13,050,524	5,360,386	0	0	5,360,386	1,650,419	677,895	0	0	677,895	859,011	352,831	0	0	352,831
Ares Special Situations Fund IV, L.P.	26,192,000	0	0	0	0	0	1,622,790	1,252,510	0	53,557	1,198,952	511,579	394,850	0	16,884	377,966
Barings Euro Real Estate II	158,753,438	29,655,144	5,881,122	582,739	0	7,048,141	8,112,303	1,608,808	159,411	0	1,928,052	3,429,075	680,044	67,383	0	814,988
Barings Real Estate European Value Add I SCSp	112,061,250	20,933,043	8,444,054	345,675	573,820	8,970,265	5,726,331	2,309,910	94,561	156,971	2,453,858	2,420,523	976,400	39,971	66,352	1,037,247
Bay Hills Capital I, L.P.	67,500,000	24,469,733	1,829,453	0	0	1,829,453	3,094,535	231,360	0	0	231,360	1,610,645	120,418	0	0	120,418
Bay Hills Capital III, L.P.	51,250,000	1	1	0	0	1	3,175,320	3,014,078	0	0	3,014,078	1,001,010	950,179	0	0	950,179
Bay Hills Emerging Partners II LP	45,000,000	16,313,156	32,694,681	0	0	32,694,681	2,063,023	4,134,693	0	0	4,134,693	1,073,764	2,152,027	0	0	2,152,027
Bay Hills Emerging Partners II-B LP	45,000,000	16,313,156	22,367,693	0	0	22,367,693	2,063,023	2,828,703	0	0	2,828,703	1,073,764	1,472,285	0	0	1,472,285
BDCM Opportunity Fund IV, L.P.	35,580,000	0	0	0	0	0	2,204,447	3,212,221	6,870	188,152	3,024,069	694,947	1,012,646	2,166	59,315	953,331
Blackstone Capital Partners V, L.P.	47,174,735	17,101,529	65,495	0	0	65,495	2,162,724	8,283	0	0	8,283	1,125,656	4,311	0	0	4,311
Blackstone Capital Partners VI, L.P.	60,000,000	0	0	0	0	0	3,299,994	1,395,987	0	167,224	1,228,763	0	0	0	0	0
Blue Torch Credit Opportunities Fund II LP	140,000,000	25,356,966	23,979,399	0	0	23,979,399	7,618,631	7,204,734	0	0	7,204,734	3,143,324	2,972,557	0	0	2,972,557
BSP Co-Invest Vehicle K LP	0	0	5,664,935	0	113,286	5,551,649	0	2,034,732	0	40,690	1,994,042	0	525,888	0	10,517	515,371
BSP Private Credit Fund	100,000,000	14,833,350	14,057,381	0	509,228	13,548,153	5,327,845	5,049,132	0	182,905	4,866,227	1,377,012	1,304,977	0	47,273	1,257,704
BTG Pactual Brazil Timberland Fund I	34,500,000	0	0	0	0	0	2,058,030	1,675,637	0	179,704	1,495,933	952,485	775,508	0	83,170	692,338
Camelot Opportunities Fund, L.P.	23,400,000	8,482,841	2,784,706	0	0	2,784,706	1,072,772	352,164	0	0	352,164	558,357	183,295	0	0	183,295
Cerberus KRS Levered Loan Opportunities Fund, L.P.	140,000,000	20,766,690	22,156,359	3,717,238	0	26,418,182	7,458,982	7,958,124	1,335,158	0	9,488,886	1,927,816	2,056,822	345,079	0	2,452,456
Columbia Captal Equity Partners IV, L.P.	27,000,000	9,787,893	1,038,991	0	0	1,038,991	1,237,814	131,395	0	0	131,395	644,258	68,388	0	0	68,388
Crestview Partners II, L.P.	67,500,000	24,469,733	11,841,318	23,416	1,096,984	10,767,750	3,094,535	1,497,498	2,961	138,729	1,361,730	1,610,645	779,418	1,541	72,206	708,754
Crestview Partners III, L.P.	39,000,000	0	0	0	0	0	2,416,341	2,373,154	5,000	71,407	2,306,746	761,744	748,129	1,576	22,511	727,195
CS Adjacent Investment Partners Parallel LP	140,000,000	20,766,690	11,588,771	2,019,119	3,633,974	9,973,916	7,458,982	4,162,456	725,227	1,305,251	3,582,432	1,927,816	1,075,810	187,439	337,350	925,900
CVC European Equity Partners VI, L.P.	23,394,941	1	1	0	0	1	1,449,491	1,684,659	13,512	182,281	1,663,785	456,948	531,084	4,260	57,464	524,503
DAG Ventures II, L.P.	27,000,000	9,787,893	698,137	0	0	698,137	1,237,814	88,289	0	0	88,289	644,258	45,953	0	0	45,953
DAG Ventures III, L.P.	27,000,000	9,787,893	132,557	0	0	132,557	1,237,814	16,764	0	0	16,764	644,258	8,725	0	0	8,725
DAG Ventures IV, L.P.	90,000,000	32,626,311	14,110,101	0	0	14,110,101	4,126,046	1,784,417	0	0	1,784,417	2,147,527	928,754	0	0	928,754
DAG Ventures V, L.P.	8,000,000	0	0	0	0	0	439,999	2,485	0	0	2,485	0	0	0	0	0
DCM VI, L.P.	13,500,000	4,893,947	2,293,119	0	489,395	1,803,724	618,907	289,996	0	61,891	228,106	322,129	150,938	0	32,213	118,725
DivcoWest Fund IV	20,800,000	0	0	0	0	0	1,244,069	82,953	0	0	82,953	447,430	29,834	0	0	29,834
Essex Woodlands Fund VIII, L.P.	22,500,000	8,156,578	-626,596	0	0	-626,596	1,031,512	-79,242	0	0	-79,242	536,882	-41,244	0	0	-41,244
Fundamental Partners III LP	70,000,000	13,076,001	11,952,375	0	263,364	11,689,012	3,577,001	3,269,628	0	72,044	3,197,584	1,512,000	1,382,073	0	30,453	1,351,620
Green Equity Investors V, L.P.	90,000,000	32,626,311	1,036,587	0	346,232	690,355	4,126,046	131,091	0	43,786	87,305	2,147,527	68,230	0	22,790	45,440
Green Equity Investors VI, L.P.	32,000,000	0	0	0	0	0	1,759,997	1,797,350	0	20,631	1,776,719	0	0	0	0	0
Green Equity Investors VII LP	25,000,000	0	0	0	0	0	1,525,000	2,252,663	0	272,822	1,979,840	0	0	0	0	0
Greenfield Acquisition Partners VI, L.P.	38,100,000	0	0	0	0	0	2,278,801	3,377	0	0	3,377	819,568	1,214	0	0	1,214
Greenfield Acquisition Partners VII, L.P.	27,800,000	0	0	0	0	0	1,662,744	233,814	0	6,956	226,858	598,005	84,091	0	2,502	81,589
H.I.G. BioVentures II, L.P.	13,500,000	0	0	0	0	0	742,499	517,953	0	0	517,953	0	0	0	0	0
H.I.G. Capital Partner V, L.P.	13,100,000	0	0	0	0	0	811,643	786,219	4,819	109,200	681,839	255,868	247,853	1,519	34,425	214,948
H.I.G. Ventures II, L.P.	18,000,000	6,525,262	1,083,759	0	0	1,083,759	825,209	137,056	0	0	137,056	429,505	71,335	0	0	71,335
H&F Spock I LP	3,250,153	1,178,228	3,741,428	0	0	3,741,428	149,003	473,155	0	0	473,155	77,553	246,268	0	0	246,268
Harvest Partners V, L.P.	36,000,000	13,050,524	-63,477	0	0	-63,477	1,650,419	-8,028	0	0	-8,028	859,011	-4,178	0	0	-4,178
Harvest Partners VI, L.P.	28,400,000	0	0	0	0	0	1,607,440	491,032	0	0	491,032	241,400	73,742	0	0	73,742
Harvest Partners VII LP	20,000,000	0	0	0	0	0	1,220,000	1,840,870	2,745	0	1,843,615	0	0	0	0	0
Hellman and Friedman Capital Partners VI, L.P.	20,000,000	7,250,291	110	0	0	110	916,899	14	0	0	14	477,228	7	0	0	7
Horsley Bridge International Fund V, L.P.	45,000,000	16,313,156	37,611,052	0	909,856	36,701,196	2,063,023	4,756,436	0	115,064	4,641,372	1,073,764	2,475,632	0	59,888	2,415,744
IFM US Infrastructure Debt Fund	70,000,000	11,678,693	9,922,899	1,187,021	330,837	10,779,083	3,596,947	3,056,176	365,593	101,895	3,319,874	1,394,272	1,184,655	141,714	39,497	1,286,871
Institutional Venture Partners XII, L.P.	27,000,000	9,787,893	125,475	0	0	125,475	1,237,814	15,868	0	0	15,868	644,258	8,259	0	0	8,259
Kayne Anderson Energy Fund VII LP	50,000,000	0	0	0	0	0	3,050,000	1,687,475	0	0	1,687,475	0	0	0	0	0
KCP IV Co-Invest	12,657,585	0	0	0	0	0	784,232	188,219	0	0	205,050	247,227	59,336	0	0	64,641
Keyhaven Capital Partners Fund III, L.P.	26,929,056	9,762,175	3,535,294	0	0	3,851,419	1,234,562	447,087	0	0	487,065	642,565	232,700	0	0	253,508
Keyhaven Capital Partners IV LP	12,657,585	0	0	0	0	0	784,232	607,270	29,376	31,612	660,274	247,227	191,440	9,261	9,966	208,150
Levine Leichtman Capital Partners V, L.P.	46,000,000	1	1	0	0	1	2,850,043	1,354,346	0	11,990	1,342,355	898,468	426,953	0	3,780	423,174
Levine Leichtman Capital Partners VI LP	37,500,000	0	0	0	0	0	2,287,504	2,438,361	0	5,155	2,433,206	0	0	0	0	0
Lubert Adler VII	34,750,000	0	0	0	0	0	2,078,050	1,247,056	0	0	1,247,056	747,124	448,356	0	0	448,356
Lubert-Adler Real Estate Fund VII-B LP	36,750,000	6,864,900	2,084,312	0	338,350	1,745,962	1,877,925	570,173	0	92,557	477,616	793,800	241,012	0	39,124	201,889
Magentar MTP Energy Opportunities Fund II LLC	37,500,000	0	0	0	0	0	2,242,500	19,747	0	0	19,747	806,249	7,100	0	0	7,100
MatlinPatterson Global Opportunities Partners II	45,000,000	16,313,156	314,561	0	0	314,561	2,063,023	39,781	0	0	39,781	1,073,764	20,705	0	0	20,705
MatlinPatterson Global Opportunities Partners III	45,000,000	16,313,156	38,048	0	0	38,048	2,063,023	4,812	0	0	4,812	1,073,764	2,504	0	0	2,504

Kentucky Public Pensions Authority
Capital Calls and Distributions
For the quarter ending December 31, 2022

Pension Funds Managers	Total Pension Funds Commitments	Kentucky Employees Retirement System					Kentucky Employees Hazardous Retirement System					State Police Employees Retirement System				
		Commitment	Beginning Valuation	Period Contributions	Period Distributions	Ending Valuation	Commitment	Beginning Valuation	Period Contributions	Period Distributions	Ending Valuation	Commitment	Beginning Valuation	Period Contributions	Period Distributions	Ending Valuation
Merit Mezzanine Fund IV, L.P.	27,000,000	9,787,893	102,659	0	0	102,659	1,237,814	12,983	0	0	12,983	644,258	6,757	0	0	6,757
Mesa West Core Lending Fund, LP	57,500,000	5,474,001	5,710,394	172,938	172,938	5,710,394	3,248,749	3,389,045	102,637	102,637	3,389,045	960,250	1,001,718	30,337	30,337	1,001,718
Mesa West Real Estate Income Fund IV LP	36,000,000	13,050,524	3,643,568	3,045,122	57,017	6,631,674	1,650,419	460,779	385,098	7,211	838,666	859,011	239,827	200,436	3,753	436,510
MiddleGround Partners I LP	50,000,000	0	0	0	0	0	2,925,000	3,957,188	239,666	116,201	4,047,708	0	0	0	0	0
MiddleGround Partners II LP	50,000,000	9,584,069	6,301,061	679,484	0	6,980,545	2,755,477	1,811,593	195,356	0	2,006,949	1,102,634	724,929	78,174	0	803,102
MiddleGround Partners II-X LP	25,000,000	4,792,034	2,913,746	362,470	0	3,276,216	1,377,739	837,719	104,212	0	941,932	551,317	335,223	41,702	0	376,924
Mill Road Capital I, L.P.	27,000,000	9,787,893	1,323,579	0	0	1,323,579	1,237,814	167,385	0	0	167,385	644,258	87,121	0	0	87,121
New Mountain Partners II, L.P.	25,000,000	9,062,864	51,448	0	51,595	-148	1,146,124	6,506	0	6,525	-19	596,535	3,386	0	3,396	-10
New Mountain Partners III, L.P.	32,337,197	11,722,705	520,451	0	107,972	412,479	1,482,498	65,818	0	13,655	52,164	771,611	34,257	0	7,107	27,150
New Mountain Partners IV, L.P.	32,800,000	1	0	0	0	0	2,032,204	668,083	2,545	23,208	647,420	640,647	210,611	802	7,316	204,097
New State Capital Partners Fund III LP	17,500,000	3,354,424	582,622	111,163	0	693,785	964,417	167,507	31,960	0	199,467	385,922	67,030	12,789	0	79,819
Oak Hill Capital Partners II, L.P.	67,500,000	24,469,733	61,952	0	0	61,952	3,094,535	7,835	0	0	7,835	1,610,645	4,078	0	0	4,078
Oak Hill Capital Partners III, L.P.	33,750,000	12,234,867	293,992	5,396	264,326	35,063	1,547,267	37,179	682	33,428	4,434	805,323	19,351	355	17,398	2,308
Oberland Capital Healthcare LP	3,450,000	0	0	0	0	0	201,825	442,531	0	53,424	389,107	0	0	0	0	0
Patron Capital V LP	38,421,000	7,177,043	3,472,807	0	0	3,783,345	1,963,314	950,003	0	0	1,034,952	829,894	401,567	0	0	437,475
Riverside Capital Appreciation Fund VI, L.P.	35,500,000	0	0	0	0	0	2,009,300	561,910	0	0	561,910	301,749	84,385	0	0	84,385
Rubenstein Properties Fund II	20,800,000	0	0	0	0	0	1,244,066	865,419	0	0	865,419	447,429	311,248	0	0	311,248
Secondary Opportunities Fund III, L.P.	25,000,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Strategic Value Special Situations Fund IV LP	43,300,000	0	0	0	0	0	2,533,050	3,084,923	0	2,221	3,082,702	0	0	0	0	0
Strategic Value Special Situations Fund V LP	70,000,000	13,417,696	4,565,927	1,001,296	0	5,567,223	3,857,668	1,312,731	287,878	0	1,600,610	1,543,688	525,304	115,198	0	640,502
Taurus Mining Finance Fund LLC	45,100,000	0	0	0	0	0	2,794,280	230,256	0	14,732	215,524	880,891	72,588	0	4,644	67,943
Tenaska Power Fund II, L.P.	27,000,000	8,824,749	27,152	0	0	27,152	1,363,534	4,195	0	0	4,195	625,175	1,924	0	0	1,924
Triton Fund IV, L.P.	26,850,860	1	0	0	0	1	1,663,611	1,109,683	0	0	1,208,911	524,449	349,824	0	0	381,106
VantagePoint Venture Partners 2006, L.P.	27,000,000	9,787,893	2,518,879	0	288,290	2,230,589	1,237,814	318,547	0	36,458	282,089	644,258	165,798	0	18,976	146,822
VantagePoint Venture Partners IV, L.P.	36,000,000	13,050,524	21,582	0	0	21,582	1,650,419	2,729	0	0	2,729	859,011	1,421	0	0	1,421
Vista Equity Partners III, L.P.	45,000,000	16,313,156	1,204,950	0	0	1,204,950	2,063,023	152,383	0	0	152,383	1,073,764	79,312	0	0	79,312
Vista Equity Partners IV, L.P.	27,000,000	0	0	0	0	0	1,484,997	1,033,511	0	0	1,033,511	0	0	0	0	0
Vista Equity Partners VI LP	25,000,000	0	0	0	0	0	1,525,000	2,014,489	0	25,741	1,988,747	0	0	0	0	0
Walton Street Real Estate Fund VI, LP	36,000,000	10,001,992	4,053,754	0	0	4,053,754	2,186,190	886,051	0	0	886,051	725,004	293,840	0	0	293,840
Walton Street Real Estate Fund VII, LP	38,120,000	0	0	0	0	0	2,279,995	549,538	0	0	549,538	820,000	197,641	0	0	197,641
Warburg, Pincus Private Equity IX, L.P.	50,000,000	18,125,728	43,149	0	36,251	6,897	2,292,248	5,457	0	4,584	872	1,193,071	2,840	0	2,386	454
Warburg, Pincus Private Equity X, L.P.	38,750,000	14,047,440	310,774	0	0	310,774	1,776,492	39,302	0	0	39,302	924,630	20,456	0	0	20,456
Wayzata Opportunities Fund II, L.P.	67,500,000	24,469,733	529	0	0	529	3,094,535	67	0	0	67	1,610,645	35	0	0	35
Wayzata Opportunities Fund III, L.P.	35,500,000	0	0	0	0	0	2,009,300	310,696	0	54,357	256,339	301,749	46,659	0	8,163	38,496
White Oak Yield Spectrum Parallel Fund LP	100,000,000	14,833,350	21,184,372	0	863,284	20,321,088	5,327,845	7,609,005	0	310,075	7,298,931	1,377,012	1,966,591	0	80,141	1,886,450

Kentucky Public Pensions Authority
Capital Calls and Distributions
For the quarter ending December 31, 2022

Insurance Funds Managers	Total Insurance Funds Commitments	Kentucky Employees Retirement System Commitment	Beginning Valuation	Period Contributions	Period Distributions	Ending Valuation	Kentucky Employees Hazardous Retirement System Commitment	Beginning Valuation	Period Contributions	Period Distributions	Ending Valuation	State Police Employees Retirement System Commitment	Beginning Valuation	Period Contributions	Period Distributions	Ending Valuation
Adams Street SPC II A1	75,000,000	13,190,205	10,445,521	4,974,968	5,048,479	10,372,009	7,095,858	5,619,316	2,676,354	2,715,901	5,579,770	2,740,996	2,170,636	1,033,825	1,049,101	2,155,360
Adams Street SPC II B1	75,000,000	13,190,205	8,470,713	3,045,364	2,186,923	9,329,154	7,095,858	4,556,940	1,638,297	1,176,486	5,018,751	2,740,996	1,760,260	632,843	454,455	1,938,649
AMERRA Agri Fund II, LP	16,200,000	2,153,555	1,259,404	0	0	1,259,404	1,746,327	1,021,256	0	0	1,021,256	656,373	383,848	0	0	383,848
AMERRA-KRS Agri Holding Company, LP	35,000,000	4,652,745	2,619,600	290,044	42,938	2,866,706	3,772,929	2,124,244	235,198	34,819	2,324,623	1,418,089	798,416	88,401	13,087	873,731
Arcano KRS Fund I, L.P.	4,000,000	903,884	371,263	0	0	371,263	430,530	176,837	0	0	176,837	191,459	78,640	0	0	78,640
Ares Special Situations Fund IV, L.P.	13,808,000	0	0	0	0	0	1,038,363	801,435	0	34,269	767,166	646,214	498,764	0	21,327	477,437
Barings Euro Real Estate II	68,037,188	9,661,282	1,915,997	189,849	0	2,296,198	7,225,547	1,432,950	141,986	0	1,717,296	2,762,312	547,814	54,281	0	656,519
Barings Real Estate European Value Add I SCSp	48,026,250	6,819,728	2,750,969	112,617	186,944	2,922,402	5,100,386	2,057,414	84,225	139,813	2,185,627	1,949,867	786,545	32,199	53,450	835,561
Bay Hills Capital I, L.P.	7,500,000	1,694,783	126,646	0	0	126,646	807,244	60,323	0	0	60,323	358,986	26,826	0	0	26,826
Bay Hills Capital III, L.P.	48,750,000	0	0	0	0	0	3,666,009	3,130,180	0	0	3,130,180	2,281,498	1,948,031	0	0	1,948,031
Bay Hills Emerging Partners II LP	5,000,000	1,129,855	2,264,446	0	0	2,264,446	538,163	1,078,581	0	0	1,078,581	239,324	479,652	0	0	479,652
Bay Hills Emerging Partners II-B LP	5,000,000	910,000	1,247,741	0	0	1,247,741	555,000	760,985	0	0	760,985	215,000	294,796	0	0	294,796
BDCM Opportunity Fund IV, L.P.	24,420,000	0	0	0	0	0	1,836,387	2,675,900	5,723	156,738	2,519,163	1,142,854	1,665,316	3,561	97,544	1,567,772
Blackstone Capital Partners V, L.P.	12,414,403	2,805,296	10,682	0	0	10,682	1,336,194	5,088	0	0	5,088	594,214	2,263	0	0	2,263
Blackstone Capital Partners VI, L.P.	40,000,000	0	0	0	0	0	3,360,001	1,421,370	0	170,265	1,251,106	1,599,998	676,842	0	81,078	595,764
Blue Torch Credit Opportunities Fund II LP	60,000,000	10,726,688	10,143,940	0	0	10,143,940	5,638,524	5,332,201	0	0	5,332,201	2,184,246	2,065,582	0	0	2,065,582
BSP Co-Invest Vehicle K LP	0	0	2,973,167	0	59,075	2,914,092	0	1,795,326	0	35,672	1,759,654	0	646,360	0	12,843	633,518
BSP Private Credit Fund	50,000,000	8,493,880	8,049,544	0	291,595	7,757,949	5,128,971	4,860,662	0	176,077	4,684,584	1,846,552	1,749,954	0	63,392	1,686,562
BTG Pactual Brazil Timberland Fund I	15,500,000	2,391,768	1,947,364	0	208,845	1,738,519	1,621,536	1,320,245	0	141,590	1,178,655	615,184	500,880	0	53,717	447,163
Camelot Opportunities Fund, L.P.	2,600,000	587,525	192,869	0	0	192,869	279,845	91,866	0	0	91,866	124,449	40,853	0	0	40,853
Cerberus KRS Levered Loan Opportunities Fund, L.P.	60,000,000	10,192,656	10,874,730	1,824,485	0	12,966,507	6,154,765	6,566,631	1,101,703	0	7,829,736	2,215,862	2,364,144	396,639	0	2,818,892
Columbia Captal Equity Partners IV, L.P.	3,000,000	677,913	71,961	0	0	71,961	322,898	34,276	0	0	34,276	143,595	15,243	0	0	15,243
Crestview Partners II, L.P.	7,500,000	1,694,783	820,133	1,622	75,981	745,773	807,244	390,639	772	36,191	355,220	358,986	173,719	344	16,094	157,969
Crestview Partners III, L.P.	21,000,000	0	0	0	0	0	1,579,203	1,550,977	3,268	46,668	1,507,577	982,799	965,233	2,034	29,043	938,224
CS Adjacent Investment Partners Parallel LP	60,000,000	10,192,656	5,687,972	991,019	1,783,618	4,895,373	6,154,765	3,434,643	598,420	1,077,026	2,956,037	2,215,862	1,236,553	215,445	387,755	1,064,244
CVC European Equity Partners VI, L.P.	12,913,938	0	0	0	0	0	971,130	1,080,434	8,666	116,903	1,067,047	604,372	672,396	5,393	72,754	664,064
DAG Ventures II, L.P.	3,000,000	677,913	48,351	0	0	48,351	322,898	23,030	0	0	23,030	143,595	10,242	0	0	10,242
DAG Ventures III, L.P.	3,000,000	677,913	9,178	0	0	9,178	322,898	4,372	0	0	4,372	143,595	1,944	0	0	1,944
DAG Ventures IV, L.P.	10,000,000	2,259,711	977,271	0	0	977,271	1,076,326	465,485	0	0	465,485	478,649	207,004	0	0	207,004
DAG Ventures V, L.P.	7,000,000	0	0	0	0	0	588,000	3,321	0	0	3,321	280,000	1,581	0	0	1,581
DCM VI, L.P.	1,500,000	338,957	158,823	0	33,896	124,927	161,449	75,649	0	16,145	59,504	71,797	33,642	0	7,180	26,462
DivcoWest Fund IV	9,200,000	1,303,635	86,925	0	0	86,925	977,043	65,148	0	0	65,148	368,004	24,538	0	0	24,538
Essex Woodlands Fund VIII, L.P.	5,000,000	1,129,855	-86,797	0	0	-86,797	538,163	-41,342	0	0	-41,342	239,324	-18,385	0	0	-18,385
Fundamental Partners III LP	30,000,000	4,260,001	3,893,938	0	85,801	3,808,138	3,185,999	2,912,226	0	64,169	2,848,057	1,218,001	1,113,338	0	24,532	1,088,806
Green Equity Investors V, L.P.	10,000,000	2,259,711	71,794	0	23,980	47,814	1,076,326	34,196	0	11,422	22,774	478,649	15,207	0	5,079	10,128
Green Equity Investors VI, L.P.	28,000,000	0	0	0	0	0	2,352,000	2,401,920	0	27,571	2,374,349	1,119,999	1,143,770	0	13,129	1,130,641
Green Equity Investors VII LP	25,000,000	4,550,000	6,721,059	0	813,995	5,907,064	2,775,000	4,099,107	0	496,447	3,602,660	1,075,001	1,587,943	0	192,318	1,395,626
Greenfield Acquisition Partners VI, L.P.	16,700,000	2,367,209	3,517	0	0	3,517	1,774,156	2,636	0	0	2,636	667,811	992	0	0	992
Greenfield Acquisition Partners VII, L.P.	12,200,000	1,729,339	243,179	0	7,235	235,944	1,296,093	182,256	0	5,422	176,834	487,855	68,602	0	2,041	66,561
GTCR Fund IX-A, L.P.	7,000,000	1,581,797	0	0	0	0	753,428	0	0	0	0	335,054	0	0	0	0
H.I.G. BioVentures II, L.P.	11,500,000	0	0	0	0	0	966,000	673,863	0	0	673,863	459,999	320,887	0	0	320,887
H.I.G. Capital Partner V, L.P.	6,900,000	0	0	0	0	0	518,881	502,628	3,081	69,811	435,898	322,920	312,805	1,917	43,446	271,276
H.I.G. Ventures II, L.P.	2,000,000	451,942	75,061	0	0	75,061	215,265	35,753	0	0	35,753	95,730	15,899	0	0	15,899
H&F Spock I LP	1,794,672	405,544	874,572	0	0	874,572	193,165	416,569	0	0	416,569	85,902	185,251	0	0	185,251
Harvest Partners V, L.P.	4,000,000	903,884	-4,397	0	0	-4,397	430,530	-2,094	0	0	-2,094	191,459	-931	0	0	-931
Harvest Partners VI, L.P.	11,600,000	0	0	0	0	0	872,320	266,472	0	0	266,472	542,879	165,836	0	0	165,836
Harvest Partners VII LP	20,000,000	3,640,000	5,492,431	8,191	0	5,500,622	2,220,000	3,349,780	4,996	0	3,354,775	860,001	1,297,663	1,935	0	1,299,598
Hellman and Friedman Capital Partners VI, L.P.	7,500,000	1,694,783	26	0	0	26	807,244	12	0	0	12	358,986	5	0	0	5
Horsley Bridge International Fund V, L.P.	5,000,000	1,129,855	2,604,956	0	63,017	2,541,939	538,163	1,240,770	0	30,016	1,210,754	239,324	551,778	0	13,348	538,430
IFM US Infrastructure Debt Fund	30,000,000	5,109,247	4,341,115	519,303	144,736	4,715,682	2,874,861	2,442,650	292,201	81,440	2,653,411	968,545	822,932	98,443	27,437	893,938
Institutional Venture Partners XII, L.P.	3,000,000	677,913	8,660	0	0	8,660	322,898	4,125	0	0	4,125	143,595	1,834	0	0	1,834
Kayne Anderson Energy Fund VII LP	50,000,000	9,100,000	5,034,761	0	0	5,034,761	5,550,000	3,070,651	0	0	3,070,651	2,150,001	1,189,532	0	0	1,189,532
KCP IV Co-Invest	8,687,415	0	0	0	0	0	653,295	156,793	0	0	170,814	406,570	97,579	0	0	106,304
Keyhaven Capital Partners Fund III, L.P.	2,988,300	675,269	244,856	0	0	266,751	321,638	116,628	0	0	127,057	143,035	51,865	0	0	56,503
Keyhaven Capital Partners IV LP	8,687,415	0	0	0	0	0	653,295	505,878	24,471	26,334	550,033	406,570	314,828	15,229	16,389	342,307
Levine Leichtman Capital Partners V, L.P.	24,000,000	0	0	0	0	0	1,804,804	857,646	0	7,593	850,053	1,123,199	533,746	0	4,725	529,021
Levine Leichtman Capital Partners VI LP	37,500,000	6,824,999	7,275,097	0	15,381	7,259,716	4,162,518	4,437,030	0	9,381	4,427,649	1,612,494	1,718,835	0	3,634	1,715,202
Lubert Adler VII	15,250,000	2,160,925	1,289,967	0	0	1,289,967	1,619,550	966,793	0	0	966,793	610,001	364,141	0	0	364,141
Lubert-Adler Real Estate Fund VII-B LP	15,750,000	2,236,500	679,043	0	110,230	568,813	1,672,649	507,848	0	82,440	425,408	639,451	194,149	0	31,517	162,633
Magentar MTP Energy Opportunities Fund II LLC	12,500,000	1,699,157	14,963	0	0	14,963	1,338,541	11,787	0	0	11,787	508,953	4,482	0	0	4,482

Kentucky Public Pensions Authority
Capital Calls and Distributions
For the quarter ending December 31, 2022

Insurance Funds Managers	Total Insurance Funds Commitments	Kentucky Employees Retirement System					Kentucky Employees Hazardous Retirement System					State Police Employees Retirement System				
		Commitment	Beginning Valuation	Period Contributions	Period Distributions	Ending Valuation	Commitment	Beginning Valuation	Period Contributions	Period Distributions	Ending Valuation	Commitment	Beginning Valuation	Period Contributions	Period Distributions	Ending Valuation
MatlinPatterson Global Opportunities Partners	5,000,000	1,129,855	0	0	0	0	538,163	0	0	0	0	239,324	0	0	0	0
MatlinPatterson Global Opportunities Partners II	5,000,000	1,129,855	21,787	0	0	21,787	538,163	10,377	0	0	10,377	239,324	4,615	0	0	4,615
MatlinPatterson Global Opportunities Partners III	5,000,000	1,129,855	2,638	0	0	2,638	538,163	1,257	0	0	1,257	239,324	559	0	0	559
Merit Mezzanine Fund IV, L.P.	3,000,000	677,913	7,110	0	0	7,110	322,898	3,387	0	0	3,387	143,595	1,506	0	0	1,506
Mesa West Core Lending Fund, LP	29,600,000	3,759,201	5,801,855	0	0	5,801,855	3,223,440	4,974,976	0	0	4,974,976	1,207,680	1,863,902	0	0	1,863,902
Mesa West Real Estate Income Fund IV LP	14,000,000	1,988,001	554,621	463,867	8,685	1,009,802	1,486,800	414,794	346,920	6,496	755,218	568,400	158,575	132,627	2,483	288,718
MiddleGround Partners I LP	25,000,000	17,500,000	23,675,490	1,433,898	695,223	24,217,065	1,250,000	1,691,107	102,421	49,659	1,729,791	500,000	676,443	40,969	19,864	691,916
MiddleGround Partners II LP	25,000,000	4,796,517	3,153,478	340,060	0	3,493,537	2,260,759	1,486,339	160,281	0	1,646,621	885,701	582,306	62,794	0	645,100
MiddleGround Partners II-X LP	12,500,000	2,398,258	1,458,235	181,405	0	1,639,640	1,130,379	687,315	85,502	0	772,817	442,851	269,271	33,497	0	302,768
Mill Road Capital I, L.P.	3,000,000	677,913	91,671	0	0	91,671	322,898	43,664	0	0	43,664	143,595	19,418	0	0	19,418
New Mountain Partners II, L.P.	5,000,000	1,129,855	6,414	0	6,405	9	538,163	3,055	0	3,051	4	239,324	1,359	0	1,357	2
New Mountain Partners III, L.P.	7,186,045	1,623,838	72,093	0	14,957	57,136	773,453	34,339	0	7,124	27,215	343,959	15,271	0	3,168	12,103
New Mountain Partners IV, L.P.	17,200,000	0	0	0	0	0	1,293,443	425,216	1,620	14,771	412,065	804,959	264,628	1,008	9,193	256,444
New State Capital Partners Fund III LP	7,500,000	1,438,955	249,929	47,686	0	297,615	678,228	117,800	22,476	0	140,276	265,710	46,151	8,805	0	54,956
Oak Hill Capital Partners II, L.P.	7,500,000	1,694,783	4,291	0	0	4,291	807,244	2,044	0	0	2,044	358,986	909	0	0	909
Oak Hill Capital Partners III, L.P.	12,500,000	2,824,638	67,873	1,246	61,024	8,095	1,345,407	32,329	593	29,067	3,856	598,311	14,377	264	12,926	1,715
Oberland Capital Healthcare LP	15,500,000	5,951,995	1,305,064	0	157,553	1,147,511	1,681,752	368,749	0	44,517	324,232	393,703	86,325	0	10,422	75,904
Patron Capital V LP	14,941,500	2,121,693	1,026,654	0	0	1,118,457	1,586,787	767,821	0	0	836,479	606,625	293,536	0	0	319,784
Riverside Capital Appreciation Fund VI, L.P.	18,712,500	0	0	0	0	0	1,396,123	390,428	0	0	390,428	862,056	241,075	0	0	241,075
Rubenstein Properties Fund II	9,200,000	1,303,637	906,859	0	0	906,859	977,044	679,669	0	0	679,669	368,003	255,997	0	0	255,997
Secondary Opportunities Fund III, L.P.	75,000,000	10,548,299	3,075,996	0	318,912	2,757,084	8,756,849	2,553,591	0	264,750	2,288,840	1,960,724	571,768	0	59,280	512,488
Strategic Value Special Situations Fund IV LP	21,700,000	8,332,800	10,148,251	0	7,306	10,140,945	2,354,450	2,867,409	0	2,064	2,865,344	551,180	671,264	0	483	670,781
Strategic Value Special Situations Fund V LP	30,000,000	5,755,820	1,958,657	429,528	0	2,388,185	2,712,910	923,180	202,451	0	1,125,631	1,062,842	361,676	79,315	0	440,990
Taurus Mining Finance Fund LLC	19,900,000	0	0	0	0	0	1,496,479	132,932	0	7,890	125,042	931,319	82,729	0	4,910	77,819
Tenaska Power Fund II, L.P.	3,000,000	588,919	1,812	0	0	1,812	316,438	974	0	0	974	137,845	424	0	0	424
Triton Fund IV, L.P.	13,814,484	0	0	0	0	0	1,038,852	709,962	0	0	773,447	646,517	441,837	0	0	481,346
VantagePoint Venture Partners 2006, L.P.	3,000,000	677,913	174,459	0	19,967	154,492	322,898	83,097	0	9,511	73,586	143,595	36,954	0	4,229	32,724
VantagePoint Venture Partners IV, L.P.	4,000,000	903,884	1,495	0	0	1,495	430,530	712	0	0	712	191,459	317	0	0	317
Vista Equity Partners III, L.P.	5,000,000	1,129,855	83,457	0	0	83,457	538,163	39,752	0	0	39,752	239,324	17,678	0	0	17,678
Vista Equity Partners IV, L.P.	23,000,000	0	0	0	0	0	1,932,000	1,344,611	0	0	1,344,611	919,999	640,290	0	0	640,290
Vista Equity Partners VI LP	25,000,000	4,550,000	6,010,441	0	76,802	5,933,639	2,775,000	3,665,709	0	46,841	3,618,868	1,075,001	1,420,050	0	18,146	1,401,905
Walton Street Real Estate Fund VI, LP	4,000,000	754,575	305,825	0	0	305,825	431,496	174,883	0	0	174,883	184,453	74,758	0	0	74,758
Walton Street Real Estate Fund VII, LP	16,755,000	2,375,001	572,437	0	0	572,437	1,780,001	429,027	0	0	429,027	669,998	161,487	0	0	161,487
Warburg, Pincus Private Equity IX, L.P.	10,000,000	2,259,711	5,379	0	4,519	860	1,076,326	2,562	0	2,153	410	478,649	1,139	0	957	182
Warburg, Pincus Private Equity X, L.P.	7,500,000	1,694,783	37,481	0	0	37,481	807,244	17,852	0	0	17,852	358,986	7,939	0	0	7,939
Wayzata Opportunities Fund II, L.P.	7,500,000	1,694,783	37	0	0	37	807,244	17	0	0	17	358,986	8	0	0	8
Wayzata Opportunities Fund III, L.P.	18,712,500	0	0	0	0	0	1,396,123	215,881	0	37,769	178,112	862,056	133,299	0	23,321	109,978
White Oak Yield Spectrum Parallel Fund LP	50,000,000	8,493,880	11,418,033	0	465,256	10,952,777	5,128,971	6,894,700	0	280,941	6,613,759	1,846,552	2,482,257	0	101,146	2,381,111

Kentucky Public Pensions Authority

Internal Asset Holdings Report & Internal Asset Transaction Report

Quarter Ending: December 31, 2022

Reports can be found:

https://kyret.ky.gov/Investments/Investments-Library/Pages/Internal-Reports.aspx

Kentucky Public Pensions Authority

Commissions Report

Quarter Ending: December 31, 2022

Reports can be found:

https://kyret.ky.gov/Investments/Investments-Library/Pages/Commissions-Reports.aspx

Kentucky Public Pensions Authority

KRS Investment Committee

Adams Street Partners

Senior Private Credit Fund III

February 28, 2023

Adams Street Partners Senior Private Credit Fund III

$150 Million Recommendation

Adams Street Partners ("Adams Street" or the "Firm") is one of the most respected and experienced private markets investment managers in the industry, providing clients with customized access to the spectrum of private market strategies. Adams Street manages $52 billion for more than 560 institutional clients, including $7.7 billion on their private credit platform..

The Fund will build upon the Firm's flagship private credit strategy and seek to invest primarily in directly originated first lien senior secured loans of middle-market companies that are backed by private equity sponsors. Diversification across several metrics is a key tenant of the overall Fund investment strategy and the Fund is expected to invest in a wide variety of industry sectors building a geographically diverse portfolio focusing primarily across regions in North America and, to a lesser extent, parts of Europe. outside of bankruptcy.

Due Diligence Summary

Date of First KPPA Meeting
June 2016

Date of First Commitment
November 2019

Continued Due Diligence
Quarterly Portfolio Reviews
On-site Visits

Consultant Report
April 2022

Fund III Legal Negotiation Initiated
January 2023

Comparable Strategies Reviewed
28 (Private / Specialty Credit)

KPPA
Kentucky Public Pensions Authority

KENTUCKY PUBLIC PENSIONS AUTHORITY

INVESTMENTS

To: KRS Investment Committee

From: Steve Willer, CIO

Date: February 28, 2023

Subject: Investment Recommendation – Adams Street Partners Senior Private Credit Fund III

KPPA Investment Staff is proposing an investment in Adams Street Partners Senior Private Credit Fund III (the "Fund") contingent on successful IMA negotiations. Adams Street Partners ("Adams Street" or the "Firm") is one of the most respected and experienced private markets investment managers in the industry, providing clients with customized access to the spectrum of private market strategies. Adams Street manages $52 billion for more than 560 institutional clients, including $7.7 billion on their private credit platform. This investment recommendation is a "re-up" including the opportunity for a fee-free co-investment sidecar vehicle should it be approved and would be part of the Specialty Credit allocation.

KPPA Investment Staff started monitoring and began a dialogue with Adams Street Partners in 2016 when the firm recruited Bill Sacher, who previously led the mezzanine investing business at credit-centric investment management firm Oaktree Capital Management. While KPPA did not invest in their first private debt fund staff continued to perform due diligence on the firm and their processes and ultimately committed $250 million to the Adams Street Partners Private Credit Fund II and an additional $250 million investment to a co-investment side car vehicle. As one of two "anchor investors" KPPA was provided with attractive preferred pricing and a position on the Limited Partners Advisory Committee for the fund.

Business / People:

The firm that would become Adams Street was formed in 1972 as part of the First National Bank of Chicago, In 1989, Adams Street's predecessor organization, Brinson Partners, Inc., was organized and acquired the institutional asset management business from First Chicago. In 1995, Brinson Partners, Inc. and Swiss Bank Corporation combined their international institutional investment management organizations into a single investment management business. Union Bank of Switzerland and SBC subsequently merged in June 1998 to form UBS AG. Adams Street spun out of UBS AG on January 1, 2001 and was comprised of the members of Brinson Partners' Private Equity Group. Today Adams Street is an independent, 100% employee-owned organization.

The Adams Street Private Credit platform has seventeen dedicated investment professionals located in New York and London and leverage the expertise of over ninety investment professionals across their global investment platform to manage $7.7 billion of assets. Bill Sacher is the Head of the Private platform and the Chair of Adams Street's Private Credit Investment Committee and a member of the Executive Committee. Bill leads the investment, portfolio construction and fundraising efforts of the team.

Fred Chung is the Head of Private Credit Underwriting and supports all aspects of the decision-making process of the team including sourcing, structuring, reviewing, and negotiating deal opportunities. Prior to joining Adams Street, he was a Vice President at Goldman Sachs where he focused on investing capital out of various private debt vehicles, including the firm's first Business Development Company (BDC). James Charalambides is the Head of European Private Credit and a voting member pf the Adams Street's Private Credit Investment Committee. Prior to joining Adams Street, James was a Managing Director in the Specialty Lending Europe Team at Sixth Street Partners.

Investment Process and Opportunity:

The Fund will build upon the Firm's flagship private credit strategy and seek to invest primarily in directly originated first lien senior secured loans of middle-market companies that are backed by private equity sponsors. Diversification across several metrics is a key tenant of the overall Fund investment strategy and the Fund is expected to invest in a wide variety of industry sectors building a geographically diverse portfolio focusing primarily across regions in North America and, to a lesser extent, parts of Europe. Based on the Fund's size and the anticipated length of its investment period the Firm expects that the Fund will invest in 40 to 50 portfolio companies. The Fund will seek to generate current income with attractive risk-adjusted returns and strong downside protection.

The Firm employs a capital preservation, loss avoidance philosophy seeking high quality borrowers, conservative leverage and significant equity cushions. Their credit intensive underwriting approach is designed with the goal of generating consistent results with low volatility, regular current income, and attractive all-in returns. Deal sourcing in the middle market remains heavily relationship driven. Adams Street is one of the largest and oldest Private Equity Fund-of-Funds firms in the world and is actively invested with over 460 general partners around the world. These GP relationships provide the firm unique access to financing opportunities within the private equity space. Also, Adams Street's position as an LP for over 40 years has provided them with an extensive database of portfolio company operating metrics. This proprietary database gives the firm a distinct advantage when evaluating potential loan opportunities.

Increasing regulation has caused commercial banks to substantially reduce their lending to middle-market companies while the demand for debt capital, particularly in the market for private equity-backed leveraged buyouts has continued to grow creating demand vs supply imbalance. Improvements in a number of key measures including absolute and relative yield, leverage, equity contributions, covenants, and lender's rights are creating positive dynamics and an attractive and compelling vintage opportunity for private credit. Relatively, private credit provides a premium spread of between 200 and 300 basis points over many liquid credit alternatives and offers defensive creditor protections. Meanwhile, the floating-rate nature of private credit provides a hedge against interest rate risk that fixed-coupon instruments lack. However, with elevated volatility and risk of a major, broad asset revaluation rigorous underwriting and careful credit selection will be key differentiators for private credit mandates.

Performance:

As of September 30, 2022

Vehicle / Investor Entity	Committed (millions)	Drawn (millions)	Distributions (millions)	NAV (millions)	Total Value (millions)	Gross Multiple	Gross IRR¹	Net Multiple	Net IRR¹
Adams Street Sr. Private Credit II-A1	$175.0	$125.4	$9.9	$138.6	$148.5	1.22x	22.1%	1.18x	18.8%
Adams Street Sr. Private Credit II-B1	175.0	103.8	6.2	112.4	118.6	1.14x	12.3%	1.14x	12.3%
Kentucky Retirement Systems Total	350.0	229.2	16.1	251.0	267.1	1.18x	17.2%	1.17x	15.6%
Adams Street Sr. Private Credit II-A1	75.0	53.7	4.3	59.4	63.6	1.22x	22.1%	1.18x	18.8%
Adams Street Sr. Private Credit II-B1	75.0	44.5	2.7	48.2	50.8	1.14x	12.3%	1.14x	12.3%
Kentucky Retirement Systems Insurance Total	150.0	98.2	6.9	107.6	114.5	1.18x	17.2%	1.17x	15.6%
Adams Street Private Credit Program Total	**$500.0**	**$327.4**	**$23.0**	**$358.5**	**$381.6**	**1.18x**	**17.2%**	**1.17x**	**15.6%**

1) Gross IRR is the since inception IRR of the Adams Street Partners fund to the client, which is gross of Adams Street Partners' fees, carried interest and expenses. Net IRR is the since inception IRR of the Adams Street Partners fund to the client, which is net of Adams Street Partners' fees, carried interest and expenses. The IRRs set forth above reflect the use of a credit line. It should not be assumed that the funds will ultimately achieve the returns set forth above; the ultimate returns of these funds may be materially lower.

Conclusion: Given the attractive economics and compelling market opportunity, Staff is recommending a "re-up" investment of up to $75mm into the Adams Street Partners Senior Private Credit Fund III, and up to an additional $75mm investment into a co-investment side car vehicle to be allocated proportionally among all KERS and SPRS Plans. KPPA will occupy an "anchor investor" position with preferred pricing and the co-investment vehicle will have a 0% management fee, and 0% carried interest. This "re-up" investment will maintain the Plans' current exposure to the Adams Street Private Credit Platform and will reside in the Specialty Credit allocation.

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Investment and Terms Summary:

Type of Investment: Specialty Credit - First Lien Senior Secured Debt
Fund Target Size: $3.0 billion
Structure: GP / LP
Management Fee: 0.35% on Gross Invested Assets
Performance Fee: 10% over 7% return hurdle
Co-Investment: 0% management fee / 0% performance fee
Target Net Return: 11% - 13%
Sponsor Commitment: At least 1% of the total capital commitments
Investment Period: Three years from the date of the final close
Term: Six years, subject to up to two one-year extensions
Risks: Credit Risk, Liquidity Risk, Manager Risk, Macro-economic Risk

* No placement agents have been involved or will be compensated as a result of this recomendation.

A Global Leader in Private Markets

LEADING WITH FORESIGHT™

Adams Street strives to generate actionable investment insights across market cycles by drawing on over 50 years of private markets experience, proprietary intelligence, and trusted relationships.

Why Adams Street Partners

Adams Street Partners has been recognized as one of the most respected and experienced private markets investment managers in the industry.

$52bn Assets Under Management[1]	100% Independent and Employee-owned	460+ Adams Street General Partners Worldwide[2]
40+ Years of Proprietary Data	29,000+ Companies Tracked	2,000+ Funds Tracked

INTEGRATED PLATFORM

- 280+ employees
- 12 offices worldwide; 30 languages spoken
- 90+ investment professionals
- Shared insights and data across investment teams

EXTENSIVE RELATIONSHIPS

- 560+ institutional investors
- 510+ advisory board seats

ALIGNMENT OF INTERESTS

- 100% independent and employee-owned
- $600mm+ invested alongside clients

RESPONSIBILITY

- ESG principles help identify risks and opportunities for value creation
- Committed to diversity, equity, inclusion, volunteerism and charitable giving

As of September 30, 2022.
1. Firmwide AUM as of September 30, 2022; does not include the more recent private credit closings or private credit leverage which may be discussed herein or is available upon request.
2. Represents the number of general partners in which Adams Street is invested.

Strategically Integrated Platform

Adams Street

Jeff Diehl
Managing Partner &
Head of Investments

29 Years of Experience*

Bon French
Chairman

46 Years of Experience*

PRIMARY INVESTMENTS - $31.3BN AUM

Provider of LP capital commitments to sponsors since 1979

Brijesh Jeevarathnam
Partner & Global Head of Fund Investments
*26 Years of Experience**

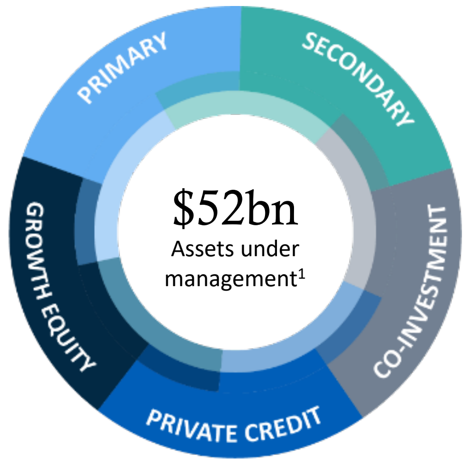
- 1,280+ funds
- 360+ GP relationships
- 510+ advisory boards
- *28 Professionals*

GROWTH EQUITY - $2.7BN AUM

Provider of long-term capital to growth stage companies since 1972

Robin Murray
Partner & Head of Growth Equity Investments
*33 Years of Experience**

- 300+ companies
- *12 Professionals*



SECONDARY INVESTMENTS - $7.6BN AUM

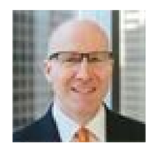
Purchaser of secondary LP interests since 1986

Jeff Akers
Partner & Head of Secondary Investments
*25 Years of Experience**

- 580+ funds
- 220+ GP relationships
- *15 Professionals*

CO-INVESTMENTS - $4.3BN AUM

Provider of direct equity co-investments to sponsor-backed transactions since 1989

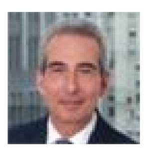


David Brett
Partner & Head of Co-Investments
*38 Years of Experience**

- 210+ companies
- 120+ GP relationships
- *10 Professionals*

PRIVATE CREDIT - $7.7BN AUM[2]

Provider of debt financing solutions to private equity-backed transactions



Bill Sacher
Partner & Head of Private Credit
*38 Years of Experience**

- 250+ GP relationships
- *18 Professionals*

*Investment and Operational
AUM figures as of September 30, 2022.
1. Firmwide AUM as of September 30, 2022; does not include the more recent private credit closings or private credit leverage which may be discussed herein or is available upon request.
2. AUM for Private Credit consists of total capital committed by investors (except with respect to funds for which the investment period has ended, in which case NAV is used) plus deployed and anticipated leverage. Capital committed by investors is $6.6bn (updated to reflect applicable investor capital commitments closed upon between 10/1/2022 and 1/4/2023).

Adams Street Private Credit

Scaled private credit platform with a range of solutions for our investors

ADAMS STREET PRIVATE CREDIT

$7.7bn Assets Under Management[1]	**18** Dedicated Investment Professionals in New York and London
[redacted] Net IRR – Commingled Funds Since Inception	[redacted] Realized Loss Rate

MIDDLE MARKET DIRECT LENDING

- ✔ Senior Only – First lien senior secured
- ✔ Flexible – Primarily first lien senior secured with second lien, mezzanine, preferred equity, and other forms of junior capital

INVESTOR SOLUTIONS

- ✔ Closed-end, evergreen, and bespoke SMA vehicles
- ✔ Levered and unlevered options
- ✔ Currency hedging
- ✔ Rated options

As of September 30, 2022.

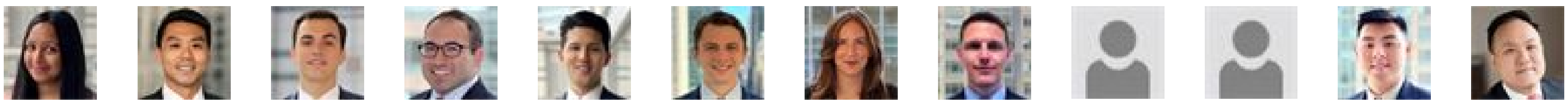
1. AUM for Private Credit consists of total capital committed by investors (except with respect to funds for which the investment period has ended, in which case NAV is used) plus deployed and anticipated leverage. Capital committed by investors is $6.6bn (updated to reflect applicable investor capital commitments closed upon between 10/1/2022 and 1/4/2023).

Dedicated Private Credit Team on Integrated Platform

Adams Street

Shared insights from global investment platform and leveraging 90+ investment professionals

	Bill Sacher	Fred Chung	James Charalambides	Justin Lawrence	Leland Richards	Nolan Pauker	Emily Shiau
Title	Partner & Head of Private Credit	Partner & Head of Credit Underwriting	Partner & Head of European Private Credit	Partner	Partner	Principal	Principal
Previous Experience	Oaktree	Goldman Sachs Asset Management	Sixth Street Partners	Ares	Churchill Asset Management	Solar Capital	AAM



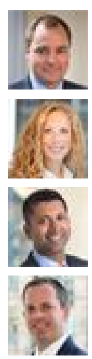
	Nisha Haran	Dennis Kan	Ervis Vukaj	Matthew Wachtel	Daniel Bracho	Julien Nifong	Margaret Ellen Crawford	William Dellow	Joseph Duffy	New Hire *Mar-23*	Chris Yang	Thomas Vuu
Title	Vice President	Vice President	Vice President	Vice President	Senior Associate	Senior Associate	Associate	Associate	Associate	Associate	Analyst	Vice President, Business Services
Previous Experience	Credit Suisse	Jefferies	Jefferies	Credit Suisse	Goldman Sachs	Deutsche Bank	Sixth Street Partners	PJT	BMO	Bank of America	UBS	Crescent

ORIGINATION & UNDERWRITING SUPPORT

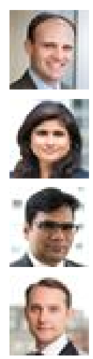
Jeff Akers
Matt Autrey
Troy Barnett
Tom Bremner

Dave Brett
Jeff Burgis
Mattias de Beau
Jeff Diehl

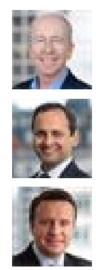
Brian Dudley
Joe Goldrick
Terry Gould
Doris (Yiyang) Guo



Greg Holden
Morgan Holzaepfel
Brijesh Jeevarathnam
Alex Kessel



Jim Korczak
Saguna Malhotra
Sunil Mishra
Ross Morrison



Robin Murray
Pinal Nicum
Sergey Sheshuryak

Yar-Ping Soo
Michael Taylor
Benjamin Wallwork

Andy Wang
Fred Wang
Craig Waslin

40+ Investment Professionals Not Shown Here

FINANCE & ACCOUNTING	LEGAL & COMPLIANCE	INVESTMENT STRATEGY AND RISK MANAGEMENT	INFORMATION TECHNOLOGY	INVESTOR RELATIONS	MARKETING	HUMAN RESOURCES & ADMINISTRATION
50 Professionals	19 Professionals	11 Professionals	39 Professionals[1]	42 Professionals	11 Professionals	31 Professionals

As of February 2023.

1. Includes 10 consultants and contractors.

Why Private Credit Now?

We believe private credit is well suited for the current environment, offering premium yields with defensive creditor protections

CURRENT MARKET OBSERVATIONS

Disruption in the liquid markets has contributed to a favorable environment for private credit investors

YIELDS	DEBT MULTIPLES	EQUITY CONTRIBUTIONS	COVENANTS
UP	DOWN	UP	IMPROVED

PRIVATE CREDIT ADVANTAGES

Floating-rate debt benefits from interest rate rises and has no interest rate risk	Safer **senior position** in the capital structure with generally **lower leverage**	Secured by all assets with **superior rights** in workouts and bankruptcy	**Premium yields** relative to most other credit investments

Based on Adams Street Private Credit market observations. Above statements generally represent a mixture of (i) objective data attained through a variety of sources which are available upon request, as well as (ii) Adams Street analysis based on market observations, historical deal flow or other factors; provided, however, that there can be no guarantee that this represents a complete universe of relevant data. Statements made represent current views and opinions as of 01/12/22 and are subject to change. While Adams Street believes in the merit of private credit investing, private credit investments are nevertheless subject to a variety of risk factors. There can be no guarantee against a loss, including a complete loss, of capital.

Market Update

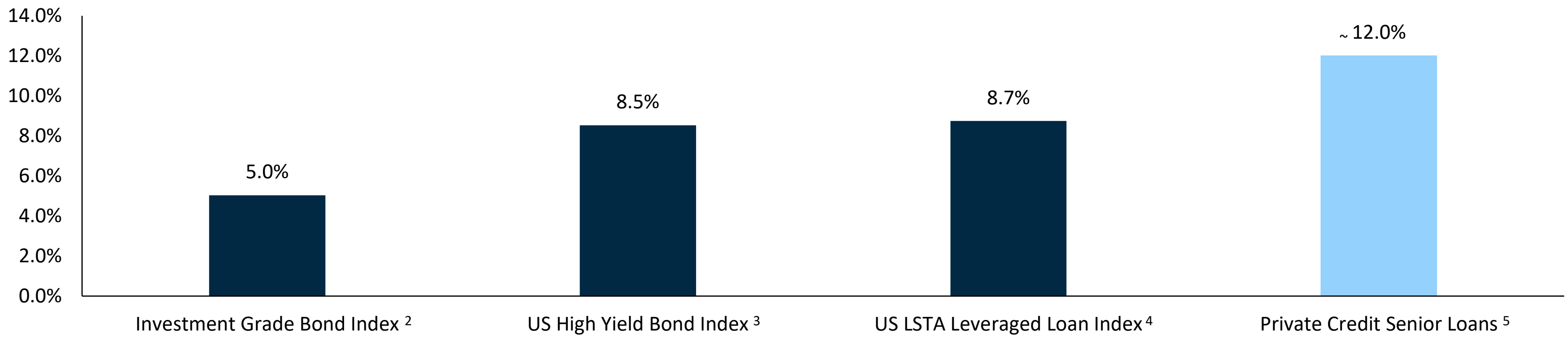
Adams Street

PRIVATE CREDIT CONTINUES TO OFFER PREMIUM YIELDS THAT COMPARE FAVORABLY TO MOST CREDIT ALTERNATIVES

Deal Terms Summary[1]

	2019	2020	2021	2022
Avg. Spreads(1)	+/- 500	+/- 600	+/- 525	650 – 700
Avg. OID(1)	1.5%	2.0%	1.5%	2.5%
Base Rate(1)	1.91%	0.24%	0.21%	4.51%
Avg. Leverage(1)	5.75x	5.00x	6.00x	5.5x
Avg. Equity Contribution(1)	40%	45%	47%	50%

Credit Alternatives Yield Comparison



Statements made represent current views and opinions as of 12/31/22 and are subject to change.

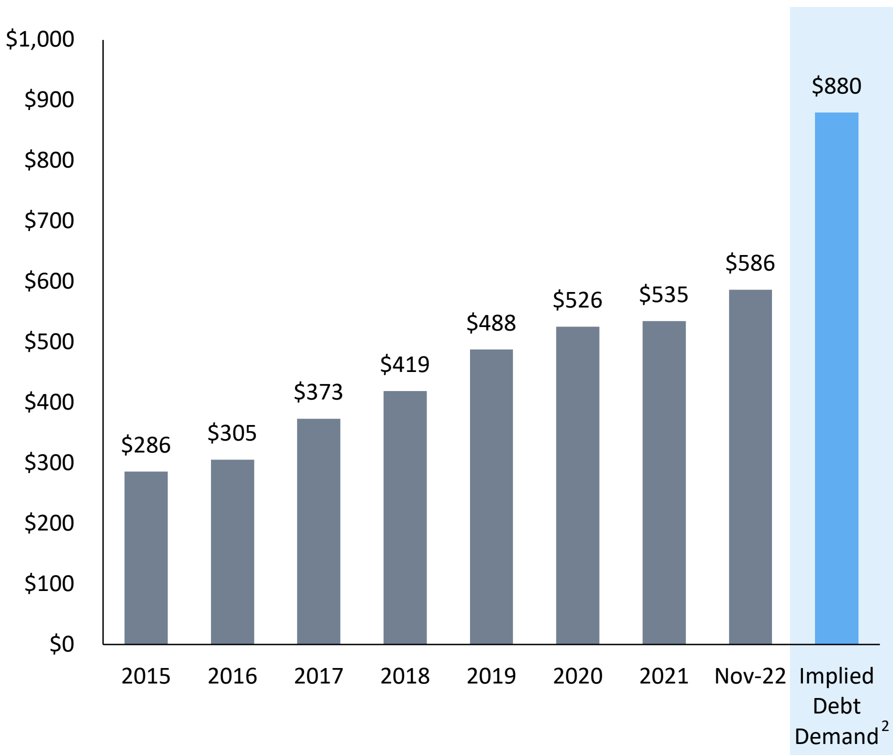
1. Based on Adams Street Private Credit market observations. Base Rate represents 3-month Libor as of the last day of each calendar year for 2019-2021 and 3-month term SOFR as of December 16, 2022 for Current.
2. US Investment Grade from S&P 500 Investment Grade Corporate Bond Index as of December 16, 2022.
3. High Yield Bonds from S&P U.S. High Yield Corporate Bond Index as of December 16, 2022.
4. Leveraged Loans from MorningStar LSTA U.S. Leveraged Loan 100 Index as of December 16, 2022.
5. Private Credit Senior Loans yield calculated based on observed market spreads of +/-650bps, 451bps SOFR as of December 16, 2022, and upfront fees of 2.5% amortized over 2.5 years.

Private Credit Supply and Demand

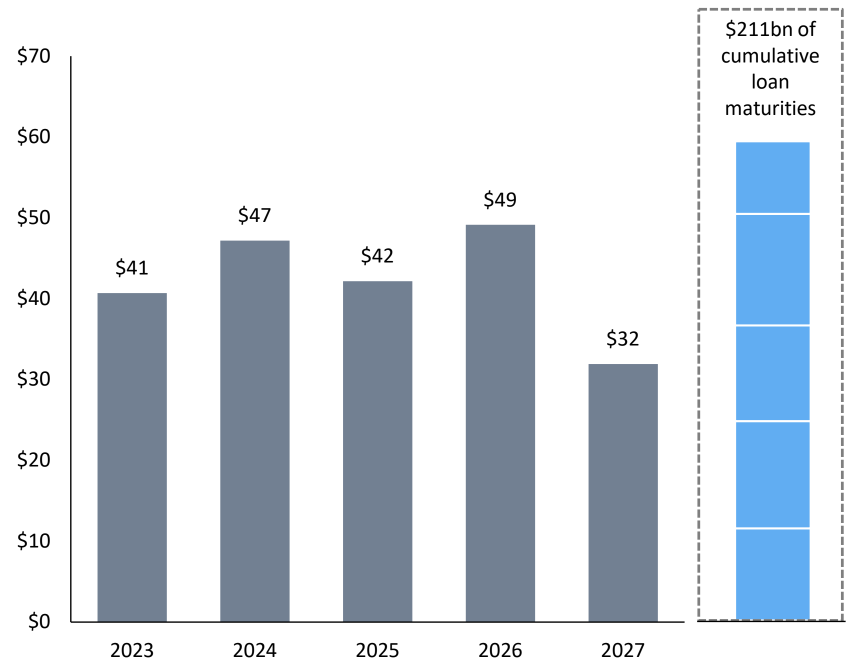
Adams Street

WE BELIEVE THE DEMAND/SUPPLY IMBALANCE FAVORING PRIVATE CREDIT REMAINS INTACT

US Private Equity Dry Powder ($bn)[1]



Middle-Market Cumulative Sponsored Leveraged Loan Maturities[3]



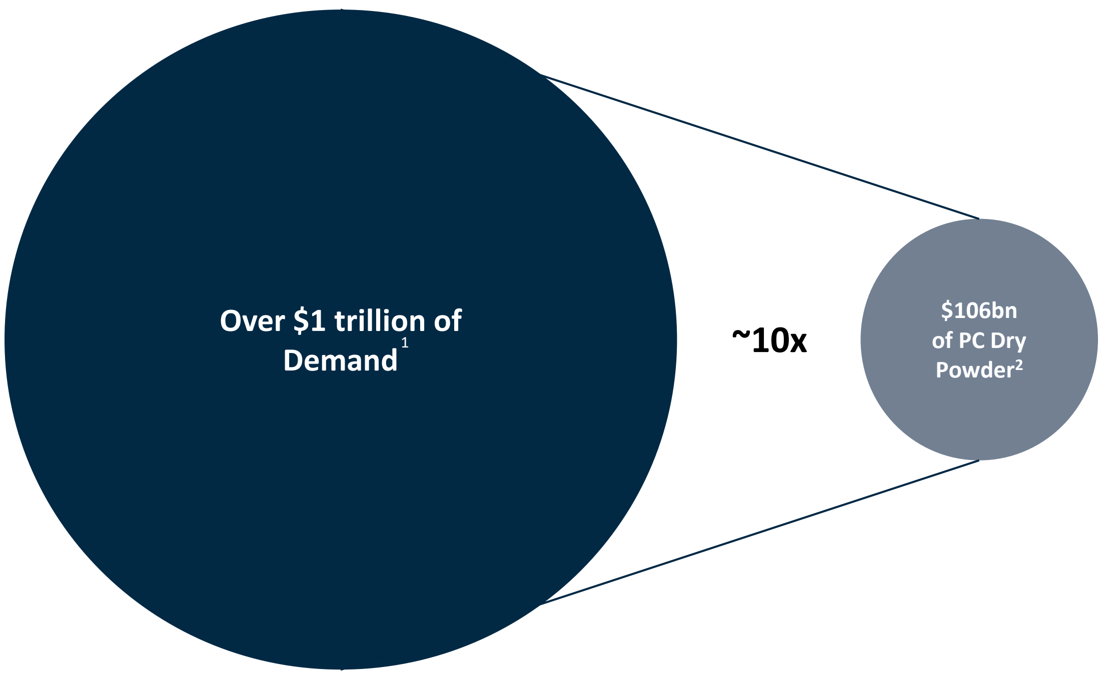
Statements made represent current views and opinions as of 12/31/22 and are subject to change.

1. Source: Preqin, North America focused Buyout funds only, as of November 22, 2022.
2. Implied debt demand assumes private equity dry powder is deployed at an average equity contribution of 40%. Equity contribution percentage is based on historical values observed from 2000 – YTD Q3 2022 per LCD's Q3 2022 Leveraged Buyout Review.
3. Source: Thompson Reuters 3Q 2022 Middle Market Lending Review. Middle-market defined as issuers with revenue of less than $500mm and total deal size of less than $500mm.

Private Credit Supply and Demand – Continued

US Prospective Financing Demand

Over $1 trillion of Debt Financing Demand[1]



Significant private equity dry powder and existing middle market leveraged loan maturities create debt financing demand well in excess of current private credit supply

Statements made represent current views and opinions as of 12/31/22 and are subject to change.

1. Debt financing demand is a combination of private equity implied debt demand and cumulative loan maturities from prior slide.
2. Source: Preqin, North American focused Direct Lending Private Credit funds, as of November 22, 2022.

Our Approach and Investment Philosophy

Adams Street

INVESTMENT APPROACH

Capital Preservation, Loss Avoidance Philosophy[1]

High Quality Borrowers, Conservative Leverage, Significant Equity Cushion

Credit Intensive Underwriting

Fundamental Due Diligence with Private Side Access

Lead Lender in Transaction

Lead Economics and Influence on Structure and Terms

Differentiated Sourcing & Knowledge Advantage

Platform Generates Unique Origination and Proprietary Data

460+

Adams Street General Partners Worldwide[3,4]

29,000+

Companies tracked[4]

510+

Active Advisory Board Seats[4]

TARGET TRANSACTIONS[2]

- **Middle Market**
  $150 - $750mm Enterprise Value / $15 - $75mm EBITDA
- **Directly Originated, Lead Agented**
  Direct Access to Sponsor and Company to Due Diligence and Structure Deal
- **Sponsor Backed**
  Strong company stewardship and enhanced alignment

1. Represent the aspirational goals of our investment philosophy and our approach to underwriting; provided, however, that past performance is not a guarantee of future results and there can be no guarantee against a loss, including a complete loss, of capital.
2. Represent target attributes, provided, however, that there can be no guarantee that all investments will display such attributes.
3. Represents the number of general partners in which Adams Street is invested.
4. As of September 30, 2022.

Sourcing Advantage and Large Opportunity Set Allows Us to be Selective

Adams Street

460+
Active Investments with Private Equity GPs[1]

510+
Advisory Board Seats

$47.6bn+
Commitments to underlying General Partners[2]

PRIVATE CREDIT TRANSACTION PIPELINE[3]
(Since the formation of Fund II - 4/1/2020)

1150+
Private Credit Opportunities[4]

$200bn+
Total Financing Available[4]

40-50%
Active Consideration

15-20%
Performed In-depth Due Diligence

~5%
Closed Deals

53
Platform Investments

+

$6bn+
Committed Capital

*A complete list of general partners in whose funds Adams Street has invested is available upon request.

1. Represents number of general partners in whose funds Adams Street is invested, as of September 30, 2022.
2. Represents aggregate commitments, as of September 30, 2022, to underlying Private Equity and Venture Capital funds on a primary or secondary basis by all funds and separate accounts of which Adams Street Partners is the general partner / investment manager.
3. There can be no guarantee that deal flow will maintain prior levels or that similarly attractive investments will be available.
4. Since April 1, 2020 through December 31, 2022.

Knowledge Advantage from Proprietary Data Has Provided an Underwriting Edge

Adams Street

INFORMATION SOURCES

29,000+
Companies tracked

2,000+
Partnerships tracked

510+
Active advisory board seats

IN-HOUSE DATA SYSTEMS

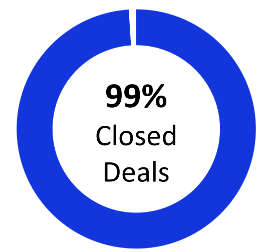
APEx
Portfolio Company Information
- Historical financials
- Credit statistics
- Industry performance & benchmarking
- Financial trends

ASPIRE
General Partner Information
- Fund performance
- Investment level track record

Clarity
Keyword Search Tool
- Board packages
- LP updates
- Financial MD&A

UNDERWRITING EDGE

Private Credit Deals Benefitted from Propriety Adams Street Database[1]



As of September 30, 2022, unless otherwise noted.

1. As of December 31, 2022. Private Credit deals benefitting from proprietary Adams Street database represents the percent of deals since inception (March 2017) where Adams Street had knowledge relating to either the company or the General Partner sponsoring the deal. Examples include but are not limited to historical company financials, credit statistics, industry performance & benchmarking, General Partner track record, and board packages.

Knowledge Advantage in Action

Case Study: Company XYZ*

Adams Street

Company XYZ

	General Partner 1			General Partner 2	General Partner 3	General Partner 1
1954	1991	2012	2017	2018	2018 – 2022	2022
***Company XYZ* was founded**	▪ Adams Street has been an investor in various *General Partner 1* funds since 1991 ▪ Adams Street also holds Advisory Board seats on three *General Partner 1* Funds.	*General Partner 1* acquires *Company XYZ*	*General Partner 1* sells to *General Partner 2,* who combined *Company XYZ* with another business	*General Partner 2* sells the consolidated business to *General Partner 3*	▪ Adams Street has been an investor in various *General Partner 3* funds since 1997 ▪ Adams Street also holds Advisory Board seats on five different funds managed by *General Partner 3* ▪ Adams Street had significant information on *Company XYZ*	Adams Street is Joint Lead Arranger, Joint Bookrunner, and the sole Administrative Agent for *General Partner 1's* buyout of *Company XYZ.* Adams Street has majority control of the credit facility

- Adams Street had over a decade of historical financial information on *Company XYZ* including that of the last two cycles
- Adams Street had original investment analyses on *Company XYZ* from prior owner, including Company performance and final investment returns
- Knowledge advantage positioned Adams Street to build high conviction on *Company XYZ* quickly and provide financing to *General Partner 1.*

*For illustrative purposes only. This case study is provided solely to demonstrate Adams Street's process, views and analysis in implementing its investment strategy and is subject to change. It is not intended to predict the performance of any Adams Street investment. The views, opinions and information presented herein, including (but not limited to) with respect to Adams Street's perception of its advantages, were current as of the date the investment was made and (unless the context indicates otherwise) are not subject to update. Past performance is not indicative of future results. A complete list of Adams Street's investments is available upon request.

Fund II Update

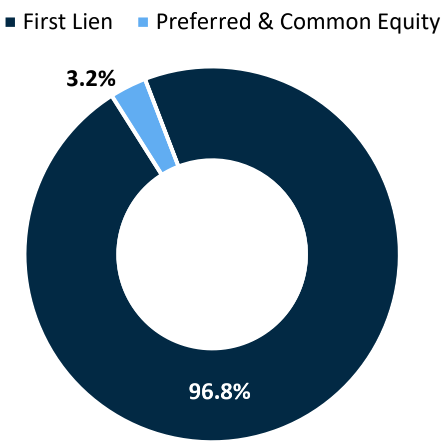
Senior Private Credit II Portfolio Highlights

Adams Street

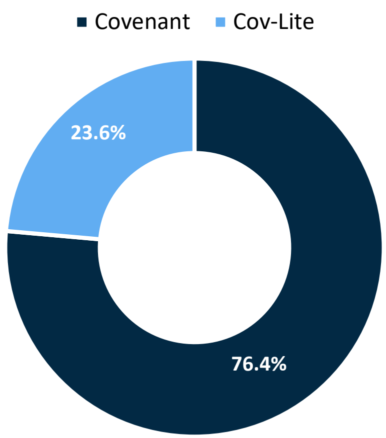
Fund Statistics[1]	Senior Private Credit II
First Investment	**May 29, 2020**
Fund Capital Raised	$1,311mm
Number of Portfolio Companies (active)	50
Weighted Average Unlevered Yield (current)[3,4]	11.6%
Weighted Average Equity Cushion (current)[5]	55.4%
Weighted Average EBITDA (current)[5]	$90.7mm
Weighted Average Net Leverage (current)[5,6]	5.4x

Adams Street Senior Private Credit II is a diversified portfolio of directly originated senior secured loans

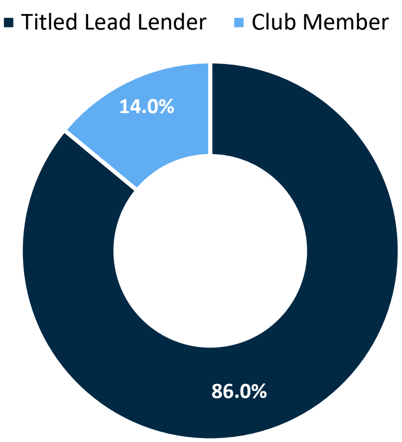
Asset Mix



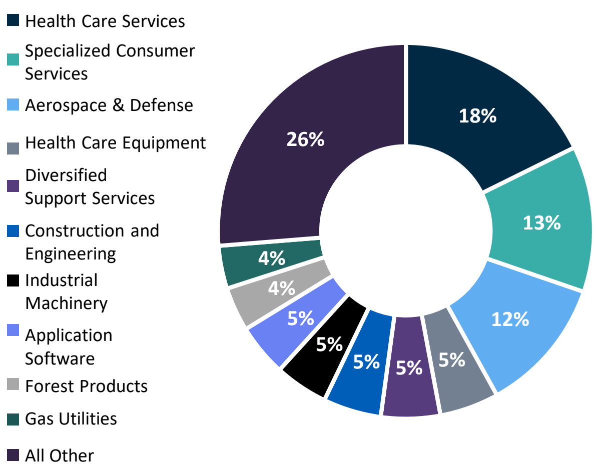
Covenants vs. Cov-Lite



Titled Lead Lender



Industry



Preliminary December 31, 2022

Please refer to page entitled "Notes to Private Credit II Program Portfolio Highlights" for detailed footnotes, including with respect to the Current Yield.

Kentucky Retirement Systems – Senior Private Credit Fund II Performance[1]

Fund	Vintage	Size (millions)[2]	Amount Drawn (millions)	Gross MOIC [3]	Net MOIC [4]	Gross IRR [5,7]	Net IRR [6,7]
Senior Private Credit II (Consolidated)	**2020**	**$500.0**	**$327.4**	**1.18x**	**1.17x**	**17.2%**	**15.6%**
Senior Private Credit II (Levered)	**2020**	**$250.0**	**$179.1**	**1.22x**	**1.18x**	**22.1%**	**18.8%**
Senior Private Credit II (Unlevered)	**2020**	**$250.0**	**$148.3**	**1.14x**	**1.14x**	**12.3%**	**12.3%**

1. Performance as of 9/30/2022. Past performance is not a guarantee of future results. The performance data set forth above includes unrealized investments. There can be no guarantee that unrealized investments included in this performance data will ultimately be liquidated at values reflected above.
2. Size reflects total capital commitments as of final close.
3. Gross MOIC (multiple of invested capital) is equal to total value (comprised of the investor's ending NAVs for the quarter plus distributions to the investor, less recallable distributions if applicable) gross of Adams Street Partners' fees, carried interest and expenses / amount drawn from investors, less recallable distributions if applicable. The Gross MOIC figure reflects the use of a credit line.
4. Net MOIC is equal to total value (comprised of the investor's ending NAV for the quarter plus distributions to the investor, less recallable distributions if applicable) net of Adams Street Partners' fees, carried interest and expenses / amount drawn from investors, less recallable distributions if applicable. Net MOIC is calculated excluding the value of the GP's investment in the fund. The Net MOIC figure reflects the use of a credit line.
5. Gross IRR is the since inception internal rate of return for your investment in the Adams Street Senior Private Credit Fund II, gross of Adams Street Partners' fees, carried interest and expenses, which reduce returns to investors.
6. Net IRR is the since inception internal rate of return for your investment in the Adams Street Senior Private Credit Fund II, which is net of Adams Street Partners' fees, carried interest, and expenses.
7. The IRRs set forth above reflect the use of a credit line. It should not be assumed that the funds will ultimately achieve the returns set forth above; the ultimate returns of these funds may be materially lower.

Fund III

Senior Private Credit Fund III

Key Terms and Conditions

Fund	Senior Private Credit Fund III (Unlevered)	Senior Private Credit Fund III (Levered)
Targeted Size	$4.5 billion	
Strategy	Invest primarily in 1st lien senior secured debt	
Minimum Commitment	$10 million[1]	
Sponsor Commitment	At least 1% of the total capital commitments	
Investment Period	Three years from the date of the final close	
Term	Six years, subject to up to two one-year extensions	
Targeted Net Return	8-10%[2]	11-13%[2]
Target Leverage	0.0x	~1.5x
Geography	Primarily North America	
Management Fees	[redacted]	
Carried Interest and Hurdle	[redacted]	

Fund terms are potentially subject to adjustment as represented in the final governing documents of such fund.

1. Adams Street Partners reserves the right to waive the minimum subscription amount.
2. Targeted net returns (after Adams Street's fees, expenses and carried interest) are only targets, aspirational in nature and based on Adams Street's historical experience as an investor; returns have not been modeled for the fund using assumptions related to returns, expenses or other factors. There is no guarantee that Adams Street or any investment vehicle advised thereby will achieve returns in the targeted range.

Proposed Commitment to Senior Private Credit Fund III
Kentucky Public Pensions Authority – Anchor Terms

Key Terms and Conditions

Fund	Senior Private Credit Fund III (Unlevered)	Senior Private Credit Fund III (Levered)
Anchor Minimum Commitment	[redacted]	
Anchor Management Fees	[redacted]	
Anchor Carried Interest	[redacted]	
Anchor Co-Investment	[redacted]	

Notes

Confidentiality Statement and Other Important Considerations

As of February 2023

Adams Street Partners has provided this presentation (the "Presentation") to the recipient on a confidential and limited basis.

Potential investors should refer to the confidential private placement memorandum, limited partnership agreement, subscription agreement, or similar documents (collectively "Final Documentation") before making any final investment decision; the information contained herein should not be used or relied upon in connection with the purchase or sale of any security. Potential investors should take into account all the characteristics or objectives of any Adams Street-managed investment vehicle. The Final Documentation contains important information regarding risk factors, performance, costs and other material aspects of any proposed investment.

This Presentation is not an offer or sale of any security or investment product or investment advice. Offerings are made only pursuant to the Final Documentation.

Any information included herein is preliminary, subject to adjustment as represented in, and qualified in its entirety by, and is replaced by the information in the Final Documentation. Subscriptions to an Adams Street-managed investment vehicle will only be made and accepted on the basis of the Final Documentation.

Statements in the Presentation are made as of the date of the Presentation unless stated otherwise, and there is no implication that the information contained herein is correct as of any time subsequent to such date. All information with respect to primary and secondary investments of Adams Street Partners' funds (the "Funds") or Adams Street Partners' managed accounts (collectively, the "Investments"), the Investments' underlying portfolio companies, Fund portfolio companies, and industry data has been obtained from sources believed to be reliable and current, but accuracy cannot be guaranteed. The source of the information in this Presentation represents a mixture of Adams Street proprietary information and subjective analysis based on deal flow, market observations, historical returns and other factors as well as objective information, the source for which has generally been indicated or is otherwise available.

The Presentation contains highly confidential information. In accepting the Presentation, each recipient agrees that it will (i) not copy, reproduce, or distribute the Presentation, in whole or in part, to any person or party (including any employee of the recipient other than an employee or other representative directly involved in evaluating the Funds) without the prior written consent of Adams Street Partners, (ii) keep permanently confidential all information not already public contained herein, and (iii) use the Presentation solely for the purpose set forth in the first paragraph.

The Presentation is not intended to be relied upon as investment advice as the investment situation of potential investors depends on individual circumstances, which necessarily differ and are subject to change. The contents herein are not to be construed as legal, business, or tax advice, and each investor should consult its own attorney, business advisor, and tax advisor as to legal, business, and tax advice.

The internal rate of return (IRR) data and multiples provided in the Presentation are calculated as indicated in the applicable notes to the Presentation, which notes are an important component of the Presentation and the performance information contained herein. IRR performance data may include unrealized portfolio investments; there can be no assurance that such unrealized investments will ultimately achieve a liquidation event at the value assigned by Adams Street Partners or the General Partner of the relevant Investment, as applicable. Any fund-level net IRRs and net multiples presented herein for the 2015 Global Program Funds and all subsequently formed commingled Funds reflect the use of the Fund's capital call credit line (or, in the case of an Adams Street Global Fund, capital call credit lines of the underlying Funds) and are calculated using limited partner capital call dates, rather than the earlier dates on which the investment was made using the line of credit. The use of such dates generally results in higher net IRR and net multiple calculations, and the related differences in net IRR and net multiple figures could be material. The use of leverage has the potential to increase returns for positive investments, but can also result in substantially increased losses or returns on negative investments.

Any target returns are only targets, are aspirational in nature and based on Adams Street's historical experience as an investor; returns have not been modeled for a particular vehicle using assumptions related to returns, expenses or other factors. There is no guarantee that targeted returns will be realized or achieved or that an investment strategy will be successful. Investors should keep in mind that the securities markets are volatile and unpredictable. There are no guarantees that the historical performance of an investment, portfolio, or asset class will have a direct correlation with its future performance.

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Confidentiality Statement and Other Important Considerations

As of February 2023

Any gross performance figures displayed herein should be taken in context with applicable net figures which include the effect of management fees, carried interest and expenses which reduce returns to investors. A full description of the costs of participation in an Investment, including such management fees, carried interest and expenses, is available in the relevant Final Documentation and relevant net figures are also included herein, including a detailed description of Adams Street's calculation methodology with respect to performance that represents a composite or extract which can be found on the pages entitled "Methodology and Assumptions Associated with Calculation of Composites and Extracts".

Past performance is not a guarantee of future results and there can be no guarantee against a loss, including a complete loss, of capital. Projections or forward-looking statements contained in the Presentation are only estimates of future results or events that are based upon assumptions made at the time such projections or statements were developed or made. There can be no assurance that the results set forth in the projections or the events predicted will be attained, and actual results may be significantly different from the projections. Also, general economic factors, which are not predictable, can have a material impact on the reliability of projections or forward-looking statements. Therefore, the returns an investor ultimately realizes will depend on a variety of factors, including but not limited to how the market performs and the length of investment. ***FOR ADDITIONAL IMPORTANT INFORMATION RELATED TO POTENTIAL RISKS ASSOCIATED WITH AN INVESTMENT, PLEASE SEE THE KEY RISK FACTORS PAGES AT THE END OF THIS PRESENTATION.***

References to the Investments and their underlying portfolio companies and to the Funds should not be considered a recommendation or solicitation for any such Investment, portfolio company, or Fund. Any case studies included in this presentation are for illustrative purposes only and have been selected to provide, among other things, examples of investment strategy and/or deal sourcing. These investments do not represent all the investments that may be selected by Adams Street Partners with respect to a particular asset class or a particular Fund or account.

Notes to Private Credit II Program Portfolio Highlights

As of December 2022

1. Deal statistics for Private Credit Fund II. Does not include commitments made to Private Credit portfolio companies by other Adams Street Funds or repayments.
2. Private Credit II refers to the successor fund to Private Credit Fund I and is a flexible mandate fund investing across the capital structure.
3. Weighted Average Unlevered Yield calculated as weighted average of deal level spreads, with weighting based on deal level investment amount. Deal level cash yield calculated based on weighted-average pricing spread, 3-month SOFR of 4.64% as of 01/09/2023, applicable LIBOR or SOFR floors, amortization of upfront fees and OID, and compounding impact. Assumes pre-payment periods as follows: assumes 1st lien is prepaid in 2.5 years, 1st lien unitranche prepaid in 3.25 years, and 2nd lien is prepaid in 4.5 years. There can be no guarantee that the foregoing assumptions will ultimately prove accurate or that the yields set forth above will be realized.
4. Yield only measures income, as an annual percentage rate, and Adams Street considers such performance metric distinct from more comprehensive overall return metrics that take into account current value, ultimate disposition, and other factors that impact total return. Additionally, yield for individual investments is not reflective of the return achieved by the relevant fund; for fund-level performance information on Adams Street's dedicated private credit funds, see the slide titled "Strong, Consistent Performance Across Our Commingled Funds" in this presentation.
5. Preliminary data as of December 31, 2022.
6. Weighted Average Net leverage represents constituent company level leverage, weighted based on deal level investment amount.

Past performance is not a guarantee of future results. There can be no guarantee that performance of other investments will equal or exceed performance of investments identified herein.

Key Risk Factors

Adams Street

This document identifies a number of benefits associated with, or inherent in, Adams Street's services and operations on behalf of a particular investment strategy or a fund; however, it is important to note that all investments come with material risks, some of which may be magnified in a private markets investment, which may pursue highly speculative investments and which have limited liquidity, as further identified in the Fund's definitive documents. Further, although Adams Street believes that the firm and its personnel will have competitive advantages in identifying, diligencing, monitoring, consulting, improving and ultimately selling investments on behalf of vehicles managed by the firm, there can be no guarantee that Adams Street will be able to maintain such advantages over time, outperform third parties or the financial markets generally, or avoid losses.

THE RISK FACTORS LISTED BELOW ARE NOT INTENDED TO BE EXHAUSTIVE; ADDITIONAL IMPORTANT RISKS ASSOCIATED WITH AN INVESTMENT IN A FUND ARE INCLUDED IN THE RELEVANT FINAL DOCUMENTATION.

Past Performance Not Necessarily Predictive of Future Performance: There is no assurance that the performance of any Adams Street-managed fund will equal or exceed the past investment performance of entities managed by Adams Street or its affiliates.

Appropriateness of Investments: An investment in an Adams Street-managed fund is not appropriate for all investors. An investment is appropriate only for sophisticated investors and an investor must have the financial ability to understand and willingness to accept the extent of its exposure to the risks and lack of liquidity inherent in an investment in an Adams Street-managed fund. Investors should consult their professional advisors to assist them in making their own legal, tax, accounting and financial evaluation of the merits and risks of investment in a fund in light of their own circumstances and financial condition. An investment in an Adams Street-managed fund requires a long-term commitment, with no certainty of return. There may be little or no near-term cash flow available to the limited partners. Many of a fund's portfolio investments will be highly illiquid. Consequently, dispositions of such portfolio investments may require a lengthy time period or may result in distributions in kind to the limited partners.

High Risk Asset Class: Private markets investments, whether made directly into portfolio companies or indirectly via investment funds or CLOs, are high-risk and subject to loss, even loss of a part or all of an investor's entire investment.

Illiquidity: An investment will be highly illiquid. There will be no market for interests, investors will have only very limited withdrawal rights for specific legal or regulatory reasons, and any transfer of an interest will be subject to the approval of the general partner of the relevant entity. The interests will not be registered under the US Securities Act of 1933, as amended (the "Securities Act"), or any state or other securities laws and may not be transferred unless registered under applicable federal or state securities laws or unless an exemption from such laws is available. In addition, the direct or indirect portfolio company investments that a fund will make are also generally and similarly illiquid.

Valuations May Fluctuate: The valuations of investments are calculated based upon good faith assessment of the fair value of the assets. Therefore, valuations of investments for which market quotations are not readily available may differ materially from the values that would have resulted if a liquid market for such investments had existed. Even if market quotations are available for any of the investments made pursuant to a fund's strategy, such quotations may not reflect the realizable value. A fund may experience fluctuations in results from period to period due to a number of factors, including changes in the values of the investments made pursuant to a fund's strategy, changes in the frequency and amount of drawdowns on capital commitments, distributions, dividends or interest paid in respect of investments, the degree of competition, the timing of the recognition of realized and unrealized gains or losses and general economic and market conditions (including, but not limited to, the effect of any catastrophic and other force majeure events on the financial markets, the economy overall and/or various industries). As an asset class, private markets have exhibited volatility in returns over different periods and it is likely that this will continue to be the case in the future. Such variability may cause results for a particular period not to be indicative of performance in a future period.

Continued on next page

Key Risk Factors (continued)

Extraordinary Events: Terrorist activities, anti-terrorist efforts, armed conflicts involving the United States, its interests abroad or other countries and natural disasters may adversely affect the United States, other countries, global financial markets and global economies and could prevent a fund from meeting its investment objectives and other obligations. The potential for future terrorist attacks, the national and international response to terrorist attacks, acts of war or hostility and natural disasters have created many economic and political uncertainties in the past and may do so in the future, which may adversely affect certain financial markets and any Adams Street-managed fund(s) for the short or long term in ways that cannot presently be predicted.

Force Majeure Events: Investments may be subject to catastrophic events and other force majeure events. These events could include fires, floods, earthquakes, adverse weather conditions, pandemics, assertion of eminent domain, strikes, acts of war (declared or undeclared), riots, terrorist acts, "acts of God" and similar risks. These events could result in the partial or total loss of an investment or significant down time resulting in lost revenues, among other potentially detrimental effects. Some force majeure risks are generally uninsurable and, in some cases, investment project agreements can be terminated if the force majeure event is so catastrophic that it cannot be remedied within a reasonable time period.

Impact of Borrowings: Borrowing will directly impact (positively or negatively) the returns of an investment in an Adams Street-managed fund and increase the risks associated with an investment in such fund. Calculations of net and gross IRRs in respect of investment and performance data included and/or referred to in performance materials, and with respect to an Adams Street-managed fund, as reported to limited partners from time to time, are based on the payment date of capital contributions received from the applicable limited partner or timing of investment inflows and outflows received or made by the investing entity. In instances where an Adams Street-managed fund utilizes borrowings under a fund's subscription-based credit facility or asset-backed facility (or other facility), use of such facility (or other leverage) may result in a higher reported IRR (on an investment level and/or fund level) than if the facility had not been utilized because such borrowings were used in lieu of capital contributions or in advance of related capital contributions that would only be made at a later date. Use of a subscription-based credit facility (or other long-term leverage) may present conflicts of interest as a result of certain factors and the applicable fund's general partner may make distributions prior to the repayment of outstanding borrowings.

A credit agreement or borrowing facility frequently will contain other terms that restrict the activities of an Adams Street-managed fund and its limited partners or impose additional obligations on them. For example, certain lenders or facilities are expected to impose restrictions on the applicable fund's general partner's ability to consent to the transfer of a limited partner's interest in such fund or impose concentration or other limits on such fund's investments, and/or financial or other covenants, that could affect the implementation of such fund's investment strategy.

As a result of the foregoing and similar factors, use of such leverage arrangements with respect to investments may provide the applicable fund's general partner with an incentive to fund investments through long-term borrowings in lieu of capital contributions. Moreover, the costs and expenses of any such borrowings will generally be borne as costs and expenses of such fund, which will increase the expenses borne by the applicable limited partners and would be expected to diminish net cash on cash returns.

Subject to the limitations set forth in the applicable partnership agreements, Adams Street maintains substantial flexibility in choosing when and how subscription-based credit facilities or other lending facilities are used. Adams Street is authorized to adopt from time to time policies or guidelines relating to the use of such credit facilities. Such policies may include using the credit facilities to systematically defer calling capital from investors (such as seeking to call capital only once a year). In addition to using such facilities to defer capital calls, Adams Street may elect to use short or long-term fund-level financing for investments including (a) for investments that have a longer lead time to generate cash flow or to acquire assets, (b) for platform investments that require capital to fund operating expenses prior to developing sufficient scale to self-fund or generate enterprise value, (c) for investments where cash is retained in the business to fund activity that results in incremental returns for the investment, (d) to make margin payments as necessary under currency hedging arrangements, (e) to fund management fees otherwise payable by investors, (f) for investments with revenues in a foreign currency and (g) when Adams Street otherwise determines that it is in the best interests of the applicable fund.

Continued on next page

Key Risk Factors (continued)

Availability of High-Quality Investment Opportunities: Investors will be dependent on the ability of Adams Street and its affiliates to provide access to high-quality private markets investment opportunities. There is no assurance that such opportunities will be available during the period over which an investor's investment will be allocated to investments or that high-quality investment opportunities will be available at attractive prices. In addition, in the event Adams Street does identify any such opportunities, it should not be assumed that an Adams Street-managed investment vehicle will be allocated a portion of any such opportunity. The application of the factors described herein, and applied under Adams Street's investment allocation policy (the "Investment Allocation Policy"), will result in the exclusion of certain managed entities from an allocation, and the Investment Allocation Policy does not require that a managed entity, including any particular investment vehicle, participate in every entity in which it is eligible to invest.

Competition: Investment vehicles managed by Adams Street will compete for investments with third parties, including other financial managers, investment funds, pension funds, corporations, endowments and foundations, wealthy individuals and family offices, among many others. Investment vehicles, including those managed by Adams Street will compete for limited capacity in such investments. There can be no assurance that Adams Street will be able to locate and complete attractive investments or that the investments which are ultimately made will satisfy all of the relevant objectives.

Compliance with the AIFMD: The European Union Alternative Investment Fund Managers Directive (EU 2011/61/EU) as implemented in each European Union member state and the United Kingdom (together with Commission Delegated Regulation (EU) No 231/2013, as well as any similar or supplementary law, rule or regulation, including any equivalent or similar law, rule or regulation to be implemented in the United Kingdom as a result of its withdrawal from the European Union, or subordinate legislation thereto, as implemented in any relevant jurisdiction, the "AIFMD") applies to (i) alternative investment fund managers (each, an "AIFM") established in the European Economic Area ("EEA") and the UK who manage EEA or non-EEA alternative investment funds (each, an "AIF"), (ii) non-EEA AIFMs who manage EEA or UK AIFs, and (iii) non-EEA AIFMs who market their AIFs within the EEA or the UK. European secondary implementation legislation has been adopted, and individual EEA member states were required to implement the AIFMD into domestic law by July 22, 2013. The AIFMD imposes various operating requirements on EEA and UK AIFMs, and, to a lesser extent, non-EEA AIFMs seeking to market an AIF within the EEA or the UK. As a result of the AIFMD's implementation, Adams Street or its agents may be required to give notice to or seek the approval of regulators in certain countries in connection with the marketing of certain investment vehicles. This may preclude Adams Street from marketing to you further until such notice is given or approval is obtained or otherwise significantly disrupt marketing activity. Compliance by Adams Street with the transparency, reporting and disclosure requirements of the AIFMD will significantly increase the regulatory burden and costs of doing business within the EEA and the UK and this may have an adverse impact on certain investment vehicles and Adams Street. The operating requirements imposed by the AIFMD include, among other things, rules relating to the remuneration of certain personnel, minimum regulatory capital requirements, restrictions on use of leverage, restrictions on early distributions ("asset stripping" rules), disclosure and reporting requirements to both investors and home state regulators, and independent valuation of an AIF's assets. As a result, the AIFMD could have an adverse effect on Adams Street and certain of its investment vehicles by, among other things, imposing extensive disclosure obligations significantly restricting marketing activities within the EEA and the UK, increasing the regulatory burden and costs of doing business in the UK and in EEA member states, and potentially requiring Adams Street to change its compensation structures for key personnel, thereby affecting Adams Street's ability to recruit and retain these personnel. The AIFMD could also limit Adams Street's operating flexibility and an Adams Street-managed fund's investment opportunities, as well as expose Adams Street and/or such fund to conflicting regulatory requirements in the United States (and elsewhere) and the EEA or the UK. The European Council and Parliament are in negotiations to finalize the revisions to the AIFMD and Directive 2009/65/EC. While the final text is yet to be published, there are proposals which, if implemented and applied to Non-EEA AIFMs, could adversely affect Adams Street's ability to market an Adams Street-managed fund in the EEA, could increase the costs associated with the management and operation of such fund as a result of additional disclosure and reporting requirements, and could affect the ability of such fund to conduct its operations, including but not limited to: concentration limits, limits on lending to connected entities, risk retention requirements, and mandated liquidity management mechanisms, to the extent applicable to such fund.

KENTUCKY PUBLIC PENSIONS AUTHORITY

David L. Eager, Executive Director

1260 Louisville Road • Frankfort, Kentucky 40601
kyret.ky.gov • Phone: 502-696-8800 • Fax: 502-696-8822

Kentucky Public Pensions Authority

MEMORANDUM

TO: KRS Board of Trustees

FROM: D'Juan Surratt
Director of Employer Reporting, Compliance and Education (ERCE)

DATE: March 1, 2023

SUBJECT: Employer Audit Update Pursuant to KRS 61.5991 and 105 KAR 1:451E

Purpose

Pursuant to KRS 61.5991 and 105 KAR 1:451E, KPPA's Employer Reporting, Compliance and Education (ERCE) division conducted audits on Judi's Place for Kids and LifeSkills, Inc. The ERCE division had an action item from the KRS Board of Trustees meeting on September 14, 2022, to audit one smaller agency and one larger agency to determine the level of effort and the percentage of agencies to audit going forward.

During the audit process, ERCE was to ensure the agencies were in compliance with reporting and paying contributions on all eligible full-time employees in accordance with KRS 61.510(21). In addition, if employers are utilizing independent contractors or leased employees through a third-party, staffing agency, or other non-participating entity, KPPA must review the contract(s) to ensure these persons are not determined to be an "employee" of that agency.

Requested Information

To conduct the audit, KPPA requested the following information:

1. Listing of all employees and contractors and their social security numbers for the reporting month of June 30, 2022.
    a. This list should include any full-time, part-time, interim, seasonal, temporary, probationary, and emergency employees, as well as volunteer employees who are paid a per diem, regardless of whether the employees are reported to KRS for retirement purposes.
    b. This list should also include all contract employees, independent contractors, and leased employees, whether they are paid by your agency or by a contracted employment agency.
2. A copy of payroll records for the reporting month of June 2022. The payroll records must contain identifying information such as the member's social security number or the KPPA

six-digit member ID.

3. A copy of the agency's most recent Personnel Policy that includes the most current sick leave policy, annual leave policy and probationary policy if offered by the agency.
4. A copy of each contract which has not already been reviewed by KPPA between the employer and any independent contractor/third party, staffing company or other non-participating entity and any other documentation explaining the services provided by each person serving as an independent contractor/third party, staffing company or other non-participating entity. Contracts that otherwise met an exemption under KRS 61.5991 and, accordingly, were not listed on any previously submitted Form 6756s, Annual Employer Certification of Non-Contributing Service Providers, must still be submitted.

Results

While auditing Judi's Place for Kids, KPPA found that four employees were not being reported as regular full-time employees, therefore KPPA requested additional information from the agency. In response, Judi's Place for Kids advised that the four persons were independent contractor positions and submitted the contracts to KPPA for review. After review, KPPA determined the four persons were independent contractors and not employees of Judi's Place for Kids. KPPA also reviewed payroll records to ensure all employees that averaged at least 100 hours per month were reported as regular full-time employees per KRS 61.510(21) and the required contributions have been received on these individuals. KPPA determined that Judi's Place for Kids is in reporting compliance according to Kentucky Revised Statutes and Administrative Regulations and found no issues.

Similar results were found while auditing LifeSkills, Inc. LifeSkills had several persons listed that were not being reported to KPPA as regular full-time employees, however when requested the agency submitted a contract for review. After review of the contract, KPPA determined these persons were independent contractors and not employees of LifeSkills, Inc. Furthermore, KPPA reviewed payroll records to ensure all the employees that averaged at least 100 hours per month were reported as regular full-time employees per KRS 61.510(21) and the required contributions have been received on these individuals. KPPA determined that LifeSkills is in reporting compliance according to Kentucky Revised Statutes and Administrative Regulations and found no issues.

Agency Audited	Judi's Place for Kids	LifeSkills, Inc
Dates Worked On Audit	2/12/2022-12/22/2022	12/27/2022-02/08/2023
Num of Employees June 30, 2022	9	325
Num of Independent Contractors	4	51
Number of Part-Time and Non-Participating Employees	2	51
Reported Salary	$26,142	$1,269,146
Employer Contributions	$2,415	$121,045
Employee Contributions	$1,195	$59,748

Recommendation

ERCE had one employee work full-time on the audits while another employee worked part-time. It took approximately two weeks to complete the audit of the smaller agency and six weeks to complete the audit of the larger agency. It is important to note that both Judi's Place for Kids and LifeSkills, Inc. were commendably cooperative with the audit and were found to be in reporting compliance, therefore we had few follow-up issues or requests. Auditing agencies in which we find evidence of noncompliance will require ERCE to request additional documentation which would extend the time required to complete the audit process. Originally staff recommended auditing 10% of the 102 agencies, however after completing the initial audits, staff recommends auditing a more conservative 5% annually for KRS 61.5991 (2)(a)(2) compliance, with the option to complete more if staff resources allow. The Board would be able to update this number later, if needed.

Recommendation for Board consideration:

Charge ERCE staff with auditing a minimum of five agencies (5% of 102 agencies) annually for KRS 61.5991 (2)(a)(2) compliance.

Milliman Actuarial Audit

Actuarial Audit of the Kentucky State-Administered Retirement Systems As of June 30, 2021

Prepared for: Public Pension Oversight Board

Prepared by:

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February 20, 2023

Senator Jimmy Higdon, Co-Chair
Representative James Tipton, Co-Chair
Public Pension Oversight Board
702 Capitol Avenue, Annex Room 170
Frankfort, KY 40601

Re: Actuarial Audit of June 30, 2021 Actuarial Valuations

Dear Co-Chairs Higdon and Tipton:

We are pleased to present the enclosed report summarizing our findings and recommendations resulting from our independent Level 1 full-scope audit of the actuarial work performed by the System Actuaries for the fiscal year 2021 actuarial valuation and most recent experience study for the following state-administered Kentucky Retirement Systems (KYSRS):

- Kentucky Employees Retirement System (KERS)
  - Includes hazardous (KERSHZ) and non-hazardous plans (KERSNHZ)
- State Police Retirement System (SPRS)
- County Employees Retirement System (CERS)
  - Includes hazardous (CERSHZ) and non-hazardous plans (CERSNHZ)
- Teachers' Retirement System (TRS)
- Judicial Form Retirement System (JFRS)
  - Includes Legislators' Retirement Plan (LRP) and Judicial Retirement Plan (JRP)

As indicated above, for purposes of this report we will use KYSRS to refer to all of the retirement systems listed above and included in this audit, and we will use the abbreviations shown above for each system/plan. We also note that the Kentucky Public Pension Authority (KPPA) administers the KERS, CERS, and SPRS funds on behalf of the KRS and CERS Boards, and the Judicial Form Retirement System (JFRS) oversees the JRP and LRP. We will use these abbreviations throughout this report.

This report presents an executive summary followed by separate sections discussing in detail our findings, analyses and recommendations. While some issues are discussed at greater length than others, this report is intended to provide a complete and independent third party review of each retirement system under KYSRS and its operations from an actuarial perspective. All comments and recommendations are intended to be constructive. Our purpose was to identify areas of possible improvement in the system, its operation and/or the actuarial procedures.

We would like to thank the staffs of the Public Pension Oversight Board (PPOB), Kentucky Public Pension Authority (KPPA), Teachers' Retirement System (TRS), Judicial Form Retirement System (JFRS), as well as the actuaries for each of the retirement systems (GRS, CavMac, and USI, respectively) for their cooperation. Their prompt and courteous responses to our questions and requests for information were of valuable assistance to us and greatly appreciated.

In preparing this report, we relied, without audit, on information (some oral and some in writing) supplied by the staff of each retirement system and each system's actuary. This information includes, but is not limited to, statutory provisions, employee data, and financial information. Since the audit results are dependent on the integrity of the data supplied, the results can be expected to differ if the underlying data is incomplete or missing. It should be noted that if any data or other information is inaccurate or incomplete, our calculations may need to be revised. The audit results were developed using models intended for actuarial valuations that use standard actuarial techniques.

A valuation report is only an estimate of the Plan's financial condition as of a single date. It can neither predict the Plan's future condition nor guarantee future financial soundness. Actuarial valuations do not affect the ultimate cost of Plan benefits, only the timing of Plan contributions. Future actuarial measurements may differ significantly from the current measurements presented in this analysis due to actual plan experience deviating from the economic and demographic assumptions, increases or decreases expected as part of the natural operation of the methodology used for these measurements (such as potential additional contribution requirements due to changes in each System's funded status), and changes in plan provisions, actuarial assumptions, and applicable law. An assessment of the potential range and cost effect of such differences is beyond the scope of this analysis.

Milliman's work product was prepared exclusively for the PPOB for a specific and limited purpose. It is a complex, technical analysis that assumes a high level of knowledge concerning the operations of each retirement system, and the uses of the data provided, which Milliman has not audited. It is not for the use or benefit of any third party for any purpose. Any third party recipient of Milliman's work product who desires professional guidance should not rely upon Milliman's work product, but should engage qualified professionals for advice appropriate to its own specific needs.

The consultants who worked on this assignment are retirement actuaries. Milliman's advice is not intended to be a substitute for qualified legal or accounting counsel.

On the basis of the foregoing, we hereby certify that, to the best of our knowledge and belief, this report is complete and accurate and has been prepared in accordance with generally recognized and accepted actuarial principles and practices which are consistent with the Actuarial Standards of Practice promulgated by the Actuarial Standards Board and the applicable Code of Professional Conduct, amplifying Opinions, and supporting Recommendations of the American Academy of Actuaries.

We are members of the American Academy of Actuaries and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein.

The signing actuaries are independent of the PPOB. We are not aware of any relationship that would impair the objectivity of our work.

We look forward to having the opportunity to present this report and respond to questions regarding our review and recommendations.

Respectfully submitted,

Nick Collier, ASA, EA, MAAA

Aaron Shapiro, FSA, EA, MAAA

Scott Porter, FSA, EA, MAAA

Daniel Wade, FSA, EA, MAAA

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KYSRS Actuarial Audit Report.doc

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Executive Summary and Recommendations

This report summarizes the results of an actuarial review of the state-administered Kentucky Retirement Systems, “KYSRS”. This review covered the most recent experience studies and the June 30, 2021 actuarial valuations for the following retirement systems:

- Kentucky Employees Retirement System (KERS)
  - Includes hazardous (KERSHZ) and non-hazardous plans (KERSNHZ)
- State Police Retirement System (SPRS)
- County Employees Retirement System (CERS)
  - Includes hazardous (CERSHZ) and non-hazardous plans (CERSNHZ)
- Teachers’ Retirement System (TRS)
- Judicial Form Retirement System (JFRS)
  - Includes Legislators’ Retirement Plan (LRP) and Judicial Retirement Plan (JRP)

As indicated above, for purposes of this report we will use KYSRS to refer to all of the retirement systems included in this audit, and we will use the abbreviations shown above for each system/plan. We also note that the Kentucky Public Pension Authority (KPPA) administers the KERS, CERS, and SPRS funds on behalf of the KRS and CERS Boards and we will use this abbreviation when discussing these three systems in tandem throughout this report.

The actuaries for each of the systems are Gabriel, Roeder, Smith & Company (“GRS”) for KPPA, Cavanaugh Macdonald Consulting, LLC (“CavMac”) for TRS and Findley, A Division of USI (“USI”) for JFRS.

The purpose of this report is to provide the results of our Level 1 full-scope audit of the actuarial work performed by the System Actuaries for each of the retirement systems noted above. This audit includes a full replication of the June 30, 2021 actuarial valuations and specifically includes a review of:

- the reasonableness and accuracy of the fiscal year 2021 actuarial valuations, most recent experience studies, and employer contribution rate recommendations
- the data, assumptions and methods for appropriateness, internal consistency, and compliance with actuarial standards of practice
- the reasonableness and accuracy of the actuary’s calculation and assignment of the prorated dollar amount of the actuarially accrued liability contribution for each of the non-hazardous employers in KERS, as required under Kentucky Revised Statute.

Overall Assessment

Our overall assessment as a result of our review of the actuarial work for KYSRS is that all major actuarial functions are being appropriately addressed across all retirement systems. The actuaries (GRS, CavMac and USI) have employed generally accepted actuarial practices and principles in studying plan experience, selecting assumptions, determining liabilities and employer contribution rates, and presenting the results of their work.

Review of Another Actuary's Work

In systems as large and complex as those in KYSRS, there are many operational aspects that have a bearing on the actuarial analysis of the plans. The reader should recognize that many of the issues that we reviewed and which we will discuss in this report are subject to opinion and professional preference. No two actuaries (or actuarial firms) are likely to use precisely the same methods and assumptions (and, therefore, arrive at precisely the same conclusions) when presented with the exact same problem and set of historical facts. Notably, our review included an actuarial audit of the actuarial work performed by three different actuarial firms. In completing our review, we have attempted to focus on those aspects of the systems and its actuarial functions that could be meaningfully improved or where an alternative approach might be beneficial. In presenting our findings in this report, we have tried to limit discussion of aspects which reflect our professional preferences but which would have minimal effect on the results and conclusions presented by the actuaries.

By its nature, a review of another professional's work product will tend to focus on those aspects where the reviewer believes some modification in current procedures would be desirable. Hence, a report such as this will devote the majority of the presentation to commentary that, even though intended to be constructive, may give the reader the impression that only problems were found. ***Therefore, we would like to state clearly up front that we found the actuarial procedures and practices to be of a high quality and in compliance with all major aspects of the applicable actuarial standards.*** While we will discuss several areas where we believe some modifications in current data collection procedures, valuation procedures, actuarial assumptions or methods would be beneficial, that discussion should be considered within the context of an overall favorable report concerning the work performed by GRS, CavMac, and USI.

Actuarial Valuation Model

KYSRS is a complex set of five retirement systems, consisting of eight pension programs, with varying contribution rates, accrual rates, retirement eligibility provisions, early retirement reductions, actuarial equivalent factors, and optional forms of benefits that members may elect upon retirement. Furthermore, there are separate models for retirement benefits and insurance benefits.

It is important to note that an actuarial valuation is based on a model that estimates benefits expected to be paid in the future. The determination of the liabilities and contributions is then based on those projections. During this modeling, some estimates or approximations may be made by the actuary due to immateriality, inadequate data, or complexity. The use of such estimates or approximations is generally accepted within the actuarial profession.

A purpose of this audit is to review the valuation model to determine if the results are reasonable and that the assumptions, estimates and approximations are appropriate. We recommend consideration of certain changes in the model that will, in our opinion, improve the "accuracy" of the model. However, overall, we believe that the June 30, 2021 actuarial valuation reports are reasonable and appropriate for the intended uses of those reports.

Audit Conclusions

Set forth below is a summary of the conclusions of the audit split into the various components considered in our review. In each subsection, we have provided commentary including any recommended changes we have or items that we suggest should be considered in the future.

The following are our most significant suggestions and comments along with the page number reference to the discussion in the executive summary:

1. This audit includes a level 1 actuarial audit where we performed a parallel valuation. As our results do not deviate significantly from those calculated in the valuations, Milliman's audit provides a high level of assurance that the results of the valuation reasonably reflect the aggregate liabilities of each system based on the assumptions and methods. Please refer to page 17.

2. We recommend consideration be given to promoting a consistent framework in setting certain assumptions to be used in the upcoming actuarial valuations across the systems. Assumptions suggested for consideration include the inflation assumption, investment return assumption, hybrid interest crediting assumption, mortality improvement assumption and healthcare trend and aging factors for valuing pre-65 health benefits provided by the KEHP. Please refer to page 11.

   We received feedback from KPPA on this recommendation:

   "The funded statuses, risk tolerances, liquidity needs, member and retiree demographics, and asset allocations vary by system. Therefore, the assumptions need to be unique to each system."

   We received feedback from TRS on this recommendation:

   "TRS takes exception to the report's broad recommendation for uniform actuarial assumptions across all Kentucky plans. The recommendation is inconsistent with the norm throughout the nation and many of the report's other determinations,

particularly the findings on the accuracy of TRS's valuation results and methodologies. Teachers, who are Kentucky's only large group of participants in state retirement plans not in Social Security, have myriad differences from other state workers. This includes demographics – 70% of TRS's membership is female with longer life expectancies compared to the general workforce. Asset allocations are an outgrowth of those demographics. Additionally, the circumstances and design of each retirement plan – including funded ratio, risk tolerance, investment returns and asset allocation – makes tailored assumptions the norm. A one-size fits all approach would appear to increase risk for Kentucky taxpayers, including the annuitants of TRS.

To clarify, we are suggesting a similar framework be applied to each group reflecting their unique characteristics that will most likely result in different assumptions selected among the systems. For example, inflation is a key assumption that currently differs for all three systems although each system is subject to the same economic environment producing the inflation.

We do note the complexity of attempting to establish such a framework that would be beneficial to all parties.

3. We recommend a modification to how the assumed interest crediting rate is set for the hybrid plan to reflect the impact of the 4% minimum on expected credits. Based on our estimates, this could result in an increase in the assumed interest crediting rate by as much as 1.5%. Please refer to pages 12 - 14.

   We received feedback from KPPA on this recommendation:

   "GRS will review the hybrid interest crediting rate assumption while they perform the next experience study. They agree that the 4% minimum interest crediting rate could result in an interest crediting rate that is higher than an annual return. However, since the interest crediting rate is based on a five-year average of the System's annual return, they believe this difference will be muted."

   We note that our analysis reflected the five-year averaging period for determining the interest crediting rate and look forward to seeing the analysis completed by each of the actuaries.

4. We suggest that consideration be given to reducing the inflation assumption and investment return assumption for JFRS. Please refer to page 12.

5. We suggest a review of the impact that the 3-High provision has on SPRS benefit amounts at retirement to determine if a load should be added to the actuarial valuation to account for this provision. Please refer to pages 6.

6. During our review and in discussion with the actuary for KPPA, there was one item that was not valued accurately in the 2021 valuations: non-hazardous benefits for retiree records with both hazardous and non-hazardous portions were excluded from KERS and CERS non-hazardous valuations. We believe this item had less than a 2% impact on the plans' liabilities and was corrected in the recently released 2022 valuations. Please refer to page 5.

7. During our review and in discussion with the actuary for JFRS, there was one item that was not valued accurately in the 2021 valuations: a mortality table was incorrectly applied in the JFRS valuations. We believe this item had less than a 2% impact and was corrected in the recently released 2022 valuations. Please refer to page 18.

Our comments should be viewed in the context of an overall favorable review of the actuarial work.

Section I – Data Validity

We performed tests on both the raw data supplied by the staffs of each system and the processed data used by each actuary in the actuarial valuations. As part of our review, we reviewed eighty-six (86) individual benefit calculations across all of the systems reflecting members who retired in the year before or year after the valuation date allowing us to review the raw data for consistency with information used in the actual benefit calculation. Based on this review, we feel the individual member data used is appropriate and complete, but offer the following comments based on our review. Please refer to the subsection below as well as *Section I – Data Validity* of this audit report for more details.

<u>KPPA</u>

Our comments on the review of KPPA data are as follows:

- **Non-Hazardous Retiree Benefits:** The retiree benefits reported in the actuarial valuation reports for KERS and CERS non-hazardous retirees excluded the non-hazardous portion if the retiree record had both a hazardous and non-hazardous benefit. It is our understanding that this issue was corrected in the 2022 valuation.

- **Hazardous Portion - Actives**: For active members with both hazardous and non-hazardous service, GRS includes the entire liability in the plan where the member is currently accruing service. Upon retirement, the liability is then allocated to each plan. We recommend that GRS and KPPA discuss this situation to determine if a prorated portion of the liability should be allocated to each plan while the employee is an active member.

- **Hazardous Portion - Retirees**: For retiree records with both a hazardous benefit and non-hazardous benefit, KPPA provides the percentage associated with each portion, but the percentage is based on accrued service rather than the actual benefit. We suggest KPPA review the possibility of providing the actual benefit accrued in each plan on the data.

- **Final Compensation:** In our review of the final average compensation used in the benefit calculations, we noticed that Tier 1 members may time their retirement to maximize the impact of compensation earned in their last fiscal year of employment on their retirement benefit amount. This appeared to have the impact of increasing a member's final average compensation over that projected using the salary data provided for the actuarial valuation. We believe it would have a greater impact on members subject to the 3-High provision than the 5-High provision, and it seemed to have the greatest impact on SPRS. For six SPRS calculations we reviewed, we estimate the approximate increase in the final average compensation ranged from 3% to 13%. We recommend a review be completed by GRS and KPPA to determine if a load should be incorporated into the actuarial valuations.

TRS

Our comments on the review of TRS data are as follows:

- **Reciprocity with KPPA**: Reciprocity service with KPPA can impact the applicable benefit multiplier and the compensation used in the development of the final average compensation. In our review of the benefit calculations, we found three of the seven records reviewed contained reciprocity service. We suggest that CavMac and TRS review the prevalence of members with KPPA reciprocity service to determine if an assumption should be incorporated into the actuarial valuation.

- **Popup Percentage:** For retirees that elect a joint and survivor annuity, the member's benefit increases or "pops up" if the beneficiary pre-deceases them. CavMac estimates the amount of the popup, but we suggest that TRS provide the single life annuity amount on the data if possible.

JFRS

Our comments on the review of JFRS data are as follows:

- **Contribution Account Balance**: We recommend that JFRS provide member contribution account balances for retirees such that it can be valued as a potential death benefit for unmarried members.

- **Benefit information Reported in Actuarial Valuation:** We recommend USI review the benefits reported in the valuation as we believe that benefits noted for LRP retirees and traditional plan terminated vested members were twice the amount included in the valuation and that the cash balance account for hybrid members was treated as if it was an annual benefit paid to traditional plan members. We believe this only impacts the reporting of benefits in the valuation report and that the benefits were correctly valued in the valuation.

Section II – Actuarial Valuation Methods and Procedures

In this section, we provide our comments on our review of the various actuarial valuation methods and procedures used in determining the contribution rates. Our review consisted of compliance with actuarial standards of practice and guidance within the actuarial community, specifically a white paper titled *Actuarial Funding Policies and Practices for Public Pension Plans* issued by the Conference of Consulting Actuaries.

Actuarial Value of Assets

We have reviewed the calculations of the funding value of assets used in the June 30, 2021 actuarial valuations. We found the calculations to be accurate and the methodology to be appropriate and in compliance with actuarial standards of practice.

Actuarial Cost Method

We have reviewed the version of the Entry Age Normal cost method employed by each of the actuarial firms and have found the methodology to be appropriate and in compliance with actuarial standards of practice.

Funding Policy

A system's funding policy sets the parameters for the actuary to determine the actuarially determined contribution rate. One of the primary features of a funding policy is how the unfunded actuarial accrued liability, if any, is paid down over time. Employer contribution requirements are established in Kentucky Revised Statute for each of the systems plus TRS incorporates a Board funding policy that produces an additional rate to be contributed.

<u>KPPA</u>

Our comments on the review of the policies in place for KPPA are as follows:

- **Amortization Period:** Beginning with the 2021 fiscal year, the amortization period in the funding policy was updated to the following:
    - Use of a 30-year closed period to amortize the unfunded liability as of June 30, 2019.
    - Use of a 20-year closed period to amortize new sources of unfunded liability (consisting of benefit changes, assumption and method changes, and experience gains and/or losses that occur since the prior valuation).

We suggest consideration be given to establishing a minimum total amortization payment calculated based on the current unfunded liability and the greater of the remaining fresh start amortization period and 20 years. This would prevent subsequent actuarial gains from lengthening the effective amortization period in any one actuarial valuation. In addition, we recommend that GRS note the effective amortization period and specify the adjustments made in determining the new amortization layer for the year.

- **HB 8 Allocation:** HB 8 modified how the unfunded liability portion of the contribution rate is allocated to KERS Non-Hazardous employers from a percent of payroll to their portion of the actuarial accrued liability as of July 1, 2019 to help prevent employers from reducing their future contribution towards the unfunded liability through payroll reductions. We confirmed the calculations used by GRS and note the following items:

    - For the issue noted above regarding retiree records who are receiving both non-hazardous and hazardous benefits that the non-hazardous benefits were not being valued, we estimated that this increased KERS non-hazardous liabilities by approximately 1.8%. This may impact some employers more than others such that it would increase their allocation. Determining any adjustment to the allocation percentage is outside the scope of this audit.

    - Due to a different projected payroll used for insurance benefits, the dollar amount of the allocated amortization was higher than the amount noted in the valuation report by approximately $801,000. GRS notes that the difference in payroll is due to members receiving pension benefits from multiple systems but would only receive insurance from one system. However, the insurance unfunded liability contribution rate was applied to the projected payroll for retirement benefits causing the slight difference.

<u>TRS</u>

Our comments on the review of the policies in place for TRS are as follows:

- **Amortization Period:** Established by Board policy, beginning with the 2014 fiscal year, the amortization period in the funding policy was updated to the following:

    - Use of a 30-year closed period to amortize the unfunded liability as of June 30, 2014.
    - Use of a 20-year closed period to amortize new sources of unfunded liability (consisting of benefit changes, assumption and method changes, and experience gains and/or losses that occur since the prior valuation).

As of the June 30, 2021 valuation, the remaining amortization period on the 2014 fresh start base is 23 years, which is in line with actuarial guidance (CCA White Paper model practices for transition periods) where the contribution rates are calculated on an actuarial basis. In the 2021 valuation, the amortization payment is slightly less than interest on the unfunded liability meaning that negative amortization continues to occur. Although, we would expect that any negative amortization would not occur for much longer, assuming the full actuarially determined contribution rate is made.

- **Special Appropriation:** Since the Board policy produces contribution rates in excess of the statutory employer rates, CavMac determines an additional employer contribution rate. This additional rate was reduced by a special 2.38% of payroll appropriation made by the State. In our opinion, it was not clear in the valuation report that this rate was intended to be fully offset against the employer contribution, as opposed to accelerating a reduction in the unfunded liability. TRS confirmed that CavMac's treatment of this additional special appropriation was applied in accordance with the Board's policy. We suggest clarification be added to the valuation report.

- **Additional Employer Contribution Rate:** Per TRS Board Policy, employers are not currently contributing the full additional contribution rate of 23.05%. The amount in excess of 14.48% of payroll is being phased-in over a 5-year period. We suggest that the report incorporate more information regarding the phase-in and note the full actuarially determined contribution rate in accordance with the Board policy. We also recommend that CavMac comment on the impact on future contribution rates of phasing in this impact, in accordance with revised actuarial standards of practice that will become effective in 2023.

JFRS

Our comments on the review of the policies in place for JFRS are as follows:

- **Amortization Period:** While this audit focuses on the 2021 actuarial valuation, beginning with the 2023 fiscal year, the amortization period in the funding policy will be updated to the following:

    - Use of a 20-year closed period to amortize the unfunded liability as of June 30, 2023.
    - Use of a 20-year closed period to amortize new sources of unfunded liability (consisting of benefit changes, assumption and method changes, and experience gains and/or losses that occur since the prior valuation).

    The use of a 20-year amortization period replaced the prior amortization methodology which equaled interest plus 1% of the unfunded liability or 7.5% of the unfunded liability in total. The prior funding policy effectively resulted in an open amortization period of 27 years. We believe the changes to the amortization period to 20 years for unfunded liabilities are consistent with model practices contained in the CCA White Paper.

- **Biennium Valuations:** A funding valuation is performed every other year to establish the contribution requirements for the following two fiscal years. To determine these subsequent contribution requirements, USI increases the required contribution with interest by one year to account for the lag and then by two years. As this method does not take into account changes in the normal cost from the traditional tier to the hybrid tier, we suggest that USI consider performing a one-year projection of the normal cost in determining the contribution amount for the second year.

Section III – Actuarial Assumptions

We have reviewed the actuarial assumptions used in the June 30, 2021 valuations for retirement and insurance benefits for each of the systems as recommended in the following three experience studies:

- For KPPA, GRS 2018 Actuarial Experience Study for the period ending June 30, 2018 dated April 18, 2019.

- For TRS, CavMac 2020 Experience Investigation prepared as of June 30, 2020 dated September 28, 2021.

- For JFRS, USI 2020 Pension Plan Experience Study dated October 23, 2020.

We found the assumptions to be in compliance with actuarial standards of practice. Although we generally agreed with the appropriateness of these assumptions, we believe that the hybrid interest crediting rate assumption should be studied, with strong consideration for increasing the assumption.

In some instances, we suggest additional disclosure for the assumption be noted in the experience study and/or valuation report. For these comments, please refer to *Section IV – Actuarial Valuation Report*.

<u>Consistency in Certain Key Actuarial Assumptions</u>

Below we provide a summary of our comments specific to each system on the actuarial assumptions used, but in this section, we recommend consideration be given to promoting a consistent framework in setting certain assumptions to be used in the upcoming actuarial valuations to promote consistency across the systems. These assumptions would consist of:

- Inflation assumption
- Investment return assumption
- Interest crediting assumption for the Hybrid plan
- Mortality improvement assumption
- Healthcare trend rates and aging factors for pre-65 insurance benefits provided through the Kentucky Employees' Health Plan (KEHP)

While we believe each individual actuary and system have made decisions that are reasonable and in conformance with actuarial standards, there are differences among the systems that when compared to each other, and viewed in aggregate, may not necessarily be consistent from a broader Kentucky perspective. We identified the above assumptions that would make sense to us to have a consistent assumption applied.

While there are states that are similar to Kentucky where the assumptions for each plan are established independently, there are also states that set certain assumptions consistently across systems or plans.

- Minnesota's Legislative Commission on Pensions and Retirement was established to study pension and retirement topics, to make recommendations furthering sound pension policy for the State's public pension plans and to arrange for review and replication of the annual actuarial work, including the experience studies. All experience studies are conducted in the same year across the systems.

- Florida sets assumptions and methods each year at its annual Assumption Conference. However, the Florida Retirement System is a single system that contains seven membership classes.

- State of Washington has a Pension Funding Council that sets assumptions and methods for all but one of the retirements systems based on recommendations by the Office of the State Actuary. The law enforcement officers and firefighters (LEOFF) Plan 2 Board sets the assumptions for that plan.

The following provides further discussion on these assumptions:

- **Inflation and Investment Return Assumption:** We performed an independent analysis using Milliman capital market assumptions as of June 30, 2021. Please note that our analysis is used to determine the reasonableness of the current assumptions. Our analysis shows the following:

  - For KERS Non-Hazardous and SPRS retirement, our analysis shows an expected median real return of 2.8%, which is slightly lower than the current assumption of 2.95%. We based our analysis on 10-year expected returns due to the current funded status of these plans.

- For KERS Hazardous and all KERS insurance plans, our analysis shows a 20-year expected median real return of 4.15%, which is a bit higher than the current assumption of 3.95%.
- For CERS retirement and insurance plans, our analysis shows a 20-year expected median real return of 4.05%, which is a bit higher than the current assumption of 3.95%.
- For TRS, our analysis shows a 30-year expected median real return of 4.3%, which is very similar to the TRS' investment consultant's analysis of 4.4%, which is a bit lower than the current assumption of 4.6%.
- For JFRS, our analysis shows a 30-year expected median real return of 3.15%, which is a bit lower than the current assumption of 3.5%.

Our analysis focused on the assumption in relation to the time of the experience study and used in the June 30, 2021 valuation. However, driven by increasing fixed income yields and lower price-to-earnings ratios, capital market assumptions have increased significantly as of June 30, 2022, as compared to a year ago. Based on Milliman's capital market assumptions as of June 30, 2022, the 20-year long-term expected returns for the systems increased by approximately 60 basis points (0.6%) from Milliman's 2021 20-year expected return.

We estimate that reflecting the June 30, 2022 economic environment would increase the expected returns above the current assumptions of 5.25% and 6.25% used for KPPA and to slightly above the current 7.1% assumption for TRS. Therefore, we suggest no changes to the assumptions at this time for KPPA or TRS.

For JFRS, our analysis suggests that a reduction in the investment return assumption and the inflation assumption should be considered. The inflation assumption used for JFRS is 3% whereas it is 2.3% for KPPA and 2.5% for TRS. Milliman's capital market assumptions would suggest a long-term inflation assumption in the range of 2.3% - 2.5%.

- **Hybrid Interest Crediting Rate Assumption:** The hybrid cash balance accounts are credited with interest equal to a minimum of 4% plus an amount equal to 75% of the average geometric return over the past five years in excess of 4%. If the geometric return over the past five years is less than 4%, the accounts are credited with 4%. Each actuary is setting the interest crediting assuming that the excess return equals the investment return assumption less 4%. The investment return assumptions are based on a distribution of returns that typically reflect a 50% chance of achieving that return or higher. Without any minimum interest crediting rate, this chance would be offset by the 50% chance that returns are below the expected return. However, for the interest crediting rate, the low end of the distribution of possible outcomes is limited due to the application of the 4% minimum interest crediting rate. This results in a greater chance the average interest crediting rate would exceed an assumption strictly based on the investment return assumption, even if the long-term investment return assumption is achieved. Not reflecting the value of the minimum interest credit risks understating the measured liabilities.

We performed two independent analyses, a historical and a forward-looking analysis, to estimate the average interest crediting rate. We based our analysis on long-term 30-year returns as the hybrid account only applies to members recently hired and thus average returns would reflect a longer time horizon for these particular members. The following table shows the results of our analysis.

Hybrid Plan Assumed Interest Crediting Rate			
	KERS NHz / SPRS	KERS Hz / CERS	JFRS
75% of Assumed Excess Return over 4%	0.9375%	1.6875%	1.875%
Historical Analysis of 75% of Excess Return over 4%	1.5%	2.9%	2.8%
Forward Looking Analysis of 75% of Excess Return over 4%	2.4%	3.0%	2.3%
Assumed Interest Crediting Rate used in Valuation	4.9375%	5.6875%	5.875%
Assumed Interest Crediting Rate based on Historical Analysis	5.5%	6.9%	6.8%
Assumed Interest Crediting Rate based on Forward Looking Analysis	6.4%	7%	6.3%

We recommend that KPPA and JFRS complete a similar analysis on the interest crediting rate to determine an applicable assumption that should be used and be reflected in the next valuation. We believe this could have a material impact on the liabilities for the hybrid plan.

- **Mortality Improvement:** Each of the actuaries use different methods for projecting mortality improvement.
  - For KPPA, GRS uses the Society of Actuaries (SOA) MP-2014 ultimate table and does not use the 15-year select table produced by the SOA.

 - For TRS, CavMac uses 75% of the SOA MP-2020 scale, including the select and ultimate scales.
 - For JFRS, USI uses 100% of the SOA MP-2020 scale, including the select and ultimate scales.

 While we find each assumption selected reasonable for each system, they are different from each other in how they forecast mortality improvement. Since these are all employees of the Commonwealth of Kentucky, and its municipalities and other governmental agencies, we would not expect rates of mortality improvement to differ for each group. Therefore, we recommend a consistent assumption be applied.

- **Healthcare trend rates and aging factors:** Each of the actuaries use different models and methods for developing healthcare trend rates and whether aging factors should apply or not apply in valuing projected premiums to be paid by the systems. We performed an independent analysis using the Getzen model developed by the SOA. Based on our review, liabilities may be lower or higher depending on the system or whether it is for benefits provided prior to or subsequent to becoming eligible for Medicare. While Milliman would utilize different trend factors than the System Actuaries did, we believe the assumptions selected by the System Actuaries are reasonable and in compliance with actuarial standards.

 We do recommend that a consistent trend model, such as the Getzen model, be used to set the healthcare trend assumptions for all the plans. We would anticipate the same trend be used for the pre-Medicare benefits across the systems as early retirees all participate in KEHP and thus, projected increases in healthcare costs should be the same. We believe this same philosophy would apply to whether to use aging factors or not for pre-65 benefits.

KPPA

The following represent additional comments related specifically to the plans administered by KPPA:

- **Mortality:** GRS constructed their own tables based on KPPA experience for post-retirement healthy mortality experience for all plans combined rather than basing it on recent tables published by the SOA, specifically the Pub-2010 tables. We offer the following comments:

 - Since the liabilities and costs for each plan under KPPA are developed independently, we are unsure why this one particular assumption comprises of all groups rather than the demographics of each specific group. We suggest that KPPA determine if this assumption should be determined separately or in a combined fashion. We suggest combining KERS and

CERS non-hazardous members together and the KERS and CERS hazardous plus SPRS together.

- Recent analysis by the SOA has indicated that the mortality experience among contingent survivors is higher than retirees or spouses of alive retirees. The experience for contingent beneficiaries was included in GRS' analysis of the postretirement mortality assumption. We suggest that this experience be studied separately in the next experience study.

- For insurance benefits, we suggest that the mortality table used be weighted based on count whereas for retirement benefits, it would be weighted based on amount.

- **Retirement Rates:** In the next experience study, we suggest that GRS review rates of retirement by tier within each group and clarify any adjustments made to rates based on the experience study data, and provide appropriate justification and rationale for the assumptions.

- **Disability Rates:** In the next experience study, we suggest that certain situations be excluded in the development of the rates of disability and in their application within the valuation model, such as:

  - Members with less than 5 years of service who are not eligible for disability benefits.

  - Members who have accrued a certain number of years of service, such as 27 years for Tier 1 non-hazardous or 20 years for Tier 1 SPRS, a disability benefit would not be payable, and the retirement benefit would be payable.

TRS

The following represent additional comments related specifically to TRS:

- **Mortality:** CavMac used the PubT-2010 tables for teachers, with customization to TRS retiree experience. We offer the following comments:

  - We suggest that a healthy post-retirement mortality table be used for beneficiaries while the retiree is alive and use the contingent mortality table only upon death of the retiree.

  - For insurance benefits, we suggest that the headcount-weighted versions of the mortality table be used.

- **Withdrawal Rates:** We suggest consideration be given to whether the rates should vary by each year of service so that there are no significant jumps in the assumption from one service grouping to the next.

- **Retirement:** We suggest the following considerations for the next experience study:

  - Potentially reflecting the impact service may have on rates of retirement, especially since the different benefit percentages apply at different service levels.
  - Establishing separate rates of retirement for members hired on or after July 1, 2008 to account for differences in retirement eligibility and benefit. A similar adjustment may be needed for a new tier of benefits for employees hired on or after January 1, 2022.

JFRS

The following represent additional comments related specifically to JFRS:

- **Salary Increase Assumption:** The salary increase assumption stated in the valuation report was 1% for three years and 3.5% thereafter. USI did not note the specific years the 1% assumption would apply to. We found that it applied to four years from the valuation date plus it was applied retroactively for purposes of determining benefits under the Entry Age Normal cost method. We suggest more clarity be provided in the use of this assumption.

- **Non-Legislative Salary Load for LRP:** USI loads the liability associated with active and inactive members by 40% to account for the expected liability associated with the possibility of significantly higher benefits provided by LRP due to salaries earned with other state employment. While we believe the analysis and subsequent recommendation completed by USI is reasonable, a load of 40% has a material impact on the valuation, so additional review may be appropriate. If available, we suggest JFRS submit to KPPA and TRS a list of current terminated members who have not commenced to receive updated salary information. This information could then be provided to the actuary and an estimated benefit for specific members could be incorporated into the valuation.

- **Insurance Valuation:** USI performs the insurance valuation on a contract basis, meaning that the coverage is valued over the retiree's lifetime and does not consider the dependent's independent lifetime. The cost of the coverage does include the value of dependent coverage if one is currently covered or assumed to be covered in the future. While actuarial standards do not require the actuary to value coverage on an individual basis versus a contract basis, we do find it unusual to use a contract basis and recommend that USI consider modifying its approach to an individual basis.

Section IV – Actuarial Valuation Report

In this section, we provide commentary on the applicable actuarial standards of practice as well as the summary of plan provisions and actuarial assumptions contained in the reports. While we note some items for improvement or additional disclosure, we find that the System Actuaries are meeting the applicable actuarial standards.

Section V – Parallel Valuations

Based on the data and actuarial assumptions provided by each actuary, we were able to successfully replicate the retirement and insurance valuations as of June 30, 2021 for each of the systems and plans. Although actuaries are well versed in the standard actuarial cost methods available, there are differences in interpretation and implementation from firm to firm such that no two actuarial valuation software programs perform calculations exactly the same way. Even if the firms use the same actuarial software, differences in programming and techniques can also result in differences. As shown below, the results of our parallel valuation for each system are similar. Overall, the values produced by the System Actuaries are reasonable and comply with relevant actuarial standards.

The following comments represent comments regarding the benefits valued and our parallel valuation.

<u>KPPA</u>

- **Non-Hazardous Retiree Benefits:** The retiree benefits reported in the actuarial valuation reports for KERS and CERS non-hazardous retirees excluded benefits payable to certain retiree records. These retiree records had both a hazardous and non-hazardous benefit, but only the hazardous benefit was included in the hazardous valuations. We estimated that correcting this issue would increase the liability for KERS Non-Hazardous and CERS Non-Hazardous by 1.8% and 1.4%, respectively. It is our understanding that this issue was corrected in the 2022 valuation.

- **Accumulated Contributions:** For members who elect the maximum single life annuity, a beneficiary may be entitled to a death benefit equal to the accumulated contribution balance less the amount of payments received in retirement. Based on the information in the KPPA data, we estimated that the average period for which a death benefit would be applicable ranged from 32 months to 36 months (from 2.7 years to 3 years) for members who retired during the past year by dividing the balance at retirement by the applicable retirement benefit for CERS, KERS and SPRS. We suggest that GRS incorporate an assumption for this provision.

TRS

- **Accumulated Contributions:** For members who elect the maximum single life annuity, a beneficiary may be entitled to a death benefit equal to the accumulated contribution balance less the amount of payments received in retirement. Based on the information in the TRS data, we estimated that the average period for which a death benefit would be applicable is 49 months (4.1 years) by dividing the balance at retirement by the applicable retirement benefit. We suggest that CavMac incorporate an assumption for this provision.

JFRS

- **Mortality Table Application:** In performing the audit, USI indicated that they incorrectly applied a mortality table in developing the liabilities for the traditional plan. USI stated the impact on the actuarial accrued liability for the traditional plan for JRP and LRP was an overstatement of 1.557% and 1.75%, respectively. It is our understanding that this issue was corrected in the 2022 GASB valuation.

- **Excluded Members from Insurance Valuation:** In performing the audit, USI indicated that 5 inactive members and 1 retiree were excluded from the LRP valuation that should have been included.

- **Accumulated Contributions:** For members who elect the maximum single life annuity, a beneficiary may be entitled to a death benefit equal to the accumulated contribution balance less the amount of payments received in retirement. We suggest that USI incorporate an assumption for this provision.

Section I – Data Validity

Background

The member data used by the actuary is one of the basic foundations of an actuarial valuation. It forms the basis for actuarially projecting the benefits provided to members by the various systems of KYSRS. Thus, an important step in an actuarial audit is reviewing the validity of the member data.

As part of our review process, we performed independent edits on the raw data and then compared our results with the valuation data used by each system's actuary. We found our results to be consistent. Our results did not match exactly in some cases; however, this is understandable since the retained actuary typically has more extensive data-editing procedures. Overall, each key data component matched within an acceptable level, and we believe the individual member data used by each system's actuary was appropriate for valuation purposes.

Valuation Data Review

A summary of the data in aggregate is shown in the following exhibits. Note that the various statistics displayed in the following exhibits may not be consistent between systems as the statistics displayed align with the information as shown in the respective valuation reports prepared by the different actuarial firms.

We have the following comments:

- Retiree benefits for KERS and CERS retirees do not match the values included in the valuation report as the numbers reported exclude the non-hazardous portion of benefits for retirees who are receiving benefits where a portion is due to hazardous service and a portion is due to non-hazardous service. The non-hazardous portion of the benefits for these members were excluded from the valuation. Please refer to our discussion in Section V for the impact on the valuation liabilities.

- For LRP, the benefits reported in the valuation for retirees and traditional terminated vested members are twice the amount included in the valuation. We believe this is only a reporting issue and the correct benefit was valued in determining plan liabilities.

- For LRP and JRP, the cash balance account for vested members is included with the benefits for traditional plan members as if both benefits were paid annually. This impacts the average benefits reported for vested members. We suggest that these members be separated for purposes of reporting data statistics.

Comparison of June 30, 2021 Membership Data
KERS

	GRS	Milliman's Review of Valuation Data	Ratio of Milliman /GRS
Total retirees			
Number	52,426	52,426	100.00%
Total annual benefits ($1,000's)	$1,043,237	$1,068,511	102.42%
Average annual benefit	$19,899	$20,381	102.42%
Average age	69.5	69.5	100.00%
Service retirees			
Number	44,907	44,907	100.00%
Total annual benefits ($1,000's)	$935,283	$957,135	102.34%
Average annual benefit	$20,827	$21,314	102.34%
Average age	69.6	69.6	100.00%
Disabled retirees			
Number	1,931	1,931	100.00%
Total annual benefits ($1,000's)	$25,043	$25,616	102.29%
Average annual benefit	$12,969	$13,266	102.29%
Average age	66.0	66.0	100.00%
Beneficiaries			
Number	5,588	5,588	100.00%
Total annual benefits ($1,000's)	$82,911	$85,760	103.44%
Average annual benefit	$14,837	$15,347	103.44%
Average age	70.1	70.1	100.00%
Active members			
Total number	34,013	34,013	100.00%
Average age	45.4	45.4	100.00%
Average service	11.2	11.2	100.00%
Total salary ($1,000's)	$1,512,165	$1,512,165	100.00%
Average salary	$44,458	$44,458	100.00%
Vested inactive members			
Number	33,853	33,853	100.00%
Total annual benefits ($1,000's)	$93,181	$93,182	100.00%
Average annual deferred benefit	$2,753	$2,753	100.00%
Nonvested inactive members			
Number	28,349	28,349	100.00%

Comparison of June 30, 2021 Membership Data
CERS

	GRS	Milliman's Review of Valuation Data	Ratio of Milliman /GRS
Total retirees			
Number	78,064	78,064	100.00%
Total annual benefits ($1,000's)	$1,080,438	$1,108,669	102.61%
Average annual benefit	$13,840	$14,202	102.61%
Average age	69.3	69.3	100.00%
Service retirees			
Number	66,069	66,069	100.00%
Total annual benefits ($1,000's)	$944,293	$968,693	102.58%
Average annual benefit	$14,293	$14,662	102.58%
Average age	69.8	69.8	100.00%
Disabled retirees			
Number	4,549	4,549	100.00%
Total annual benefits ($1,000's)	$55,924	$57,230	102.33%
Average annual benefit	$12,294	$12,581	102.33%
Average age	65.3	65.3	100.00%
Beneficiaries			
Number	7,446	7,446	100.00%
Total annual benefits ($1,000's)	$80,221	$82,746	103.15%
Average annual benefit	$10,774	$11,113	103.14%
Average age	66.8	66.8	100.00%
Active members			
Total Members	86,540	86,540	100.00%
Average age	46.9	46.9	100.00%
Average service	9.5	9.5	100.00%
Total salary ($1,000's)	$3,107,090	$3,107,090	100.00%
Average salary	$35,904	$35,904	100.00%
Vested inactive members			
Number	52,534	52,534	100.00%
Total annual deferred benefits	$91,309	$91,309	100.00%
Average annual deferred benefit	$1,738	$1,738	100.00%
Nonvested inactive members			
Number	52,099	52,099	100.00%

Comparison of June 30, 2021 Membership Data
State Police

	GRS	Milliman's Review of Valuation Data	Ratio of Milliman /GRS
Total retirees			
Number	1,673	1,673	100.00%
Total annual benefits ($1,000's)	$62,700	$62,700	100.00%
Average annual benefit	$37,478	$37,478	100.00%
Average age	63.9	63.9	100.00%
Service retirees			
Number	1,375	1,375	100.00%
Total annual benefits ($1,000's)	$54,771	$54,771	100.00%
Average annual benefit	$39,833	$39,834	100.00%
Average age	63.5	63.5	100.00%
Disabled retirees			
Number	54	54	100.00%
Total annual benefits ($1,000's)	$913	$913	100.00%
Average annual benefit	$16,907	$16,907	100.00%
Average age	57.0	57.0	100.00%
Beneficiaries			
Number	244	244	100.00%
Total annual benefits ($1,000's)	$7,016	$7,016	100.00%
Average annual benefit	$28,754	$28,754	100.00%
Average age	67.4	67.4	100.00%
Active members			
Total Members	775	775	100.00%
Average age	37.7	37.7	100.00%
Average service	11.1	11.1	100.00%
Total salary ($1,000's)	$45,338	$45,338	100.00%
Average salary	$58,501	$58,501	100.00%
Vested inactive members			
Number	313	313	100.00%
Total annual benefits ($1,000's)	$1,134	$1,134	100.00%
Average annual benefit	$3,623	$3,623	100.00%
Nonvested inactive members			
Number	321	321	100.00%

Comparison of June 30, 2021 Membership Data
Teachers

	CavMac	Milliman	Ratio of Milliman / CavMac
Total retirees			
Total number	57,465	57,493	100.05%
Annual benefits ($1,000's)	$2,265,323	$2,266,073	100.03%
Average age	70.7	70.7	100.00%
Service retirees			
Total number	50,129	50,132	100.01%
Annual benefits ($1,000's)	$2,061,901	$2,062,003	100.00%
Disability retirees			
Total number	2,831	2,831	100.00%
Annual benefits ($1,000's)	$88,783	$88,783	100.00%
Beneficiaries			
Total number	4,505	4,530	100.55%
Annual benefits ($1,000's)	$114,639	$115,287	100.57%
Total active members			
Total number	69,256	69,260	100.01%
Average age	43.4	43.4	100.00%
Average service	11.7	11.7	100.00%
Total salary	$3,784,400	$3,784,722	100.01%
Average salary	$54,644	$54,645	100.00%
University			
Total number	3,047	3,048	100.03%
Total salary	$191,462	$191,520	100.03%
Average salary	$62,836	$62,835	100.00%
Non-University			
Total number	66,209	66,212	100.00%
Total salary	$3,592,938	$3,593,202	100.01%
Average salary	$54,267	$54,268	100.00%
Inactive members			
Vested	10,538	10,539	99.99%
Nonvested	50,697	50,696	100.00%

Comparison of June 30, 2021 Membership Data

Legislators

	USI	Milliman	Ratio of Milliman / USI
Retirees & Beneficiaries			
Total number	245	245	100.00%
Total annual benefits ($1,000's)	$10,317	$5,159	50.00%
Average benefit	$42,110	$21,055	50.00%
Terminated Vested			
Vested (Traditional)	39	39	100.00%
Total annual benefits ($1,000's)	$1,025	$513	50.00%
Average benefit	$21,817	$13,146	60.26%
Vested (Hybrid)	8	8	100.00%
Hybrid Account ($1,000's)	$63	$63	100.00%
Total Active Members			
Total number	101	101	100.00%
Average age	56.3	55.8	99.11%
Average service	9.9	8.7	87.88%
Total salary ($1,000's)	$4,201	$4,201	100.00%
Average salary	$41,597	$41,597	100.00%

Judicial

	USI	Milliman	Ratio of Milliman / USI
Retirees & Beneficiaries			
Total number	356	356	100.00%
Total annual benefits ($1,000's)	$49,034,016	$49,592,216	101.14%
Average benefit	$137,736	$139,304	101.14%
Terminated Vested			
Vested (Traditional)	12	12	100.00%
Total annual benefits ($1,000's)	$812,180	$406,089	50.00%
Average benefit	$58,013	$33,841	58.33%
Vested (Hybrid)	2	2	100.00%
Hybrid Account ($1,000's)	$58	$58	100.00%
Total Active Members			
Total number	231	231	100.00%
Average age	57.4	57.4	100.00%
Average service	15.1	14.7	97.35%
Total salary ($1,000's)	$29,537	$29,603	100.22%
Average salary	$127,864	$128,150	100.22%

Benefit Calculation Review

Our data review process included an extra layer of data verification by comparing valuation data and benefit calculation data. The purpose of the valuation is to determine the liability for benefits to be paid in the future. Therefore, verifying the consistency between the data used for valuation purposes and the data used for benefit calculation purposes is a critical and integral component of the audit process.

To perform this task, we requested the data that each system provided to their actuary for the June 30, 2021 valuation and additional information from each system regarding members who retired after June 30, 2021. After reviewing this data, we then requested individual benefit calculations from each system that were randomly selected to encompass all employee categories and the majority of the benefits members can receive from the systems. In total, we requested eighty-six (86) benefit calculations across all systems. These benefit calculations included service retirement benefits, disability benefits, survivor benefits, and lump sum options in the systems. Forty-one (41) of the requested calculations were for members whose benefits commenced subsequent to June 30, 2021 (they were reported as active members on the valuation date) and forty-five (45) of the requested calculations were for members whose benefits commenced prior to June 30, 2021 (they were reported as retired members on the valuation date). This information was the basis for our review. The following table details the number of calculations reviewed for each system.

System	Commenced Subsequent to June 30, 2021	Commenced Prior to June 30, 2021	Total
KERS	10	13	23
CERS	12	10	22
SPRS	6	5	11
KPPA Subtotal	28	28	56
TRS	7	8	15
JRP	4	4	8
LRP	2	5	7
JFRS Subtotal	6	9	15
Grand Total	41	45	86

The purpose of reviewing actual benefit calculations is two-fold. First, we reviewed the benefit calculations for reasonableness, consistency and compliance with applicable member handbooks and summary plan descriptions. Second, we reviewed the data used in the benefit calculations for consistency with the valuation data provided to the plan actuary for the June 30, 2021 valuation.

Benefit Calculation Review – Retiree Data

The following table describes the items reviewed for members who were reported with the retiree data in the June 30, 2021 actuarial valuation.

	Benefit Calculation Review: Retiree Data	Milliman
1.	Benefits were generally computed accurately in the calculation based on the information contained in the calculation and were reasonable and consistent with the Summary Plan Descriptions	✓
2.	Basic data information (date of birth, gender, date of commencement) was provided accurately in the retiree data to the actuary (see discussion on date of retirement for JFRS)	✓
3.	Benefit amounts (maximum allowance, current benefit, social security benefits) were provided accurately in the retiree data (see discussion on initial benefits for KPPA)	✓
4.	Form of payment information was provided accurately	✓
5.	Information on beneficiaries (spouse date of birth, joint annuitant percentage, payee type) was provided accurately (see discussion on popup joint and survivor benefits for TRS)	✓
6.	For KERS and CERS, portion of benefit attributed to hazardous and non-hazardous (see discussion on hazardous percentage for KPPA)	✓
7.	For survivors, benefit and other information was provided accurately	✓
8.	For members receiving a disability benefit from TRS, the benefit amount and date the entitlement period ceases were provided accurately (see discussion on disability below for TRS)	X
9.	Service credit, final average compensation and employee contribution balance were consistent with amounts computed in the benefit calculation (see discussion on date of hire for TRS and contribution account balance for JFRS)	✓
10.	Employee type (hazardous, non-hazardous for KERS and CERS) was provided accurately	✓

In our experience, this degree of matching indicates that high quality retiree data is being provided to the actuary by each System.

However, we did identify the following items in our review related to the retiree data. Some of these may be record keeping items with no impact on the calculation of benefits or liability and some of them may be considered to have an immaterial effect on the calculation of liability. Nevertheless, we have included all items that we identified for each system to review and determine if any actions should be taken.

KPPA

1) **Initial Benefits:** We did notice a few items in our review where the data provided to the actuary did not exactly match the final benefit calculation provided to us due to adjustments made after the data was submitted to the actuary for the valuation. For example, there were situations where additional service was included, changes in compensation due to the application of the pension spike cap or due to qualifying for disability since the initial calculation occurred. These types of issues are fairly common among retirement systems.

   Recommendation: One suggestion we have been providing to clients is for them to provide an indicator on the data whether the information in the data reflects an estimated calculation or final calculation. Based on our review, we do not believe there is a significant lag in completing calculations. The actuary can then determine if it is appropriate to adjust the liability for those with estimated benefits.

2) **Hazardous Portion**: Some members have accrued both hazardous and non-hazardous service during their career. Each benefit is calculated separately with the sum paid to the member. The total benefit is included in the data submitted to the actuary. In addition, percentages of the service accrued as hazardous and non-hazardous are provided and used by the actuary to split the benefit between the hazardous and non-hazardous groups. However, the percentage of service would not necessarily be the same as the percentage of the retirement benefit due to various other factors such as differences in final average compensation, benefit multiplier, early retirement factor, etc. Using the actual benefits accrued, we determined slightly different percentages due to these various factors.

   Recommendation: We suggest that KPPA review the possibility of providing the actual benefit accrued under each plan on the data.

TRS

1) **Pop-up Percentage**: When a member elects a joint and survivor benefit, they are entitled to receive an increase in their monthly benefit in the event that their contingent beneficiary pre-deceases them. CavMac estimates the pop-up percentage based on the retiree's date of retirement and various plan factors. We believe the approach used by CavMac is reasonable given the data provided,

although this estimate differs from the reciprocal of the option factor used in the benefit calculation.

Recommendation: We suggest that CavMac and TRS determine if the single life annuity amount (i.e., the pop-up amount) can be included in the data TRS submits to the actuary to reflect the actual value of this benefit feature without the need for use of an estimation technique.

2) **Disability:** When a member becomes disabled, the disability benefit is paid for an entitlement period, typically 5 years. During the period of disability, members are eligible for cost-of-living adjustments (COLA) and survivor benefits upon death. At the end of entitlement period, the benefit is re-determined based on actual service plus service during the entitlement period. The benefit calculation includes the benefit to be paid at the end of the entitlement period. However, this information is not included in the valuation data provided to the actuary.

   Recommendation: We suggest that the date the entitlement period ceases and the member's projected benefit at that date be included in the valuation data TRS submits to the actuary and incorporated into the valuation programming to more accurately value this benefit feature. Please note that we do not believe this impacts many records.

3) **Date of Hire**: For two members, the date of hire in the valuation data was not consistent with the date of hire in the benefit calculation as both of these members have reciprocity service with KPPA. Please see our discussion on KPPA reciprocity service in the active data section below.

<u>JFRS</u>

1) **Contribution Account Balance**: For an unmarried member, their beneficiary receives a refund of the remaining balance of accumulated employee contributions equal to the amount that exceeds the sum of the annuity payments made to the member in retirement. However, the employee contribution balance is currently not included on the data submitted to the actuary for current retirees, and therefore not reflected in the calculation of the retiree liability. In addition, we believe the liability associated with this refund provision for death after retirement, is not being reflected for future retirees.

   Recommendation: We suggest that JFRS includes a member's contribution account balance at date of retirement in the data submitted to the actuary so that USI can accurately value this provision. As discussed in Section II, we also suggest that USI value this provision for future retirees as well.

2) **Date of Retirement**: For one LRP member, date of retirement in the data is actually the date of termination rather than date of commencement.

   Recommendation: We suggest that JFRS provides both date of termination and date of commencement to USI.

Benefit Calculation Review – Active Data

The following table describes the items reviewed for members who were reported with the active data in the June 30, 2021 actuarial valuation and retired subsequent to the valuation date. Calculations reflected a cross-section of members from various participant groups.

Benefit Calculation Review: Active Data		Milliman
1.	Benefits were generally computed accurately in the calculation based on the information contained in the calculation and were reasonable and consistent with the Summary Plan Descriptions	✓
2.	Basic data information (date of birth, gender, date of hire) was provided accurately in the active data to the actuary	✓
3.	Total service credit was generally consistent with the active data, including split of hazardous and non-hazardous service for KERS and CERS (see discussion on sick leave service for KPPA, on reciprocity for TRS and on date of hire / years of service for JFRS)	✓
4.	Annual salary and historical salary were generally consistent with the active data (see discussion on final compensation for KPPA and compensation for TRS)	✓
5.	Employee contribution balance was generally consistent with the active data	✓

In our experience, this degree of matching indicates that high quality active data is being provided to the actuary by the System.

However, we did identify the following items in our review related to the active data. Some of these may be record keeping items with no impact on the calculation of benefits or liability and some of them may be considered to have an immaterial effect on the calculation of liability. Nevertheless, we have included all items that we identified for each system to review and determine if any actions should be taken.

KPPA

1) **Sick Leave Service**: Tier 1 members may elect to convert unused accumulated sick leave to service upon retirement. We found that four of the five SPRS members we reviewed had converted unused sick leave to service ranging from

19 months to 38 months. Note that the fifth member had purchased 41 months of service. This issue was not prevalent for KERS or CERS.

Recommendation: We understand that employers contribute an additional amount for employees who convert unused sick leave service that is equal to the estimated actuarial value. Since there would be no expected cost impact to the system, we believe no further analysis is required.

2) **Final Compensation:** Final compensation for Tier 1 members is based on a member's five highest years of final compensation for non-hazardous members (5-High) and three highest years for hazardous members (3-High). However, partial years may be included as a full year for this purpose where the average is then determined based on actual months worked during the 3-High period. For example, a hazardous or SPRS member who terminates employment in August may receive compensation from July 1 to date of termination representing one month of service. This partial year would count as the third year in determining the average final compensation used in calculating the member's benefit. Based on the timing of compensation received during this partial year, there is a likelihood that it could be significantly higher than the member's typical monthly salary. The spiking prevention provision does not seem to apply in these situations. For the six SPRS calculations, the approximate percentage increase in the final average compensation for reflecting this partial year method ranged from 3% to 13% higher. This could materially increase a member's final average compensation over the value projected using the salary data provided for the actuarial valuation.

   Recommendation: We recommend a review be completed by GRS and KPPA to determine if a load should be incorporated into the actuarial valuations for SPRS, KERS and CERS to account for the potential impact of partial year compensation on the final average compensation for Tier 1 members. While it may impact non-hazardous members subject to the 5-High provision, it will have a lesser impact due to the additional years included in the final average period. Also, the 5-High and 3-High provision may not necessarily apply to all members, but it does appear that it would have the greatest impact on SPRS.

<u>TRS</u>

1) **Compensation**: For a few records, actual compensation used in the benefit calculation was lower than the amount reported in the active data due to Kentucky Revised Statute § 161.220(9)(b), a statute that limits the increases in salary for the three years preceding retirement to prevent compensation spiking.

   Recommendation: We suggest that TRS and CavMac review the impact of this provision to determine if an assumption would be appropriate for limiting the final salary calculation when members are assumed to retire.

2) **Reciprocity with KPPA**: It is our understanding that service with KPPA can impact a member's benefit in a couple of different ways:

    a. Reciprocity service may impact the applicable benefit multiplier
    b. Compensation earned with KPPA may be used in the development of final average salary

    Of the seven active records reviewed, three had reciprocity service with KPPA. In addition, there were an additional two retiree records that also had reciprocity service. It appears that the KPPA compensation and service used in the benefit calculation is not included in the valuation data. This can lead to large differences in expected benefit amounts due to using a higher benefit multiplier (for example 2.5% versus 1.5%) and for members with recent KPPA compensation that is greater than the compensation history in the valuation data.

    Recommendation: We suggest that CavMac and TRS review the prevalence of members with KPPA reciprocity service. If KPPA service and compensation information can be provided on the valuation data, we recommend it be incorporated into the valuation processing. If this information is unavailable, we suggest a further review to determine if an assumption should be incorporated into the actuarial valuation.

<u>JFRS</u>

1) **Date of Hire / Years of Service**: We found a few situations where the date of hire or years of service information was not necessarily consistent with that shown in the benefit calculation. For example:
    a. The date of hire for a LRP member was not specified in the benefit calculation but years of service was reasonable based on information in the valuation data.
    b. The date of hire for a JRP member in the valuation data reflected prior service but years of judicial service reported in the data did reflect the member's judicial date of hire.
    c. The date of hire for a JRP member in the valuation data was reported as the end of the month of hire rather than the actual day of hire.
    d. The total years of service for a JRP member in the valuation data did not reflect service years that was transferred from KPPA. However, since JFRS charges KPPA their portion of applicable costs, we do not believe there is any material issue.

    Recommendation: Although there were some inconsistencies in the reporting of date of hire and years of service, we do not believe any issue is material and thus, we are not recommending any changes at this time.

Valuation Data Review

In preparing an actuarial valuation, the actuary will review the “raw” data provided by the plan sponsor and will “edit” the data as needed to complete missing data and/or to remove discrepancies. We requested and received a copy of the edited data from each system’s actuary. Based on our understanding of the data provided to the actuary, we reviewed the data procedures employed by GRS, CavMac, and USI to review the reasonableness of interpretations, estimates and adjustments made in the data editing process.

A general review of the valuation data should include the following:

General Annual Data Review

1.	Compare data with prior year’s data to ensure all records from prior year are accounted for	✓
2.	Prepare data reconciliation from prior year to current year and identify status changes, such as new members, terminations, retirements, deaths, etc. during the year (see discussion on data reconciliation)	X
3.	Compare data reconciliation with prior year reconciliation to identify trends and anomalies	X
4.	Review data for unusual changes in compensation, benefits or other fields	✓
5.	Interpreting the data fields appropriately (see discussion on retiree data for KPPA)	✓
6.	Determine reasonable assumption for missing data fields (see discussion on Missing Data Fields for TRS)	✓

Overall, we found the procedures for each system’s actuary to be reasonable and appropriate for the scope of the project and consistent with Actuarial Standard of Practice 23 – *Data Quality*. The following represent a few minor comments regarding the general data procedures employed by GRS, CavMac, and USI.

<u>All Systems</u>

1) **Data Reconciliation**: We understand that systems as complex as these systems require a significant amount of data editing and review to understand movement in membership from one year to the next. Identifying this movement in data is important in understanding the reason for actuarial gains and losses, understanding changes in status, continual review of actuarial assumptions, etc. Furthermore, it may be helpful in understanding when members transfer from hazardous to non-hazardous or vice versa.

Recommendation: We recommend each of the actuaries incorporate a data reconciliation for each plan in the valuation report detailing changes in status, transfers among groups, and members added who were not previously included in the census data.

KPPA

1) **Retiree Data**: We found certain situations where the applicable benefit payable to a retiree, surviving spouse or alternate payee may not have been completely clear based on codes provided with the data from KPPA. These situations included where the later pay benefit differed from the current pay benefit, but the benefit was not expected to change based on the form of payment selected, the later pay benefit was set to zero or some other benefit amount for certain records where the form selected was the Social Security leveling option, etc. After discussions with KPPA in conjunction with our review of the actuary data, we determined the actuary was correctly valuing the proper benefits in all situations we had inquired on.

   Recommendation: We understand that KPPA had made a change to their programming for one situation we noticed. We suggest that KPPA may provide additional notes on the correct benefits to value by form of payment to eliminate any possible confusion in the future.

TRS

1) **Missing Data Fields**: It is not uncommon for valuations of large plans (like TRS) to include an assumption for selected missing data fields based on the data received for all other members. To the extent the number of missing data fields are minimal, this is a reasonable approach. For those records missing or having an unreliable date of birth, it appears that CavMac used an average age for these members though this is not clear in the report.

   There are about 50 records on the 2021 valuation data who are missing gender but have statuses that are valued. It is unclear what assumption CavMac is making for these records.

   Recommendation: We suggest that CavMac disclose the assumptions for missing data fields in the valuation report.

Data Review – Retiree Data

For a system as complex as KYSRS, a significant part of the valuation is ensuring that the data provided to the actuary is accurate and provides all information necessary to value all the benefits that could be payable upon future contingent events. In the prior section, our comments focused on data items verified against members' specific calculations. In this section, we provide commentary on the reasonableness of the total data files provided to the actuary.

The following table describes the items reviewed for members who were reported with the retiree data in the June 30, 2021 actuarial valuations.

	Valuation Data Review: Retiree Data	**Milliman**
1.	Member's status is reasonable and consistent with other data fields in file	✓
2.	Basic data information (date of birth, gender, date of commencement), including adjustments for missing data, was reasonable	✓
3.	Relationship between the current benefit and the later pay benefit is used appropriately for members electing a social security leveling option or the popup joint and survivor benefit	✓
4.	For members electing a joint and survivor benefit, the joint percentage and joint annuitant date of birth were reasonable	✓
5.	The member's accumulated contributions information is included on the data (see discussion)	X
6.	For TRS members receiving a disability benefit, information on when and how the benefit amount may change after the entitlement period ends is included (see discussion above)	X
7.	For beneficiaries receiving the survivor portion of the retirement benefit, the current benefit reflects the survivor percentage appropriately	✓
8.	Basic Healthcare data information (health plan information, Medicare eligibility, etc.) was reasonable (see discussion on health plan for JFRS)	✓
9.	Basic Healthcare dependent data information (dependent type, date of birth, health plan information, Medicare eligibility, etc.) was reasonable	✓

Based on our review, we believe that each actuary is correctly reflecting the data provided by each system into the actuarial valuation process, although we did identify the following item in our review.

<u>All Systems</u>

1) **Accumulated Contributions:** For members who elect the maximum single life annuity, a beneficiary may be entitled to a death benefit equal to the accumulated contribution balance less the amount of payments received in retirement. While KPPA and TRS are including this information and JFRS did not provide it, none of the actuaries are incorporating this information into the valuation.

   Based on the information in the KPPA data, we estimated that the average period for which a death benefit would be applicable ranged from 32 months to 36 months or from 2.7 years to 3 years for members who retired during the past year by dividing the balance at retirement by the applicable retirement benefit for CERS, KERS and SPRS.

Based on the information in the TRS data, we estimated that the average period for which a death benefit would be applicable is 49 months or 4.1 years by dividing the balance at retirement by the applicable retirement benefit.

Recommendation: Based on this analysis, we recommend that each of the actuaries incorporate a value for this feature for current and future retirees.

Data Review – Active Data

The following table describes the items reviewed for members who were reported with the active data in the June 30, 2021 actuarial valuation.

	Valuation Data Review: Active Data	Milliman
1.	Basic data information (date of birth, gender), including adjustments for missing data, was reasonable	✓
2.	Service credit information provided was reasonable and included both hazardous and non-hazardous service information for KERS and CERS (see discussion on hazardous / non-hazardous service)	✓
3.	Employee contribution balance was generally consistent with service and compensation information (see discuss on member contributions for JFRS)	✓

Based on our review, we believe that each actuary is correctly reflecting the data provided by each system into the actuarial valuation process, although we did identify the following item in our review.

KERS and CERS

1) **Hazardous / Non-Hazardous Service**: Certain active members have accrued both hazardous and non-hazardous service. KPPA provides two records for these members, a current active record for where the member is currently accruing service and an inactive record indicating service accrued as a prior employee. GRS incorporates the total service in the valuation under the current active record. For example, if a current hazardous member with 15 years of service and 5 years of non-hazardous service, GRS values all 20 years as a hazardous member. Therefore, the entire liability is held under the member's current active status.

   Upon retirement, KPPA includes the portion of the benefit attributable to hazardous service and to non-hazardous service. This split is incorporated into the valuations. When the member does retire, this methodology results in a loss to the plan not holding any liability and a gain to the plan holding the entire liability.

Recommendation: We recommend that GRS and KPPA discuss this issue to determine if a prorated portion of the liability should be determined while the employee is an active member. Based on the service included in the valuation, we believe this would result in an increase in the liability held for KERS and CERS Hazardous as there is more hazardous service for non-hazardous members than non-hazardous service for hazardous members.

JFRS

1) **Member Contributions**: For hybrid members in the LRP and JRP Hybrid Plans, JFRS data files provided by USI do not specify the member's portion of their hybrid account balance. This information is included in the data submitted by JFRS. Please note that there are certain contingencies where only the member's portion of the hybrid balance would be paid, such as members who terminate with less than 5 years of service.

   Recommendation: While the estimated impact on the valuation liabilities is anticipated to be insignificant, we suggest that USI review its valuation procedures and include accordingly.

2) **Health Plan**: A member's health plan election determines the amount of premiums to be paid by JFRS for the upcoming year. This information is not submitted to the actuary on an individual basis. In valuing the insurance benefits, USI utilizes a weighted average of the group premium rates based on coverage tier based on information provided by JFRS in total.

   Recommendation: We believe applying average group information to develop average costs for retirees is reasonable, but suggest health plan election information, including dependent information, be included in the data submitted to the actuary.

Section II – Actuarial Valuation Methods and Procedures

In this section, we discuss the various actuarial methods used in the actuarial valuation to measure the plan's liabilities and funded status and calculate the contribution rates in accordance with statute and the board's funding policy.

Asset Valuation Method

An asset valuation method develops the actuarial value of assets, which is used to develop the unfunded liability for purposes of determining the statutory contribution rate. The asset valuation methods used by each system are identical. The method applies to both the retirement benefits and the insurance benefits.

The asset valuation method recognizes the difference between the actual investment income on the market value of assets and the expected investment income on the market value of assets based on the valuation interest rate over a period of five years. No corridor is applied to this value to compare the resulting actuarial value of assets to the market value. A corridor would limit how far the actuarial value of assets could deviate from the market value of assets. For example, if the actuarial value exceeds (or is below) the market value by 30%, a 20% corridor would limit this deviation such that a greater portion of prior losses (or gains) is recognized in the current year. While a corridor is a common practice, it is not required by Actuarial Standards of Practice for the asset valuation methods used in the KYSRS valuations.

Actuarial Standard of Practice 44 – *Selection and Use of Asset Valuation Methods for Pension Valuations (ASOP 44)* provides guidance to actuaries in selecting or evaluating asset valuation methods. ASOP 44 states that a method is reasonable if it produces values within a sufficiently narrow range around market value or if it recognizes differences from market value in a sufficiently short period.

One purpose of an asset valuation method is to assist in the determination of an actuarially determined contribution rate. Recognizing investment gains or losses over a period of time limits annual fluctuations in contribution rates to prevent large increases in one year followed by large decreases in the next year. Recognizing the importance of minimizing the impact of potentially volatile investment returns on the application of the statutory funding policy, we agree with the use of the asset valuation methods used in the valuations.

We find that the methods used are reasonable and consistent with the guidance provided in Actuarial Standard of Practice 44 – *Selection and Use of Asset Valuation Methods for Pension Valuations*.

We reviewed the numerical calculations of the development of the actuarial value of assets and found them to be accurate for each system.

Actuarial Cost Method

Both the pension and retiree healthcare valuations use the Entry Age Normal actuarial cost method to determine the cost of benefits accrued during the upcoming year (known as the normal cost) plus the value of benefits accrued for all years of past service (known as the accrued liability) as of the valuation date. This method is used by all the systems for all plan benefits.

The purpose of any cost method is to allocate the cost of future benefits to specific time periods. Most public plans follow one of a group of generally accepted funding methods, which allocate the cost over the members' working years. In this way, benefits are financed during the time in which services are provided.

The Entry Age Normal actuarial cost method is the most common cost method used by public plans. The 2022 Public Fund Survey from the National Association of State Retirement Administrators shows that about 90% of the retirement systems surveyed are using the Entry Age Normal cost method.

The focus of the Entry Age Normal cost method is the level allocation of costs over the member's working lifetime. For a public plan, in theory this means current taxpayers pay their fair share of the pensions of the public employees who are currently providing services. Current taxpayers are not expected to pay for services received by a past generation, nor are they expected to pay for the services that will be received by a future generation. The cost method does not anticipate increases or decreases in allocated costs.

We find that the actuarial cost method used in both the pension and retiree healthcare valuations is reasonable and consistent with the guidance provided in Actuarial Standard of Practice 4 – *Measuring Pension Obligations and Determining Pension Plan Costs or Contributions* (ASOP 4) and Actuarial Standard of Practice 6 – *Measuring Retiree Group Benefits Obligations and Determining retiree Group Benefits Program Periodic Costs or Actuarially Determined Contributions.*

For GASB Statements Nos. 67, 68, 74 and 75, the Entry Age Normal actuarial cost method is the only permissible cost method for financial reporting purposes.

Funding Policy

A system's funding policy sets the parameters for the actuary to determine the actuarially determined contribution rate once the assets are developed in accordance with the asset valuation method and the liabilities are determined in accordance with the actuarial cost method. One of the primary features of a funding policy is how the unfunded actuarial accrued liability, if any, is paid down over time. ASOP 4 provides guidance to actuaries in selecting or evaluating the various procedures used to determine actuarially determined contribution rate or amount.

In addition, there are publications within the actuarial community that also provide guidance on these items, particularly a white paper on public pension plan funding issued by the Conference of Consulting Actuaries.

Conference of Consulting Actuaries White Paper

The Conference of Consulting Actuaries (CCA) has issued a white paper titled *Actuarial Funding Policies and Practices for Public Pension Plans*. The white paper was composed by a group of public plan actuaries from the major consulting firms that work with public plans and was the result of an extensive series of meetings which lasted for over two years. The white paper was not meant as a replacement for the actuarial standards of practice. The white paper focuses on a Level Cost Allocation Model (LCAM) and provides detailed analysis for classifying each of the three major components of LCAM funding policies: (a) cost methods, (b) asset methods and (c) amortization methods. The classification system uses the following terms:

Categories under CCA Guidelines	
Model Practices	Those practices most consistent with the Level Cost Allocation Model (LCAM)
Acceptable Practices	Well established practices that typically do not require additional analysis to demonstrate their consistency with the LCAM.
Acceptable Practices with Conditions	May be acceptable in some circumstances either to reflect different policy objectives or on the basis of additional analysis.
Non-Recommended Practices	Systems using these practices should acknowledge the policy concerns identified by the CCA Guidelines or acknowledge they reflect different policy objectives.
Unacceptable Practices	No description provided by CCA, but the implication is that these should not be used.

As we evaluate the different funding policies for each system, we have used this CCA White Paper as a guide.

Contribution rates are set through a combination of statutory requirements and Board policies that vary by each system.

There will always be a competition between providing strong funding to the system and having reasonable contribution rates. We believe that the funding policies now in place for all the systems strikes a reasonable balance between the two objectives.

KPPA

For KERS and SPRS, employer contribution requirements are based on Kentucky Revised Statute § 61.565 and for CERS on § 78.635. The following are the principles for calculating the total actuarially determined employer contribution:

A. Use of the Entry Age Normal actuarial cost method
B. Use of a five-year asset smoothing method.
C. Use of a 30-year closed period to amortize the unfunded liability as of June 30, 2019.
D. Use of a 20-year closed period to amortize new sources of unfunded liability (consisting of benefit changes, assumption and method changes, and experience gains and/or losses that occur since the prior valuation).
E. Separate contributions shall be determined for employers with employees participating in hazardous duty retirement coverage.
F. Employer contribution rates shall include separate rates to fund retirement benefits and insurance benefits.
G. All employers including the General Assembly, shall pay the full actuarially required contributions to KERS and SPRS. For CERS, each employer shall include in the budget sufficient funds to pay the employer contribution.
H. For CERS, the sum of the normal cost and actuarially accrued liability contributions for retirement and insurance benefits shall not increase by more than a factor of 1.12 over the prior year for contribution rates established until June 30, 2028.

For poorly funded plans, using a long amortization period such as 30 years may not be advisable as it can produce negative cash flow. Negative cash flow occurs when benefits paid out of the system exceed the contributions coming into the system. Negative cash flow is common among mature well-funded plans as contributions were made such that asset values can pay for benefits upon retirement. However, poorly funded plans with negative cash flow can result in continual decreases in asset values such that a plan could become insolvent. We do note that KERS Non-Hazardous and SPRS were cash flow positive during the year ending June 30, 2021.

A long amortization period also results in negative amortization, where the unfunded liability is projected to grow from year to year, meaning that the payment is less than the interest accrual. Negative amortization would not be applicable to those plans with a 0% payroll growth but would currently apply to CERS with a 2% payroll growth assumption. Establishing layers for subsequent changes in the unfunded liability over a 20-year period is consistent with the CCA White Paper but depending on how experience has unfolded since the fresh start, negative amortization may still occur. In fact, if actuarial gains occur immediately, this can increase the effective amortization period beyond the fresh start period. For example, an actuarial gain that is amortized over 20 years combined with a fresh start base amortized over 30 years, can result in an effective amortization period of the unfunded liability exceeding 30 years. This is the issue in the 2021 actuarial valuations for each of the plans.

Recommendation: We suggest consideration be given to establishing a minimum total amortization payment calculated based on the current unfunded liability and the greater of the remaining fresh start amortization period and 20 years. This would prevent subsequent actuarial gains from lengthening the effective amortization period in any one actuarial valuation. In addition, we recommend that GRS note the effective amortization period.

Payment of the Full Actuarially Determined Contribution Rate

Specifying the payment of the full actuarially determined contribution rate into the funding policy is an important element that cannot be overlooked. One theme we have found among poorly funded retirement systems are that contributions have been less than the amount an actuary has calculated using sound funding policies. When this latest funding policy was adopted, there were significant increases in the contribution rates for many employers. The legislation allowed certain employers to continue to contribute for fiscal year 2020 and 2021 based on the prior funding policy. Beginning with fiscal year 2022, it is our understanding that all employers would be contributing the full actuarially determined contribution.

Determination of the Amortization Payment

When there is a lag between the date the unfunded liability is determined and the payment of the resulting contribution, actuaries use various techniques to account for the delay in determining the contribution. For KPPA, GRS uses the following methods:

- Increases the amortization base with one year of interest from the valuation date to the end of the year
- Adjusts the amortization base to account for payments during the year
- Adjusts the amortization base to account for expected payments in the current year that differ from the prior year due to changes in covered payroll
- Amortizes the resulting amortization over a period 1 year less than indicated

For example, the fresh start unfunded liability was determined as of July 1, 2019. This amount was brought forward with interest to June 30, 2020 and adjusted for payments received during the 2020 fiscal year, which were determined in a prior valuation. This resulting base was then amortized over 29 years, such that this fresh start unfunded liability is paid off by the 2049 fiscal year (30 years after July 1, 2019).

Once the fresh start base has been established, the payment amount is anticipated to be fixed in each future year. Subsequent adjustments are then all included in the new amortization base established for the year. This can produce an unexpected result in the current year a new base is established. For example, the new base established in the 2020 valuation had a balance of $153,145,000, but a payment of only $2,708,000. On the surface, this payment would not pay off this balance. However, due to the adjustments made to the 2019 fresh start liability, there was a $125,048,000 adjustment made to this balance. Applying interest adjustments appropriately yields a balance of $32,895,000 and the payment of $2,708,000 would pay this balance off over a 20-year period.

Due to certain employers contributing less than the full actuarially determined contribution rate in fiscal years 2020 and 2021, the adjustments are larger than would be expected in future years once all employers are contributing the full contribution requirement. We agree that the adjustments made are appropriate. However, the adjustments made are not disclosed in the valuation report. We recommend that GRS specify the adjustments in the amortization payments report exhibit such that another actuary could replicate the calculation based on the information contained in the report.

HB 8 Allocation for KERS Non-Hazardous

HB 8 modified the method for determining each employer's portion of the actuarially determined contribution for KERS Non-Hazardous, which is codified in Kentucky Revised Statute § 61.565(d). Previously, each employer was charged the applicable contribution rate on pensionable payroll. However, due to contribution rates that are a significant portion of payroll, which were caused by the very low funded status of the plan, many KERS Non-Hazardous employers attempted to reduce their pensionable payroll to limit the amount of contributions being made to the plan. As such, HB 8 separated the actuarial accrued liability component of the required contribution and allocated it based on each employer's portion of the actuarial accrued liability as of July 1, 2019. This should prevent employers from reducing their future contribution towards the unfunded liability through payroll reductions. Employers would continue to be assessed the normal cost rate as a percentage of pensionable compensation. We agree with many of the opinions that this methodology would help stabilize the contributions being made by employers into the plan as GRS stated in the Actuarial Analysis Summary of BR424 "we believe this legislation will result in an improved and sustainable funding policy for the KERS Non-Hazardous System."

As part of this audit, we reviewed the allocation of the amortization component of the actuarially determined contribution and the development of the required contribution for the 2021-2022 fiscal year based on the July 1, 2020 actuarial valuation. We confirmed the following:

- The actuarial accrued liability as of July 1, 2019 used in the allocation matched the sum of the retirement and insurance actuarial accrued liability noted in the 2019 actuarial valuation report. This amount is based on the employer code submitted to the actuary. Quasi-governmental agencies were able to appeal the employees allocated to them. Based on information provided by KPPA, some of these employees had separate contracts between the executive branch and the governmental agency where the member was provided to KPPA by the agency but should be allocated to the executive branch for purposes of the allocation.

  Please note that we found that retiree records who are receiving both non-hazardous and hazardous benefits that the non-hazardous benefits were not being valued. We estimated that this increased KERS non-hazardous liabilities by approximately 1.8%. This may impact some employers more than others such that it would increase their allocation. Determining any adjustment to the allocation percentage is outside the scope of this audit.

- The projected payroll for the 2021-2022 fiscal year was consistent with the amount for retirement purposes noted in the actuarial valuation report. Please note that GRS develops a different projected payroll in the actuarial valuation report for insurance purposes than retirement purposes. The determination of the amounts in the employer allocation file were based on retirement payroll. Since the dollar amount of the amortization component was based on the sum of the amortization rate for retirement and insurance benefits, multiplied by the retirement projected payroll, a higher amortization cost was developed in the allocation than determined in the 2020 valuation report. The following table compares the amounts developed in the valuation report versus those used in the employer allocation.

Amortization Cost for Fiscal Year 2021 - 2022 $ in thousands			
	Retirement	**Insurance**	**Total**
Projected Payroll	$1,387,761	$1,376,818	$1,387,761
Amortization Rate	67.42%	7.51%	74.93%
Amortization Amount (Valuation)	935,656	103,392	1,039,048
Allocated Amortization	Not Shown	Not Shown	1,039,849

The use of different payrolls is resulting in the amortization amount for the 2022 fiscal year used for employer allocation purposes to be higher than amounts shown in the 2020 actuarial valuation report by $801 thousand (rounding differences may cause a difference as well). GRS notes that the difference in payroll is due to members receiving pension benefits from multiple systems but would only receive insurance from one system.

In the fiscal year 2023 allocation, the sum of the dollar amount of amortizations for retirement and insurance was used in the allocation so any payroll difference would not impact the allocation calculation.

- The allocation percentages used were adjusted properly by agencies that ceased participation or adjusted through the appeals process, such that the sum of the allocation percentages added to 100%. Any rounding adjustment was applied to the executive branch.

- The contribution rates were consistent with those reported in the July 1, 2020 actuarial valuation and applied to each employer properly.

Limiting Contribution Increases for CERS

To provide some budget stability to employers of CERS until June 30, 2028, there is a 12% limit on relative increases in the contribution rate from one year to the next. This would limit increases in the contribution rates from 26.79% to 30.00% for non-hazardous and from 49.59% to 55.54% for hazardous from the 2021 actuarial valuation to the 2022 actuarial valuation, respectively.

Kentucky Revised Statute § 61.670 requires the actuaries to perform a sensitivity analysis on the impact on contribution rates of varying the investment return assumption, payroll growth assumption and inflation assumption. As part of the analysis completed by GRS based on the June 30, 2021 valuations, the CERS limitation is not discussed although the impact of a 1% decrease in the interest rate assumption would increase the contribution rates to 34.95% and 64.47%, respectively. These calculated contribution rates exceed the 12% limitation. We suggest that GRS incorporate the potential impact of this limitation into future analyses.

<u>TRS</u>

For TRS, Kentucky Revised Statute § 161.540(1) and § 161.550(1) specify the minimum contribution rates that would apply for members and employers, respectively. To the extent that these rates are lower than the Board’s funding policy, an additional rate is determined. Per Appendix 17 of the Board Governance Manual, the following are principles for calculating the total actuarially determined employer contribution:

A. Use of the Entry Age Normal actuarial cost method
B. Use of a five-year asset smoothing method.

C. Use of a 30-year closed period that began fiscal year 2014 to amortize the unfunded liability.
D. Use of a 20-year closed period to amortize new sources of unfunded liability (consisting of benefit changes, assumption and method changes, and experience gains and/or losses that occur since the prior valuation).
E. Reach a minimum funded ratio of 100% within the closed period adopted by the Board.

In practice, the actuary maintains the base from 2014 and establishes new incremental bases for each subsequent year. The bases are amortized as a level percentage of payroll meaning that the dollar amount of each payment would increase each year at the payroll growth assumption but is expected to be level as a percentage of pay assuming actual payroll increases at the assumption each year.

As of the June 30, 2021 valuation, the remaining amortization period on the 2014 fresh start base is 23 years, which is in line with actuarial guidance (CCA White Paper model practices for transition periods) where the contribution rates are calculated on an actuarial basis. A long amortization period results in negative amortization, where the unfunded liability is projected to grow from year to year, meaning that the payment is less than the interest accrual. Establishing layers for subsequent changes in the unfunded liability over a 20-year period is consistent with the CCA White Paper but depending on how experience has unfolded since the fresh start, negative amortization may still occur. In the 2021 valuation, the amortization payment is slightly less than interest on the unfunded liability. Although, we would expect that any negative amortization would not occur for much longer, assuming the full actuarially determined contribution rate is made.

In accordance with the Board funding policy, the actuary calculates the unfunded liability amortization rate and the normal cost rate, including an administrative expense load, for the total actuarially determined contribution rate. The “Additional (contribution rate) to comply with Board Funding Policy” equals 23.05% and reflects the difference between the actuarially determined rate and the rates specified by statute and any appropriation made by the State.

Statutory Contribution Rates

The following chart specifies the statutory contribution rates for both the member and the employer.

Statutory Contribution Rates		
	Non-University	**University**
Member	9.105%	7.625%
Employer for Member Hired Prior to July 1, 2008	12.355%	10.875%
Employer for Member Hired July 1, 2008 and later	13.355%	*10.875%*

Please note that in the 2021 actuarial valuation report the University employer contributions for members hired July 1, 2008 and later is 11.875%, or 1% higher than noted in statute. TRS confirmed that the additional 1% contribution for University was in accordance with statute at the time of the July 1, 2021 actuarial valuation. The law changed regarding the contribution rate in 2021 with an implementation date of January 1, 2022.

The weighted-average total of member and employer statutory contribution rates using valuation salaries is 21.68%, based on information provided to us by CavMac for the audit.

Special Appropriation

In the 2021 actuarial valuation, there is an additional special appropriation of 2.38% of total payroll, which is made by the State. Per TRS Board Policy, this additional appropriation reduced the contribution to be covered by employers as it reduced the additional amount need to comply with the Board's funding policy. Please note that in our opinion the report is not clear that this special appropriation was intended to be fully offset against the employer contribution in the current year, rather than accelerate a reduction in the unfunded liability.

In fact, the Board's funding policy references "accelerated funding options in recognition that the state may want to pay off the unfunded liability earlier than the closed amortization period." However, this appropriation is used to reduce the employer rates rather than pay off the unfunded liability sooner. TRS confirmed that CavMac's treatment of this additional special appropriation was applied in accordance with the Board's policy.

Total Contribution Rate

Based on the Board's funding policy and the information contained in the report, we have estimated the total contribution rate to be 47.12% (before reflecting the phase-in of assumption changes). The following table displays the components of this rate.

Actuarially Determined Contribution Based on Board Funding Policy	
	Rate
Weighted-Average Statutory Rates	21.68%
Special State Appropriation	2.38%
Additional Employer Contribution Rate	23.05%
Total Contribution Rate	47.12% [1]

[1] may not add due to rounding

Please note that the additional employer contribution rate is not being fully charged to employers in the 2021 valuation as the increases associated with the most recent experience study are being phased-in over a 5-year period. Due to this phase-in, the report does not specify the full actuarially determined contribution rate. We recommend that this disclosure be added in future reports.

Additional Contribution Rate

As noted above, the additional contribution rate to comply with the Board funding policy equals 23.05%. We did not feel that the report provides sufficient clarity on the development of this rate and recommend an exhibit be incorporated into the valuation displaying it. Below is an example of what we consider to be an appropriate disclosure.

Development of Additional Contribution Rate Based on Valuation Salaries of $3,784.4 million		
	Amount (in millions)	Rate
Gross Normal Cost	$613.2	16.20%
Unfunded Liability Contribution	$1,170.0	30.92%
Actuarially Determined Contribution	$1,783.2	47.12%
Statutory Contributions (Member + Employer)	$(820.7)	21.68%
Special State Appropriation	$(90.1)	2.38%
Net Additional Contribution to comply with Board Policy	$872.4	23.05%

Employers are not contributing the full additional 23.05% rate as the portion associated with most recent experience study is being phased-in over a 5-year period. The rate being phased-in equals the difference between the calculated rate of 23.05% and 14.48% per CavMac. The applicable rate as of June 30, 2021 is 16.18% (14.48% x 80% + 23.05% x 20%). While the actuarial valuation report indicates that direct rate smoothing of contribution rates is used to phase-in the impact of the experience study, we recommend the report also reference the baseline 14.48% rate and explain its derivation and use.

Under the revised ASOP No. 4 to become effective in 2023, phasing-in the impact of assumption changes on contributions is referred to as an output smoothing method. Per the revised ASOP, an actuary may select an output smoothing method that produces a value that does not fall below a reasonable range without the application of the smoothing method and be recognized within a reasonable period of time. While there is no guidance on what constitutes a reasonable range, we do agree that the recognition period should not exceed five years. Although we recognize that this type of approach may be judged to be fiscally necessary, any phase-in will ultimately push additional costs into the future.

We recommend that the actuary comment on the impact on future contribution rates of phasing in this impact.

Health Insurance Contribution Rate

For the Health Insurance Trust, the unfunded liability is amortized over a closed period. As of the June 30, 2021 valuation, the remaining amortization period is 19 years, which is in line with actuarial guidance. We note that the sum of the statutory contributions by the members, employers and the State exceed the actuarially determined contribution rate such that it would be anticipated that the unfunded liability would be paid off more rapidly than the 19-year period would indicate. Total statutory contributions equal 8.99% of payroll, whereas the actuarially determined contribution rate equals 4.64% of payroll, resulting in an excess contribution rate of 4.35%. In CavMac's sensitivity analysis provided in the report, the actuarially determined contribution rate would increase to 6.00% of payroll with a 1% decrease in the discount rate resulting in an excess contribution rate of 2.99%.

We note that the schedule of employer contributions included in the report compares the statutory contribution to the actual employer contribution. These contribution amounts have been the same each year since 2014. For the retirement benefits (and life insurance trust), a similar schedule compares the actuarially determined contributions to the actual amounts made. We would suggest a similar comparison to the actuarially determined contribution amount be included for the health insurance trust.

JFRS

While this audit focuses on the 2021 actuarial valuation, the funding policy parameters have since been modified. Per Kentucky Revised Statute § 21.525, the following are principles for calculating the total actuarially determined employer contribution beginning with the 2023 valuation:

A. Use of the Entry Age Normal actuarial cost method
B. Use of a five-year asset smoothing method.
C. Use of a 20-year closed period that will begin with the 2023 valuation to amortize the unfunded liability.
D. Use of a 20-year closed period beginning subsequent to the 2023 valuation to amortize new sources of unfunded liability (consisting of legislative changes, assumption and method changes, and experience gains and/or losses that occur since the prior valuation).
E. If the plan has surplus assets, all prior amortization bases would be eliminated, and the surplus would be amortized over a 20-year closed period.
F. Determine the normal cost contribution and actuarially accrued liability contribution on a biennium basis.
G. Employer costs for the hybrid cash balance plan shall be incorporated into the employer contribution rate of LRP and JRP.

The use of a 20-year amortization period replaced the prior amortization methodology which equaled interest plus 1% of the unfunded liability or 7.5% of the unfunded liability in total. The prior funding policy effectively resulted in an open amortization period of 27 years. We believe the change to the amortization period to use a closed 20-year period for unfunded liabilities is consistent with model practices contained in the CCA White Paper. Please note that the model practice for amortizing surpluses suggests a longer amortization period to produce a lesser offset to the contribution requirement. It suggests a period of 30 years but does agree with the elimination of all prior bases once a surplus has been achieved. While the 20-year period is shorter than the 30-year period for surpluses noted in the White Paper, we believe the 20-year period is reasonable based on the current funded ratios of the plans.

Biennium Valuations

The policy requires a funding valuation every other year (odd years) to establish the contribution requirements for the following two fiscal years. To determine these subsequent contribution requirements, USI increases the required contribution with interest by one year to account for the lag and then by two years. By establishing the contribution rate for the second year in this manner, there are certain implicit assumptions made:

1. Any investment gains and losses are reflected every two years.

2. If actual contributions differ than that calculated, any shortfall is not reflected until after the two-year period.
3. The normal cost in the second year of the biennium is expected to be the same as the first year.
    a. It does not take into account that normal cost for Tier 1 and Tier 2 participants increases with salary
    b. It does not take into account that Tier 1 and Tier 2 members who retire are replaced with Hybrid plan members, who would have a lower normal cost.

We believe the first two elements are due to the fiscal need to establish a budget on a 2-year basis and the relatively low contribution levels relative to the state budget. For the normal cost component, we suggest that USI consider performing a one-year projection of the normal cost to understand how it may change due to anticipated changing demographics and reflect this change in the calculation.

Hybrid Plan Costs

Since the retirement assets of the plan for all tiers are combined, we agree that the costs of the Hybrid Plan members should be combined with all other members.

<u>All Systems</u>

Normal Cost Rates by Group

Within each plan administered by KPPA, benefits vary by date of hire. The traditional tier applies to members hired prior to January 1, 2014 and the hybrid tier applies to members hired thereafter. Furthermore, the traditional tier benefits and retirement conditions vary for members hired before or after September 1, 2008. This information is provided by CavMac for TRS and by USI for JRP and LRP.

Please note that information by contingency (retirement, termination, disability, and death) is provided by GRS for KPPA, but is not provided by CavMac for TRS and by USI for JFRS.

Recommendation: To provide more information to stakeholders on the relative difference in the Plan provisions, we recommend that the normal cost rates be reported for each group by GRS for plans administered by KPPA. Please see a sample exhibit below for KERS Non-Hazardous based on information provided by GRS for purposes of this audit. In addition, we recommend normal cost rates by decrement be provided for TRS and JFRS.

Sample Normal Cost Rate by Group Exhibit
KERS Non-Hazardous
($ in millions)

	Pension	Insurance	Total
Tier 1a	13.90%	4.06%	17.96%
Tier 1b [1]	13.90%	2.29%	16.19%
Tier 2	11.38%	1.56%	12.94%
Tier 3	8.53%	1.40%	9.93%
Average	11.96%	2.54%	14.50%

[1] Tier 1b applies to members hired on or after July 1, 2003, but before September 1, 2008. Separate normal cost rates are determined for insurance benefits due to changes in benefit provisions.

Section III – Actuarial Valuation Assumptions

Selection of Actuarial Assumptions

The purpose of the actuarial valuation is to analyze the resources needed to meet the current and future obligations of the System. To provide the best estimate of the long-term funded status of the System, the actuarial valuation should be predicated on methods and assumptions that will estimate the future obligations of the System in a reasonable manner.

An actuarial valuation uses various methods and two different types of assumptions: economic and demographic. Economic assumptions are related to the general economy and its long-term impact on the System, or to the operation of the System itself. Demographic assumptions are based on the emergence of the specific experience of the System's members.

Choosing actuarial assumptions is highly subjective. It is unlikely that any two actuaries, given the same set of experience statistics, would arrive at exactly the same set of actuarial assumptions for any system as complex as KYSRS. Even allowing for the minor variations that occur because of the variability of the underlying statistics and possible data anomalies, differences among actuarial approaches will occur in analyzing trends. Some actuaries prefer to match the results of recent experience very closely in setting future assumptions, while other actuaries will use recent experience as a guide but tend to change existing assumptions gradually over time. Valid arguments can be made for either approach.

We will comment on the demographic and the economic assumptions used in the June 30, 2021 valuations for retirement and insurance benefits for each of the systems. We will provide commentary and make suggestions to be considered for future experience studies. In our analysis, we refer to the following three experience studies:

- For KPPA, GRS 2018 Actuarial Experience Study for the period ending June 30, 2018 dated April 18, 2019.
- For TRS, CavMac 2020 Experience Investigation prepared as of June 30, 2020 dated September 28, 2021.
- For JFRS, USI 2020 Pension Plan Experience Study dated October 23, 2020.

Economic Assumptions

Overview

In our opinion, the packages of economic assumptions used in the June 30, 2021 valuations of pension benefits and life and health benefits are generally reasonable, although we suggest a reduction in the inflation assumption for JFRS be considered, as well as the potential impact a reduction in inflation (if made) would have on the investment return assumption. We also recommend consideration be given to taking a holistic view in setting the economic assumptions to reflect a consistent market perspective in the economic assumptions selected across all systems.

Holistic Viewpoint of Capital Market Assumptions

For each system, the set of economic assumptions is based on the latest experience study conducted and the methodology followed by each actuarial firm:

- For KPPA, GRS bases the analysis on an average of 11 different capital market assumption outlooks at the time of the experience study. We do note that the investment return assumptions were not modified in this experience study, but reflect decisions made by the Board in 2017. Based on an inflation assumption of 2.3%, GRS recommended no change to the 5.25% investment return assumption used for KERS Non-Hazardous or SPRS retirement plans. For CERS and all of the KERS insurance funds, GRS found the current assumption of 6.25% to be reasonable but did suggest the possibility of reducing it to 6%.

- For TRS, CavMAC bases its recommendation on the 2020 Horizon Survey and recommended a reduction in the investment return assumption from 7.5% to 7.1% primarily due to a recommendation to reduce the inflation assumption from 3% to 2.5%.

- For JFRS, the investment return assumption was not specifically addressed in the experience study by USI (its Findley division produced the report). It's current investment return assumption of 6.5% is based on an inflation assumption of 3%.

While actuarial assumptions are based on long-term economic outlooks, these outlooks can vary from year to year and sometimes significantly. For instance, capital market outlooks are significantly different as of June 30, 2022 than in 2021 due to the significant increases in interest rates. Changes in financial markets can impact current asset values. For example, higher interest rates result in lower values for bonds held but higher expectations for new bonds bought.

If the systems are making decisions at different times, this could potentially lead to different decisions made on an assumption for one system versus another although the Commonwealth of Kentucky is the plan sponsor for each of the systems. The following table displays the inflation assumption, real return and nominal investment return assumptions used for each of the systems.

Components of Investment Return Assumption					
	KERS NHz / SPRS Retirement	KERS / SPRS Insurance and KERS Hz Retirement	CERS Retirement and Insurance	TRS Retirement and Insurance	JFRS Retirement and Insurance
Inflation Assumption	2.30%	2.30%	2.30%	2.50%	3.00%
Assumed Real Return	2.95%	3.95%	3.95%	4.60%	3.50%
Investment Return Assumption	5.25%	6.25%	6.25%	7.10%	6.50%

From a holistic perspective, one question would be why would the inflation assumption differ across the retirement systems? Furthermore, does the assumed real return reflect the appropriate differences in the long-term expected rate of return associated with each system's asset allocation?

In addition to these items, a plan's projected cash flows and funded ratio should be reflected in any final decision on the investment return assumption. For example, KERS Non-Hazardous and SPRS utilize a lower assumed real return to account for a shorter duration due to the very low funded ratio.

Recommendation: We recommend consideration be given to promote consistency in reviewing and recommending certain assumptions, such as the inflation and investment return assumptions, to be used in the upcoming actuarial valuations. Note that we also recommend other assumptions be reviewed for consistency such as the hybrid interest crediting assumption, mortality improvement assumption and healthcare trend and aging factors for valuing pre-65 health benefits provided by the KEHP as discussed in other sections of this report.

While there are states that are similar to Kentucky where the assumptions for each plan are established based on the individual characteristics of those plans, there are also states that set assumptions consistent across systems or plans.

- Minnesota's Legislative Commission on Pensions and Retirement was established to study pension and retirement topics, to make recommendations furthering sound pension policy for the State's public pension plans and to arrange for review and replication of the annual actuarial work, including the experience studies. All experience studies are conducted in the same year across the systems.

- Florida sets assumptions and methods each year at its annual Assumption Conference. However, the Florida Retirement System is a single system that contains seven membership classes.

- State of Washington has a Pension Funding Council that sets assumptions and methods for all but one of the retirements systems based on recommendations by the Office of the State Actuary. The law enforcement officers and firefighters (LEOFF) Plan 2 Board sets the assumptions for that plan.

Inflation

Inflation, as referred to here, means price inflation. The inflation assumption has an indirect impact on the results of the actuarial valuation through the development of the assumptions for investment return and wage growth.

There is expected to be a long-term relationship between inflation and the investment return assumption. The basic principle is that the investors demand a “real return” – the excess of actual investment returns over inflation. If inflation rates are expected to be high, investors will demand expected investment returns that are also expected to be high enough to exceed inflation, while lower inflation rates will result in lower demanded expected investment returns, at least in the long run.

As noted above, KPPA utilizes an assumption of 2.3%, TRS reduced it from 3.00% to 2.50% based on CavMac’s recommendation in the 2015-2020 experience study and JFRS utilizes an assumption of 3%.

CavMac and GRS considered several forecasts of inflation in making their recommendations. Please note that USI did not address inflation in its experience study.

- The median expected annual rate of inflation for the next ten years reported by the “Survey of Professional Forecasters”. It was 2.21% for fourth quarter of 2018 reported by GRS for KPPA and 2.12% for fourth quarter of 2020 reported by CavMac for TRS.

- For TRS, CavMac noted a forecast from the National Association for Business Economics (NABE) showed its members largely agreed that inflation would be moderately higher for the remaining of 2021 and 2022. Note the survey was as of May 2021. For KPPA, GRS noted forward-looking expectations developed by investment consulting firms over the next ten years to be 2.20%.

- CavMac and GRS both looked at the forecast for long-term CPI increases from the Office of the Chief Actuary for the Social Security Administration. The projected ultimate average annual increase in the CPI under the intermediate cost assumptions was 2.6% in the 2018 Trustees report and 2.4% in the 2020 Trustees Report. In the 2022 Trustees report, it is currently 2.4%.

- For TRS, CavMac notes the median inflation assumption for statewide systems was 2.5% as of 2020 according to the National Association of State Retirement Administrators (NASRA) Public Fund Survey (a survey of approximately 200 large municipal and statewide systems).

At the time of the experience studies, we believe the inflation assumptions used of 2.3% for KPPA and 2.5% for TRS are reasonable. Over the past year, inflation has increased dramatically. However, long-term inflation is not anticipated to be significantly higher than the current assumptions. Based on Milliman's capital market assumptions, long-term inflation is anticipated to be in the 2.3% - 2.5% range. The JFRS assumption of 3% exceeds these expectations.

Recommendation: We recommend that the same inflation assumption be chosen for all the systems. Based on the current market outlook, an assumption in the range of 2.3% - 2.5% would be reasonable, which would result in a reduction in the assumption used for JFRS.

Investment Return

The investment return assumption is one of the primary determinants in the calculation of the expected cost of benefits, providing a discount of the estimated future benefit payments to reflect the time value of money. This assumption has a direct impact on the calculations of actuarial accrued liabilities, normal cost rate, and the actuarially determined contribution rate. The discount rate is the rate used to discount future benefit payments into an actuarial present value. The traditional actuarial approach used for public sector funding sets the discount rate equal to, or approximately equal to, the expected median investment return over a long-time horizon.

To develop an analytical basis for assessing the investment return assumption, GRS and CavMac reviewed forward looking long-term capital market assumptions developed by Wilshire (KPPA's investment consultant) and Aon (TRS' investment consultant). In addition, they each also considered those of other investment consultants by performing separate analysis using:

- An average of 11 investment consultant expectations of short-term outlooks (7 – 10 years) for KPPA gathered by GRS. In addition, three of the investment consulting firms provided longer term outlook (20 – 30 years).
- The capital market assumptions in the *Survey of Capital Market Assumptions: 2020 Edition* published by Horizon Actuarial Services, LLC.

Both actuarial firms utilized these other investment consultants as the basis for their recommendations. Based on the assumptions adopted, this resulted in the real returns noted in the table above. For KPPA, GRS continued to recommend expected real returns of 2.95% for the most poorly funded plans, KERS Non-Hazardous and SPRS retirement, and 3.95% for the other systems. CavMac increased the expected real return from 4.5% to 4.6%. For JFRS, the real return assumption is 3.5%.

While we believe the real return assumption chosen for each system is reasonable when considered by itself, we do not believe that the real assumptions selected are consistent when compared to each other. We address this point in the following comments.

- **Independent Milliman Analysis:** We performed additional analysis on the investment return assumption as of June 30, 2021 using Milliman capital market assumptions.
    - For KERS Non-Hazardous and SPRS, our analysis shows a 10-year expected median real return of 2.8%, which is a bit lower than the current assumption of 2.95%. Please note that we utilized Milliman's 10-year assumptions rather than 30-year assumptions to provide a more conservative measurement given the low funded ratios of the system. Although our estimated expected returns are less than the current assumption, the difference is not enough that we would say it is unreasonable.
    - For KERS Hazardous and all KERS insurance plans, our analysis shows a 20-year expected median real return of 4.15%, which is a bit higher than the current assumption of 3.95%. As the funded ratio for these plans is significantly higher than KERS Non-Hazardous and SPRS, we believe using a longer-term outlook is appropriate. This results in our current expectations exceeding the 6.25% assumption slightly.
    - For CERS retirement and insurance plans, our analysis shows a 20-year expected median real return of 4.05%, which is slightly higher than the current assumption of 3.95% and approximately 10 basis points less than KERS Hazardous and all KERS insurance plans. As the funded ratio for these plans is significantly higher than KERS Non-Hazardous and SPRS, we believe using a longer-term outlook is appropriate. This results in our current expectations exceeding the 6.25% assumption slightly.
    - For TRS, our analysis shows a 30-year expected median real return of 4.3% (lower for shorter periods), which is very similar to the Aon analysis of 4.39% cited in CavMac's experience investigation. It should be noted that although our estimated expected returns are less than the current 7.1% assumption, the difference is not enough that we would say it is unreasonable. Also, our

analysis is based on our understanding of TRS' assets which is not as extensive as Aon's.

Relative to CERS, our analysis shows a 20-year expected median real return of 4%, which is about 5 basis points lower than CERS. As such, a holistic perspective may result in a return assumption selected for TRS to be consistent or very slightly less than CERS.

- For JFRS, our analysis shows a 30-year expected median real return of 3.15%, which is a bit lower than the current assumption of 3.5%. Relative to CERS, our analysis shows a 20-year expected median real return of 2.85%, which is about 120 basis points lower than CERS. Combining this analysis with our lower anticipated inflation assumption, our estimated expected returns are approximately 1% less than the current 6.5% assumption. Based on this difference, a reduction in the investment return assumption should be considered, although this should be viewed in the context of the current capital market assumptions which have increased since June 30, 2021. Please see our further comments below.

- **Investment Expertise:** Given Wilshire and Aon have specific expertise with KPPA and TRS investments, consideration should be given in the future to giving more weight to each of their expected return calculation. Furthermore, this would eliminate mapping of asset classes that may not exist in the analysis performed by GRS or in the Horizon Survey.

  - For KPPA, GRS based its analysis on an average of 14 different return expectations. The 14 return expectations reflect short-term expectations from 11 investment firms plus long-term expectations from three investment firms. The three firms that submitted the long-term expectations had also submitted short-term expectations. Therefore, GRS provided these three firms additional weight on their short-term expectations than the other firms. We are unsure if Wilshire is one of the three firms, but even so, we are unsure why two other firms would be provided additional weight in making the recommendations. As noted, we believe more weight should be given to Wilshire or KPPA's investment consultant.

  - Timing of the Horizon Survey can also have an impact on differences in capital market assumptions with TRS' investment consultant. The Horizon Survey is typically published in August reflecting capital market assumptions as of January 1 whereas Aon's assumption may be more reflective of capital markets as of June 30. While most years this timing difference is not significant, there can be situations where they can be significantly different, such as 2022. The Horizon Survey in 2022 reflects capital market assumptions as of January 1, 2022 prior to any adjustment for increases in inflation and in short-term interest rates that have occurred during 2022.

- **Recent Changes in Investment Environment:** Our commentary has focused on the assumption in relation to the time of the experience study and use in the June 30, 2021 valuation. However, driven by increasing fixed income yields and lower price-to-earnings ratios, capital market assumptions have increased significantly as of June 30, 2022, as compared to a year ago. Based on Milliman's capital market assumptions as of June 30, 2022, the 20-year long-term expected returns increased by approximately 60 basis points (0.6%) from Milliman's 2021 20-year expected return.

  This would increase the expected returns based on Milliman's capital market assumptions to be above the current assumptions of 5.25% and 6.25% used for KPPA and to slightly above the current 7.1% assumption for TRS but still lower than the current 6.5% assumption used by JFRS by 0.5%.

Recommendation: For KPPA and TRS, we would not suggest modifications to the investment return assumption at this time. For JFRS, we suggest a reduction in the inflation assumption be considered which may also apply in setting the investment return assumption.

We understand that HB 76 recently modified Kentucky Revised Statute § 61.670 to require at least once every two years to conduct a review of the economic assumptions, including but not limited to the inflation rate, investment return and payroll growth assumptions. This type of off-cycle review allows for smaller adjustments more often than larger adjustments that may take place after a 5-year period. While a system wants to avoid frequent changes in assumptions due to short-term fluctuations, if it waits until the end of a 5-year period, large changes in the assumption may be politically and/or economically more difficult to implement. Further, the assumptions have the potential to fall out of compliance with actuarial standards of practice. We believe adoption of this provision will assist in maintaining reasonable assumptions.

Hybrid Interest Crediting Rate Assumption

Another assumption we believe consideration should be made on a consistent basis among the systems is the interest crediting rate on the cash balance accounts for the hybrid plans. This impacts KPPA and JFRS; TRS did not offer a hybrid plan at the time of the June 30, 2021 actuarial valuation. Neither GRS nor USI address this assumption in the experience study.

The cash balance accounts are credited with member and employer payroll based contributions. These contributions are credited with interest equal to a minimum of 4% plus an amount equal to 75% of the average geometric return over the past five years in excess of 4%. For example, if the average return over the past five years is 6%, the excess return is 2%. Taking 75% of this return equals 1.5% so each member's account would be credited with an additional 1.5% in the upcoming year. If the average return is 4% or less, then no additional return would be credited, but each account would still be credited with 4%.

Each actuary is setting the interest crediting assuming that the excess return equals the investment return assumption less 4%.

Hybrid Plan Assumed Interest Crediting Rate			
	KERS NHz / SPRS	KERS Hz / CERS	JFRS
Investment Return Assumption	5.25%	6.25%	6.5%
75% of Assumed Excess Return over 4%	0.9375%	1.6875%	1.875%
Assumed Interest Crediting Rate	4.9375%	5.6875%	5.875%

The investment return assumptions are based on a distribution of returns that typically reflect a 50% chance of achieving at least that return. In other words, there is a 50% chance that the geometric average of actual returns over a long-term horizon would exceed the assumption selected. As a result, there is a 50% chance that returns and the associated interest crediting rate could exceed the assumption. Without any minimum interest crediting rate, this chance would be offset by the 50% chance that returns are below the expected return. However, for the interest crediting rate, the low end of the distribution of possible outcomes is limited due to the application of the 4% minimum interest crediting rate. Therefore, the average expected interest crediting rate would be higher than that shown in the chart above.

To estimate the potential average interest crediting rates, we employed two analyses:

- Hypothetical historical analysis assuming the asset allocation was in effect for the prior 30 years.
- Forward looking analysis taking into account expected returns and standard deviation of returns using Milliman's 30-year capital market assumptions as of June 30, 2021 based on each plan's asset allocation.

The following chart compares the results of our analysis with the current assumption.

Hybrid Plan Assumed Interest Crediting Rate			
	KERS NHz / SPRS	KERS Hz / CERS	JFRS
75% of Assumed Excess Return over 4%	0.9375%	1.6875%	1.875%
Historical Analysis of 75% of Excess Return over 4%	1.5%	2.9%	2.8%
Forward Looking Analysis of 75% of Excess Return over 4%	2.4%	3.0%	2.3%
Assumed Interest Crediting Rate used in Valuation	4.9375%	5.6875%	5.875%
Assumed Interest Crediting Rate based on Historical Analysis	5.5%	6.9%	6.8%
Assumed Interest Crediting Rate based on Forward Looking Analysis	6.4%	7.0%	6.3%

We based our analysis on long-term 30-year returns as the hybrid account only applies to members recently hired and thus average returns would reflect a longer time horizon for these particular members.

Due to the impact of the 4% minimum return, we have determined average interest crediting rates that exceed the current assumption by up to 150 basis points (1.5%) depending on the plan.

Recommendation: We recommend that KPPA and JFRS complete a similar analysis as shown here on the interest crediting rate to determine an applicable assumption that should be used and be reflected in the next valuation. We believe this could have a material impact on the costs of the hybrid plan.

Economic Assumptions - KPPA

In this section, we review wage-related assumptions used in the KERS, CERS and SPRS actuarial valuations. GRS proposes wage inflation that differs from non-hazardous membership and hazardous duty, which includes SPRS. The total salary increase assumption then adds on salary increases due to merit and promotion, which vary by each individual group and are higher for shorter-service members than long-service members.

Wage Inflation

Wage inflation consists of two components, 1) a portion due to pure price inflation (i.e., increases due to changes in the CPI), and 2) increases in average salary levels in excess of pure price inflation (i.e., increases due to changes in productivity levels, supply and demand in the labor market and other macroeconomic factors) referred to as real wage growth.

GRS recommended real wage inflation of 1% per year for non-hazardous and 1.25% for hazardous and SPRS. These would be added to the price inflation assumption of 2.3% for the underlying salary increases prior to additional increases for promotion and merit. These levels are consistent with assumptions used in the private sector but they may be somewhat higher than used by other public retirement systems.

We believe that the 1% / 1.25% real wage growth assumption is reasonable. We do note that inflation has increased significantly since the 2021 valuation that may increase pressure on salaries in the near future.

Payroll Growth

The future rate of payroll growth is an assumption used in the development of the level percent of pay amortization amount of the Unfunded Actuarial Accrued Liability (UAAL) in developing the UAAL contribution rate under the funding policy.

For KERS and SPRS, the payroll growth assumption is set to 0%. As noted in the experience study, actual payroll had declined during the 10-year period measured at that time for KERS Non-Hazardous and SPRS, and there was only a small increase (0.62%) for KERS Hazardous. GRS recommended to maintain the 0% payroll growth assumption for these systems, and we believe this assumption is reasonable.

For CERS, the payroll growth assumption was set to 2%. Typically, the payroll growth is equal to the general wage growth assumption, which would be 3.3% and 3.55%, respectively. In the experience study, GRS noted actual changes in payroll over the past 10-years was 1.31% for CERS Non-Hazardous and 1.19% for CERS Hazardous. GRS recommended to maintain the payroll growth assumption at 2%, we believe this assumption is reasonable.

Salary Increases due to Merit & Promotion

GRS studied merit and promotion pay increases by plan. Employees by plan were segmented into short-service and long-service based on GRS' observation of the data. For hazardous duty, 10 years was used as the split, 11 years for KERS Non-Hazardous and 15 years for CERS Non-Hazardous. For members with service in excess of these levels, GRS proposes no additional salary increases due to merit and promotion. We agree that length of service is generally the best predictor of future merit increases. For Hazardous groups and SPRS, we are a bit surprised that no increases are included after 10 years as we typically see longevity and promotions to continuing beyond 10 years of service. In looking at the charts included in the experience study, actual salary increases exceeded inflation by 3.8% for KERS Hazardous, 2.7% for CERS Hazardous and 2.5% for SPRS. Reducing these increases by the 1.25% wage inflation assumption would appear to suggest that increases due to merit and promotion may continue beyond this 10-year period.

We recommend that an assumption be incorporated for salary increases due to merit and promotion for hazardous and SPRS members with at least 10 years of service if the next experience study continues to see these types of increases.

Economic Assumptions - TRS

In this section, we review wage-related assumptions used in the TRS actuarial valuation.

Wage Inflation

As noted in the CavMac experience study report, wage inflation consists of two components, 1) a portion due to pure price inflation (i.e., increases due to changes in the CPI), and 2) increases in average salary levels in excess of pure price inflation (i.e., increases due to changes in productivity levels, supply and demand in the labor market and other macroeconomic factors) referred to as real wage growth.

TRS reduced the real wage growth assumption from 0.50% to 0.25% consistent with CavMac's recommendation in the experience study. CavMac considered both Social Security data and forecasts of real wage growth which are higher than 0.50%, but ultimately made its recommendation based on the past experience for Kentucky teachers being lower than the 0.50% and their assumption that it is unlikely that public sector employees can match the productivity rates of those in the private sector.

After the reduction in the real wage growth, this assumption is lower than that used by most public sector retirement systems and lower than what we usually recommend. However, we agree that there is merit to the idea that teacher compensation patterns may be different than other employees, as we have observed lower real wage growth among teachers.

For use in the June 30, 2021 actuarial valuation, we believe that the 0.25% real wage growth (2.75% total wage growth) assumption was reasonable.

Payroll Growth

The future rate of payroll growth is an assumption used in the development of the level percent of pay amortization amount of the Unfunded Actuarial Accrued Liability (UAAL) in developing the UAAL contribution rate under the funding policy. The current payroll increase assumption is equal to the general wage inflation assumption of 2.75%. We also typically set the payroll increase assumption equal to the general wage inflation assumption, unless there is a specific circumstance that would call for an alternative assumption.

CavMac notes that payroll growth has been less than expected over the last 10 to 15 years; however, CavMac cites some positive population growth within the state and the correlation with the need for teachers. On balance, they conclude that it is reasonable to keep the payroll growth assumption equal to the general wage growth assumption. We believe this assumption is reasonable, but if in the next experience study the data does not support this assumption, we believe consideration should be given to reducing the assumption.

Rates of Salary Increase - Merit

This assumption relates to increases in each individual's salary due to promotion or longevity (often referred to as merit) that are in excess of the general wage increase. Based on CavMac's recommendation, new merit salary scale rates which vary by service were adopted for use in the June 30, 2021 valuation. The recommended changes appear reasonable based on CavMac analysis, and we believe they were reasonable for use in the June 30, 2021 valuation. In particular, we agree with the change to a service-based scale as opposed to the old table that varied by age.

We suggest that in future experience studies consideration be given to studying this assumption over a longer period than five years. CavMac notes the primary difficulty actuaries have in studying merit which is that it can be hard to isolate what part of an individual member's salary increase is due to general wage growth and what part is due to merit. To perform their analysis, CavMac assumes an ultimate merit rate of 0.25% for long service members and then based on that calculates the merit salary increases at shorter service levels. This is accurate to the extent the assumed ultimate merit rate is correct. By using a longer period, short term fluctuations can be minimized and an estimate of the actual general wage growth over the period and the ultimate merit rate can be made.

Economic Assumptions - JFRS

In this section, we review wage-related assumptions used in the JRP and LRP actuarial valuations. USI notes that experience for salary increases was less than 1% per year from 2013 to 2019 but does not provide any evidence supporting the review. While raises for judges and legislators can follow a different pattern than the typical public sector employee, we do suggest an experience chart be included in the next experience study.

USI recommended no change to the assumption unless the Board provided additional insight. The assumption specified 1% salary increases for the next five years and 3.5% thereafter. With an inflation assumption of 3%, this would indicate a real wage inflation assumption of 0.5%, which is more than assumed for TRS and less than assumed for KPPA. We believe a long-term assumption for real wage inflation of 0.5% - 1.5% to be reasonable depending on the employee group.

Please note that USI does not specifically state the 5-year period for which the 1% of pay increases would apply. In the 2021 valuation, they applied for 4 years subsequent to the valuation date although the valuation report noted 3 years. We discuss this further in the Section IV of this report. Furthermore, the 1% of pay applied to all years retroactively for purposes of determining benefits under the Entry Age Normal cost method. We discuss this further in Section V of this report.

We believe the assumptions selected are reasonable for the 2021 actuarial valuation, we do suggest more clarity be provided in its use and disclosure.

Demographic Assumptions

Overview

Actuarial Standard of Practice (ASOP) No. 35 governs the selection of demographic and other noneconomic assumptions for measuring pension obligations. ASOP 35 states that the actuary should use professional judgment to estimate possible future outcomes based on past experience and future expectations, and select assumptions based upon application of that professional judgment. The actuary should select reasonable demographic assumptions in light of the particular characteristics of the defined benefit plan that is the subject of the measurement. A reasonable assumption is one that is expected to appropriately model the contingency being measured and is not anticipated to produce significant cumulative actuarial gains or losses over the measurement period.

We found that the methodologies used to prepare the experience study were appropriate and that the assumptions developed comply with the guidance provided by ASOP 35. We have offered a few suggestions for considerations in future experience studies. The ultimate purpose of any actuarial experience study is to provide a basis for setting the actuarial assumptions for future valuations. We believe that the statistical analysis included in the CavMac and GRS experience study reports and the resulting recommendations are reasonable. Although the USI experience study report has limited statistical analysis, partially due to the small plan size of JRP and LRP, we believe the recommendations are reasonable.

Annuitant Mortality Assumption

Please note that our comments are based on the assumptions in place as of June 30, 2021, and do not reflect any potential adjustments due to the Covid-19 pandemic.

Mortality rates are used to project the length of time benefits will be paid to current and future retirees and beneficiaries. The selection of a mortality assumption affects plan liabilities because the estimated value of retiree benefits depends on how long the benefit payments are expected to continue. There are clear differences in the mortality rates by gender and non-disabled versus disabled retired members.

In 2019 the Retirement Plans Experience Committee (RPEC) of the Society of Actuaries ("SOA") issued the "Pub-2010" family of static base mortality tables. The 2010 in the title refers to the central year of collected study data. These are the first tables published by the RPEC based solely on public sector experience. This family of mortality tables include specific tables for general employees, public safety, and teachers. In addition, each set of tables includes above median and below median rates based on benefit amount. We note that each of the actuaries for the systems have selected to use some variation of these tables for at least a portion of their system's population.

For the KPPA systems, GRS developed system specific mortality tables based on the experience for all the systems combined. We reviewed their methodology, which focused on those retirees between ages 58 and 94. We found their discussion to be consistent with actuarial practice and reasoning to be appropriate taking into account the credibility of the experience. We do note that they indicated that there were 5,078 male deaths and 5,060 female deaths during the 5-year period ending June 30, 2018 indicating that they are "99% confident that the experience for the 5-year observation period are within 5% and 3% of the true mortality experience for males and females, respectively". We agree that this many deaths would provide a credible set to build a system specific mortality table. Please note that the charts shown in the experience study report are based on benefit amount. We do suggest that experience also be shown on a count basis.

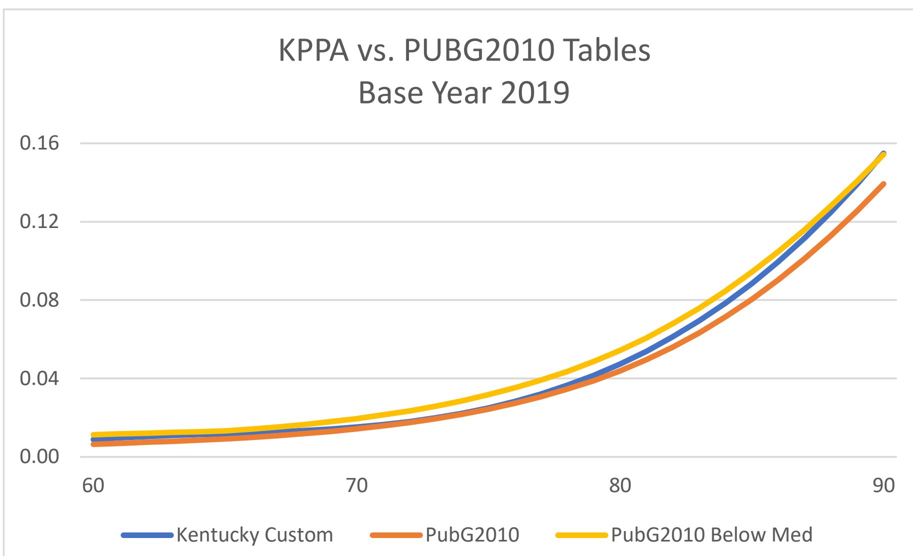
On a benefits basis, GRS indicates that there were $767,000 benefits associated with male deaths and $491,000 benefits associated with female deaths during the study period. Based on the reported number of actual deaths by gender, this converts to an average benefit of $151 and $97, respectively. These amounts do not appear to be consistent with the actual retiree benefit amounts. We suggest GRS review to ensure that the scale is correct in the report exhibits and that the benefits associated with the deaths were tabulated correctly.

GRS developed one mortality table and used it for all non-disabled members in receipt, with no differentiation based on whether the member was a retiree or a beneficiary, or whether the member had served as a general employee or in a public safety role. For each of the systems, we reviewed the results for the probability of death for healthy and disabled retired members and found them to be reasonable and generally consistent with the methods we usually recommend. We have the following observations, but we have no recommended changes but offer some considerations for the next experience study.

1. **Benefit Weighting:** When analyzing mortality experience, we believe rates should be studied on either benefits-weighted or liability-weighted basis for pension assumptions. Analysis has shown that higher benefit/liability retirees tend to live longer than lower benefit/liability retirees. CavMac and GRS used a benefit-weighted approach in their mortality analysis to account for this relationship. We agree with this approach. There is no credible experience for JFRS to report.

2. **New Mortality Tables**:

   a. GRS constructed their own tables based on KPPA experience for post-retirement healthy mortality experience rather than basing it on the Pub-2010 tables. They do use the Pub-2010 table series for other situations as discussed below. To put the table developed by GRS in context, we found that the rates of mortality were between the standard general employee table and the Below Median version. The following graphs compares the rate of mortality by age for the 2019 base year.



The tables developed by GRS are in compliance with actuarial standards although we offer suggestions below in separating experience of hazardous duty members and contingent survivors in the next experience study. GRS may also wish to adjust the PubG tables to the extent that the fit is reasonable.

b. For TRS, the PubT-2010 tables for teachers, with customization to TRS retiree experience, was recommended in the experience study and is being used in the valuation. We agree with the use of the newer tables.

c. For JFRS, USI recommended the PubG-2010 Above Median table, which would reflect lower mortality for this population than a standard public employee population. We agree with the selection of the Above Median table.

3. **Mortality Tables by Membership Group:** Based on various mortality studies published by the Society of Actuaries, it is generally expected that mortality rates will vary between those who had worked in general employment versus public safety versus in the classroom. For KPPA, GRS developed one post-retirement mortality table for all non-disabled members, with no differentiation between non-hazardous membership and hazardous duty, including SPRS. Since the liabilities and costs for each system are developed independently, we are unsure why this one particular assumption comprises of all groups rather than the demographics of each specific group. We suggest that KPPA determine if this assumption should be determined separately or in a combined fashion. We suggest combining KERS and CERS non-hazardous members together and the KERS and CERS hazardous plus SPRS together. We also suggest that this information be provided in the next experience study even if one combined table is recommended or not.

4. **Contingent Survivor Mortality**: The analysis of contingent survivor mortality experience reflects the experience of survivors where the member has previously died, and the survivor is now receiving payments. That is, it excludes contingent beneficiaries where the retiree is receiving the payment and no pension benefit is currently being paid to the contingent beneficiary. We caution against using the experience of the in-payment survivors to set the assumption for the not-in-payment contingent beneficiaries, as studies have shown in-payment survivors have materially higher mortality rates at ages less than 85 than contingent beneficiaries of members who are still alive and receiving benefits. This is sometimes referred to as the “grieving widow effect.” The RPEC notes that the contingent survivor mortality rates were developed solely from the experience data for surviving beneficiaries <u>after</u> the death of the primary member. This assumption could also impact the development of the actuarial equivalent factors for retirees electing a joint and survivor annuity. Assuming a shorter life span for a beneficiary will reduce the cost of these options and produce a larger relative benefit.

a. For KPPA, the experience for contingent beneficiaries was included in GRS' analysis of the postretirement mortality assumption. We suggest that this experience be studied separately in the next experience study.

b. For TRS, we suggest that a healthy post-retirement mortality table be used for beneficiaries while the retiree is alive and use the contingent mortality table only upon death of the retiree.

c. For JFRS, USI does not use the contingent survivor mortality table. We believe this is a reasonable choice for this plan.

5. **Applicable Mortality for Healthcare Benefits**: For healthcare benefits, mortality would not typically reflect benefit weighting as the liability is not based on benefit amount. For healthcare benefits, we suggest consideration be given in the experience study to incorporating an analysis on the number of deaths as compared to the headcount-weighted version of the Pub-2010 mortality tables. If GRS continues to develop tables based on actual KPPA experience, we suggest a table be developed based on headcount weighted for insurance purposes. We would anticipate that use of headcount-weighted tables would produce a lower liability in the healthcare valuation. However, since teachers tend to be a more homogeneous group, there will likely be less difference between the two approaches than a typical public employee retirement system for this group. We do note that USI is using headcount-weighted for the JFRS insurance valuations.

   As with the retirement benefits, we would caution against using the contingent survivor mortality for dependents of current retirees. This could have a greater impact on the liabilities of the healthcare valuation since benefits are provided to dependents while the retiree is alive.

6. **Pre-Retirement & Disability Mortality:**

   a. For pre-retirement mortality for KPPA systems, GRS recommended using mortality rates based on the Pub-2010 tables. Specifically, for Non-Hazardous employees they recommended the PubG-2010 table for general employees and for Hazardous and State Police employees, they recommended the PubS-2010 table for Public Safety employees. We believe this is a reasonable assumption.

      For disability mortality for KPPA systems, GRS recommended using the Pub-2010 Disabled Mortality Table with a 4-year set forward based on the experience of the systems. We found the selection of this assumption to be reasonable.

b. For TRS, similar to retiree mortality, the active employee and disabled mortality assumptions are based on the Pub-2010 employee and disability mortality tables for teachers with adjustment based on TRS' experience. We believe this is a reasonable assumption.

c. For JFRS, the pre-commencement version of the Above Median version of the PubG-2010 table was selected, which is consistent with the selection for the post-retirement mortality assumption. We believe this is a reasonable assumption.

7. **Pandemic Impact**: In the US, there was a significant increase in mortality rates in second quarter of 2020 through the first quarter of 2022, which are likely driven by the pandemic and may not be indicative of future experience. For purposes of the experience study, CavMac made no explicit adjustment for this. Since only the last quarter of the study overlapped with the higher mortality period, the impact on the results should have been relatively small.

Mortality Improvement Scale

In general, it is widely accepted that mortality will continue to improve in the future. This means that the expected life expectancy for someone who reaches age 65 in 20 years from now will be greater than the expected life expectancy for someone who is age 65 today. Since the liability for a pension promise is heavily dependent on how long the member is expected to live, it is important that future mortality improvement be taken into consideration.

To provide an estimate of the gradual improvement expected in mortality in the future, beginning in 2014 the Society of Actuaries (SOA) has created projections of mortality improvement in "MP" tables that are updated each year. It has become very common for pension actuaries to utilize some version of the SOA's MP tables for estimating future mortality improvements.

For KPPA, GRS noted that the SOA MP tables (through 2018) have an ultimate annual improvement rate of about 1%, while there are select rates in effect for the first 15 years. In their experience study, GRS noted that the more recent SOA MP tables had to scale back the mortality improvement rates initially published in the SOA's 2014 MP table, while the ultimate rates remained consistent between the MP-2014 through MP-2018 tables. In addition, they found the ultimate rates to be more consistent with other demographer sources. Based on this, they concluded that it is more appropriate to utilize the ultimate mortality improvement rates for all years as compared to utilizing the select rates for the first 15 years. Accordingly, they recommended use of the ultimate rates from the SOA MP-2014 table. We would note that beginning with the MP-2020 mortality improvement scale table, the ages with ultimate improvement rates of 1% was modified to be based on age where some ages are anticipated to be greater and some less than the 1%

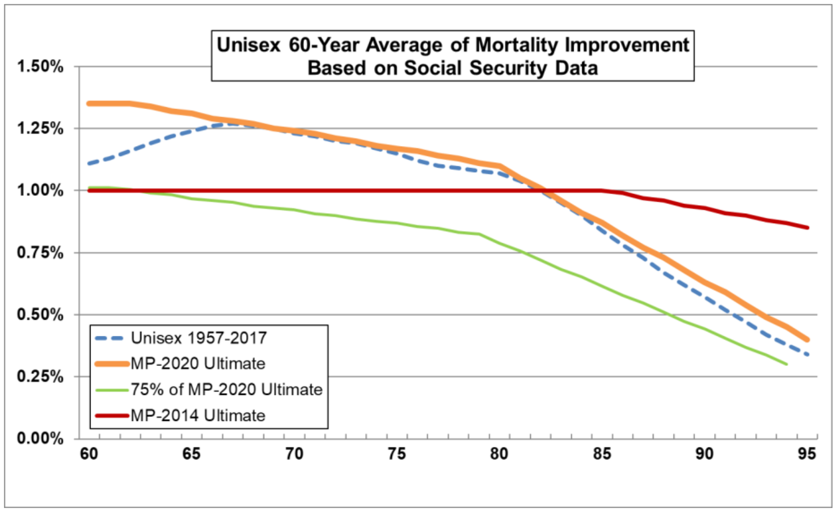
assumption previously included in the SOA tables. While we believe the selection of the ultimate mortality improvement rates from the SOA MP-2014 table was reasonable at the time of the experience study, we do suggest that the latest MP table be reviewed for selection in the next experience study, including its select and ultimate rates.

For TRS, in the experience study report, CavMac recommended the valuation use the most recent version, at that time, of the MP table (MP-2020 version) multiplied by 75%. The rationale for only partially recognizing this table is that the SOA in its annual updates has consistently reduced the level of expected improvement reflected in MP tables from previous years.

We agree with the recommendation to use a mortality improvement scale and using the most recent one published by the SOA is appropriate. Given the uncertainty surrounding future improvements in mortality, we believe the recommended table is reasonable, although it is not what we have been recommending to our clients. As CavMac correctly notes, the projected rates of improvement predicted by the SOA have declined since the MP table was first published in 2014; however, this decline has only applied to the short-term rates (the first 15 years). The long-term projected rates (after 15 years) of improvement have only changed once. As noted above, the MP-2020 table modified the long-term rates from a constant 1% across most ages to rates that vary by age, which resulted in generally longer life expectancies for future retirees. Therefore, consideration should be given to whether such a reduction in the long-term standard rates is appropriate.

Milliman has studied data from the Social Security Administration (SSA) website. The SSA provides historical rates of death from 1900 to 2017. From the most recent 60-year period available in this data, Milliman calculated historical mortality improvement. The SSA database was used because of its size, credibility, and public availability.

The graph below shows the average rates of mortality improvement by age for a this 60-year period compared to the MP-2020 ultimate rates (those applicable 15 years in the future and later) with the recommended rates of the 2014 MP ultimate scale for KPPA (red line) and 75% of the MP-2020 rates for TRS (green line).



Of course, past results are no guarantee that the same patterns will be repeated in the future, but it does provide some perspective on how the recommended improvement assumption compares with actual historical improvements. Note that the green 75% of MP-2020 Ultimate line only shows the valuation rates of mortality improvement after 15 years. In the first 15 years, the valuation rates are less than the green line shown in the graph. This means that in the first 15 years, the difference between the valuation assumptions and actual historical experience is even greater than shown in the graph.

Although our preference is to use the unadjusted mortality projection scale, it should be noted that there are other systems using reduced versions of the MP-2020 projection scale. For example, analysis performed by actuaries at the largest state retirement system (CalPERS) found that 80% of the MP-2020 scale was more representative of mortality improvement over the last 20 years among its retirees.

For JFRS systems, USI recommended using the SOA MP-2020 table unadjusted. We found this assumption to be reasonable.

While we find each assumption selected reasonable for each system, they are different from each other in how they forecast mortality improvement. Since these are all employees of the Commonwealth of Kentucky, and its municipalities and other governmental agencies, we would not expect rates of mortality improvement to differ for each group.

Recommendation: As noted above, we recommend that consideration be given to promote consistency for certain assumptions to be used in the upcoming actuarial valuations, and we recommend the mortality improvement assumption be included in that review.

Other Demographic Assumptions – KPPA

Withdrawal

For KPPA, GRS recommended termination or withdrawal rates based on service weighted by compensation for each plan separately. The experience for male and female members was combined to provide for greater statistical credibility. Prior to 2016 the termination experience included pre-retirement mortality experience. Since this period was included in the experience study, all of the pre-retirement mortality experience in the study was included in the study. The final resulting termination assumption was then adjusted by the pre-retirement mortality rates noted above.

In the experience study GRS noted that actual rates of withdrawal were much higher than expected and they purposely did not increase the rates all the way to match the experience to avoid over-adjusting the assumption. Having a withdrawal assumption that produces an actual to expected ratio above 100% results in a conservative estimate of the liability.

Overall, we agree with the approach used by GRS in setting this assumption. The use of membership group and service is appropriate and reasonable along with weighting the experience by payroll.

In addition to the probability a member withdraws from active employment, an assumption must be made as to whether that member will take a refund of their contributions upon withdrawal or keep their contributions with KPPA and receive a deferred monthly allowance at a later date. The valuation assumes the member takes the more valuable of the two options. This is a reasonable assumption.

Retirement

Rates of retirement vary by plan, tier, eligibility for unreduced retirement benefits, and available retiree medical benefits. Based on these items, there are numerous different combinations to be considered in setting retirement rates. For hazardous employees and SPRS, GRS recommended continued use of a service-based retirement assumption that varies by tier. For Non-Hazardous employees, they recommended continued use of an age-based assumption with distinctions based on gender with differences based on the value of medical premium subsidy expected to be received.

We generally found the selection of the retirement assumptions to be reasonable and appropriate subject to the following additional comments.

1. For members hired on or after July 1, 2003, GRS recommended to use 80% of the rates recommended for members hired before July 1, 2003 to account for the change in retiree medical benefits for ages below age 65. As there is little

experience for this group, this determination is primarily based on actuarial judgement. For members hired prior to July 1, 2003 who retire with at least 20 years of service, members would receive a premium subsidy equal to the full premium. For members hired after July 1, 2003, members receive a monthly supplement towards medical coverage in retirement equal to $10 for non-hazardous and $15 for hazardous per year of service with 1.5% annual increases. We believe an adjustment is reasonable and agree that an 80% adjustment until age 65 is reasonable absent actual experience.

2. The benefit multiplier for Tier 2 Non-Hazardous employees (hired between September 1, 2008 and January 1, 2014) is based on service at termination. While there is presumably very little retirement experience available for these employees at this time, it may be reasonable to consider implementing service-based retirement rates since they may be more likely to retire once a key service threshold is attained.

3. Under the various plans the unreduced retirement eligibility is based on age or service or a combination of both age and service. When a member first meets the age and service criteria for an unreduced retirement, we typically see a spike in those retiring in that year. In the next experience study, we suggest that GRS consider reviewing rates of retirement at first eligibility separately from other ages. We believe this could have an impact on non-hazardous rates of retirement.

4. In the experience study report, GRS notes that adjustments are made to set retirement rates for Tier 2 and Tier 3 members from those developed for Tier 1 members. They note these differences are due to differences in retirement benefits and retiree medical benefits, but do not necessarily detail the rationale for the specific changes in retirement rates. For example, a SPRS members with 31 years of service would receive the same benefit under Tier 2 as Tier 1. However, the retirement rate at 31 years of service is 58% under Tier 1 and only 22.4% under Tier 2. It was noted that due to changes in retiree medical benefits, the retirement rates for Tier 2 were set to 80% of Tier 1 if hired prior to July 1, 2003, but this difference is greater than this adjustment. We recommend that GRS review the retirement rates by Tier within each group to clarify the adjustments made to the rates determined based on the experience study data and provide appropriate justification and rationale for the adjustments.

Disabilities among Active Members

The assumptions for rates of disability from active status vary by membership group and age. In the experience study GRS recommended rates that were greater than the previous rates, mostly to account for a lag in the reporting of disabilities. It has been our experience that there is often a lag between when a member leaves active employment and when they are approved for a disability retirement, so not all disability retirements may be included in the experience study. We agree with the methodology used by GRS to account for this lag.

It is also in our experience that there may be situations where a member may become disabled, but may not apply for disability:

- Members with less than 5 years of service are not eligible for disability benefits and therefore, members who terminate employment due to disability would most likely be categorized as a termination. GRS makes an adjustment to the rates of termination for pre-retirement deaths that cannot be distinguished from regular terminations, but no such adjustment is made for disabilities during the first five years. We recommend not applying the rates of disability prior to the member reaching the eligibility requirement.

- Once a member has accrued a certain number of years of service, such as 27 years for Tier 1 non-hazardous or 20 years for Tier 1 SPRS, a disability benefit would not be payable, and the retirement benefit would be payable. We suggest that in these situations the rates of disability do not apply in the actuarial valuation and members in these situations are excluded from the experience study.

We do note that GRS does not vary the rates of disability by gender. While this may appropriate for hazardous duty and SPRS due to the nature of the job, we typically see experience vary by gender for general public sector employees.

<u>Other Demographic Assumptions - TRS</u>

Withdrawal

The withdrawal assumption was based on quinquennial age group and further split between gender and service group (less than 5 years, 5 to 10 years, and 10 or more years). CavMac provides analysis for these groups on a compensation-weighted basis. Based on this analysis and CavMac's recommendation, the withdrawal rates were lowered.

Based on CavMac's analysis, the withdrawal rates proposed in the experience study and used in the June 30, 2021 valuation are aligned with actual experience, and the assumptions appear reasonable. One aspect of the withdrawal assumption that we recommend CavMac consider for the next experience study is whether the rate should vary by each year of service so there are not significant jumps in the assumption from one service grouping to the next.

In addition to the probability a member withdraws from active employment, an assumption must be made as to whether that member will take a refund of their contributions upon withdrawal or keep their contributions with TRS and receive a deferred monthly allowance at a later date. The valuation assumes the member takes the more valuable of the two options. This is a reasonable assumption. Our only recommendation is that the assumption for future refunds be disclosed in the valuation and discussion of this be added to future experience studies.

Rates of Service Retirement

The service retirement assumption has rates that vary by age, with rates that tend to be lower at younger ages and higher at older ages. The rates are further split by gender and whether the member has more or less than 27 years of service. An additional adjustment (increase in the rates) is made in the year the member is first eligible for unreduced retirement with 27 years of service. Analysis was done on a headcount weighted basis. Based on the results of the 2015-2020 experience study, the service retirement rates were increased at most ages.

The recommended changes appear reasonable based on CavMac analysis, and we believe they were reasonable for use in the June 30, 2021 valuation.

We have two suggestions for consideration in future experience studies. First, we suggest consideration be given to additional analysis by years of service, as we have found retirement patterns vary based on years of service of the member. Of particular note for TRS is the different benefit percentages that apply at different service levels. For example, for certain members the retirement benefit is a 2.0% formula with less than 10 years of service but increases to 2.5% when the member reaches 10 years of service. In this type of situation, it is unlikely the member would retire with 8 or 9 years of service, but the likelihood would increase significantly at 10 years of service. Our experience with other teacher retirement systems is that the members are knowledgeable about their retirement benefits, and they make retirement decisions based upon them.

A similar situation exists with members hired on July 1, 2008 or later where the applicable percentage increases at several service levels. This formula is likely to have a noticeable impact on retirement patterns for this group, as compared to the older group. The current service retirement assumption does not differentiate between the pre-2008 and post-2008 hires. It would make sense to do custom analysis on the retirement rates of post-2008 hires, but at this point there is not meaningful data to perform this type of analysis, and there will not be for a number of years. We suggest consideration be given in the next experience study to having separate retirement assumptions for the post-2008 hires that are reflective of their benefit formula which would need to be set primarily based on actuarial judgment.

Second, we suggest consideration be given to performing the analysis on a liability or compensation-weighted basis, as that approach can provide a more accurate measurement of the liability. We do note that teachers tend to be a fairly homogeneous group, so this type of analysis may not produce materially different results, but we still believe it is worthwhile (if this analysis has not already been completed).

Neither the valuation report nor the experience study appears to disclose an assumption for when deferred vested members will commence their retirement benefit. We recommend the assumption and rationale be added to future reports.

Other Assumptions and Methods

Based on our review of CavMac's analysis in the experience study, we believe the other assumptions and methods (probability of disability, administrative expense load, probability of marriage, unused sick leave load and part-time service) used in the June 30, 2021 valuation are reasonable.

Other Demographic Assumptions - JFRS

Withdrawal

For JRP the termination assumption was updated to assume no terminations prior to retirement. This assumption seems reasonable.

For LRP, there was very little experience, so the assumption was updated to the Society of Actuaries Basic Turnover table. This assumption seems reasonable. However, we suggest that USI consider if a termination assumption based on service would be more reasonable than an assumption based on age.

Retirement

In their experience study USI developed their retirement rates for both JRP and LRP based on the member's eligibility for normal retirement with a breakdown by year for those within 5 years of normal retirement age. In addition, USI extended the retirement rates past normal retirement age until age 70, recognizing that some members are working past normal retirement age.

We recognize that there is very little data for these plans and generally believe the retirement rates selected are reasonable subject to the following comments.

1. For both JRP and LRP, USI might consider developing retirement rates based on age instead of time until normal retirement age also while taking into account the service requirement for unreduced retirement. In general, we find age to be a more relevant indicator of a when a member may choose to retire. Recognizing that there is likely limited data at each age, USI may consider incorporating 10 years of experience to see if that provides more credibility.

2. USI applies an additional 20% rate of retirement at 27 years of service for the traditional tiers. However, the experience study does not note the actual experience at this service point. We suggest an analysis of this assumption be included in future reports.

3. As noted above, for both JRP and LRP, USI extended the retirement rates from normal retirement age until age 70. Previously the retirement rate at normal retirement age was 100%. This meant that all members would retire once they attain normal retirement age and anyone already past normal retirement age was expected to retire immediately. Under the new assumption, the retirement rate at normal retirement age was reduced to 20%, the retirement rate between normal retirement age and age 70 was set to 33% and age 70 was set to 100%. We agree with the change although typically we find the rate of retirement at normal retirement age to be higher than subsequent ages.

4. For LRP, the proposed rates recommended did not necessarily seem to match up with the actual experience observed and the prior assumption, although there was very limited experience. For example, the assumption for five years before normal retirement age (NRA-5) of 15% was set similar to the previous assumption of 16.7% yet there were no retirements at this point. On the other hand, the rates at three (NRA-3) and four years (NRA-4) before normal retirement age were decreased to 7.5% although actual experience exceeded 15% and the current assumption exceeded 20%. We recommend that USI provide additional rationale for the assumptions selected.

Other Assumptions

In the LRP a member's benefit is based on the highest 36 months of state salary, even if that salary is earned while not a member of the LRP. For example, a member may be active in the LRP for 20 years and then work for the State at higher pay for 5 years. The LRP benefit would be based on the higher pay earned after leaving the legislative position. While it is expected that some members will have their benefit determined based on non-legislative compensation, which is generally higher than legislative compensation, this compensation information and impact on the member's benefit is not known until the member applies for retirement. To account for the expected liability associated with this provision, USI reviewed the impact that this provision had on retirees who commenced their benefit during the study period and determined the average impact of using the non-legislative compensation for all retirees was a 36% increase in the member's retirement benefit. Therefore, they recommended to continue to load the liability for those not yet retired by 40%.

Often actuaries have to incorporate a load for certain items that occur at retirement and are not known at the time of the actuarial valuation, such as loads for additional service, increases in earnings, etc. Instituting a load of 40% is fairly significant.

Additionally, this provision impacts members who have ceased legislative service and have not yet retired. If the member retires with a LRP pension, then any subsequent non-legislative salary earned would not impact the LRP pension. Therefore, this provision only impacts current and future terminated members. The load is applied to the liability of all active members in addition to terminated members, which affects people who are projected to leave the system directly into retirement. If the load was limited to terminated members, the percentage load would be much higher, but affect fewer people.

While this load seems to be consistent for quite some time, it does not necessarily mean that it would occur in the future. Changes in administration may result in less or more legislative members accepting state jobs.

We believe the analysis and subsequent recommendation completed by USI to be reasonable, although a load of 40% has a material impact on the valuation, so additional review may be appropriate. If available, we suggest that JFRS submit to KPPA and TRS a list of current terminated members who have not commenced to receive updated salary information. This information could then be provided to the actuary and an estimated benefit for specific members could be incorporated into the valuation.

Assumptions for Insurance Benefits

Many of the assumptions used in the valuation of retirement allowances are also used in the valuation of health care and life insurance benefits. Additional assumptions used in the June 30, 2021 insurance valuations are discussed below.

TRS Investment Return – Health & Life

The investment return assumptions used for the Health Trust and Life Trust valuation as of June 30, 2021 were equal to the 7.1% used in the pension valuation. These were lowered from 8.0% (Health Trust) and 7.5% (Life Trust) based on the recommendations in the 2015-2020 experience study. CavMac made this recommendation as they note the various trusts showed similar long-term projections. While the current asset allocations for the three trusts are different, TRS confirmed that this is due to a transition from the prior allocation. To the extent that the transition is short-term in nature, we agree that use of the same assumption is reasonable. If the transition will be extended over a significant period, we believe this phase-in period should be reflected in the assumption selected.

Premium Valuation

The per capita claim costs are effectively set to the premiums charged for each plan. The purpose of the insurance trust is to fund the healthcare premiums anticipated to be paid in future years. Pre-65 premiums are determined by the Kentucky Employees' Health Plan (KEHP). The retirement systems provide benefits upon eligibility for Medicare.

The premiums charged by KEHP are blended rates based on the combined experience of active and retired members. As retired members prior to Medicare eligibility have higher costs than active members on average, actuarial standards of practice require the actuary to reflect this higher cost when performing a valuation of retiree health benefits. This higher cost is typically referred to as the implicit rate subsidy. Since the trust funds pay the specific premiums charged for each individual, the value of the implicit rate subsidy is not reflected in the funding valuations. We believe this is a reasonable approach in developing the funding liabilities for the insurance benefits.

We do note that this deviation from actuarial standards of practice is not allowed for purposes of determining liabilities under GASB statements No. 74 and 75. Reviewing those reports was outside the scope of this audit.

Aging Factors

In estimating the projected premiums, the actuary determines whether those premiums would increase in the future due to aging. As healthcare costs increase with age, if a population's average age increases, then the average cost of the population would increase, in addition to any further increases due to healthcare trend. Each actuary applies aging factors somewhat differently for each system:

- For KPPA, GRS applies aging factors to the Medicare plans but not the pre-65 KEHP plans. Since KPPA purchases its own Medicare policies and those polices are priced based on KPPA data, GRS applies the aging factors such that each individual reflects their expected cost.

- For TRS, CavMac follows a similar approach as GRS.

- For JFRS, USI does not apply aging factors to the Medicare plans but does apply aging factors to the pre-65 costs. The Medicare plans purchased by JFRS are commercially rated and as such no aging related to JFRS experience would occur. While they do reflect aging factors for pre-65 costs, these factors are still based on the combined premium for actives and early retirees and thus, do not include a value for the implicit rate subsidy.

For KPPA, the Medicare aging factors are based on table 4 in the Society of Actuaries 2013 study "Health Care Costs – From Birth to Death". These factors are for a plan that uses Medicare carve-out coordination and are not specific to a Medicare Advantage plan. Most KPPA retirees are covered by a Medicare Advantage plan just for KPPA retirees.

For TRS, the source of the Medicare aging factors was not provided. In addition, TRS retirees are covered by a Medicare Advantage plan just for TRS retirees.

Although section 3.7.7 of ASOP 6 requires that the actuary use age-specific costs in the development of the per capita costs, the ASOP 6 practice note dated March 2021 notes that Medicare Advantage ("MA") and Medicare Advantage Prescription Drug plans ("MAPD") have a relatively flat age and gender curve after federal payments and supports not age-rating these types of plans.

Recommendation: Based on ASOP 6 and the ASOP 6 practice note, for KPPA and TRS we recommend that GRS and CavMac either utilize MA and MAPD specific aging factors to develop per capita claim costs to reflect the flat age and gender curve or not age-rate the plan as supported by the ASOP 6 practice note.

While different approaches are taken on this issue, we believe the assumptions used by each actuary are reasonable and in compliance with actuarial standards of practice.

Recommendation: As noted above, we recommend that consideration be given to promote consistency for certain assumptions to be used in the upcoming actuarial valuations, and we recommend the approach used for applying aging factors or not applying age factors, especially for benefits received from the KEHP, be included in that review.

Health Care Cost Trend Rates

In setting trend rates ASOP 6 provides the following guidance under Section 3.12:

- "The actuary should consider separate trend rates for major cost components such as hospital, prescription drugs, other medical services, Medicare integration, and administrative expenses. Even if the actuary develops one aggregate set of trend rates, the actuary should consider these cost components when developing the aggregate set of trend rates."

- When developing a long-term trend assumption and the select period for transitioning, the actuary should consider relevant long-term economic factors such as projected growth in per capita gross domestic product (GDP), projected long-term wage inflation, and projected health care expenditures as a percentage of GDP. The actuary should select a transition pattern and select period that reasonably reflects anticipated experience.

Based on ASOP 6, we recommend that the actuaries consider the following:

1. For JFRS, trends that differ for pre-Medicare benefits and Medicare benefits rather than a single trend to reflect any short-term differences in the expected trends for the two components.

2. The time to the ultimate rate for both pre-Medicare and Medicare. For KPPA and TRS, GRS and CavMac reach the ultimate rate sooner than Milliman normally recommends to its clients.

3. Relevant long-term economic factors, including considering health costs share of GDP.

To illustrate the impact of these considerations, we developed trend assumptions incorporating the Getzen model developed by the Society of Actuaries (SOA). The Society of Actuaries (SOA) developed and regularly updates this long-term medical trend model based on detailed research performed by a committee of economists and actuaries, which included a representative from Milliman. Milliman uses this model as the foundation for the trend that it recommends to our clients for postretirement health valuations, with certain adjustments designed to produce trends that are appropriate for employer plans. These adjustments include incorporating assumed administrative cost trend where applicable and removing the impact of age-related morbidity (since age-related morbidity assumptions are applied separately in the valuation when applicable).

Ultimate rates were determined considering historic and projected rates of real growth, long-term inflation and additional growth attributable to technology, and medical costs as a component of gross domestic product (GDP).

A summary of the cumulative impact on the liability of the difference between the actuaries' trend assumptions and Milliman's assumptions is shown below. For purposes of this trend comparison, Milliman's assumptions reflect the actuaries' assumptions for inflation (2.3% for KPPA, 2.5% for TRS, and 3% for JFRS).

Comparison of Cumulative Healthcare Trend - KPPA Based on Milliman's Model vs GRS		
Duration from Valuation Date	**Pre-Medicare**	**Medicare**
5	-3.8%	-4.2%
10	-7.0%	-7.3%
20	-3.0%	-3.4%

Based on this analysis for KPPA, Milliman would determine a liability lower by 3% - 4% for pre-Medicare benefits and Medicare-eligible benefits. Please note that we estimate that 65% of the KERS and CERS Non-Hazardous liability and 35% of the KERS and CERS Hazardous liability plus SPRS are associated with Medicare-eligible benefits.

Comparison of Cumulative Healthcare Trend – TRS Based on Milliman's Model vs CavMac		
Duration from Valuation Date	**Pre-Medicare**	**Medicare**
5	-5.9%	1.4%
10	-7.7%	3.0%
20	-4.4%	6.7%

Based on this analysis for TRS, Milliman would determine a liability lower by 4% - 5% for pre-Medicare benefits and higher by 5% - 6% for Medicare-eligible benefits. Please note that we estimate that 60% of the liability is associated with Medicare-eligible benefits. The trend from Milliman's model would result in a liability approximately 1% - 2% higher overall.

Comparison of Cumulative Healthcare Trend – JFRS Based on Milliman's Model vs USI		
Duration from Valuation Date	**Pre-Medicare**	**Medicare**
5	-2.5%	-3.3%
10	-2.7%	-3.4%
20	-0.7%	-1.5%

Based on this analysis for JFRS, Milliman would determine a liability lower by 1% - 2% for pre-Medicare benefits and lower by 2% - 3% for Medicare-eligible benefits. Please note that we estimate that 85% of the liability is associated with Medicare-eligible benefits.

While Milliman would utilize different trend factors, we believe the assumptions selected by each actuary are reasonable and in compliance with actuarial standards.

Recommendation: As noted above, we recommend that consideration be given to promote consistency for certain assumptions to be used in the upcoming actuarial valuations and we recommend the healthcare trend assumptions be included in that review. For instance, we recommend that a consistent trend model, such as the Getzen model, be used to set the healthcare trend assumptions. We would anticipate the same trend be used for the pre-Medicare benefits across the systems as early retirees all participate in KEHP and thus, projected increases in healthcare costs should be the same. Short-term trends for Medicare benefits could reflect the individual characteristics of each system and the input of the healthcare providers.

Application of Healthcare Costs

In valuing insurance benefits, additional data is required on dependents of retirees. From a retirement benefits perspective, benefits paid to beneficiaries are paid upon the death of a retiree. From an insurance benefits perspective, dependents receive benefits while the retiree is alive as well as, potentially, upon the death of retiree. This requires the actuary to collect information on current dependents who are receiving health insurance coverage plus make assumptions regarding the number of dependents to be covered in the future. The associated costs of covering dependents are then valued over the current or future dependent's coverage lifetime.

GRS and CavMac both receive this information and value the additional cost of dependent coverage over the assumed lifetime of the dependent for KPPA and TRS, respectively ("individual basis").

On the other hand, USI performs the valuation on a "contract basis" for JFRS. Meaning that the coverage is valued over the retiree's lifetime and does not consider the dependent's independent lifetime. The cost of the coverage does include the value of dependent coverage if one is currently covered or assumed to be covered in the future. While actuarial standards do not require the actuary to value coverage on an individual basis versus a contract basis, we do find it unusual to use a contract basis and recommend that USI consider modifying its approach to an individual basis.

Section IV – Actuarial Valuation Report

Actuarial Standards of Practice

We reviewed the June 30, 2021 actuarial valuation reports from the perspective of serving as an actuarial communication and Statement of Actuarial Opinion (SAO). There are a number of Actuarial Standards of Practice (ASOPs) that apply to the development of the valuation results and the preparation of the actuarial valuation report. We found that the valuation report is in compliance with the applicable ASOPs (see below), but we have identified several suggestions for consideration for future valuation reports.

The following ASOPs are applicable to pension actuarial reports:

- 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 23: Data Quality
- ASOP 27: Selection of Economic Assumptions for Measuring Pension Obligations
- ASOP 35: Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations
- ASOP 41: Actuarial Communications
- ASOP 44: Selection and Use of Asset Valuation Methods for Pension Valuations
- ASOP 51: Assessment and Disclosure of Risk Associated with Measuring Pension Obligations and Determining Pension Plan Contributions
- ASOP 56: Modeling

Review of Compliance with the ASOPs and Suggestions for Future Reports

ASOP 4: This ASOP provides guidance to actuaries when preparing pension valuations, as well as certain other SAOs. The ASOP requires the actuary to include a number of items in the actuarial report, including the purpose of the measurement, summary of plan provisions, data and actuarial methods and assumptions, as well as certain additional information.

The valuation reports for all systems appeared to include the required information.

ASOP 6: This ASOP provides guidance to actuaries when preparing healthcare valuations including the selection of healthcare specific assumptions. Effectively, it incorporates the provisions of ASOP 4 for pension valuations in terms of selection and disclosure of actuarial methods and the provisions of ASOP 35 but applicable to healthcare specific assumptions.

Since the funding valuations for the insurance benefits only value the healthcare premiums and do not reflect the value of the implicit rate subsidy, this is a deviation from ASOP 6. GRS and CavMac both note that this is a deviation from ASOP 6, and thus, are in conformance with actuarial standards. Although USI does use aging factors for pre-65 costs, the aging factors apply to the combined premium for both active and early retirees and thus, do not include the value of the implicit rate subsidy, which is consistent with the valuation of the other systems. We suggest that USI include a statement that the premiums valued do not incorporate the implicit rate subsidy, and thus, is a deviation from ASOP 6.

As discussed above in Section III, the healthcare assumptions selected appear to be reasonable and appropriate. In addition, the valuation report contains a description of the assumptions used and where there is a deviation from ASOP 6. The experience study referenced in the valuation report contains justification for the assumptions that were selected. Therefore, the valuation reports are in compliance with ASOP 6 excluding the one issue noted above for JFRS.

ASOP 23: This ASOP provides guidance to actuaries when selecting, reviewing, using, or relying on data supplied by others, when performing actuarial services. The ASOP requires the actuary to disclose the source of the data, whether the actuary reviewed the data, and to indicate any concerns about the data and if there are any limitations on the actuarial work product as a result of those concerns.

The reports indicate the source of the data and note that while the actuary checked for year to year consistency, they did not audit the data. This approach is consistent with the requirements of the ASOP and general actuarial practice.

ASOP 27: This ASOP provides guidance to actuaries when selecting economic assumptions for measuring pension obligations in a defined benefit plan. The ASOP also requires actuaries to disclose the assumptions used as well as the rationale for the selection of the assumptions.

As discussed above in Section III, the economic assumptions selected appear to be reasonable and appropriate. In addition, the valuation report contains a description of the assumptions used, and the experience study referenced in the valuation report contains justification for the assumptions that were selected. Therefore, the valuation reports are in compliance with ASOP 27.

Please refer to Section III above for our comments on the economic assumptions.

ASOP 35: This ASOP provides guidance to actuaries when selecting demographic assumptions for measuring pension obligations in a defined benefit plan. The ASOP also requires actuaries to disclose the assumptions used as well as the rationale for the selection of the assumptions.

As discussed above in Section III, the demographic assumptions selected appear to be reasonable and appropriate. In addition, the valuation report contains a description of the assumptions used, and the experience study referenced in the valuation report generally contains justification for the assumptions that were selected. Therefore, the valuation reports are in compliance with ASOP 35.

Please refer to Section III above for our comments on the demographic assumptions as well as below for some additional disclosure suggestions.

ASOP 41: This ASOP provides guidance to actuaries when issuing actuarial communications. The ASOP requires actuaries to include various disclosure items in the actuarial report including the intended user, scope, purpose, actuarial qualifications.

The reports prepared by the relevant System Actuaries included the required information. Therefore, the valuation reports are in compliance with ASOP 41.

ASOP 44: This ASOP provides guidance to actuaries when selecting an asset valuation method for an actuarial valuation.

The asset valuation method for each system recognizes 20% of actuarial investment gains and losses with no corridor around the market value of assets. We find the asset valuation method is in compliance with ASOP 44. In particular, this method satisfies Section 3.3 and 3.4 of the ASOP in that it is without any bias.

ASOP 51: This ASOP provides guidance to actuaries on the assessment and disclosure of the risks that future measurements may differ from that which is expected.

<u>KPPA</u>

The valuation reports discuss several risks facing each of the plans and presents various risk metrics with an explanation of the importance of those metrics. The report includes key risk metrics such as the asset volatility ratio, the liability volatility ratio, liquidity ratio, contribution percentage and maturity ratio.

In addition, there is an additional letter addressed to the Board illustrating the sensitivity of the costs of the plan with changes in the discount rate, price inflation, and wage inflation per Kentucky Revised Statute § 61.670.

Therefore, the reports are in compliance with ASOP 51.

<u>TRS</u>

The valuation report discusses several risks facing TRS and presents various risk metrics to illustrate the sensitivity of the costs of the plan with changes in the discount rate, price inflation, and wage inflation, in addition to other disclosures required under ASOP 51. Therefore, we believe that the report is in compliance with ASOP 51.

We would note the following observations for consideration in future reports:

1) The valuation report illustrates a sensitivity analysis for multiple scenarios by varying the discount rate, price inflation, and wage inflation. The report does not define any of these risks such as investment risk, interest rate risk, inflationary risk, or contribution risk and does not discuss any other risks.

2) Other risks that may be worth discussing include demographic, contribution, and maturity risks. For example, we recommend including the asset volatility ratio and the liability volatility ratio as these are measures of the system's maturity which affects the magnitude of any contribution rate increase or decrease.

<u>JFRS</u>

The valuation reports discuss several risks facing each of the plans covering investment risk, demographic risks and other factors. Therefore, we believe the reports are in compliance with ASOP 51.

We suggest additional items be included in future reports such as the asset volatility ratio, the liability volatility ratio, liquidity ratio, maturity ratio and discussion on contribution risks.

ASOP 56: This ASOP provides guidance to actuaries when performing actuarial services that require modeling. The ASOP requires certain disclosures including the intended purpose of the model, any material limitations or known weaknesses of the model, and the extent of any reliance on a third-party model.

<u>KPPA</u>

The reports prepared by GRS included the required information. Therefore, the valuation reports are in compliance with ASOP 56.

<u>TRS</u>

The June 30, 2021 valuation report does not clearly discuss the use or reliance of models. This ASOP was effective for work done on or after October 1, 2020 and therefore the 2021 valuation report is not in compliance. However, the June 30, 2022 valuation report has an additional paragraph that discusses models and is in compliance with ASOP 56.

<u>JFRS</u>

The June 30, 2021 valuation reports do not clearly discuss the use or reliance of models. This ASOP was effective for work done on or after October 1, 2020 and therefore the

2021 valuation report is not in compliance. We recommend that these disclosures be included in the 2023 reports.

Summary of Plan Provisions

KPPA

We believe that the plan provision section provides a robust summary, but recommend the following item be incorporated:

- The benefit multipliers for Tier 2 participants apply to all past service once the requirement is met. We suggest the report clarify this provision.

TRS

We believe that the plan provision section provides a robust summary, but recommend the following items be incorporated:

- For members hired on or after 7/1/2008, the valuation report says that the allowance is equal to a percentage of final salary without noting that the percentage is multiplied by the member's benefit service. For comparison, the Summary Plan Description (SPD) has a similar description of the percentages but notes that they are the "retirement factors" and not the "retirement allowance."
- The SPD notes that the retirement allowance cannot exceed the last annual compensation for a member or their final average salary. The valuation report does not state this provision.
- The valuation report lists the minimum benefit of $440 per year of service with the pre 7/1/2008 hire plan provisions. Based on the SPD, this minimum also applies to members hired after 7/1/2008 but is not noted in the plan provisions for that group.
- A surviving spouse of an active member with less than ten years of service is eligible for a death benefit of $2,160 or $2,880 depending on their income. The SPD notes that this benefit can also be paid to the surviving spouse of a member with over ten years of service while they wait to qualify for an annuity benefit. The valuation report does not include this provision.
- The interest rate used to credit contributions should be disclosed in the valuation report.

JFRS

We believe that the plan provision section provides a robust summary, but recommend the following item be incorporated:

- JFRS hybrid plan members receive a monthly premium subsidy for health insurance equal to $10 per month per year of service. Based on language in the statute, the monthly subsidy increases 1.5% per year each July 1. At the time of the June 30, 2021 valuation, USI applied the 1.5% increase from each member's date of retirement rather than from the inception of the provision for all members. We understand that this provision was corrected in the 2022 valuation. We suggest clarity be provided in the report on this provision.

Summary of Actuarial Assumptions

KPPA

The summary of actuarial assumptions included in the actuarial valuation report is a robust summary and includes nearly all of the assumptions reflected in the valuation model. In future valuation reports, we suggest the following assumptions be included:

- The factors used to convert the Tier 3 cash balance accounts into an annuity should be disclosed in the valuation report.
- The actuarial equivalent factors used for determining death benefits should be disclosed in the valuation report.
- It is our understanding that the monthly blended premium as of July 1, 2021 used to determine retiree contributions for Medicare benefits is $206.95. This should be disclosed in the report.
- It is our understanding that the healthcare participation assumption for future terminated vested participants is the same as for current terminated vested participants. This should be disclosed in the report.
- It is our understanding that current retirees with family healthcare coverage are assumed to keep this coverage for five years, with spousal coverage thereafter. This should be disclosed in the report.

TRS

The summary of actuarial assumptions included in the actuarial valuation report is a robust summary and includes nearly all of the assumptions reflected in the valuation model. In future valuation reports, we suggest the following assumptions be included:

- The unused sick leave is noted as 3% for "all active liability at the time of retirement." Based on discussions with CavMac, the 3% load is applied to the retirement decrement for active members while a 2.5% load is applied to the death and termination decrements, a 2% load is applied to the disability decrement, and a 2% load applied to vested terminated liabilities. These various loads are not noted in the report.

- CavMac communicated that they assume members will take the greater of the contribution balance or an annuity when valuing the termination decrement for active members. This is not disclosed in the report.
- The experience investigation report notes that part-time active members are assumed to accrue 0.25 years of service though it is unclear if this assumption applies only to benefit service or to eligibility service too. The valuation report is silent on this assumption.
- The mortality rates shown for active members in the June 30, 2021 valuation report are not consistent with the description of the mortality table but are instead rates as of 2018. CavMac updated this for their June 30, 2022 valuation report.
- The valuation report is unclear that age 60 is used for benefit commencement timing for active members who terminate employment in the future while vested. A different benefit commencement timing assumption is used for current vested terminated members. These assumptions were not disclosed in the report.
- The valuation report should disclose the assumption for the timing of decrements.
- The valuation report does not discuss any assumptions about reciprocity service for active or terminated employees. Based on discussions with CavMac, current known reciprocity service is included in eligibility service for active members but no assumption is included for any future reciprocity service. We suggest this assumption should be disclosed in the report.
- In Milliman's review of an active sample life for a part-time member hired prior to 7/1/2008, CavMac said they assumed a 2% multiplier for all part-time members rather than basing the multiplier on the individual's service or hire date. This assumption is not stated in the valuation report.
- A surviving spouse of an active member with less than ten years of service is eligible for a death benefit of $2,160 or $2,880 depending on their income. Unmarried children are also eligible for certain death benefits. CavMac does not include what benefits they assume for spouses or the number of children.
- For post-65 costs for OPEB, CavMac adjusts the Medicare Eligible Health Plan (MEHP) costs for different ages. CavMac uses the $211 premium for 2022, then trends it backwards six months using the 5.125% medical trend assumption. CavMac then applies a normalization factor to calculate a $161.11 age 65 per capita claim cost. The $161.11 amount and the procedure to derive it should be disclosed in the report.

<u>JFRS</u>

- In the valuation report, the salary increase assumption is noted as 1% for the next three years and 3.5% thereafter. During replication, the 1% salary increase assumption was used for next four years and 3.5% thereafter to match. We recommend that the specific years the 1% is intended to apply be noted in the valuation report.
- The salary increase assumption of 1% is also used to determine member salaries "backwards" from the valuation date to date of hire. Salaries prior to the valuation

date are used in developing the actuarial accrued liability under the Entry Age Normal cost method. A lower backwards salary rate will result in a higher actuarial accrued liability. We are unsure if this application of the 1% salary increase assumption was intended and suggest it be clarified in the next valuation report.

- The assumption regarding price inflation is not disclosed in the report.
- The valuation report should disclose the assumption for the timing of decrements.

Section V – Parallel Valuation

Our approach to performing a parallel valuation is two-fold. First, we calculate and compare actuarial calculations for selected individual sample members with those produced by the System Actuary. Second, we run the full census data through our valuation software to compare overall valuation results. Below we discuss some important differences between the actuarial valuation programs used by GRS, CavMac, USI, and Milliman, then we present the results of our parallel valuation.

Differences in Actuarial Software

Both the retirement and insurance valuations use the entry age actuarial cost method to determine annual contribution requirements and the unfunded actuarial accrued liability. Although actuaries are well versed in the standard actuarial cost methods available, there are differences in interpretation and implementation from firm to firm such that no two actuarial valuation software programs perform calculations exactly the same way. Even if the firms use the same actuarial valuation software, differences in programming and techniques can also result in differences. As shown below, the results of our parallel valuation for each system are similar. Overall, the values produced by the actuaries are reasonable and comply with relevant actuarial standards.

Individual Sample Member Liability Calculations

As noted above, our approach involves first attempting to replicate the actuarial calculations for selected individual sample members. This allows us to understand the actuary's valuation programming on a micro basis and enables us to customize our valuation programming to perform similar calculations as much as possible. Each actuary provided us with total liability results for several selected members covering the various divisions, plans and groups. While the actuaries did not provide us with detailed individual sample member liability calculations, they did provide complete and timely responses as requested and, in some cases, reviewed output from our system to discuss potential causes of differences in results that led to our conclusions. While we cannot state for certain that every detail of the valuation program is correct for each decrement for each division, plan and group, we do believe that each actuary has appropriately reflected all major benefits available to members of each of the systems based on the total results of our parallel valuation.

Full Parallel Valuation Runs - Pension

The following tables compare the present value of future benefits, actuarial accrued liability, and normal cost for each of the systems by status and Tier calculated by Milliman in our replication valuation versus the results reported in the actuarial valuation reports. Milliman's figures should not replace the results reported in the Actuarial Valuation and are only appropriate for actuarial review purposes and are not suitable for other purposes.

The present value of benefits represents the present value of future cash flows from the system based on the plan provisions and application of the actuarial assumptions. The application of the entry age normal cost method would then allocate this present value to service attributed to past service for determining the actuarial accrued liability, service attributed to the upcoming year of service for determining the normal cost and to service attributed to future service for determining benefits to be paid by future normal costs.

KERS

The following tables compare the results of our parallel replication valuation of the retirement benefits split by tier and status for KERS Non-Hazardous and Hazardous groups, separately.

For KERS Non-Hazardous in total, we were able to replicate present value of future benefits in the valuation report within 1.8%. On an actuarial accrued liability basis, our replication is within 1.6% and we are within 1.7% of the normal cost rate.

One reason for the difference is that in performing the audit, GRS indicated that they excluded the non-hazardous benefit for retirees with both a non-hazardous benefit and a hazardous benefit from the valuation. We estimated that this increased KERS non-hazardous liabilities by approximately 1.8%.

For KERS Hazardous in total, we were able to replicate present value of future benefits in the valuation report within 0.1%. On an actuarial accrued liability basis, our replication is within -0.1% and we are within -1.4% of the normal cost rate.

These small differences are expected when comparing calculated liabilities for a complex valuation. As the results do not deviate significantly, Milliman's audit provides a high level of assurance that the results of the valuation reasonably reflect the aggregate liabilities of KERS Non-Hazardous and Hazardous plans based on the assumptions and methods.

In summary, we view the results as a successful replication by Milliman of GRS' results.

Comparison of June 30, 2021 Valuation Results
KERS
($ in millions)

	Valuation Report		Milliman's Review		Percent Difference of Milliman / GRS	
	Non Hazardous [1]	Hazardous	Non Hazardous	Hazardous	Non Hazardous	Hazardous
Present Value of Future Benefits						
Actives						
Tier 1 Traditional	4,047,896	328,747	4,017,652	332,444	-0.7%	1.1%
Tier 2 Traditional	601,930	109,235	617,457	110,553	2.6%	1.2%
Tier 3 Hybrid	436,369	128,034	447,412	126,425	2.5%	-1.3%
Total	5,086,195	566,016	5,082,520	569,423	-0.1%	0.6%
Inactives	689,684	51,492	700,564	51,613	1.6%	0.2%
Retirees	11,736,267	864,939	12,047,197	863,383	2.6%	-0.2%
Total	17,512,146	1,482,447	17,830,281	1,484,419	1.8%	0.1%
Active Accrued Liability						
Tier 1 Traditional	3,424,925	280,289	3,362,399	280,292	-1.8%	0.0%
Tier 2 Traditional	341,861	62,321	344,450	63,397	0.8%	1.7%
Tier 3 Hybrid	128,635	36,203	128,293	35,734	-0.3%	-1.3%
Total	3,895,421	378,812	3,835,142	379,423	-1.5%	0.2%
Total Accrued Liability	16,321,372	1,295,243	16,582,903	1,294,419	1.6%	-0.1%
Normal Cost as % of Payroll	11.96%	16.01%	12.16%	15.79%	1.7%	-1.4%

[1] The liability for the non-hazardous benefits for retirees with both a non-hazardous benefit and a hazardous benefit, was not included in the 2021 actuarial valuation.

<u>CERS</u>

The following tables compare the results of our parallel replication valuation of the retirement benefits split by tier and status for CERS Non-Hazardous and Hazardous groups, separately.

For CERS Non-Hazardous in total, we were able to replicate present value of future benefits in the valuation report within 2.0%. On an actuarial accrued liability basis, our replication is within 1.9% and we are within 0.2% of the normal cost rate.

One reason for the difference is that in performing the audit, GRS indicated that they excluded the non-hazardous benefit for retirees with both a non-hazardous benefit and a hazardous benefit from the valuation. We estimated that this increased CERS non-hazardous liabilities by approximately 1.4%.

For CERS Hazardous in total, we were able to replicate present value of future benefits in the valuation report within 0.0%. On an actuarial accrued liability basis, our replication is within 0.0% and we are within -0.8% of the normal cost rate.

These small differences are expected when comparing calculated liabilities for a complex valuation. As the results do not deviate significantly, Milliman's audit provides a high level of assurance that the results of the valuation reasonably reflect the aggregate liabilities of CERS Non-Hazardous and Hazardous plans based on the assumptions and methods.

In summary, we view the results as a successful replication by Milliman of GRS' results.

Comparison of June 30, 2021 Valuation Results
CERS
($ in millions)

	Valuation Report		Milliman's Review		Percent Difference of Milliman / GRS	
	Non Hazardous [1]	Hazardous	Non Hazardous	Hazardous	Non Hazardous	Hazardous
Present Value of Future Benefits						
Actives						
Tier 1 Traditional	5,558,336	1,773,571	5,501,832	1,784,866	-1.0%	0.6%
Tier 2 Traditional	870,855	510,731	891,233	510,332	2.3%	-0.1%
Tier 3 Hybrid	977,936	433,593	989,781	415,247	1.2%	-4.2%
Total	7,407,127	2,717,895	7,382,846	2,710,446	-0.3%	-0.3%
Inactives	623,791	77,921	630,492	77,082	1.1%	-1.1%
Retirees	8,774,177	3,699,392	9,131,347	3,708,906	4.1%	0.3%
Total	16,805,095	6,495,208	17,144,685	6,496,433	2.0%	0.0%
Active Accrued Liability						
Tier 1 Traditional	4,705,533	1,492,116	4,625,511	1,483,020	-1.7%	-0.6%
Tier 2 Traditional	504,084	259,867	508,395	259,690	0.9%	-0.1%
Tier 3 Hybrid	287,321	100,162	280,470	99,074	-2.4%	-1.1%
Total	5,496,938	1,852,145	5,414,376	1,841,784	-1.5%	-0.6%
Total Accrued Liability	14,894,906	5,629,458	15,176,215	5,627,772	1.9%	0.0%
Normal Cost as % of Payroll	10.44%	18.39%	10.46%	18.25%	0.2%	-0.8%

[1] The liability for the non-hazardous benefits for retirees with both a non-hazardous benefit and a hazardous benefit, was not included in the 2021 actuarial valuation.

SPRS

The following tables compare the results of our parallel replication valuation of the retirement benefits split by tier and status for SPRS.

In total, we were able to replicate present value of future benefits in the valuation report within 0.1%. On an actuarial accrued liability basis, our replication is within 0.4% and we are within -3.1% of the normal cost rate.

These small differences are expected when comparing calculated liabilities for a complex valuation. As the results do not deviate significantly, Milliman's audit provides a high level of assurance that the results of the valuation reasonably reflect the aggregate liabilities of SPRS based on the assumptions and methods.

In summary, we view the results as a successful replication by Milliman of GRS' results.

Comparison of June 30, 2021 Valuation Results
SPRS
($ in millions)

	Valuation Report	Milliman's Review	Percent Difference of Milliman /GRS
Present Value of Future Benefits			
Actives			
Tier 1	197,591,995	196,790,235	-0.4%
Tier 2	62,049,133	62,034,311	0.0%
Tier 3	34,287,357	33,988,549	-0.9%
Total	293,928,485	292,813,095	-0.4%
Inactive	10,465,000	10,426,034	-0.4%
Retirees	850,336,000	852,165,282	0.2%
Total	1,154,729,485	1,155,404,411	0.1%
Active Accrued Liability			
Tier 1	162,482,361	161,990,731	-0.3%
Tier 2	23,570,932	26,191,208	11.1%
Tier 3	6,404,920	6,612,463	3.2%
Total	192,458,213	194,794,402	1.2%
Total Accrued Liability	1,053,259,213	1,057,385,718	0.4%
Normal Cost as % of Payroll	26.13%	25.32%	-3.1%

TRS

The following tables compare the results of our parallel replication valuation of the retirement benefits split by participant group and status.

In total, we were able to replicate present value of future benefits in the valuation report within -0.5%. On an actuarial accrued liability basis, our replication is within -0.4% and we are within -2.0% of the normal cost rates (combined university and non-university).

These small differences are expected when comparing calculated liabilities for a complex valuation. As the results do not deviate significantly, Milliman's audit provides a high level of assurance that the results of the valuation reasonably reflect the aggregate liabilities of TRS based on the assumptions and methods.

In summary, we view the results as a successful replication by Milliman of CavMac's results.

Comparison of June 30, 2021 Valuation Results
Teachers
($ in millions)

	CavMac	Milliman	Percent Difference
Present Value of Future Benefits			
Actives			
University hired before 7/1/2008	$ 485.5	$ 482.5	-0.6%
University hired after 7/1/2008	235.5	234.1	-0.6%
Non-University hired before 7/1/2008	13,892.9	13,779.2	-0.8%
Non-University hired after 7/1/2008	4,776.2	4,742.2	-0.7%
Total Actives	19,390.1	19,238.0	-0.8%
Inactives (Includes Actives)	19,893.9	19,736.2	-0.8%
Retirees	24,863.8	24,789.6	-0.3%
Total Present Value of Future Benefits	44,757.7	44,525.8	-0.5%
Actuarial Accrued Liability			
Actives			
University hired before 7/1/2008	420.1	417.3	-0.7%
University hired after 7/1/2008	129.8	130.1	0.2%
Non-University hired before 7/1/2008	11,554.1	11,464.1	-0.8%
Non-University hired after 7/1/2008	2,110.1	2,108.6	-0.1%
Total Actives	14,214.1	14,120.1	-0.7%
Inactives (Includes Actives)	14,717.9	14,618.3	-0.7%
Retirees	24,863.8	24,789.6	-0.3%
Total Actuarial Accrued Liability	39,581.7	39,407.9	-0.4%
Normal Cost as a % of Payroll (After NC Loads)			
University	12.28%	12.15%	-1.0%
Non-University	16.41%	16.05%	-2.2%

JFRS

The following tables compare the results of our parallel replication valuation of the retirement benefits split by tier and status for JRP and LRP, separately.

For JRP in total, we were able to replicate present value of future benefits in the valuation report within -1.8%. On an actuarial accrued liability basis, our replication is within -1.7% and we are within -2.8% of the net employer normal cost.

For LRP in total, we were able to replicate present value of future benefits in the valuation report within -1.4%. On an actuarial accrued liability basis, our replication is within -1.7% reflecting the 40% load and we are within -2.7% of the net employer normal cost.

One reason for the difference is that in performing the audit, USI indicated that they incorrectly applied a mortality table in developing the liabilities for the traditional plan. USI stated the impact on the actuarial accrued liability for the traditional plan for JRP and LRP was an overstatement of 1.557% and 1.75%, respectively. It is our understanding that this issue was corrected in the 2022 GASB valuation.

These small differences are expected when comparing calculated liabilities for a complex valuation. As the results do not deviate significantly, Milliman's audit provides a high level of assurance that the results of the valuation reasonably reflect the aggregate liabilities of JRP and LRP based on the assumptions and methods.

In summary, we view the results as a successful replication by Milliman of USI's results.

Comparison of June 30, 2021 Valuation Results
Judicial Retirement Plan
($ in millions)

	USI [1]	Milliman	Percent Difference
Present Value of Future Benefits			
Actives			
Traditional	$133.5	$129.9	-2.7%
Hybrid	$7.5	$7.5	0.0%
Total Actives	$141.0	$137.4	-2.6%
Inactives	$3.7	$3.6	-2.7%
Retirees	$258.3	$254.8	-1.4%
Total Present Value of Future Benefits	$403.0	$395.8	-1.8%
Actuarial Accrued Liability			
Actives			
Traditional	$115.3	$112.5	-2.4%
Hybrid	$2.2	$2.2	0.0%
Total Actives	$117.5	$114.7	-2.4%
Inactives	$3.7	$3.6	-2.7%
Retirees	$258.3	$254.8	-1.4%
Total Actuarial Accrued Liability	$379.5	$373.1	-1.7%
Net Employer Normal Cost			
Traditional	$2.6	$2.5	-3.1%
Hybrid	$0.2	$0.2	1.2%
Total Normal Cost	$2.8	$2.7	-2.8%

[1] In performing the audit, USI indicated that they incorrectly applied a mortality table in developing the Traditional Plan's liabilities. USI stated the impact on the Traditional Plan's Actuarial Accrued Liability was an overstatement of 1.557%.

Comparison of June 30, 2021 Valuation Results
Legislators Retirement Plan
($ in millions)

	USI [1]	Milliman	Percent Difference
Present Value of Future Benefits			
Actives			
Traditional	$10.9	$10.7	-1.8%
Hybrid	$1.8	$1.8	0.0%
Total Actives	$12.7	$12.5	-1.6%
Inactives	$4.0	$4.1	2.5%
Retirees	$52.3	$51.4	-1.7%
Total Present Value of Future Benefits	$69.0	$68.0	-1.4%
Actuarial Accrued Liability			
Actives			
Traditional	$10.0	$9.8	-2.0%
Hybrid	$0.7	$0.7	0.0%
Total Actives	$10.7	$10.5	-1.9%
Inactives	$4.0	$4.1	2.5%
Retirees	$52.3	$51.4	-1.7%
Total Actuarial Accrued Liability	$67.0	$66.0	-1.5%
Total Actuarial Accrued Liability (Includes Load [2])	$72.6	$71.4	-1.7%
Net Employer Normal Cost			
Traditional	$0.1	$0.1	-2.9%
Hybrid	$0.1	$0.1	-2.4%
Total Normal Cost (excludes Load [2])	$0.2	$0.2	-2.7%

[1] In performing the audit, USI indicated that they incorrectly applied a mortality table in developing the Traditional Plan's liabilities. USI stated the impact on the Traditional Plan's Actuarial Accrued Liability was an overstatement of 1.75%.

[2] A 40% load is reflected for non-legislative salaries

Full Parallel Valuation Runs – Insurance

The following tables compare the present value of future benefits, actuarial accrued liability, and normal cost for each of the system by status calculated by Milliman in our replication valuation versus the results reported in the actuarial valuation reports for the insurance benefits. Milliman's figures should not replace the results reported in the Actuarial Valuation and are only appropriate for actuarial review purposes and are not suitable for other purposes.

Similar to the pension benefits, the present value of benefits represents the present value of future cash flows from the system based on the plan provisions and application of the actuarial assumptions. The application of the entry age normal cost method would then allocate this present value to service attributed to past service for determining the actuarial accrued liability, service attributed to the upcoming year of service for determining the normal cost and to service attributed to future service for determining benefits to be paid by future normal costs.

Please note that it is not unusual for differences in actuarial programming to result in larger differences on a valuation covering healthcare benefits due to the application of aging factors and healthcare trend, the change in per capita claim costs and premiums when eligible for Medicare, and leveraging caused by contributions made by retirees.

KERS

The following tables compare the results of our parallel replication valuation of the insurance benefits split by status for KERS Non-Hazardous and Hazardous groups, separately.

For KERS Non-Hazardous in total, we were able to replicate present value of future benefits in the valuation report within -0.6%. On an actuarial accrued liability basis, our replication is within -1.2% and we are within 3.9% of the normal cost rate.

For KERS Hazardous in total, we were able to replicate present value of future benefits in the valuation report within 0.5%. On an actuarial accrued liability basis, our replication is within -3.6% and we are within -3.1% of the normal cost rate.

These small differences are expected when comparing calculated liabilities for a complex valuation. As the results do not deviate significantly, Milliman's audit provides a high level of assurance that the results of the valuation reasonably reflect the aggregate liabilities of KERS Non-Hazardous and Hazardous plans based on the assumptions and methods.

In summary, we view the results as a successful replication by Milliman of GRS' results.

Comparison of June 30, 2021 Valuation Results
KERS Insurance
($ in millions)

	Valuation Report		Milliman's Review		Percent Difference of Milliman / GRS	
	Non Hazardous	Hazardous	Non Hazardous	Hazardous	Non Hazardous	Hazardous
Present Value of Future Benefits						
Actives	1,186.4	182.1	1,164.3	178.0	-1.9%	-2.3%
Inactive	148.2	11.0	145.4	8.6	-1.9%	-22.4%
Retirees	1,461.6	277.0	1,470.0	286.0	0.6%	3.2%
Total	2,796.2	470.1	2,779.7	472.5	-0.6%	0.5%
Active Accrued Liability	964.3	136.4	927.6	131.5	-3.8%	-3.6%
Total Accrued Liability	2,574.1	424.5	2,543.0	426.0	-1.2%	0.4%
Normal Cost as % of Payroll	2.54%	4.46%	2.64%	4.32%	3.9%	-3.1%

CERS

The following tables compare the results of our parallel replication valuation of the insurance benefits split by status for CERS Non-Hazardous and Hazardous groups, separately.

For CERS Non-Hazardous in total, we were able to replicate present value of future benefits in the valuation report within -1.1%. On an actuarial accrued liability basis, our replication is within -2.0% and we are within 0.7% of the normal cost rate.

For CERS Hazardous in total, we were able to replicate present value of future benefits in the valuation report within 1.0%. On an actuarial accrued liability basis, our replication is within 1.0% and we are within -1.7% of the normal cost rate.

These small differences are expected when comparing calculated liabilities for a complex valuation. As the results do not deviate significantly, Milliman's audit provides a high level of assurance that the results of the valuation reasonably reflect the aggregate liabilities of CERS Non-Hazardous and Hazardous plans based on the assumptions and methods.

In summary, we view the results as a successful replication by Milliman of GRS' results.

Comparison of June 30, 2021 Valuation Results
CERS Insurance
($ in millions)

	Valuation Report		Milliman's Review		Percent Difference of Milliman / GRS	
	Non Hazardous	Hazardous	Non Hazardous	Hazardous	Non Hazardous	Hazardous
Present Value of Future Benefits						
Actives	2,155.4	723.0	2,129.7	717.3	-1.2%	-0.8%
Inactive	191.1	21.2	182.4	18.1	-4.6%	-14.8%
Retirees	1,644.6	1,196.3	1,633.4	1,224.9	-0.7%	2.4%
Total	3,991.1	1,940.5	3,945.6	1,960.3	-1.1%	1.0%
Active Accrued Liability	1,614.8	533.7	1,566.9	526.3	-3.0%	-1.4%
Total Accrued Liability	3,450.5	1,751.2	3,382.8	1,769.2	-2.0%	1.0%
Normal Cost as % of Payroll	3.07%	4.83%	3.09%	4.75%	0.7%	-1.7%

SPRS

The following tables compare the results of our parallel replication valuation of the insurance benefits split by status for SPRS.

In total, we were able to replicate present value of future benefits in the valuation report within 1.7%. On an actuarial accrued liability basis, our replication is within 1.7% and we are within -4.5% of the normal cost rate.

These small differences are expected when comparing calculated liabilities for a complex valuation. As the results do not deviate significantly, Milliman's audit provides a high level of assurance that the results of the valuation reasonably reflect the aggregate liabilities of SPRS based on the assumptions and methods.

In summary, we view the results as a successful replication by Milliman of GRS' results.

Comparison of June 30, 2021 Valuation Results
SPRS Insurance
($ in millions)

	Valuation Report	Milliman's Review	Percent Difference of Milliman / GRS
Present Value of Future Benefits			
Actives	86.5	86.6	0.1%
Inactive	4.0	3.9	-2.6%
Retirees	202.7	207.7	2.4%
Total	293.2	298.1	1.7%
Active Accrued Liability	65.7	65.4	-0.4%
Total Accrued Liability	272.4	276.9	1.7%
Normal Cost as % of Payroll	7.35%	7.02%	-4.5%

TRS

The following tables compare the results of our parallel replication valuation of the Retiree Health and Life Insurance Trusts split by participant group and status for TRS.

In total, we were able to replicate present value of future benefits in the valuation report within 1.4%, actuarial accrued liability within 2.5%, and the normal cost rate within 10 basis points.

These small differences are expected when comparing calculated liabilities for a complex valuation. As the results do not deviate significantly, Milliman's audit provides a high level of assurance that the results of the valuation reasonably reflect the aggregate liabilities of TRS based on the assumptions and methods.

In summary, we view the results as a successful replication by Milliman of CavMac's results.

Comparison of June 30, 2021 Valuation Results
Teachers
($ in millions)

	CavMac	Milliman	Percent Difference
Present Value of Future Benefits			
Actives			
University	$ 100.4	$ 98.4	-2.0%
Non-University	2,397.1	2,397.8	0.0%
Total Actives	2,497.5	2,496.2	-0.1%
Inactives (Includes Actives)	2,552.2	2,546.1	-0.2%
Retirees	1,635.7	1,583.2	-3.2%
Total Present Value of Future Benefits	4,187.9	4,129.3	-1.4%
Actuarial Accrued Liability			
Actives			
University	73.3	70.4	-4.0%
Non-University	1,693.0	1,665.6	-1.6%
Total Actives	1,766.3	1,736.0	-1.7%
Inactives (Includes Actives)	1,821.0	1,785.8	-1.9%
Retirees	1,635.7	1,583.2	-3.2%
Total Actuarial Accrued Liability	3,456.7	3,369.0	-2.5%
Normal Cost as a % of Payroll			
University	1.92%	2.02%	5.2%
Non-University	1.92%	2.02%	5.2%

JFRS

The following tables compare the results of our parallel replication valuation of the insurance benefits split by status for JRP and LRP, separately.

For JRP in total, we were able to replicate present value of future benefits in the valuation report within 0.5%. On an actuarial accrued liability basis, our replication is within 0.5% and we are within 0.7% of the net employer normal cost.

For LRP in total, we were able to replicate present value of future benefits in the valuation report within 2.7%. On an actuarial accrued liability basis, our replication is within 3.5% and we are within -9.6% of the net employer normal cost.

One reason for the difference is the 1.5% annual increase in the monthly medical insurance stipend for hybrid plan members is reflected in Milliman's parallel valuation from inception of the provision. The original valuation included the 1.5% increase from each member's date of retirement. Another reason for the difference is that in performing the audit, USI indicated that 5 inactive members and 1 retiree were excluded from the LRP valuation. We believe the difference in the normal cost is due to few employees included and the application of the entry age normal cost method. We believe the results produced by USI are reasonable and the result is due to differences in actuarial programming.

These small differences are expected when comparing calculated liabilities for a complex valuation. As the results do not deviate significantly excluding the issues noted, Milliman's audit provides a high level of assurance that the results of the valuation reasonably reflect the aggregate liabilities of JRP and LRP based on the assumptions and methods.

In summary, we view the results as a successful replication by Milliman of USI's results.

Comparison of June 30, 2021 Valuation Results
Judicial Insurance Plan
($ in millions)

	USI	Milliman	Percent Difference
Present Value of Future Benefits			
Actives	$20.9	$21.0	0.5%
Inactives	$0.4	$0.3	-1.3%
Retirees	$22.1	$22.2	0.5%
Total Present Value of Future Benefits	$43.4	$43.5	0.5%
Actuarial Accrued Liability			
Actives	$16.9	$16.9	0.0%
Inactives	$0.4	$0.3	-1.3%
Retirees	$22.1	$22.2	0.5%
Total Actuarial Accrued Liability	$39.4	$39.4	0.2%
Normal Cost	$0.7	$0.7	0.7%

Comparison of June 30, 2021 Valuation Results
Legislators Insurance Plan
($ in millions)

	USI	Milliman	Percent Difference
Present Value of Future Benefits			
Actives	$4.1	$4.0	-2.4%
Inactives [1]	$1.3	$1.6	28.9%
Retirees [1]	$10.9	$11.1	1.6%
Total Present Value of Future Benefits	$16.2	$16.7	2.7%
Inactives [1]	$1.3	$1.6	28.9%
Retirees [1]	$10.9	$11.1	1.6%
Actuarial Accrued Liability			
Actives	$3.5	$3.5	0.0%
Inactives [1]	$1.3	$1.6	28.9%
Retirees [1]	$10.9	$11.1	1.6%
Total Actuarial Accrued Liability	$15.6	$16.2	3.5%
Normal Cost	$0.1	$0.1	-9.6%

[1] During the audit, USI indicated that 5 inactive members and 1 retiree were excluded from the liability.

Milliman Actuarial Audit of the Kentucky State-Administered Retirement Systems as of June 30, 2021

Key Findings and Recommendations for the Systems Administered by KPPA and the Response from KPPA, CERS, KRS and GRS

We believe institutions such as ours can benefit from periodic audits, particularly when they are as complete and thorough as this one conducted by Milliman. Overall, we are very pleased with their findings.

Milliman's comments appear below in italics. Our responses follow each Milliman comment.

1) *Our overall assessment as a result of our review of the actuarial work for KYSRS is that all major actuarial functions are being appropriately addressed across all retirement systems* (pg.2). Response: We are pleased with this finding.

2) *Overall, the values produced by the System Actuaries are reasonable and comply with relevant actuarial standards* (pg. 17). Response: We are pleased with this finding.

3) *In summary, we view the results (of the parallel valuation process) as a successful replication by Milliman of GRS' results* (pg. 100). Response: We are pleased with this finding.

4) *Overall, each key data component matched within an acceptable level, and we believe the individual member data used by each system's actuary was appropriate for valuation purposes* (pg. 20). Response: We are pleased with this finding.

5) *We found the assumptions to be in compliance with actuarial standards of practice. Although we generally agreed with the appropriateness of these assumptions, we believe the hybrid interest crediting rate assumption (for Tier 3) should be studied, with strong consideration for increasing the assumption* (pg. 10). Response: GRS will review the hybrid interest crediting rate assumption while they perform the next experience study. They agree that the 4% minimum interest crediting rate could result in an interest crediting rate that is higher than an annual return. However, since the interest crediting rate is based on a five-year average of the System's annual return, they believe this difference will be muted.

6) *We recommend consideration be given to promoting a consistent framework in setting certain assumptions to be used in the upcoming actuarial valuations to promote consistency across the systems. We identified the above assumptions (list in the preceding paragraph) that would make sense to us to have a consistent assumptions applied. We recommend a consistent (mortality) assumption be applied. We suggest combining KERS and CERS non-hazardous members together and KERS and CERS*

hazardous and SPRS together. (pgs. 11, 14, 58, 60, 76, 85, and 87). Response: The funded statuses, risk tolerances, liquidity needs, member and retiree demographics, and asset allocations vary by system. Therefore, the assumptions need to be unique to each system.

7) *Milliman suggests we use different real return assumptions than what we currently do (*pg. 12). Response: We respectfully disagree. We believe our process is thorough and well grounded. Further, in our opinion, the real returns provided by Milliman are not materially different than those currently adopted by the Board so as not to have a material impact on the valuation.

8) Milliman made a wide variety of other recommendations which appear to have a de minimis impact on the process or results of the valuation. None-the-less, GRS will review these other recommendations during the next experience study to determine which ones may improve the valuation with minimal additional complexity, additional cost and time to prepare the actuarial valuation.

David L. Eager, Executive Director of the Kentucky Public Pensions Authority

Jerry W. Powell, Board Chair of the Kentucky Public Pensions Authority

Ed Owens III, CEO of the CERS Retirement System

John E. Chilton, CEO of the KRS Retirement System

Danny White, GRS Consulting

Janie Shaw, GRS Consulting

[Insert KRS Letterhead]

March 1, 2023

Allison Ball
Kentucky State Treasurer
1050 US Highway 127 South
Suite 100
Frankfort, KY 40601

The Kentucky Retirement Systems is aware that on January 3, 2023, Kentucky State Treasurer Allison Ball released a list of financial companies that she had determined are engaged in energy company boycotts and is requiring state agencies to notify her if they own direct or indirect holdings of the listed financial companies. If the state agency does have any direct or indirect holdings in these companies Ms. Ball is also requiring notice be sent to the companies demanding cessation of any energy boycott, or the company will face divestment by the state agency.

Pursuant to Kentucky Revised Statutes Section 41.472(3) KRS has determined that the requirements set forth in KRS 41.470 to KRS 41.476 are inconsistent with its fiduciary responsibilities with respect to the investment of KRS assets or other duties imposed by law relating to the investment of KRS assets, thus, per the law, it is not subject to the notification and other requirements set forth in KRS 41.470 to KRS 41.476.

Respectfully submitted,

[John Chilton or Lynn Hampton]
[KRS CEO or KRS Chair]