

**Public School Employees' Retirement System (PSERS)
Responses to Public Pension Management and Asset Investment
Review Commission (PPMAIRC)
Data Request PSERS-004**

**Public Pension Management and Asset Investment Review Commission
(PPMAIRC)**

Data Request: PSERS-004

Date submitted: June 11, 2018

Date for response: July 2, 2018

Stress Testing

1. Please describe your current practices regarding stress testing and how this information is made available to the board and the public. In particular:

- Who is conducting stress testing on behalf of the system: the system's consultant, the actuary, or another entity?
- What is the frequency of stress testing?
- What scenarios are included in the stress tests?
- To whom are the results of stress tests provided?
- How is this information used to make recommendations on asset allocation/investment strategies?

AON HEWITT ("AON"), PSERS' GENERAL INVESTMENT CONSULTANT, CONDUCTS STRESS TESTING OF PSERS' ASSET ALLOCATION ANNUALLY AND THOROUGHLY REVIEWS THIS ANALYSIS WITH BOTH PSERS INVESTMENT PROFESSIONALS AND THE BOARD ANNUALLY. THE STRESS TESTING INCLUDES BOTH DETERMINISTIC AND STOCHASTIC MODELING OF SEVERAL ECONOMIC SCENARIOS. AON HAS DEVELOPED SEVERAL ECONOMIC SCENARIOS THAT SEEK TO REPLICATE DIFFERENT SCENARIOS INCLUDING SEVERE ASSET SHOCKS SUCH AS THE BLACK SKIES SCENARIO. THESE ECONOMIC SCENARIOS SEEK TO REPLICATE REAL LIFE SITUATIONS SO THE EXPECTED RETURNS USED VARY BY YEAR RATHER THAN ASSUMING A CONSTANT FIXED RATE OF RETURN MORE TYPICAL IN TRADITIONAL DETERMINISTIC MODELING. THESE SCENARIOS INCLUDE:

- **BASE SCENARIO**
 - **MARKETS PERFORM AS EXPECTED (~50TH PERCENTILE)**
- **BLUE SKIES SCENARIO**
 - **OPTIMISTIC OUTLOOK FOR MARKETS (~10TH PERCENTILE)**
 - **RETURN-SEEKING ASSETS INCREASE MATERIALLY**
- **RECESSION SCENARIO**

- SOMEWHAT PESSIMISTIC OUTLOOK FOR THE MARKETS (~95TH PERCENTILE)
- RETURN-SEEKING ASSETS DECLINE IN THE FIRST TWO YEARS WITH A MODEST REBOUND IN LATER YEARS.
- **BLACK SKIES SCENARIO**
 - VERY PESSIMISTIC OUTLOOK FOR MARKETS (~99TH PERCENTILE)
 - RETURN-SEEKING ASSETS DECLINE SIGNIFICANTLY. THE VALUE OF PUBLIC EQUITIES ROUGHLY SPLITS IN HALF OVER THREE YEARS, WITHOUT AN IMMEDIATE REBOUND

THIS STRESS TESTING ANALYSIS IS PRESENTED ALONG WITH FULL STOCHASTIC ASSET/LIABILITY MODELING OF THE PSERS PLAN. TOGETHER THE STOCHASTIC ASSET/LIABILITY MODELING AND THE ECONOMIC STRESS TESTING IS USED TO THOROUGHLY EVALUATE THE EXPECTED OUTCOMES FOR THE PLAN FOR SEVERAL KEY VARIABLES INCLUDING: FUNDED STATUS, EXPECTED MARKET VALUE, AND CONTRIBUTIONS AND PLAN LIQUIDITY OVER A 10-YEAR HORIZON TO BETTER UNDERSTAND THE PERFORMANCE OF THE ASSET ALLOCATION IN DIFFERENT SCENARIOS.

2. Please describe the system's implementation of the recommendations from the Society of Actuaries Blue Ribbon Panel on stress testing. In particular:
- How is your system currently conducting stress testing, if testing differs from the Society of Actuaries Blue Ribbon Panel recommendations?
 - How often does the system conduct stress testing?
 - Are the results of these stress tests made publicly available?

AS DESCRIBED ABOVE, PSERS UTILIZES STOCHASTIC MODELLING PROVIDED BY AON THAT VARIES THE EXPECTED RETURN FOR DIFFERENT ECONOMIC CONDITIONS RATHER THAN MODELLING SIMPLISTIC, FIXED RATE DETERMINISTIC SCENARIOS. THIS TYPE OF STRESS TESTING IS MORE ROBUST THAN THE DETERMINISTIC MODELING RECOMMENDED BY THE SOCIETY OF ACTUARIES BLUE RIBBON PANEL. AS DESCRIBED ABOVE, THIS ANALYSIS IS PRESENTED TO THE BOARD ANNUALLY DURING ITS PUBLIC MEETING. AON'S REPORT IS PUBLICLY AVAILABLE AS IT IS POSTED TO THE PSERS WEBSITE.

Fee transparency

3. Please describe the system's current practices on reporting fees to the Board and the public.
- ACTUAL INVESTMENT COSTS ARE REPORTED ON A FISCAL YEAR BASIS IN PSERS' CAFR AND BUDGET SUBMISSIONS, AND PRESENTED TO THE BOARD NOT LESS THAN ANNUALLY (SEE PSERS-001 #3 FOR EXAMPLES). EACH OF THESE ITEMS IS POSTED TO PSERS' PUBLIC WEBSITE.**

4. Please describe the system's implementation of the standardized reporting template of the Institutional Limited Partners Association (ILPA). In particular:

- Does your system require all private equity managers to submit complete information as specified in the reporting template? **PSERS WAS AN EARLY ENDORSER OF THE ILPA REPORTING TEMPLATE. PSERS ADDED A SIDE LETTER PROVISION TO ALL NEW FUNDS ABOUT A YEAR AND A HALF AGO REQUIRING THE INVESTMENT MANAGER TO UTILIZE THE ILPA REPORTING TEMPLATE AS PART OF THEIR REPORTING PACKAGE TO PSERS.**
- Is information from these reports used as a basis of the fees and expenses included in the system's CAFR? If so, starting with which year's CAFR was this done? **THE ILPA TEMPLATES ARE NOT BEING USED AS THE BASIS OF THE FEES AND EXPENSES REPORTED IN THE SYSTEM'S FINANCIAL STATEMENTS.**
- Are managers of other asset classes with similar legal structures required by the system to use the ILPA reporting template? If so, which asset classes are included? If not, how do these managers report fees and performance? **PSERS DOES REQUIRE SUBMISSION OF ILPA TEMPLATES WHEN INVESTING IN DRAWDOWN STRUCTURES IN OTHER ASSET CLASSES VIA A STANDARD CLAUSE IN SIDE LETTER AGREEMENTS.**

5. Please provide a copy of the applicable offering document(s)/side letter(s)/investment management agreement(s) outlining the terms of the investment arrangement for each investment made within the past five years. **PSERS CAN PROVIDE THIS INFORMATION FOLLOWING RECEIPT OF AN EXECUTED NON-DISCLOSURE AGREEMENT.**

6. Please provide a copy of the most recent invoice showing the fee calculation (for private equity/real estate/infrastructure/etc., please additionally provide a copy of the capital statement showing the carry calculation and a copy of the ILPA report) for each investment made within the past five years. **PSERS CAN PROVIDE THIS INFORMATION FOLLOWING RECEIPT OF AN EXECUTED NON-DISCLOSURE AGREEMENT.**

Asset Allocation

7. Please provide a numerical (not a chart) history of the portfolio asset/risk allocation.

FOR THE MOST RECENT LISTING PLEASE SEE:

PPMAIRC PSERS-004 #7.pdf

Financial Consultants / Advisors

8. Please identify all consultants and advisors used by the system, the services they provide, the managers they oversee, the date of and a copy of their last presentation to the system, and their costs. **PSERS POSTS AN UPDATED "ROSTER OF INVESTMENT MANAGERS, ADVISORS, AND CONSULTANTS" TO ITS WEBSITE EACH QUARTER;**

PLEASE SEE:

PPMAIRC PSERS-004 #8A.pdf

SEE PSERS-004 #8B FILES FOR LAST CONSULTANT PRESENTATIONS AS FOLLOWS:

PPMAIRC PSERS-004 #7.pdf

PPMAIRC PSERS-004 #8A.pdf

PPMAIRC PSERS-004 #8B Aksia.pdf

PPMAIRC PSERS-004 #8B Aon1.pdf

PPMAIRC PSERS-004 #8B Aon2.pdf

PPMAIRC PSERS-004 #8B Courtland.pptx

PPMAIRC PSERS-004 #8B GL.pdf

PPMAIRC PSERS-004 #8B HL.pptx

SEE RESPONSE TO #9 BELOW FOR ADDITIONAL INFORMATION ON INVESTMENT CONSULTANTS.

9. For each of the system's consultants and advisors, please describe the contractual terms with them and how long they have been providing services to the system. **PLEASE SEE TABLE BELOW FOR INFORMATION WITH REGARD TO INVESTMENT CONSULTANTS. PSERS DOES NOT MAINTAIN A DATABASE INDICATING THE INCEPTION DATE OF INVESTMENT MANAGERS.**

<u>INVESTMENT CONSULTANT</u>	<u>SERVICE DESCRIPTION</u>	<u>CEPTION DATE</u>	<u>CONTRACT TERMS</u>
AKSIA, LLC	ABSOLUTE RETURN INVESTMENT CONSULTANT; ADVISES BOARD AND PSERS' INVESTMENT PROFESSIONALS ON INVESTMENT MATTERS RELATING TO ABSOLUTE RETURN AND PRIVATE CREDIT INVESTMENTS AND INVESTMENT MANAGERS, AND CALCULATES AND REPORTS INVESTMENT PERFORMANCE.	6/15/2010	5-YEAR CONTRACT; FY 2017 FEES WERE \$700,000
AON HEWITT INVESTMENT CONSULTING	GENERAL INVESTMENT CONSULTANT; ADVISES BOARD AND PSERS' INVESTMENT PROFESSIONALS ON INVESTMENT MATTERS INCLUDING ASSET ALLOCATION, RISK, AND PUBLIC MARKET INVESTMENTS AND INVESTMENT MANAGERS, AND CALCULATES AND REPORTS INVESTMENT PERFORMANCE.	11/15/2013	5-YEAR CONTRACT; FY 2017 FEES WERE \$694,738
COURTLAND PARTNERS, LTD.	REAL ESTATE CONSULTANT; ADVISES BOARD AND PSERS' INVESTMENT PROFESSIONALS ON INVESTMENT MATTERS RELATING TO REAL ESTATE INVESTMENTS AND INVESTMENT MANAGERS, AND CALCULATES AND REPORTS INVESTMENT PERFORMANCE.	10/19/2005	5-YEAR CONTRACT; FY 2017 FEES WERE \$71,250 (EXCLUDING A SUBSEQUENT SETTLEMENT AGREEMENT OF \$298,163)
GLASS LEWIS & CO., LLC	PROXY VOTING AGENT; VOTES PSERS' SHARES CONSISTENT WITH PSERS' U.S. AND NON-U.S. PROXY VOTING POLICIES.	1/1/2006	5-YEAR CONTRACT; FY 2017 FEES WERE \$178,681
HAMILTON LANE ADVISORS, LLC	PRIVATE MARKETS INVESTMENT CONSULTANT; ADVISES BOARD AND PSERS' INVESTMENT PROFESSIONALS ON INVESTMENT MATTERS RELATING TO PRIVATE MARKETS INVESTMENTS AND INVESTMENT MANAGERS, AND CALCULATES AND REPORTS INVESTMENT PERFORMANCE.	9/15/2017	5-YEAR CONTRACT; NO FEES WERE PAID IN FY 2017 (WILL PAY \$1,400,000 ANNUALLY DURING THE COURSE OF THE ENGAGEMENT)

Investment Performance

10. For each investment manager, please describe how benchmarks are assigned. For example, is the benchmark determined by the system/consultant before the search for the manager is conducted, is the benchmark selected by the manager and included in its proposal, or is the benchmark an element of the negotiation process?

ASSET CLASS AND BROAD CATEGORY-LEVEL BENCHMARKS ARE DEFINED IN ADVANCE OF IMPLEMENTATION AND ARE BASED UPON THE ROLE OF THE

GIVEN ASSET CLASS IN THE OVERALL PORTFOLIO (FOR EXAMPLE: COMMODITIES ARE INCLUDED TO PROVIDE INFLATION PROTECTION, WHILE LONG DURATION FIXED INCOME PROVIDES PROTECTION AGAINST DEFLATION). THESE BENCHMARKS ARE DEVELOPED BY THE ASSET ALLOCATION COMMITTEE IN CONJUNCTION WITH THE EXTERNAL CONSULTANT AND ARE ULTIMATELY PRESENTED TO THE BOARD FOR APPROVAL. THE INVESTMENT OFFICE PROFESSIONAL STAFF AND EXTERNAL CONSULTANTS REMAIN CONSCIOUS OF THESE ROLES THROUGHOUT THE IMPLEMENTATION PROCESS, BALANCING EACH MANAGER'S PORTFOLIO CONSTRUCTION BENEFITS AND ALPHA POTENTIAL AGAINST POTENTIAL MISFIT RISK AT THE CATEGORY LEVEL.

AT THE INDIVIDUAL MANAGER LEVEL WE WILL GENERALLY ADOPT THE BENCHMARKS THAT THE MANAGER IN QUESTION FEELS BEST MATCHES ITS TARGETED UNIVERSE OF OPPORTUNITIES. MANAGERS SHOULD OPERATE WITHIN THEIR SELF-IDENTIFIED AREA OF EXPERTISE RATHER THAN STRETCHING INTO MARKET SEGMENTS WHERE THEY HAVE LESS OF AN EDGE, SIMPLY BECAUSE THEY ARE TRYING TO MEET A SPECIFIC MANDATE. NEVERTHELESS, WE BELIEVE THAT ANY BENCHMARKS USED SHOULD BE RELEVANT TO THE MANDATE, KNOWN IN ADVANCE AND INVESTABLE. IF A MANAGER'S SELF-SELECTED BENCHMARK INTRODUCES AN UNACCEPTABLE AMOUNT OF CATEGORY-LEVEL MISFIT RISK (I.E. THE INVESTMENTS UTILIZED DO NOT MEET THE ROLE OF THE ASSET CLASS IN THE OVERALL PORTFOLIO) OR IF WE BELIEVE THEY ARE SIMPLY ATTEMPTING TO "GAME A BENCHMARK", WE WILL NOT CONSIDER THE MANAGER FOR A PARTICULAR MANDATE.

IT IS ALSO IMPORTANT TO NOTE THAT OUR TARGETED MANAGERS WILL USUALLY HAVE HIGH ACTIVE SHARES (I.E., THE WEIGHTS OF THE COMPONENTS OF THE PORTFOLIO DIFFER SIGNIFICANTLY FROM THE WEIGHTS OF THE COMPONENTS OF THE BENCHMARK). THEY OFTEN ACCEPT MEANINGFUL TRACKING ERROR AND TYPICALLY DO NOT CONTEMPLATE THE BENCHMARK WHEN MANAGING THEIR PORTFOLIOS. THE GOAL IS TO OUTPERFORM THE BENCHMARK IN THE LONG RUN BUT NOT NECESSARILY TO TRACK IT IN THE SHORT-TO-INTERMEDIATE TERM. FOR SUCH MANAGERS, SPECIFIC NUANCES BETWEEN PROPOSED BENCHMARKS ARE NOT PARTICULARLY RELEVANT.

WE ARE CONSCIOUS OF THE FACT THAT ALPHA IS RARE AND THAT UNIQUE STRATEGIES, WHICH DO NOT NEATLY ALIGN WITH TRADITIONAL INDEX BENCHMARKS, CAN ADD TREMENDOUS VALUE TO OVERALL PORTFOLIO EFFICIENCY. WHEN WE ENCOUNTER SUCH MANAGERS WE WILL LOOK ACROSS THE PORTFOLIO TO FIND THE MOST APPROPRIATE CATEGORY FOR THEM. IN SOME INSTANCES WE MAY BALANCE MULTIPLE ALPHA-ORIENTED MANDATES AGAINST EACH OTHER. FOR EXAMPLE, IN OUR INTERNATIONAL EQUITY PORTFOLIO, WE HAVE ADDED MANAGERS THAT INDIVIDUALLY TARGET WESTERN DEVELOPED MARKETS, JAPAN AND EMERGING MARKETS. WHILE

EACH MANAGER IS BENCHMARKED AGAINST THE RELEVANT EQUITY INDEX (MSCI WORLD, MSCI JAPAN AND MSCI EMERGING MARKETS, RESPECTIVELY), WE HAVE BALANCED OUR ALLOCATIONS TO REFLECT THE CATEGORY-LEVEL MSCI ALL COUNTRY WORLD EX-U.S. INDEX. WE BELIEVE THAT THE ALPHA POTENTIAL OF EACH MANAGER MORE THAN OFFSETS ANY MISFIT RISK THAT WE MAY ENCOUNTER. IN MORE EXTREME INSTANCES, MANDATES MAY BE ALLOCATED TO A SPECIAL SITUATIONS ALLOCATION.

11. Please describe the manner by which investment managers' performance is monitored and evaluated. Provide several examples where an investment manager has been terminated for not meeting performance benchmarks.

THE GOAL OF PSERS' MANAGER MONITORING EFFORT IS TO DEVELOP AN EX-ANTE OPINION REGARDING A MANAGER'S LIKELY FUTURE PERFORMANCE. HISTORICAL PERFORMANCE DATA REPRESENT A SINGLE PIECE OF INFORMATION USED TO CREATE THIS VIEW AND THEY ARE OF MINIMAL VALUE WHEN VIEWED IN ISOLATION. UNDERSTANDING THE CONTEXT IN WHICH SUCH PERFORMANCE HAS BEEN ACHIEVED AND MOST IMPORTANTLY, HOW THAT CONTEXT MAY BE CHANGING IS THE MOST IMPORTANT ELEMENT IN DEVELOPING THIS OPINION.

WE EMPHASIZE CONTEXT AND A FORWARD-LOOKING VIEW BECAUSE IN MOST CASES, PSERS PREFERS EXTERNAL MANAGERS THAT ARE ACTIVE, ACCEPTING SIGNIFICANT TRACKING ERROR IN PURSUIT OF OUTPERFORMANCE (PSERS INTERNAL STAFF CAN GENERALLY PROVIDE BETA MORE COST EFFECTIVELY THAN EXTERNAL MANAGERS). STRATEGIES MOVE IN CYCLES THAT CAN LAST 10 YEARS OR MORE. OFTEN, BY THE TIME A MANAGER HAS ACCUMULATED A TRACK-RECORD LONG ENOUGH TO OFFER MEANINGFUL OBSERVATIONS, THE MANAGER ITSELF WILL HAVE CHANGED SIGNIFICANTLY, RENDERING SUCH CONCLUSIONS MEANINGLESS. FINALLY, ALPHA (OUTPERFORMANCE) IS FREQUENTLY CONCENTRATED AROUND SPECIFIC EVENTS. PROPER RISK MANAGEMENT CALLS FOR REBALANCING TOWARD A MANAGER/ASSET CLASS AFTER PERIODS OF UNDERPERFORMANCE AND AWAY FROM THEM AFTER SUCCESS - A DISCIPLINE THAT RUNS COUNTER TO THE VISCERAL IMPULSE TO "TERMINATE FOR NOT MEETING PERFORMANCE BENCHMARKS".

OUR MONITORING EFFORTS STRIVE TO DISTINGUISH BETWEEN GOOD (BAD) DECISIONS AND GOOD (BAD) OUTCOMES IN ORDER TO ASSESS PERSISTENCE. SUCH UNDERSTANDING BEGINS WITH THE MONTHLY COLLECTION AND REVIEW OF PERFORMANCE DATA, MANAGER COMMENTARY, EXPOSURE REPORTS AND PUBLIC NEWS SURROUNDING THE MANAGER OR CORE POSITIONS. THIS DATA REVIEW PROVIDES THE CONTEXT FOR REGULAR INTERVIEWS WITH THE SENIOR INVESTMENT PERSONNEL AT EACH MANAGER. DURING THESE INTERVIEWS PSERS INVESTMENT PROFESSIONALS EXPLORE

TOPICS WHICH PROVIDE THE AFOREMENTIONED CONTEXT TO PERFORMANCE AND INFORM A FORWARD-LOOKING VIEW. SUCH TOPICS INCLUDE:

- **PERSONNEL CHANGES:** THIS INCLUDES DEPARTURES AND NEW HIRES. WE EXPLORE WHY RESOURCES MAY HAVE BEEN ADDED, WHERE THE MANAGER BELIEVES THEY WOULD LIKE TO GROW IN THE FUTURE, HOW NEW PERSONNEL MAY BE INTEGRATED AND MOST CRITICALLY HOW DECISION MAKING MAY CHANGE FOR THE PORTFOLIO AND THE FIRM.
- **MOVEMENT IN ASSETS UNDER MANAGEMENT / INTRODUCTION OF NEW PRODUCTS:** IF THERE ARE SIGNIFICANT CHANGES, WE REVIEW THE MANAGER'S STRATEGY FOR INTEGRATING NEW ASSETS AND ANTICIPATED IMPACT ON THE PORTFOLIO.
- **POTENTIAL DISTRACTIONS:** THESE CAN BE BOTH PROFESSIONAL (I.E. MOVING OFFICES OR A REGULATORY AUDIT) AND PERSONAL.
- **DRIVERS OF RECENT PERFORMANCE:** WERE THE CORE THESES FROM PRIOR PERIODS CORRECT? WAS PERFORMANCE MOST IMPACTED BY THE HIGHEST CONVICTION IDEAS? HOW DID THE MANAGER REACT TO ADVERSITY?
- **EXPOSURE:** WHEN REVIEWING EXPOSURE, WE ATTEMPT TO UNDERSTAND HOW THE PORTFOLIO'S POSITIONING MAY BE CHANGING. WE LOOK FOR CHANGES TO THE RISK PROFILE AND EVIDENCE OF STYLE DRIFT. WE ALSO REVIEW THE THESIS BEHIND THE LARGEST NEW POSITIONS.

MEETING NOTES ARE WRITTEN, STORED AND FORM THE BASIS FOR FUTURE INTERVIEWS. IMPORTANTLY, THEY PROVIDE THE DESIRED CONTEXT FOR ONGOING MANAGER EVALUATION.

WHILE PERFORMANCE IS MONITORED DILIGENTLY, PERFORMANCE-DRIVEN TERMINATIONS ARE RARE AND PERFORMANCE ALONE IS NOT A SUFFICIENT REASON TO TERMINATE A MANAGER. MANAGER TERMINATIONS ARE GENERALLY DRIVEN BY ONE OR MORE OF THE FOLLOWING:

- **FUNDING FOR A NEW MANDATE:** WE ARE CONTINUOUSLY EVALUATING NEW INVESTMENT OPPORTUNITIES AND AS SUCH, OUR MANAGERS COMPETE FOR CAPITAL AGAINST ALL AVAILABLE OPTIONS.
- **KEY PERSONNEL DEPARTURES/ISSUES:** A MANAGER'S TRACK RECORD IS A REFLECTION OF DECISIONS MADE BY KEY INVESTMENT PERSONNEL. NOT EVERY DEPARTURE TRIGGERS A TERMINATION; HOWEVER, WE SPEND SIGNIFICANT TIME IN ADVANCE TO UNDERSTAND WHICH DEPARTURES WOULD BE UNACCEPTABLE. WHEN NECESSARY WE ENSURE THAT KEY PERSON PROVISIONS ARE INCLUDED IN CONTRACTING LANGUAGE.

- **AUM CHANGES:** MOST INVESTMENT STRATEGIES LOSE EFFECTIVENESS AS ASSETS UNDER MANAGEMENT GROW. IRONICALLY, ASSET GROWTH IS OFTEN THE RESULT OF STRONG PERFORMANCE, LEADING TO THE POSSIBILITY THAT MANAGERS WITH COMPELLING HISTORICAL PERFORMANCE WILL BE TERMINATED BECAUSE THEY HAVE GROWN TOO LARGE. REDUCTIONS IN AUM MAY ALSO TRIGGER TERMINATION, IF THEY INTRODUCE CHALLENGES TO THE MANAGEMENT OF THE STRATEGY. (FOR EXAMPLE, SMALLER MORE ILLIQUID POSITIONS GROWING IN REPRESENTATION OR QUESTIONS REGARDING MANAGER SOLVENCY).
- **STYLE/STRATEGY DRIFT:** THIS CAN OFTEN COME IN RESPONSE TO OUTPERFORMANCE RATHER THAN UNDERPERFORMANCE. REPEATED SUCCESS CAN METASTASIZE INTO HUBRIS, LEADING MANAGERS TO ATTEMPT STRATEGIES OUTSIDE OF THEIR AREA OF EXPERTISE. THIS COULD MEAN TAKING ON ADDITIONAL LEVERAGE, SHIFTING STYLES, INCREASING CREDIT EXPOSURE OR TARGETING DIFFERENT GEOGRAPHIES.
- **STRUCTURAL ISSUES:** EITHER PSERS OR THE MANAGER MAY REALIZE THAT A PARTICULAR VEHICLE STRUCTURE PRESENTS UNFORESEEN CHALLENGES, WITH REGARD TO MONITORING, OPERATIONS OR COSTS. IF AN APPROPRIATE ALTERNATIVE CANNOT BE REACHED, WE MAY CHOOSE TO END THE MANDATE.
- **THESIS BREAK:** WE MAY CONCLUDE THAT OUR ORIGINAL THESIS REGARDING THE MANAGER'S SKILL WAS INCORRECT. IF OUR REGULAR INTERVIEWS REVEAL THAT A MANAGER HAS A PATTERN OF SPECIOUS LOGIC ON CORE IDEAS, WE MAY FIND THAT THERE WAS A FLAW IN OUR ORIGINAL UNDERWRITING. THIS SHOULD BE THE LEAST COMMON REASON FOR TERMINATION GIVEN THE MULTIPLE CHECKS IN OUR HIRING PROCESS (I.E. CONSENSUS OF MULTIPLE PSERS INVESTMENT PROFESSIONALS, THE ASSET IMPLEMENTATION COMMITTEE AND EXTERNAL CONSULTANTS) AND INDEED, WE HAVE NO RECENT EXAMPLES OF MANAGER TERMINATIONS THAT FALL IN THIS CATEGORY.

IN EARLY 2018 PSERS TERMINATED A DEVELOPED INTERNATIONAL EQUITY MANDATE WITH BLACKROCK, PROVIDING AN INSTRUCTIVE EXAMPLE. THE MANAGER HAD OUTPERFORMED ITS BENCHMARK BY 68 BASIS POINTS PER ANNUM OVER THE TRAILING FIVE-YEAR PERIOD AND BY 143 BASIS POINTS PER ANNUM SINCE THEY WERE HIRED IN 2004. WHILE PERFORMANCE WAS NOT OSTENSIBLY AN ISSUE, WE ENCOUNTERED STRUCTURAL DIFFICULTIES, WITNESSED MODEST STRATEGY DRIFT, AND MOST IMPORTANTLY, REQUIRED FUNDING FOR A NEW MANDATE WITH A MUCH HIGHER EXPECTED RETURN. THE MANAGER'S ACCOUNT WAS QUITE COMPLEX INVOLVING EIGHT GEOGRAPHIC SUB ACCOUNTS. WE GREW CONCERNED THAT OVER TIME THE OUTPERFORMANCE OF A SINGLE SUB ACCOUNT WAS DRIVING MORE THAN ALL OF THE ALPHA. MOREOVER, THE CAPITAL ALLOCATION ACROSS THE SUB

ACCOUNTS LACKED A CLEARLY ARTICULATED LOGIC. THE STRATEGY HAD SEEN GROSS LEVERAGE EXPAND AND WHILE A PORTABLE ALPHA MANDATE WAS ALWAYS CONTEMPLATED, EXPOSURE HAD GROWN BEYOND OUR COMFORT LEVEL. FINALLY, THE MANAGER WE INTENDED TO FUND HAD OUTPERFORMED BY 1100 BASIS POINTS PER ANNUM OVER A SIMILAR SINCE-INCEPTION PERIOD WITH SUBSTANTIALLY LESS GROSS EXPOSURE.

12. For each investment manager, please provide the quartile comparison of performance for a manager that was presented to the Board at the time of hiring, and the current equivalent quartile comparison. **WHEN RECOMMENDING THAT PSERS COMMIT TO A PARTICULAR FUND, THE CONSULTANT PROVIDES A DUE DILIGENCE REPORT WHICH INCLUDES THE QUARTILE PERFORMANCE OF THE MANAGER'S PRIOR FUNDS. WHILE NO REPORT EXISTS SUMMARIZING THIS INFORMATION ACROSS ALL OF OUR MANAGERS AND FUNDS, NO MANAGER IS RECOMMENDED FOR INVESTMENT THAT DOES NOT HAVE HISTORICAL PERFORMANCE IN THE TOP TWO QUARTILES. NO REPORT EXISTS THAT PROVIDES BOTH THE QUARTILE COMPARISON OF PERFORMANCE FOR A MANAGER THAT WAS PRESENTED TO THE BOARD AT THE TIME OF HIRING, AND THE CURRENT QUARTILE COMPARISON.**

13. Please describe how the system monitors its managers' use of subscription lines of credit (subscription facilities, subscription line financing, capital call facilities, or bridge lines) in order to ensure alignment of interests and to prevent any potential negative effects on the reporting of performance and expenses incurred. **THERE ARE A NUMBER OF WAYS PSERS MONITORS THE USE OF SUBSCRIPTION LINES. PSERS IS A MEMBER OF THE LIMITED PARTNER ADVISORY BOARD (LPAC) OF EVERY FUND IN WHICH IT INVESTS. AT EVERY LPAC MEETING THERE IS A DISCUSSION OF HOW A SUBSCRIPTION LINE, IF THE FUND UTILIZES ONE, IS MANAGED. PSERS HAS ALSO BEGUN ASKING AT EACH LPAC MEETING THAT MANAGERS REPORT NET PERFORMANCE WITH AND WITHOUT THE IMPACT OF A SUBSCRIPTION LINE. THE USE OF SUBSCRIPTION LINES IS ALSO REPORTED IN A FUND'S FINANCIAL STATEMENTS AND IN CAPITAL CALL REQUESTS WHEN APPLICABLE.**

14. Please describe how the system measures the performance of its private market investments compared to Public Market Equivalents. **PSERS COMPARES ITS PRIVATE MARKET PERFORMANCE TO PUBLIC MARKETS THROUGH THE GENERATION OF A PUBLIC MARKET EQUIVALENT ("PME"). IT DOES SO BY TAKING THE ACTUAL DAILY CASH FLOWS (BOTH CONTRIBUTIONS AND DISTRIBUTIONS) FROM THE PRIVATE MARKET PORTFOLIO AND ASSUMES THAT THE CAPITAL IS EITHER INVESTED INTO THE INDEX OR DISTRIBUTED FROM THE INDEX ON THE SAME DAYS. THE END RESULT IS THE PERFORMANCE THAT PSERS WOULD HAVE GENERATED HAD IT INVESTED IN THE PUBLIC MARKETS ON THE SAME CASH FLOWS DATES, IN A PARTICULAR INDEX INSTEAD OF PRIVATE MARKETS, ESSENTIALLY MEASURING THE BENEFIT OF INVESTING IN THE PRIVATE MARKETS RATHER THAN THE PUBLIC MARKETS.**

Competitive Purchasing / RFPs

15. Please describe the policy and process for selecting financial consultants, advisors, investment managers, and service providers, *e.g.*, which ones are selected through a public procurement, which ones are negotiated, your system's use of placement agents, etc. **INVESTMENT CONSULTANTS ARE SELECTED BY THE BOARD FOLLOWING A REQUEST FOR PROPOSAL PROCESS CONSISTENT WITH COMMONWEALTH PROCEDURES. INVESTMENT MANAGERS ARE SELECTED BY THE BOARD AND ARE TYPICALLY SOURCED THROUGH THE BOARD'S INVESTMENT CONSULTANTS OR PSERS INVESTMENT PROFESSIONALS. SERVICE PROVIDERS MAY BE SELECTED BY THE BOARD (E.G., SECURITIES LENDING AGENT) OR STAFF (E.G., ORDER MANAGEMENT SYSTEM) AND MAY OR MAY NOT BE SELECTED THROUGH FORMAL PUBLIC PROCUREMENT. PSERS DOES NOT RETAIN OR USE PLACEMENT AGENTS.**