



# Investment Section

Report on Investment Activity and Policies .....	3
Annualized Total Returns (%) Net of Fees .....	8
Portfolio Summary Statistics Asset Allocation Basis as of June 30, 2022 .....	9
Comparison of Actual Portfolio Distribution to Asset Allocation Plan as of June 30, 2022 .....	10
Graph – Comparison of Actual Portfolio Distribution to Asset Allocation Plan as of June 30, 2022 .....	10
Graph – Portfolio Capital Distribution 10 Year Trend .....	11
10 Largest Holdings Schedules .....	11
Public Equity .....	11
Fixed Income .....	12
Absolute Return .....	12
Postemployment Healthcare Investments .....	13
Defined Contribution Investments .....	13
Comparison of Investment Activity Income Fiscal Years Ended June 30, 2022 and 2021 .....	14
Summary Schedule of Brokers’ Fees .....	14
Professional Consultants .....	15

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## Report on Investment Activity and Policies

### For Fiscal Year July 1, 2021 through June 30, 2022

#### Authority and Fiduciary Standard

The Board has the responsibility to invest funds of the System in accordance with guidelines and limitations set forth in the Code and other applicable state law. Pursuant to the Board's enabling legislation, the members of the Board, employees of the Board, and their agents are fiduciaries to the System's members and beneficiaries and must invest and manage the fund for exclusive benefit of the System's members and beneficiaries (24 Pa. C. S. §8521(e)). As such, they must act consistent with the duty of prudence as well as the duty of loyalty.

In performance of their duties, the trustees shall exercise "that degree of judgment, skill and care under the circumstances then prevailing which persons of prudence, discretion and intelligence who are familiar with such matters exercise in the management of their own affairs not in regard to speculation, but in regard to the permanent disposition of the fund, considering the probable income to be derived therefrom as well as the probable safety of their capital." (24 Pa. C.S. §8521(a)).

The System shall at all times be managed in accordance with all applicable state and federal laws, rules, and regulations, as well as the Investment Policy Statement and other applicable policies of the Board.

#### Policies and Objectives and Investment Philosophy

The Board is responsible for the formulation of investment policies for the System. Professional Staff is responsible for the implementation of those investment policies. The overall investment objectives of the System are as follows:

- to generate returns to support the System's actuarial soundness so it may provide its members with benefits as required by law;
- to earn a long-term total return, net of fees, and investment and administrative expenses, that equals or exceeds the actuarial assumed rate approved by the Board (currently 7.00%);
- to earn a long-term total return, net of fees and investment expenses, that equals or exceeds the Policy Index approved by the Board; and
- to prudently manage investment risks that are related to the achievement of investment goals.

The PSERS Board of Trustees believes the System's assets should be managed in accordance with the System's unique liability stream, funding sources, cash flows, and portfolio size, focusing on the prudent accumulation of wealth over the long term to meet the retirement benefit obligations established by the plan sponsor to its members. The Board's Investment Policy Statement states that the System's assets should be managed based on the following investment beliefs:

1. Uncertainty - The future is difficult to forecast with any accuracy or certainty, particularly changes in the economic and market environment.
2. Asset Allocation - The strategic asset allocation mix, more than implementation or any other factor or decision, largely determines the portfolio's overall risk and return.
3. Diversification - Diversification is the best approach to addressing future uncertainty and therefore meeting PSERS' long-term investment objectives.
4. Risk - For an underfunded plan or for a plan with negative external cash flow (benefits paid exceed contributions received), the path of compounding of investment returns – from month to month, quarter to quarter, and year to year – matters more than for a plan that is fully funded or has positive external cash flow; for the former type of plan, peak-to-trough declines transform unrealized losses into permanent ones. Drawdown risk should be mitigated, especially since the environment in which drawdowns occur is likely to take place when the plan sponsor's willingness and ability to make contributions to the plan may be less than in normal times. Liquidity should be managed to reasonably ensure that the fund can meet its obligations during periods of market dislocations.
5. Leverage - Leverage at the total fund level can be an effective tool to enhance diversification, since asset classes, over the long-term, have similar risk-adjusted returns, different correlations to each other, and different responses to changes in the economic and market environment. Leverage can be a vital tool to increase or decrease total fund risk in a diversified manner.
6. Rebalancing - Disciplined rebalancing enhances long-term returns as it is an inherently contrarian process. Rebalancing restores strategic asset allocation as the primary driver of return and risk.

## Investment Section

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7. **Portfolio Size** - Managing a large pool of assets provides investors unique access to investment opportunities not available to smaller institutional investors or individual investors. PSERS should use its size to its advantage to enhance its net-of fees return and diversification opportunities.
8. **Private Investments** - Allocations to Private Equity, Private Credit, Private Real Estate, Private Infrastructure, and other illiquid asset classes may be justified by the illiquidity risk premium available to investors. Allocations to these asset classes may also be justified by the diversification benefit they provide, through exposure to sectors, businesses, and mode of corporate governance not obtainable through public markets.
9. **Active Management** - Passive investing, rather than active management, is the default choice to be used for any asset class that is highly efficient or where skilled active managers are less likely to be identified. Certain asset classes continue to exhibit information inefficiency, where skilled active management and well-resourced investors such as PSERS can potentially persistently outperform peers and the benchmark for that asset class. There will be short-term periods when a skilled active manager may underperform peers and the benchmark; that is to be expected and accepted; therefore a long-term perspective will be employed.
10. **Internal Management** - PSERS has developed skilled internal investment managers; as such, internal investment management is preferred over external investment management in cases where internal management most likely can match or exceed the long-term, net of fees, risk-adjusted returns provided by external managers, provided the internal investment and operational resources are available to do so.
11. **Investment Fees** - Investment management fees for external management are one of the few aspects of investment management that are certain and over which the investor has control. Investment management and performance fees should be managed to (i) maximize long-term, net of fees, risk-adjusted returns, (ii) split the value added fairly between the investment manager and PSERS, and (iii) align the interests of the investment manager with PSERS.

To achieve the System's objectives, the Board meets periodically to review the overall asset allocation plan and investment policies for the System. Implementation of investment policy decisions necessitates asset management. Implementation is through external investment management firms which act as agents for the System as well as through internal investment managers.

### Roles and Responsibilities

The Board, via its Investment Committee, provides direction and oversight of investment activities. The Investment Committee generally conducts six meetings per year and may meet more frequently as needed. Investment Office professionals, as well as external consultants, external investment managers, Investment Accounting professionals, and Internal Audit professionals, assist the Board in achieving investment objectives and monitoring compliance with investment policies.

As of June 30, 2022, the Board's consultants include the following: Verus Advisory, Inc. provides investment oversight consulting services; Aon Investment Consulting, Inc. (Aon) serves as the general investment consultant, assisting the Board and Professional Staff in formalizing investment objectives, establishing an asset allocation, conducting investment manager due diligence, calculating and reviewing performance, and commenting on compliance with investment policies; Aksia, LLC serves as absolute return and private credit consultant; Hamilton Lane Advisors, L.L.C. serves as private equity, private infrastructure, private credit and private real estate consultant; and Constellation Advisers LLC provides investment compliance services.

Investment Office professionals implement investment decisions within the guidelines established in the Investment Policy Statement, Objectives and Guidelines regarding asset allocation, manager selection, security selection, and other objectives directed by the Board.

The Board employs both external investment management firms and internal investment managers to manage the investment portfolio of the System. At fiscal year-end, \$7.8 billion in assets were managed by external public markets managers, \$32.5 billion in assets were managed by internal investment managers, and the remaining \$30.0 billion in assets were managed by numerous private equity, private credit, private infrastructure, private real estate investment managers, and absolute return managers.

### Asset Allocation

The Board reviews the long-term asset allocation targets of the System on a periodic basis. The Board consults with its actuary, consultants, Investment Office professionals, and other sources of information it deems appropriate in formulating the asset

allocation. The level of risk assumed by the System is largely a result of the asset allocation. The Board, in determining its long-term asset allocation, takes the following factors into consideration:

- The System's investment time horizon;
- The demographics of the plan participants and beneficiaries;
- The cash flow requirements of the System;
- The actuarial assumptions approved by the Board;
- The funded status of the System;
- The Board's willingness and ability to take risk; and
- The employers' (Commonwealth and school districts) financial strength.

In approving the asset allocation for the System, the Board considers capital market expectations for expected return, volatility, and asset class correlations for each asset class, as prepared by its general investment consultant.

For the long-term target asset allocation as of June 30, 2022, In the 4th calendar quarter of 2021, the Board approved changes to the long-term target asset allocation. In the new long-term target asset allocation, the allocations are as follows. The equity target allocation is 40%, comprised of 28% public equity and 12% private equity. Public equity in turn consists of U.S. equity (12%) and non-U.S. equity (16%). Within U.S. equity, the allocation is diversified across small, mid, and large capitalization equity. Within non-U.S. equity, exposure includes international developed markets and emerging markets, and small, mid, and large capitalization equity. Non-U.S. developed markets equity exposure is partially currency-hedged back to the U.S. dollar.

The fixed income target allocation is 33%, comprised of 9% investment grade exposure, 6% public credit-related exposure, 6% private credit-related exposure, and 12% U.S. inflation-protected exposure. Investment grade exposure consists of U.S. core fixed income (1%) and U.S. long-term treasury bonds (8%). Public credit-related exposure consists of public high yield bonds (4%) and emerging markets debt (2%).

The real assets target allocation is 29%, comprised of public and private real estate (11%), public and private infrastructure (9%), and commodities and gold (9%).

The absolute return target allocation of 6.0% consisted primarily of investment managers retained by the System to generate positive returns over time that are independent of how the equity, fixed income, and commodity markets perform. Strategies implemented to achieve this target include, but are not limited to, event-driven, relative value, tactical trading, and long/short equity. The absolute return program is included in the allocation to generate positive, absolute returns with low volatility and low correlation to the public financial markets to diversify the System's total portfolio risk.

Leverage is utilized in the asset allocation as a means of gaining exposure to a portion of the above fixed income and real assets asset classes. Leverage is deployed through use of derivative instruments (typically total return swaps) that allow the System to gain this exposure with minimal margin requirements. Total leverage is targeted at (11%). (Market convention is to show this with a negative sign.)

Finally, the System has a 3% allocation to cash, consisting of short-duration, liquid, high quality securities.

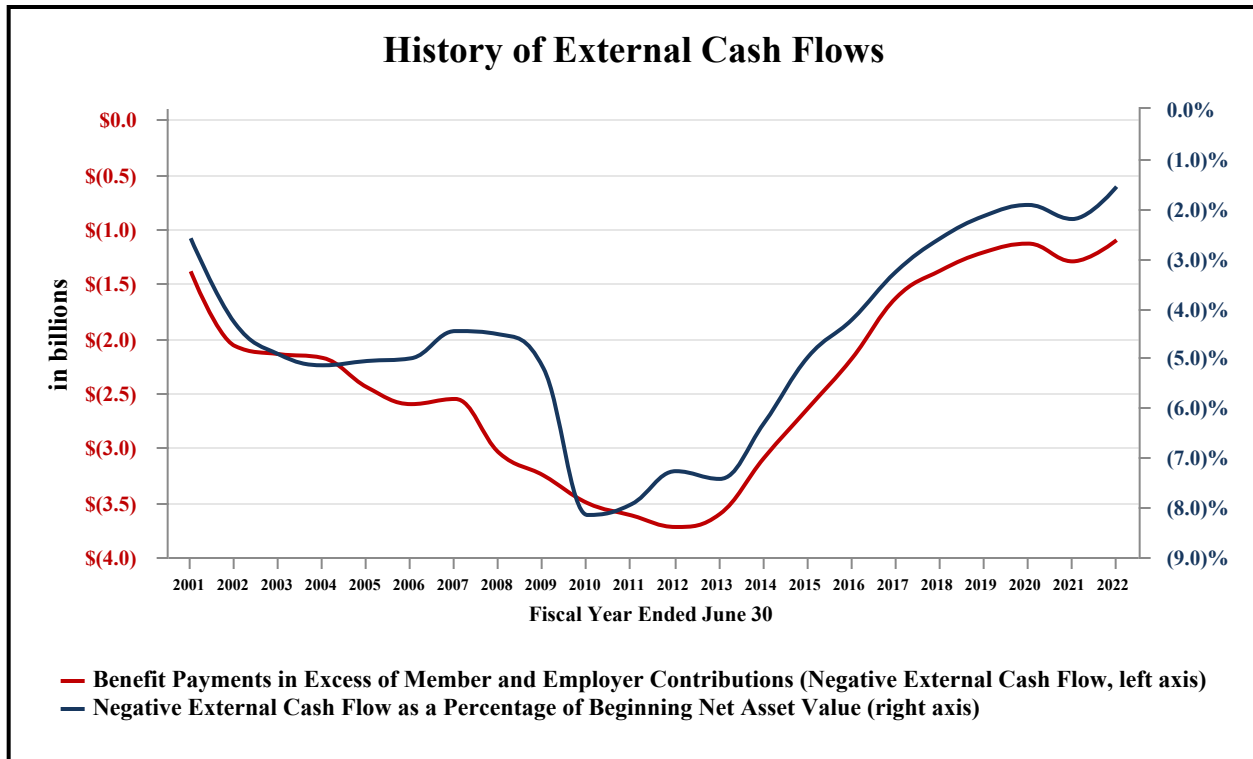
The System also participates in a securities lending program administered by Deutsche Bank AG. This program is designed to provide incremental income to the System by lending publicly-traded securities in the System's portfolio held by the System's custodial bank, The Bank of New York Mellon, to securities dealers in exchange for cash collateral, which can be reinvested to generate income. This program generated \$25.7 million in net income during the fiscal year.

### Liquidity and Cash Flow

The System's asset allocation and risk profile are, in part, driven by its liquidity needs. Over the past twenty fiscal years, the System has paid out \$50.4 billion more in benefits than it has received in member and employer contributions (i.e., the System has experienced negative external cash flow). The average negative external cash flow was approximately \$2.2 billion per year during this period. This annual funding deficiency has amounted to 1.6% or more of beginning net assets each year and represents the amount of investment return needed each year to make up the shortfall (for example, if in a given year the System earned 3% on its investments and had a 3% external cash flow shortfall, then the net assets of the System will be unchanged for that year). The negative annual external cash flow has improved significantly since fiscal year 2012 due to the implementation of Act 120 in 2010 (see chart below). Act 120 provided for increased employer contributions to the actuarial required

## Investment Section

contribution levels. The annual cash flow shortfall, while much improved, will continue over the next few years and necessitates a larger liquidity position and lower risk profile than a retirement system that has smaller liquidity requirements.



### The Economy and Investment Markets During The Past Fiscal Year

The combined aggressive response from monetary policy (central banks) and fiscal policy (governments) to the COVID-19 pandemic successfully transitioned economies from collapse in fiscal year 2020 (July 2019 to June 2020), to lift off in fiscal year 2021, to a more uncertain state in fiscal year 2022. This heightened uncertainty in fiscal year 2022 was due to the emergence of three powerful forces: inflation, geopolitical instability from Russia's invasion of the Ukraine, and the continued mutation of COVID-19 into new variants. Each issue- on its own; would have been difficult for policy makers and investors to manage. Together, they made the cone of potential outcomes far wider than normal and the job of policy makers and investors that much more difficult to navigate.

Despite most every country and region of the world facing the same three powerful forces, specific conditions differed somewhat from country to country and region to region. The United States arguably had the largest monetary and fiscal response to COVID-19. The United States saw a significant rise in the level and stickiness of inflation and witnessed growing tightness in labor market conditions (where the demand for labor far exceeded the supply). As a result, the Federal Reserve (the U.S. central bank) increased its hawkish rhetoric and began to move to increase interest rates in an effort to subdue inflation. Nominal GDP growth remained healthy, giving the Federal Reserve some room to maneuver without inducing a recession.

Europe confronted a more dire set of conditions. It faced the same inflationary and labor market dynamics, but saw nominal GDP growth worse than in the United States. Europe was also far closer, geographically and economically, to the fallout of the Russia/Ukraine war; than the United States. Europe's dependence on imports of oil and natural gas made it especially vulnerable to supply interruptions and spikes in energy prices. Finally, Europe's own political and economic heterogeneity among its constituent countries made a unified monetary and fiscal response very difficult to achieve, with the risk growing of the disintegration of the Eurozone.

China saw its "zero COVID" policy exact a material toll on economic growth, helping to keep China's inflation rate moored at relatively modest levels compared to the rest of the world. Coupled with a weakening commercial and residential real estate sector – a large sector in China's economy – China's policymakers were concerned with preventing deflation and maintaining economic growth, admittedly at a growth rate lower than the high growth rate of the past two decades. In addition, policymakers were focused on maintaining political stability leading up to China's party congress in late 2022.

Reflecting the turbulent macroeconomic picture, the return picture for investors was a tale of two halves for fiscal year 2022. Returns for the first half were markedly different from returns for the second half. In the first half, nearly all asset classes had positive returns. In the second half, nearly all asset classes had negative returns. See the table below for the returns of some common benchmarks.

ASSET CLASS	1H FY 2022	2H FY 2022
U.S. Large Cap Stocks	11.7%	(20.0%)
U.S. Mid Cap Stocks	6.1%	(19.5%)
U.S. Small Cap Stocks	2.6%	(18.9%)
Non-U.S. Developed Markets Stocks	(0.4%)	(16.5%)
Emerging Markets Stocks	(8.3%)	(17.9%)
U.S. Investment Grade Bonds	0.1%	(10.3%)
U.S. Long Maturity Treasury Bonds	3.6%	(21.3%)
Emerging Markets Bonds	(1.9%)	(15.6%)
U.S. High Yield Bonds	1.6%	(14.2%)
U.S. Inflation Linked Bonds	4.4%	(9.7%)
Non-U.S. Inflation Linked Bonds	6.0%	(14.7%)
Infrastructure Stocks	9.9%	(0.7%)
Commodities	4.9%	18.4%
Gold	2.9%	(1.5%)
REITS Stocks	12.1%	(16.2%)

The sharp dichotomy in performance between the first half of the fiscal year and the second half of the fiscal year was evidence of the difficulty in navigating a world driven by the three powerful forces mentioned above. In the second half, there was no place to hide and it was hard to make money. In the first half, there was no need to hide and it was hard not to make money.

We expect these quick and large shifts in performance to continue for the foreseeable future. They will be hard to anticipate and hard to manage. Heightened volatility is likely to be a persistent feature of the investing landscape.

### Investment Results

Aon calculates the total investment return of the System, the total fund Policy Index return, and the performance of each externally managed and internally managed portfolio. Performance is calculated using a time-weighted return methodology.

For the one-year period ended June 30, 2022, the System generated a total net of fee return of 2.23%. This return exceeded the total fund Policy Index return of (0.18)% by 2.41%. Annualized total net of fee returns for the three-, five- and ten-year periods ended June 30, 2022 were 8.80%, 8.46% and 7.91%, respectively. The three-, five- and ten-year returns exceeded the total fund Policy Index returns by 1.37%, 0.80%, and 0.55%, respectively.

Asset classes that were significant positive contributors to PSERS performance this past fiscal year included:

- Private Real Assets: +38.2%
- Private Equity: +22.6%
- Absolute Return: +8.8%
- Private Credit: +7.6%
- Public Real Assets: +5.7%

Asset classes that were significant detractors from PSERS performance this past fiscal year included:

- Public Real Estate: -9.2%
- Public Credit-Related Fixed Income: -12.9%
- Public Global Equity: -17.6%
- Public Investment Grade Fixed Income: -17.6%

**Prepared by PSERS Investment Office**  
**Robert Devine, Interim CIO/Managing Director**  
**Thomas Bauer, Deputy Chief Investment Officer**

<b>Annualized Time-Weighted Returns (%) Net of Fees (1)</b>				
<b>Periods Ended June 30, 2022</b>				
	<b>1 Year</b>	<b>3 Years</b>	<b>5 Years</b>	<b>10 Years</b>
<b>PSERS Total Portfolio</b>	2.23	8.80	8.46	7.91
Total Fund Policy Index	(0.18)	7.43	7.66	7.36
Median Public Defined Benefit Plan (DBP) Fund Universe (Aon Investment Consulting Database)	(7.21)	6.26	6.47	7.54
<b>PSERS U.S. Equity Portfolios</b>	(11.61)	10.21	10.48	12.74
U.S. Equity Policy Index	(11.87)	9.83	10.65	12.60
<b>PSERS Non-U.S. Equity Portfolios</b>	(21.33)	3.98	5.01	7.94
Non-U.S. Equity Policy Index	(18.87)	2.34	3.50	6.79
<b>PSERS Fixed Income Portfolios (4)</b>	(5.58)	2.39	4.28	4.82
Fixed Income Policy Index	(9.10)	0.74	2.51	2.67
<b>PSERS Commodity Portfolios (4)</b>	8.66	8.20	5.98	0.54
Commodity Policy Index	8.27	6.50	4.84	(0.99)
<b>PSERS Absolute Return Portfolios</b>	8.79	6.86	5.55	4.82
Absolute Return Policy Index	1.10	6.11	5.97	5.71
<b>PSERS Infrastructure (4)</b>	10.92	0.60	1.73	N/A
Blended Infrastructure Index	10.63	1.69	2.60	7.63
<b>PSERS Real Estate (hedged) (2) (4)</b>	26.92	14.31	12.79	11.98
Blended Real Estate Index (2)	16.69	8.93	9.09	9.87
<b>Private Equity (hedged) (3)</b>	22.64	22.68	19.01	13.85
Burgiss Private Equity (3)	23.07	21.96	18.71	14.97

1. For more specific details on policy indices, refer to PSERS Investment Policy Statement at [www.psers.pa.gov](http://www.psers.pa.gov).
2. Returns reported on a one-quarter lag, except for publicly traded real estate security investments.
3. Returns reported on a one-quarter lag.
4. Returns are presented on an unleveraged basis for comparability purposes to the Policy Index.

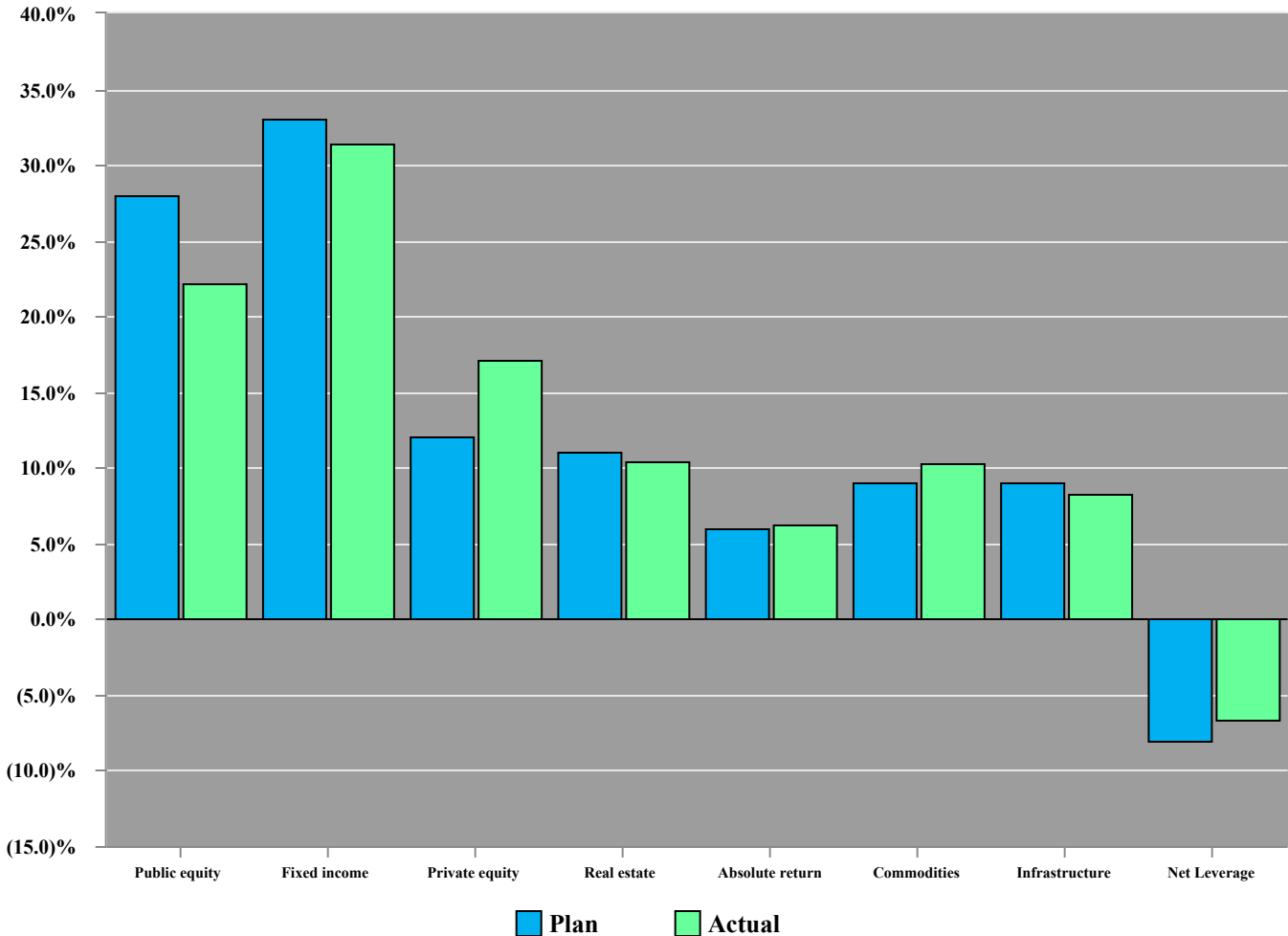
**Portfolio Summary Statistics**  
**Asset Allocation Basis**  
**As of June 30, 2022**  
(Dollar Amounts in Thousands)

Pension investments	Fair Value	% Fair Value
<b>Public equity:</b>		
Large and mid cap equity	\$ 5,971,280	8.5
Small cap equity	597,775	0.9
Emerging markets equity	2,595,451	3.7
<b>Total Non-U.S. equity</b>	<b>9,164,506</b>	<b>13.1</b>
Large cap equity	4,712,155	6.7
Mid and small equity	1,687,023	2.4
<b>Total U.S. equity</b>	<b>6,399,178</b>	<b>9.1</b>
<b>Total Equity</b>	<b>15,563,684</b>	<b>22.2</b>
<b>Fixed income:</b>		
Investment grade fixed income	14,919,065	21.2
Private credit	5,257,782	7.5
<b>Total U.S. Fixed income</b>	<b>20,176,847</b>	<b>28.7</b>
Non-U.S. developed markets fixed income	1,522,416	2.2
Emerging markets fixed income	373,157	0.5
<b>Total Non-U.S. Fixed income</b>	<b>1,895,573</b>	<b>2.7</b>
<b>Total Fixed income</b>	<b>22,072,420</b>	<b>31.4</b>
<b>Real estate</b>	<b>7,323,505</b>	<b>10.4</b>
<b>Private equity</b>	<b>12,006,503</b>	<b>17.1</b>
<b>Absolute return</b>	<b>4,460,394</b>	<b>6.4</b>
<b>Commodities</b>	<b>7,253,255</b>	<b>10.3</b>
<b>Infrastructure</b>	<b>5,852,937</b>	<b>8.3</b>
<b>Tail Risk Mitigation</b>	<b>369,975</b>	<b>0.5</b>
<b>Leverage:</b>		
Leverage	(8,561,198)	(12.2)
Cash and cash equivalents	3,967,098	5.6
<b>Total Net Leverage</b>	<b>(4,594,100)</b>	<b>(6.6)</b>
<b>Total Pension investments</b>	<b>\$ 70,308,573</b>	<b>100.0</b>
<b>Postemployment Healthcare investments</b>	<b>\$ 496,525</b>	<b>100.0</b>
<b>Defined Contribution plan investments</b>	<b>\$ 99,638</b>	<b>100.0</b>



## Comparison of Actual Portfolio Distribution to Asset Allocation Plan - Pension Investments \* As of June 30, 2022

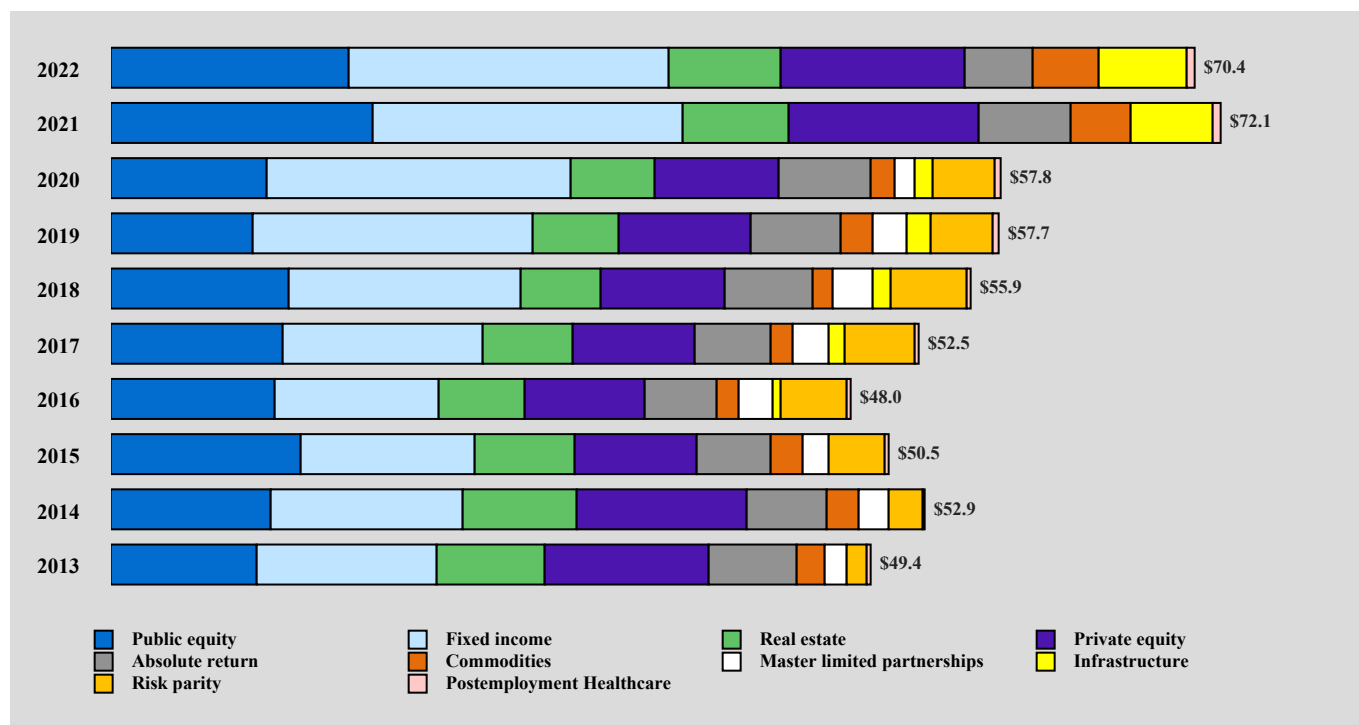
Asset Category	Plan	Actual
Public Equity	28.0%	22.2%
Fixed income	33.0	31.4
Private equity	12.0	17.1
Real estate	11.0	10.4
Absolute return	6.0	6.4
Commodities	9.0	10.3
Infrastructure	9.0	8.3
Net Leverage	(8.0)	(6.6)
Tail Risk Mitigation	—	0.5
<b>Total</b>	<b>100.0%</b>	<b>100.0%</b>



\*Tail Risk Mitigation is not included in the above chart.

## Portfolio Capital Distribution 10 Year Trend\*

(Fair Value - Dollar Amounts in Billions)



\*Defined Contribution Plan and Tail Risk Mitigation are not included in the above chart.

The following lists of portfolio detail statistics present the 10 largest holdings by descending order of fair value for the largest public market asset classes. Information on the complete holdings of the System can be downloaded from the PSERS website at [www.pfers.pa.gov](http://www.pfers.pa.gov).

### Public Equity

#### 10 Largest Holdings in Descending Order by Fair Value

#### As of June 30, 2022

(Dollar Amounts and Shares in Thousands)

Description	No. of Shares	Fair Value
iShares MSCI ETF	18,619	\$ 913,438
The Children's Investment Fund LP	614,318	614,318
BlackRock Emerging Markets Alpha Advantage Fund Ltd.- Class D	251	392,717
Effissimo Capital Management Feeder Fund 2	713	381,412
Apple Inc.	2,239	306,080
Steadview Capital Partners LP	255,373	287,371
Microsoft Corporation	1,089	279,813
Wellington Management Company LLP	30,245	267,361
Cederberg Greater China Equity Fund	2,534	216,089
Alphabet Inc.	95	207,016
<b>Total of 10 Largest Holdings</b>		<b>\$ 3,865,615</b>

**Fixed Income**  
**10 Largest Holdings in Descending Order by Fair Value**  
**As of June 30, 2022**  
(Dollar Amounts and Shares in Thousands)

Description	No. of Shares	Fair Value
BlackRock US Extended Core Global Alpha Bond Fund Ltd.	365	\$ 888,163
Garda Fixed Income Relative Value Opportunity Fund Ltd.	319	677,890
Bridgewater Pure Alpha Fund II, Ltd.	105	659,308
Bridgewater International Inflation-Linked Bond Fund	148	520,571
PSERS TAO Partners Parallel Fund, LP	N/A	493,758
Park Square - PSERS Credit Opportunities Fund, LP	N/A	397,058
Cerberus PSERS Levered Loan Opportunities Fund, LP	N/A	392,711
LBC-P Credit Fund, LP	N/A	337,320
Bain Capital Credit Managed Account, LP	N/A	291,446
PIMCO BRAVO Fund III Onshore Feeder, LP	N/A	246,244
<b>Total of 10 Largest Holdings</b>		<b>\$ 4,904,469</b>

**Absolute Return**  
**10 Largest Holdings in Descending Order by Fair Value**  
**As of June 30, 2022**  
(Dollar Amounts and Shares in Thousands)

Description	No. of Shares	Fair Value
Aeolus Property Catastrophe Keystone PF Fund, LP	128	\$ 750,501
Bridgewater Pure Alpha Fund II, Ltd.	256	442,218
Capula Global Relative Value Fund, Ltd.	3,460	431,290
Capula Tail Risk Fund Ltd.	178	399,751
Caspian Select Credit International, Ltd.	280	373,984
Nimbus Weather Fund, Ltd.	153	290,043
Oceanwood Opportunities Fund	1,964	178,643
OWS Credit Opportunity Offshore Fund III, Ltd.	217	139,049
Palmetto Fund, Ltd.	48	83,273
PIMCO Commodity Alpha Fund, Ltd.	93	81,796
<b>Total of 10 Largest Holdings</b>		<b>\$ 3,170,548</b>

**Postemployment Healthcare Investments**  
**Holdings in Descending Order by Fair Value**  
**As of June 30, 2022**  
(Dollar Amounts in Thousands)

Description	Maturity Date	Interest Rate (%)	Par Value	Fair Value
Wilmington US Government MM	N/A	Various	\$ 263,182	\$ 263,182
PSERS Short-Term Investment Fund	Various	Various	196,213	196,213
Dell Equipment Financial	10/22/2024	1.90%	107	107
<b>Total Holdings</b>				<b>\$ 459,502</b>

**Defined Contribution Plan Investments**  
**10 Largest Holdings in Descending Order by Fair Value**  
**As of June 30, 2022**  
(Dollar Amounts and Shares in Thousands)

Description	No. of Shares	Fair Value
T Rowe Price Target Date 2060	2,575	\$ 33,675
T Rowe Price Target Date 2055	1,012	12,564
T Rowe Price Target Date 2050	741	9,206
T Rowe Price Target Date 2065	750	8,051
T Rowe Price Target Date 2045	604	7,511
T Rowe Price Target Date 2040	508	6,277
PSERS Short-Term Investment Fund	N/A	5,301
T Rowe Price Target Date 2035	426	5,216
T Rowe Price Target Date 2030	324	3,924
Vanguard® Treasury Money Market	2,881	2,881
<b>Total of 10 Largest Holdings</b>		<b>\$ 94,606</b>

**Comparison of Investment Activity Income**  
**Fiscal Years Ended June 30, 2022 and 2021**  
(Dollar Amounts in Thousands)

<b>Investment Activity</b>	<b>2022</b>	<b>2021</b>
Net appreciation (depreciation) in fair value of investments	\$ (1,781,150)	\$ 13,949,087
Short-term	23,385	12,691
Fixed income	556,068	294,417
Equity	416,326	272,651
Collective trust funds	477	913
Real estate	455,027	267,489
Alternative investments	547,142	565,392
<b>Total investment activity income</b>	<b>\$ 217,275</b>	<b>\$ 15,362,640</b>

Brokers' fees on equity investment transactions for the fiscal year ended June 30, 2022, were \$5.7 million. The System has commission recapture contracts with several brokers. These contracts generally stipulate that the brokers rebate a percentage of commissions earned on investment transactions directly to the System. During the fiscal year ended June 30, 2022, the System earned approximately \$26,000 from a commissions recapture program. A list of the brokers receiving fees in excess of \$100,000 during the fiscal year follows:

**Summary Schedule of Brokers' Fees**  
**(Cumulative Fiscal Year Amounts Exceeding \$100,000)**  
**Fiscal Year Ended June 30, 2022**  
(Shares in Thousands)

<b>Broker Name</b>	<b>Fees Paid</b>	<b>Shares</b>	<b>Broker Name</b>	<b>Fees Paid</b>	<b>Shares</b>
Instinet LLC	\$ 1,040,032	216,745	J P Morgan Chase & Co.	\$ 186,515	101,518
Bank Of America Merrill Lynch	273,880	82,566	Macquarie Bank Ltd.	152,847	53,282
Liquidnet Inc.	220,325	34,732	Credit Suisse	138,892	30,357
Morgan Stanley & Company	219,016	96,414	Goldman Sachs & Company	136,937	34,950
UBS	215,738	99,393	Citigroup Inc.	117,791	73,921
Fimat USA	213,171	87	Direct Trading	112,351	7,100
Knight Securities	199,233	20,158	Sanford Bernstein & Co.	102,712	7,894

**Professional Consultants**  
**Roster of Investment Managers, Advisors, and Consultants**  
**As of June 30, 2022**

**Absolute Return Managers**

- ◆ Aeolus Capital Management, Ltd.
- ◆ Bridgewater Associates, LP
- ◆ Capula Investment Management, LLP
- ◆ Carlyle Aviation Management Limited
- ◆ Caspian Capital, LP
- ◆ Falko Regional Aircraft Limited
- ◆ Garda Capital Partners, LP
- ◆ HS Group Ltd.
- ◆ Independence Reinsurance Partners GP, LLC
- ◆ Nephila Capital, Ltd.
- ◆ Oceanwood Capital Management, Ltd.
- ◆ One William Street Capital Management, LP
- ◆ Pacific Investment Management Company, LLC
- ◆ Venor Capital Management, LP

**Non-U.S. Equity Managers**

- ◆ Acadian Asset Management, LLC
- ◆ Baillie Gifford Overseas, Ltd.
- ◆ BlackRock Institutional Trust Company, N.A.
- ◆ Cederberg Capital
- ◆ Effissimo Capital Management Pte. Ltd.
- ◆ Marathon Asset Management Limited
- ◆ Oberweis Asset Management, Inc.
- ◆ Steadview Capital Partners, LP
- ◆ The Children's Investment Fund, LP
- ◆ Wasatch Advisors, Inc.

**Tail Risk Mitigation Manager**

- ◆ Capstone

**Fixed Income Managers****U.S. High Yield Fixed Income Manager**

- ◆ BlackRock Institutional Trust Company, N.A.

**Private Credit Managers**

- ◆ Apollo Global Management, LLC
- ◆ Ares SSG Capital Management Limited
- ◆ Avenue Capital Group
- ◆ Bain Capital Credit, LP
- ◆ Brigade Capital Management

- ◆ Carlyle Group, The
- ◆ Cerberus Business Finance, LLC
- ◆ Clearlake Capital Group, LP
- ◆ Galton Capital Group, LLC
- ◆ Hayfin Capital Management LLP
- ◆ Intermediate Capital Group PLC
- ◆ LaSalle Mortgage Real Estate Investors
- ◆ LBC Credit Management, LP
- ◆ Newmarket Global Management, LP
- ◆ Pacific Investment Management Company, LLC
- ◆ Park Square Capital, LLC
- ◆ Sixth Street Partners, LLC
- ◆ Summit Partners
- ◆ TCI Fund Management Limited
- ◆ Varde Partners, Inc.
- ◆ Whitehorse Liquidity Partners, Inc.

**Emerging Markets Debt Manager**

- ◆ Franklin Templeton Investments

**Non-U.S. Inflation-Linked Securities Manager**

- ◆ Bridgewater Associates, LP

**LIBOR-Plus Short-Term Investment Pool Manager**

- ◆ Radcliffe Capital Management

**Real Assets****Commodity Managers**

- ◆ Denham Capital Management, LP
- ◆ Gresham Investment Management, LLC
- ◆ NGP Energy Capital Management
- ◆ Wellington Management Company, LLP

**Farmland Advisor**

- ◆ Prudential Agricultural Group

**Professional Consultants (Continued)**

**Private Infrastructure Managers**

- ◆ Blackstone Group, The
- ◆ Brookfield Asset Management, Inc.
- ◆ GCM Grosvenor
- ◆ I Squared Capital
- ◆ Newmarket Global Management, LP
- ◆ Strategic Partners

**Publicly Traded Real Estate Securities Manager**

- ◆ Security Capital Research & Management, Inc.

**Real Estate Advisors**

- ◆ Bell Partners, Inc.
- ◆ GF Management, Inc.
- ◆ L&B Realty Advisors
- ◆ O'Connor Real Estate Advisors, LLC.
- ◆ Property Management, Inc.
- ◆ Stockbridge Capital Partners

**Real Estate Fund Managers**

- ◆ Almanac Realty Investors, LLC
- ◆ Angelo, Gordon & Co., LP
- ◆ Ares Management, LLC
- ◆ Avenue Capital Group
- ◆ Bell Partners, Inc.
- ◆ BlackRock Real Estate
- ◆ Blackstone Group, The
- ◆ Brookfield Asset Management, Inc.
- ◆ Cabot Properties, Inc.
- ◆ Carlyle Group, The
- ◆ C-III Capital Partners, LLC
- ◆ DRA Advisors, LLC
- ◆ Exeter Property Group
- ◆ Fortress Investment Group
- ◆ LAI Real Estate Investors, LLC
- ◆ LaSalle Mortgage Real Estate Investors
- ◆ LEM Capital Partners, LP
- ◆ O'Connor Capital Partners
- ◆ Paramount Group, Inc.
- ◆ PGIM Real Estate
- ◆ RCG Longview Management, LLC
- ◆ Silverpeak Real Estate Partners
- ◆ Stockbridge Capital Partners
- ◆ Strategic Partners
- ◆ UBS Realty Investors, LLC

**Currency Hedging Manager**

- ◆ Insight Investment International Limited

**Private Equity Fund Managers**

**Buyout Fund Managers**

- ◆ Actis LLP
- ◆ APAX Partners, LLP
- ◆ Apollo Global Management, LLC
- ◆ Arrowhead Mezzanine
- ◆ Avenue Capital Group
- ◆ Bain Capital Partners, LLC
- ◆ Baring Private Equity Asia Limited
- ◆ Black Diamond Capital Management, LLC
- ◆ Blue Point Capital Partners LLC
- ◆ Bridgepoint Capital Ltd.
- ◆ Capital Group
- ◆ L Catterton Management Company LLC
- ◆ Cerberus Capital Management, LP
- ◆ Cinven
- ◆ Clearlake Capital Group, LP
- ◆ Collier Investment Management LTD
- ◆ Crestview Advisors LLC
- ◆ CVC Capital Partners Group
- ◆ Denham Capital
- ◆ The Energy & Minerals Group
- ◆ Equistone Partners Europe Limited
- ◆ First Reserve Corporation
- ◆ Gold Hill Venture Lending 03, LLC
- ◆ GoldPoint Partners LLC
- ◆ Hahn & Company
- ◆ HgCapital
- ◆ Huntsman Gay Global Capital LLC
- ◆ Incline Management Corp.
- ◆ IPC Advisors
- ◆ K4 Capital Advisors
- ◆ Landmark Partners
- ◆ Lindsay Goldberg & Bessemer
- ◆ Milestone Partners
- ◆ Morgan Stanley
- ◆ New Mountain Investments
- ◆ NGP Energy Capital Management
- ◆ Oaktree Capital Management, LP
- ◆ Odyssey Investment Partners LLC
- ◆ Orchid Asia
- ◆ PAI Europe

**Professional Consultants (Continued)**

- ◆ Palladium Equity Partners
- ◆ Partners Group Mgt VI LTD
- ◆ Platinum Equity Advisors, LLC
- ◆ Polaris Capital Group, Ltd.
- ◆ Portfolio Advisors, LLC
- ◆ Searchlight Capital Partners, LP
- ◆ StepStone Group
- ◆ Sterling Partners
- ◆ Strategic Partners
- ◆ Trilantic Capital Management, LLC
- ◆ Tulco Management, LLC.
- ◆ Venor Capital Management, LP
- ◆ Versa Capital Management, LLC
- ◆ Webster Capital Management, LLC

**Growth Equity Fund Managers**

- ◆ Greenoaks Capital
- ◆ Insight Venture Management, LLC
- ◆ LLR Partners
- ◆ Oak HC/FT Management Company, LLC
- ◆ Summit Partners

**Venture Capital Fund Managers**

- ◆ Adams Capital Management, Inc.
- ◆ Aisling Capital, LLC
- ◆ Cross-Atlantic Capital Partners
- ◆ Insight Venture Management, LLC
- ◆ Mid-Atlantic Venture Funds
- ◆ Sante Ventures
- ◆ SCP Private Equity Partners
- ◆ StarVest Associates
- ◆ Sterling Partners
- ◆ Strategic Partners
- ◆ Tenaya Capital
- ◆ Valar Ventures, LLC

**Custodian Bank**

- ◆ The Bank of New York Mellon Corporation

**Securities Lending Agent**

- ◆ Deutsche Bank AG

**Investment Accounting Application Service Provider**

- ◆ STP Investment Services, LLC

**Proxy Voting Agent**

- ◆ Glass, Lewis & Co., LLC

**Board Investment Consultant**

- ◆ Verus Advisory, Inc.

**General Investment Consultant**

- ◆ Aon Investments USA Inc.

**Private Equity, Private Real Estate, Private Credit, and Private Infrastructure Investment Consultant**

- ◆ Hamilton Lane Advisors, LLC

**Absolute Return & Private Credit Consultant**

- ◆ Aksia, LLC

**Risk Management System Provider**

- ◆ BlackRock Solutions

**Defined Contribution Investment Consultant**

- ◆ CAPTRUST Financial Advisors

**General Pension Consultant**

- ◆ Ernst & Young US LLP