

SAN JOSE POLICE AND FIRE DEPARTMENT RETIREMENT PLAN

INVESTMENT POLICY STATEMENT

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Executive Summary

The purpose of this document is to set forth the goals and objectives of the San Jose Police and Fire Department Retirement Plan, and to establish guidelines for the implementation of investment strategy.

This document will be reviewed at least annually. Any revisions to this document may be made only with the approval of the Board.

The Board of Administration recognizes that a stable, well-articulated investment policy is crucial to the long-term success of the Plan. As such, the Board members have developed this Investment Policy Statement with the following goals in mind:

- To clearly and explicitly establish the objectives and constraints that govern the investment of the Plan's assets,
- To establish a long-term target asset allocation with a high likelihood of meeting the Plan's objectives given the explicit constraints, and
- To protect the financial health of the Plan through the implementation of this stable long-term investment policy.

This document includes detail on the Plan's adopted asset allocation policy (summarized in Appendix A) and process, including the selected Functional asset class structure and the Plan benchmarks approved by the Board. It also includes the Plan's policy on manager selection, retention, evaluation, and termination, as well as the Plan's adopted risk policy, with specific risk parameters summarized in Appendix B.

Throughout this document, expected returns and volatilities were based on capital market assumptions from the general consultant.

I. San Jose Police and Fire Department Retirement Plan Goals

The San Jose Police and Fire Department Retirement Plan was established to provide retirement income for San Jose Police and Fire Department Retirement Plan employees and their families. The Plan's assets are structured to provide growth from capital gains and income, while maintaining sufficient liquidity to meet beneficiary payments.

II. Investment Objectives

The investment strategy of the San Jose Police and Fire Department Retirement Plan is designed to ensure the prudent investment of Plan assets in such a manner as to provide real growth of assets over time while protecting the value of the assets from undue volatility or risk of loss.

A. Risk Objectives

1. To accept the optimal level of risk required to achieve the Plan's return objective as stated immediately below.
2. To target total portfolio investment risk consistent with the investment beliefs and strategic goals set forth by the San Jose Police and Fire Department Retirement Board.
3. To consider the financial health of the Sponsor when assuming investment risks.
4. To use diversification to minimize exposure to company and industry-specific risks in the aggregate investment portfolio.

B. Return Objective

1. In a manner consistent with the goals stated in Section I above, to manage the Plan's assets as to achieve the highest, reasonably prudent return possible.

III. Investment Constraints

A. Legal and Regulatory

The San Jose Police and Fire Department Retirement Plan is a defined benefit retirement program for certain employees of the Police and Fire departments of the City of San Jose in the State of California. The terms of the Plan are described in the San Jose Municipal Code.

B. Time Horizon

The Plan will be managed on a going-concern basis. The assets of the Plan will be invested with a long-term time horizon (ten to twenty years or more), consistent with the participant demographics and the purpose of the Plan.

C. Liquidity

The Board members intend to maintain sufficient liquidity to meet at least five years of anticipated beneficiary payments, net of plan sponsor and member contributions.

D. Tax Considerations

The Plan is a tax-exempt entity. Therefore, investments and strategies will be evaluated only on the basis of expected risks and potential returns.

IV. Risk and Return Considerations

The Board members accept the risks associated with investing in the capital markets (market risks), but will minimize wherever possible those risks for which the Plan is unlikely to be compensated (non-market or diversifiable risks).

V. Diversification

The Board members of the San Jose Police and Fire Department Retirement Plan recognize that an important element of risk control is diversification. Therefore, investments will be allocated across multiple classes of assets, chosen in part for their low correlation of expected returns. Within each asset type, investments will be distributed across many individual holdings, with the intention of further reducing volatility.

The specific degrees of diversification within asset classes will be addressed in each separate account manager's investment guidelines, or in each commingled manager's fund documents.

The purpose of the functional classifications and major asset classes are defined in the language and table below.

A. Functional Sub-portfolios

The investment strategy for the Investment Program employs three functional sub-portfolios to construct the comprehensive asset allocation. The allocation to the sub-portfolios is assessed at least annually and is based on projected capital market assumptions. The Chief Investment Officer ("CIO") shall review the relative size and composition of these sub-portfolios and advise the Investment Committee ("IC") of any necessary revisions to the allocation among the sub-portfolios.

1. **Growth Sub-portfolio:** The purpose of the Growth Sub-portfolio is to grow invested assets over the long term in order to pay future benefits. This portfolio is characterized by a long investment horizon and can, therefore, accept a higher level of volatility. Assets in this portfolio may be volatile, have reduced liquidity, and derive the bulk of their return from capital appreciation. These assets include public and private equity, corporate and other debt with credit risk premiums, private real estate and other private assets. The success of this portfolio will be measured primarily by compounded annual growth rates in conjunction with the annualized standard deviation of returns as the primary measure of risk. Performance evaluation will, therefore, focus on the long-term total risk-adjusted return of the portfolio.
2. **Low Beta Sub-Portfolio:** The purpose of the Low Beta Sub-portfolio is to ensure that the overall (total portfolio) a) is relatively immune from market fluctuations while providing a source of alpha b) is a source of capital for purchasing undervalued assets in the Growth sub-portfolio, and c) has adequate assets available to pay benefits over an extended timeframe (the immunized cash portfolio). It will contain an "absolute return" program that invests in risk assets in isolation but whose combined long and short betas are relatively neutral to market movements, an immunized cash portfolio, as well as cash and cash-like assets such as short-term bonds, derivatives, and other investments that provide fixed, contractual cash flows with a minimum level of credit risk. For the immunized cash portfolio, the Board has established a target allocation amount of up to 60 months' worth of projected benefit payments in the Low Beta Sub-portfolio, which will be drawn down and replenished annually. The Low

Beta portfolio is expected to provide a stable offset to the rest of the portfolio during periods of severe market stress and to effectively dampen the market volatility across the entire portfolio. The success of the Low Beta Sub-portfolio will be measured by its ability to offset declines in value in the Growth Sub-portfolio, as well as its ability to provide liquidity during times of market stress.

3. **Other Sub-Portfolio:** The purpose of the Other Sub-portfolio is to ensure that the overall portfolio is specifically protected against inflation risks while also providing for further diversification. The success of the Other sub-portfolio will be measured by its ability to protect the portfolio from inflation risk while also providing an additional source of return and diversification.

B. Interaction between the Functional Sub-Portfolios

The allocations to the Growth, Low Beta, and Other sub-portfolios will vary over time. When Growth assets are undervalued, the Low Beta Sub-portfolio will act as a source of funds and when Growth assets are overvalued the Low Beta sub-portfolio will act as a use for harvested Growth portfolio returns. The Growth and Other sub-portfolios will be subject to the volatility of the markets in which each functional sub-portfolio invests. In order to reallocate between the functional sub-portfolios, the CIO and the General Consultant will conduct an annual capital review to assess the relative value and risks associated with each asset class and deliver a review of the capital markets to the Board. The Consultant will provide the Board current forward-looking risk and return assumptions for all major asset classes. In conjunction with this review, the CIO will provide a recommendation of how best to allocate assets within each functional sub-portfolio. If necessary, the CIO will recommend changes in target allocations to the underlying asset classes in order to deploy the Investment Program's assets effectively in the upcoming year. While considering changes to the allocation to each functional sub-portfolio, the CIO will view the totality of all functional portfolios, and consider the impact of changes to the overall risk and return profile of the total portfolio.

Public Equity – Growth

The purpose of Public Equity is to provide the Plan exposure to the total return due to equity capital owners, including exposure to capital appreciation from economic growth, while managing volatility relative to the equity market.

Private Markets – Growth

The purpose of Private Markets is to provide the Plan exposure to asset growth and income while diversifying the portfolio and capturing an illiquidity premium.

Emerging Market Bonds – Growth

The primary purpose of Emerging Market Bonds is to provide the Plan exposure to rates and credit risk within emerging markets.

High Yield Bonds – Growth

The primary purpose of High Yield Bonds is to provide the Plan with exposure to high yielding corporate debt.

Market Neutral Strategies –Low Beta

The purpose of Market Neutral Strategies is to produce alpha based returns while reducing overall Plan volatility and increasing Sharpe ratio.

Bonds (Immunized Cash Flows) – Low Beta

The purpose of Bonds (Immunized Cash Flows) is to provide liquid funds for expected outflows and allow for other assets to be invested in an illiquid fashion.

TIPS – Other

The purpose of TIPS is to provide exposure to inflation in addition to interest rates.

Core Real Estate – Other

The purpose of Core Real Estate is to produce the Plan income and price appreciation while maintaining a low correlation to both stocks and bonds.

Long-Term Government Bonds – Other

The purpose of Long-Term Government Bonds is to provide a positive return in highly stressed market environments, with a low correlation to equity risk.

Core Bonds – Other

The purpose of Core Bonds is to produce returns and income for the Plan by providing exposure to rates and credit risk.

Commodities – Other

The purpose of Commodities is to increase the Plan's portfolio diversification and provide a hedge against unexpected inflation.

VI. Asset Allocation Policy

Asset Allocation and Portfolio Construction

- A. The Board recognizes that establishing an appropriate strategic asset allocation (SAA) portfolio is critical to the long-term success of the investment program, as asset allocation is the single biggest determinant of the expected risk and return of the Plan.
- B. In arriving at the SAA, the Board shall follow a *building block* approach whereby it approves a series of benchmark portfolios, each offering expected risk and return characteristics that are preferable to the one before it. This building block approach is further explained below:
 - 1. *Liability Benchmark Portfolio (LBP)*. As the first step in the portfolio construction process, the Board shall approve a LBP. The LBP is the portfolio that offers the lowest possible expected funding risk, where funding risk is defined as the risk that assets will grow at a slower rate than the system's liabilities. The LBP is expected to consist solely of bonds that match the duration of the liabilities.
 - 2. *Low-Cost Passive Portfolio (LCPP)*. If the Board believes a portfolio can be constructed that offers expected return/risk characteristics that are preferable to those of the LBP, but does not wish to invest significant resources in staff and consultants, the Board would then approve a LCPP. The LCPP would be simple to construct and implement and would consist only of public market asset classes managed on a passive basis. It would exclude private market asset classes and hedge funds, which are complex and costlier to implement.
 - 3. *Strategic Asset Allocation Portfolio (SAAP)*. If the Board believes an even more diversified portfolio would enhance the risk-adjusted return characteristics of the Plan and justify a meaningful investment in staff and consulting resources, the Board would then develop and approve an SAAP. The SAAP would be more complex than the LCPP because it would likely include private market asset classes and/or hedge funds. The staff and consulting resources required to manage such a portfolio would significantly increase the cost and administrative complexity of the Plan.
 - 4. *Investable Benchmark Portfolio (IBP)*. The Benchmark Portfolio would include the same underlying benchmarks as the SAAP, but would use a beginning-of-month weight for each asset class. This will account for weighting differences to the SAAP in asset classes that take more than one year to invest (private markets asset classes).
- C. The Board believes the above building-block approach represents a thoughtful way of approaching its asset allocation decisions, as it makes each step in the portfolio construction process clear and explicit. It also requires the Board to consider and confirm the rationale for accepting the potential incremental risk, complexity and cost introduced by moving from one portfolio model to the next. Their relative merits would include evaluation on a net-of-expenses basis.
- D. The benchmarks approved by the Board as of the date of this document, and the expected return of each, are described below:

1. A LBP consisting of a market benchmark with a duration profile similar to the Plan's liabilities. The expected return for the LBP is 3.1% (20 years/geometric mean) as of the date of this document.
2. A LCPP consisting of the following asset classes and targets, and the broad, commonly-used market indices that could be used for each asset class, are shown in Appendix A. The expected return for the LCPP is 6.3% (20 years/geometric mean) as of the date of this document.
3. A SAAP consisting of the following asset classes and targets shown in Appendix A. The expected return of the SAAP is 7.1% (20 years/geometric mean) as of the date of this document.

Asset Allocation Tools & Methods

- A. The LBP will be re-evaluated annually following the results of the annual actuarial study. LCPP and SAPP shall be established and modified based on the results of formal asset allocation studies performed approximately every three years or when a significant market correction occurs. The capital market assumptions (CMA) used in such studies shall be reviewed and updated annually or when the S&P 500 experiences a decrease of more than 20% from peak. The Board shall consult with the general investment consultant in connection with such asset allocation studies and CMA reviews.
- B. Asset allocation studies shall be designed to ensure rigorous and objective analysis, and minimize decision-making bias by:
 1. Requiring the use of a portfolio construction engine ("Engine"); and
 2. Requiring that the Board and IC always focus first on establishing the most reasonable and defensible inputs to the Engine. That is, if the Board is uncomfortable with the results of the Engine, it shall respond by reviewing the reasonableness of the inputs to the Engine, rather than simply modifying the results.
- C. When arriving at the LCPP and the SAAP, asset allocation studies shall include the four basic steps outlined below:
 1. Step 1: Inputs
 - a. For each study, the Board shall approve the inputs to the Engine including:
 - Permitted asset classes (Permitted asset classes for the LCPP shall include only public markets and permitted asset classes for the SAA Portfolio shall include both public and private markets);
 - CMAs; and
 - Material constraints (e.g. maximum allocations to certain asset classes), along with supporting rationale.

- b. The CIO shall propose the inputs to the IC, with prior input from the Board's general investment consultant, and work with the investment consultant throughout the process to make subsequent revisions to inputs, based on feedback from the IC.
 - c. The Board, IC, CIO and investment consultant are expected to reach a consensus regarding the above inputs and the Board shall formally approve them. Staff shall document the process by which it arrives at its recommended inputs.
2. Step 2: Modeling and Analysis
- a. The investment consultant will incorporate the approved inputs into the Engine to be used to identify and analyze potential asset allocation choices for each study and present the results to the CIO.
 - b. The Board expects that the Engine will rely on mean-variance optimization ("MVO").
 - c. The Board shall also consider the results of the MVO analysis under additional constraints to ensure adherence with approved risk limits including:
 - Stress testing, including historical scenario analysis and factor-specific testing;
 - Liquidity analysis under normal and stressed conditions; and
 - Cash flow management requirements for the immunization of certain projected benefits and expenses.
3. Step 3: Recommendations
- a. The CIO will present the current asset allocation and a number of reasonable alternatives along the so-called "efficient frontier" for the Board to consider.
 - b. In presenting the alternatives, the CIO initially will present only the return/risk characteristics of each alternative and will not reveal the underlying asset class allocations (i.e. "blind" format). This will allow the Board/IC to focus initially on the return/risk implications of each alternative, rather than the underlying asset allocations.
 - c. After the Board has engaged in a preliminary discussion and analysis of the alternatives, the underlying asset allocations of each alternative will be revealed for further consideration.
 - d. The Board/IC may provide feedback to the CIO and investment consultant, which may require further analysis and a request for revised recommendations for the Board/IC to consider.

4. Step 4: Approvals

- a. The Board/IC will review the final analyses and recommendations from the CIO and general consultant and approve:
 - Low Cost Portfolio Benchmark weights; and
 - Strategic Asset Allocation Portfolio weights, targets and ranges (maximum – minimum).

Rebalancing

- A. The CIO shall adhere to the SAAP asset and sub-asset class “targets” approved by the Board and shall rebalance to within the approved range at least quarterly if the actual weights at the sub-asset class levels are not within 10% of the approved target, considering the cost of more frequent rebalancing. For example, if the target allocation for an asset class is 20%, re-balancing will be triggered quarterly when the actual allocation for the asset class deviates by +/- 2% (i.e. 10% x 20%, reaching 18% or 22%). The CIO may use discretion to rebalance to within the approved range at more frequent intervals than quarterly, and when actual weights are within 10% of the approved target, subject to an assessment of market risk, active risk, and transactions costs. When a change to the SAAP is made by the Board, the CIO and the investment team will rebalance to the new target weights as expeditiously as possible, or in tranches if directed by the Board. The CIO shall also use his discretion in rebalancing to the new SAAP in the event that instant liquidation of managers within an asset class may work against the interests of the System. Changes to the weights of illiquid asset classes may take several quarters to implement, and the CIO shall keep the IC apprised of progress toward the new SAAP. Synthetic rebalancing through an overlay provider may also be used when appropriate. The Immunized Cash Flows portfolio is exempt from this rebalancing provision, as it is amortizing by design.
- B. Total plan active risk (i.e. tracking error) is to be maintained below 3%. While asset class exposures may fall within acceptable capital allocation ranges as noted above, total plan tracking error is not to exceed this 3% threshold.

Evaluating Asset Allocation Decisions

- A. The Board shall periodically evaluate the effectiveness of its asset allocation decisions using the above portfolio benchmarks (i.e. Liability Portfolio Benchmark, Low-Cost Passive Portfolio, and Strategic Asset Allocation Portfolio).
- B. The following table uses hypothetical returns to illustrate how the above benchmarks shall be used to evaluate the Board's asset allocation decisions.

Portfolio Benchmark	Net Return (%)	Value Added (%)	Conclusions
A. Liability Benchmark Portfolio	3.1%	n/a	
B. Low Cost Passive Portfolio	6.3%	3.2% (B - A)	By deviating from a portfolio with modest funding risk to a low-cost, passive portfolio that does not require significant staff or consulting resources, the Board shall have added net value of 3.2%
C. SAA Portfolio	7.1%	0.8% (C - B)	By enhancing the passive portfolio with investments in private markets and hedge funds, the Board added net value of 0.8%

- C. The Board will evaluate two additional benchmarks in order to assess the value added by the CIO, investment staff, and the investment consultants:
1. **Actual Portfolio:** This is the actual portfolio implemented by the CIO and investment staff with support from investment consultants. The Actual Portfolio includes private markets and hedge funds and reflects any active management exercised by the CIO and the underlying investment managers, subject to Board-approved policies and CIO-approved procedures.
 2. **Investable Benchmark Portfolio:** The Investable Benchmark Portfolio is identical to the SAAP but is adjusted for the fact that the SAAP is not constantly "investable" with respect to private market asset classes. For private markets, the Investable Benchmark Portfolio would apply the best available private market benchmarks and, for weighting purposes, would reflect the pacing plans for private markets (assuming the pacing plans are reasonable). For example, if the private equity pacing plan called for 12% to be invested in private equity by the end of the performance measurement period, then the Investable Benchmark Portfolio would reflect a 12% allocation to private equity, even though the SAA Portfolio calls for 22% to be invested in private equity.

The following table illustrates how the performance of the CIO would be evaluated. Again, the returns are hypothetical and for illustration purposes only.

Portfolio Benchmark		Net Return (%)	Value Added (%)	Conclusions
A	Actual Portfolio	7.5	0.5% (A - B)	CIO outperformed the Benchmark Portfolio from these sources: i) manager selection (including security selection effects) and ii) other effects
B	Benchmark Portfolio	7.0	n/a	

D. For the benefit of stakeholders, the Board shall also measure and report for comparison purposes, on a quarterly basis, the actual portfolio return relative to the return of the LCPP and relative to commonly cited benchmarks, including:

1. A 60% equity and 40% fixed income portfolio ("60/40 Portfolio") comprised of 60% MSCI ACWI IMI (net, unhedged) and 40% Bloomberg Barclays Global Aggregate Bond Index; and
2. A peer group benchmark consisting of other U. S. public pension plans similar in size to the system, as reported in the InvestorForce Public DB > \$1B Net.

VII. Manager Selection, Retention, Evaluation & Termination Policy

Background

- A. The Board has delegated to the CIO the authority to select and terminate all investment managers of the Plan subject to constraints and parameters contained herein. Such authority shall be further subject to Manager Selection, Retention, Evaluation & Termination Procedures ("Procedures"), approved by the CIO, that provide more detailed constraints and parameters.
- B. It is the Board's intention that the CIO shall have the necessary authority and resources to effectively select, retain, evaluate, and terminate investment managers with the exceptions of venture capital and co-investments (due to the nascent nature of the venture capital program and investment concentration risk of co-investments). The Venture Capital program shall be approved by the Investment Committee and the Board prior to its implementation. These exceptions do not pertain to funds where an external manager has discretion.
- C. Accordingly, the CIO shall have the authority to:
 1. Manage the Investment Personnel of the System, including:
 - a. Recommending to the CEO the appointment and duties of all professional, technical, and clerical employees of the Investment Division;

- b. Directing and supervising all Investment Personnel on a day-to-day basis; and
 - c. Evaluating all Investment Personnel and managing their professional development.
- 2. Select and terminate investment consultants to assist in the selection, retention, evaluation, and termination of investment managers.
 - a. The CIO may use the services of the general investment consultant appointed by the Board. Alternatively, if the services of the general consultant can be unbundled to separate manager research services, the CIO may select a consultant(s) of his or her choice to carry out manager research services that would otherwise have been included in the general investment consultant scope of services.
 - b. The CIO shall ensure that the total fees and expenses associated with the consultants he or she selects are reasonable and shall provide a report of such fees and expenses to the Investment Committee and the Board on at least a quarterly basis.
 - c. While the CIO shall have the authority to select and terminate investment consultants to assist staff in selecting, retaining, evaluating and terminating investment managers, the Board shall approve all contracts with investment consultants selected by the CIO to ensure such contracts reflect fair and reasonable value for the Plan.
- 3. Delegation of authority to the CIO to select and terminate investment managers reflects the Board's desire to:
 - a. Promote efficiency and effectiveness in the manager selection and termination processes;
 - b. Focus the Board's time and attention on investment policy, asset allocation, and oversight, rather than manager selection and termination; and
 - c. Establish clear accountability on the part of the CIO and investment staff for manager selection, retention, evaluation, and termination.

General Constraints and Parameters

- A. The CIO's authority to select and terminate investment managers shall be subject to the following general constraints and parameters:
 - 1. Investment managers shall meet the following **minimum qualifications** to be selected to manage any assets of the fund:

- a. Be **registered as an investment advisor** under the Investment Advisor’s Act of 1940 or comparable legislation, unless the manager represent and warrants that it is exempt from such registration under applicable law.
 - b. Agree to enter into a contract with the Plan requiring them to perform their services consistent with the fiduciary services established under (a) the Investment Advisor’s Act of 1940; (b) California law applicable to fiduciaries of public employee retirement systems, which includes the California State Constitution, Art. XVI sec. 17 and the San Jose Municipal Code and/or (c) terms and conditions substantially comparable to the foregoing that are satisfactory to the Plan.
2. The nature and size of the manager’s mandate shall be consistent with:
 - a. The asset allocation policy of the Plan;
 - b. Applicable constraints (e.g. **manager or strategy concentrations**) contained in this Investment Policy Statement; and the total Plan **active risk limit(s)¹ contained in the risk section of this IPS.**
 3. Notwithstanding paragraph 2) b) above, the CIO shall not approve the selection of an investment management firm for mandates that exceed the following limits:

Basis*	Description	Strategy Limit ²
Vehicle	Separately managed accounts (active)	15%
	Commingled funds and SMAs (public, passive)	No limit ³
	Commingled funds (public, active)	15%
	Commingled funds (hedge funds)	15%
	Commingled funds (private strategies)	15% ⁴
Public Markets ⁵	Passive strategies	No limit
	Active strategies	15%
Private Markets (excluding venture capital)		Transaction Limit⁶
	Total \$ commitment to asset class (e.g. Private Debt)	150% of Board-approved pacing plan (cumulative) ⁷
	Primary fund commitment (1st allocation to mgr.)	2%**
	Primary fund commitment (follow-on)	3%**
	Secondary fund investment	1%**

¹ Active risk or tracking error limits may apply at the total fund level, or another aggregation (e.g. public markets assets only, excluding private markets). Risk limits may also be based on concentration, expressed for example, as a percentage (%) of some total amount of risk.

² Percentage (%) of total Plan assets allowable per investment strategy

³ Rationale: Fund is constrained by the asset allocation. This is the “default” option for investing, and scale determines pricing.

⁴ For private strategies, limit applies to the capital invested plus future callable commitments.

⁵ Some of these limits related to public markets may be “interim”, to be replaced by risk-based limits for example.

⁶ Percentage (%) of total Plan assets allowable per investment manager.

⁷ This would allow, for example, a commitment in Year 1 that is 50% above “plan”. The “cumulative” provision would allow for a “catch-up” for any slower-than-planned investments in prior years.

* To be selected, the manager must satisfy the “Vehicle” constraint and the appropriate “Public Markets” or “Private Markets” constraints

** Percentage (%) of total plan assets

4. When a market movement is the cause of a breach in the above limits, it should be reported to the IC at the earliest of a mutually agreed-upon time during which the Investment Committee could convene with a quorum, or at the next regularly scheduled Investment Committee meeting, along with a report on how the breach was addressed, or a recommendation to address the breach.

Manager Selection

Manager Selection Process

- A. The process used to select an investment manager shall, at a minimum, include the following elements:
1. Imposition of a Quiet Period/No Contact policy. Board members and staff shall not have contact with individuals or entities who are seeking engagement by the Plan in response to an RFP, RFI, purchase order, or other solicitation or contracting process, except in accordance with the published terms of the contracting process or except for, and limited to, contact necessary in connection with ongoing Plan business with an individual or entity. The Plan's RFPs, RFIs, and other contract solicitations shall include notice that a "quiet period" will be in place from the beginning of the contracting process until the selection of the successful party such that these communications shall not occur, except as provided above. As part of the contracting process, potential contracting parties shall be required to disclose potential conflicts of interest. Board members and staff shall not use or attempt to use influence, outside of the individual authority to cause the organization to enter into a contract with any individual or entity. Board members and staff may refer individuals or entities for consideration for contracting to the appropriate Plan staff member(s) responsible for the particular procurement or contract process.
 2. Identification of a mandate to implement the Board's SAA Policy Portfolio.
 3. Comprehensive **operational due diligence** performed by the investment staff, qualified investment consultant, or qualified quasi-discretionary investment manager;
 4. In the case of private markets, comprehensive **operational due diligence** performed by the investment staff, qualified investment consultant, or qualified quasi-discretionary investment manager;
 5. **Legal review** by qualified investment counsel of the manager agreement and related documentation;
 6. **An internal meeting of investment officers, including the CIO** and the officer responsible for the asset class in question, during which staff's due diligence analysis is reviewed and debated and a staff recommendation is made;
 7. **Approval by the CIO**;
 8. **Concurrence by a qualified investment consultant** or quasi-discretionary investment manager as to the reasonableness of the selection decision; and
 9. Written affirmation to the Investment Committee by the CIO that the process used to select the manager complied with applicable policies and the Procedures. Such affirmation shall be submitted to the Investment Committee at

the next regularly scheduled Investment Committee meeting following the selection of the manager.

- B. The Procedures shall include any **checklists and templates** to be used in the due diligence process. Such Procedures shall be presented to the Investment Committee for review and input at least every three years, or sooner upon request of the Investment Committee or any member of the Board.
- C. Whenever amendments are made to the Procedures, a copy shall be provided to the Investment Committee at its next regularly scheduled meeting.
- D. Should any Investment Officer responsible for performing manager due diligence and preparing manager selection and termination recommendations to the CIO cease to be employed by the City for any reason, the CIO shall inform the Investment Committee immediately.
- E. The selection of an investment manager that would contravene a provision of this policy or the Procedures shall require Investment Committee approval.
- F. A file or files shall be established to serve as a permanent record of the due diligence process for each investment manager hired and shall contain a summary of the due diligence information and analysis generated during the search process, as well as the legal documentation.
- G. The **internal audit plan** of the internal auditor shall include a review of a random sample of investment manager selection decisions at least once per year to confirm compliance with this policy and the Procedures approved by the CIO, the scope of which shall not include the investment performance of such selection decisions. The results of such review shall be reported to the Audit Committee and the Investment Committee.
- H. A **“Watch List”** will be established for underperforming managers and managers under extraordinary review for qualitative reasons, and will be maintained by the General Consultant.
 - 1. Quantitative criteria for underperformance which would trigger placement on the Watch List includes manager underperformance versus the appropriate benchmark over a three and/or five year period.
 - 2. Potential actions resulting from placement on the Watch List include finding appropriate resolution of outstanding issues, renewed confidence in the manager or strategy, or determination that the termination of the manager or strategy is appropriate.
 - 3. Investment staff will identify underperforming managers in conjunction with consultants.
 - 4. As necessary, nuanced investment strategies or fund types may require customized review.
- I. The Plan will seek alignment of interests when negotiating fees while pursuing the best net of fees performance results. Investment costs shall be monitored, controlled, and whenever possible negotiated to ensure cost effectiveness. The Board shall give

consideration to the impact of administrative expenses, external management fees and performance fees when establishing the asset mix policy of the Plan. The Board will be provided reports on investment costs of the Plan at least annually.

- J. The Plan's staff, in coordination with its investment consultants and legal counsel, will negotiate, monitor, and report on fees with investment managers regularly to ensure market competitiveness and appropriateness.
- K. The Plan will seek to ensure that excessive fees are not being paid for alternative assets by reviewing manager fees at least annually. Fee structures could incorporate fixed fees, performance based fees, high water marks, waterfall, hurdles, floors and caps. The Plan may also incorporate multi-year performance periods with clawbacks as needed.

Manager Termination Procedures

- A. City of San Jose Department of Retirement Services investment staff is aware that the ongoing review and analysis of investment managers is just as important as the due diligence implemented during the investment manager selection process. The performance of the investment managers will be monitored on an ongoing basis and it is at the CIO's discretion to take corrective action by terminating and/or replacing an investment manager if it is deemed appropriate at any time for any reason.

The CIO, in agreement with the appropriate consultant for the manager/asset class in question, may terminate an investment manager or product due to a variety of reasons. These reasons can include but are not limited to the following:

1. Plan asset allocation change
2. limited market opportunity
3. style drift
4. violation of policies or guidelines
5. key personnel turnover
6. failure to achieve performance or risk objectives
7. legal or regulatory action
8. any change deemed likely to impact or impair investment performance
9. any other material adverse events, whether reputational or financial, that could be expected to cause significant headline risk

Termination of private funds is typically not possible. If the CIO wishes to exit a private fund, they may evaluate opportunities for secondary market sales of fund interests.

The CIO will report any termination actions at the next Committee meeting, detailing the rationale for action.

XIII. Risk Policy

Purpose and scope

The purpose of this Risk Policy is to ensure that the total portfolio investment risk is consistent with the investment beliefs and strategic goals set forth by the San Jose Police and Fire Retirement Board. This document defines the roles and responsibilities for maintaining this Risk Policy, management of the investment risks of the Plan, and monitoring the results. It also articulates the Board's philosophy towards investment risk. The Plan intends to use risk management to make more informed decisions and improve the likelihood of achieving its strategic goals and objectives within the appendix, specific risk targets and limits are established.

The Risk Policy will cover investment risk, liquidity risk, credit risk, and funding risk. The Risk Policy will not cover enterprise risk concepts such as operational risk, regulatory risk, legal risk, and counterparty risks.

Objectives

The objectives of the risk management program are:

- A. To communicate the Plan's commitment to risk management and the central role in achieving Plan goals and objectives;
- B. To formalize and communicate a consistent approach for managing risk;
- C. To ensure the investment risks assumed by the Plan are appropriate given the financial health of the Sponsor;
- D. To ensure the Plan operates within the agreed risk tolerance and risk limits.

Definitions

To aid with the interpretation of this policy, a glossary of terms is included in the Appendix D, which defines all the technical terms used in this policy.

Governance

Consistent with the Board's governance model, which delegates specific authority, responsibility, and accountability to others based on areas of expertise, this Risk Policy defines the following roles and responsibilities. The Board retains sole responsibility of governing the Plan, setting investment policy and risk policy, and monitoring the Investment Program. The Board delegates specific areas of responsibility while retaining appropriate oversight of the delegated activity.

Board of Administration

The Board maintains the sole and plenary authority and fiduciary responsibility for the Investment Program. The Board also understands it may delegate certain responsibilities under the Investment Program for purposes of administrative efficiency and expertise. The areas of the Investment Program the Board may not delegate include:

- A. Engaging Board consultants and service providers
- B. The governance model of the Investment Program
- C. Monitoring the Investment Program
- D. Establishing and maintaining investment policy, including:
 - 1. The Investment Policy Statement (“IPS”)
 - 2. This Risk Policy
 - 3. Investment objectives
 - 4. Strategic asset allocation
 - 5. Allocation-level performance benchmarks
 - 6. Risk philosophy

Investment Committee

The Investment Committee (“IC”) is a subset of the Board assigned to review investment related matters in greater detail. The IC has been assigned authority to assist the Board in its duties by meeting on at least a quarterly basis regarding matters of investment policy, risk management, portfolio structure, vendor selection, real estate operations, human resources, reporting, and monitoring. Please refer to the IC Charter for specific detail.

Staff

San Jose Retirement Services Staff (“Staff”), including the Chief Executive Officer (CEO) and Chief Investment Officer (CIO), is broadly responsible for supporting the Board in the effective execution of the Investment Program. The CIO has been delegated authority to execute specific elements of the Investment Program as outlined herein. Staff risk operating zones are defined in Appendix C.

General Investment Consultant

The General Investment Consultant (“GC”) is appointed by the Board to provide independent, objective investment advice. The GC is a fiduciary to the Plan under California law. The GC works with Staff and specialty consultants in the development of recommendations while recognizing its fiduciary duty is to provide prudent investment advice to the Board. The GC provides advice without discretionary authority to execute on its advice. With regard to this Risk Policy, the GC contributes to the following:

- A. Asset allocation recommendations among classes and subclasses
- B. Investment manager selection, evaluation and termination
- C. Investment performance monitoring
- D. Investment risk monitoring
- E. Capital markets projections
- F. Coordination with the Plan's actuary in conducting periodic asset/liability studies and other required reporting
- G. Recommend changes to the actual portfolio to achieve compliance with this Risk Policy
- H. Board education

Specialty investment consultants

A. Absolute Return Consultant

The Absolute Return Consultant ("AC") is appointed by the Board to provide independent, objective investment advice. The AC is a fiduciary to the Plan under California law. The AC works with Staff and the other consultants in the development of recommendations while recognizing its fiduciary duty is to provide prudent investment advice to the Board. The AC provides advice without discretionary authority to execute on its advice. With regard to this Risk Policy, the AC contributes to the following:

1. Assists with providing transparency into the absolute return investment strategies, including recent holdings and transactions.
2. Assists with the analysis of recommended investment strategies that have not yet been incorporated into the Plan including recent holdings and transactions.
3. Board education

B. Risk Advisory Consultant

The Risk Advisory Consultant ("RC") is appointed by the Board to provide independent, objective investment advice. The RC is a fiduciary to the Plan under California law. The RC works with Staff and the other consultants in the development of recommendations while recognizing its fiduciary duty is to provide prudent investment advice to the Board. The RC provides advice without discretionary authority to execute on its advice. With regard to this Risk Policy, the RC contributes to the following:

1. Asset allocation recommendations among classes and subclasses
2. Investment manager evaluation
3. Risk policy development and maintenance
4. Investment risk monitoring
5. Recommend changes to the actual portfolio to achieve compliance with this Risk Policy
6. Board education

Investment managers

Investment Managers are delegated the responsibility of investing and managing Plan assets in accordance with the IPS, Risk Policy, and all other applicable laws and the terms of the applicable investment documents evidencing the Plan's acquisition of an interest in an investment vehicle, and other controlling documents. Investment Managers are responsible for making all investment decisions on a discretionary basis regarding assets placed under their jurisdiction and will be accountable for achieving their investment objectives. Such discretion shall include decisions to buy, hold, and sell investments in amounts and proportions that are reflective of the stated investment mandate.

Custodian bank

The Custodian Bank, selected by the Board to act as the principal custodian of assets of the trust, is delegated the responsibility of holding the assets and evidence of interests owned by the Plan in investment vehicles and cash (and equivalents). The Board may authorize the Custodian Bank to invest in temporary short-term fixed income investments both for the investment strategies and as a part of the cash portion of Plan assets. Such investments will be managed in general accordance with short-term fixed income investment guidelines as detailed in the Custodial Agreement. Cash managed for investment strategies shall be considered to be sub-portions of the assets managed by the directing Investment Managers.

Philosophy

An institutional investment program is inherently exposed to many types of risk. This Risk Policy focuses primarily on the investment risks caused by the markets to which the Plan is exposed (e.g. domestic equities, real estate, domestic fixed income, and others). Related risks such as counterparty, geo-political, and fraudulent or unethical behavior, among others, are not addressed in this Risk Policy.

This Risk Philosophy represents the foundational principles on which the Investment Program is based. Every investment decision should be made with these foundational principles in mind to promote the fulfillment of fiduciary obligations. The statements below set forth the Board's Risk Philosophy, in order of importance:

Investment risk policy should consider the financial health of the sponsor

Contribution volatility (i.e. the volatility of annual contributions made to the Plan by the Sponsor) represents a significant budgetary constraint on the Sponsor's financial planning with important implications for taxpayers. The Investment Program shall, therefore, assume a level of volatility that can be tolerated by the Sponsor in both normal as well as stressed market conditions.

The funded status (i.e. funded ratio), viewed as a general proxy for the health of the Plan, is reviewed on both actuarial and market value of assets bases. While a higher funded ratio is always preferred, the Investment Program shall not accept a level of risk that for a given probability could cause the funded ratio to fall below the limit identified in Appendix B.

The Plan will manage funding risk in three main ways:

- A.** Actuarial review: The actuary will periodically review the Plan's liabilities
- B.** Asset/Liability studies: The general consultant will periodically perform this study to identify changes in the relationship between assets and liabilities

C. Asset Allocation: The Plan will periodically conduct asset allocation studies to ensure:

1. portfolio diversification
2. expected portfolio returns over the long-term (i.e. 10 years or more) in combination with projected contributions are sufficient to meet expected liabilities

Volatility and drawdown are the primary measures of investment risk

Because the Plan must satisfy long-term liabilities and receives regular contributions from the Sponsor, the Investment Program invests for the long-term appreciation of assets. It is, therefore, able to withstand short-term volatility spikes without undue impairment of capital. For this reason, long-term volatility (i.e. 8 years or more) is considered the appropriate timeframe. Volatility is forecasted through the Plan's strategic asset allocation and risk reporting processes and is measured and monitored as outlined in Appendix B and C.

Market corrections due to economic recession, geo-political instability, and other causes have historically proven detrimental to the funded status of the Plan. Drawdown and tail-risk metrics are designed to assess potential investment returns during such periods of market stress. Historical drawdown scenario analysis provides insight into how the portfolio would respond if it were exposed to prior stressed market conditions. Tail-risk analysis provides insight into the probabilities of experiencing a negative investment return with a small (e.g. 5%) probability. These metrics provide insight into how much may be lost during a stressed market environment. Because market corrections are statistically infrequent and typically caused by unforeseen events, neither approach can be used with certainty, but each provides insight into the potential impact a worst-case scenario may represent to the Plan and Sponsor.

Active risk, factor exposures, and liquidity must be monitored

Implementation of any strategic asset allocation introduces deviations between the Plan's actual portfolio and its policy index. While it is generally desired to minimize these differences to achieve efficiency, deviations from the policy index may be desirable for various reasons. To ensure the actual portfolio is appropriately adhering to the policy index, active risk must be measured and monitored through tracking error statistics.

Factor exposures capture the underlying economic drivers supporting asset class returns. While the policy index and actual portfolio are constructed primarily through asset class forecasts, factor exposures provide important insight into the underlying economic drivers supporting the Investment Program. Each security owned within each investment strategy has some exposure to various economic drivers. The Investment Program's total exposure to the economic drivers is, therefore, driven by the exposures inherent in those securities as well as the correlations across the factor exposures. To understand better the Plan's exposure to the economic drivers and anticipate how the Investment Program will perform under various economic environments, factor exposures must be measured and monitored.

In addition to benefit payments, the Plan must meet its obligations to pay its expenses and satisfy capital calls. Generally, these cash outflows are predictable and can be met through the normal administration of the Plan. Under stressed market conditions, however, liquidity within the Investment Program can change significantly and with little advance notice while the Plan must continue to meet its obligations. Liquidity must, therefore, be monitored and measured to ensure

that the Plan can continue to meet its financial obligations during periods of market stress without being forced to sell assets at stressed prices.

Monitoring

Reporting processes are designed to provide the Board with the information needed to execute its oversight function. As such, the Board has developed the following monitoring structure.

The Investment Committee, CIO and RC will monitor the Investment Program's risk exposures quarterly. This detailed review process will include security-level exposure analysis of the Investment Program's factor exposures; asset class exposures; tracking error; tail-risk and drawdown scenario analysis, and geographic exposures.

The Board, Staff, and RC will monitor the Investment Program's adherence to this Risk Policy on a quarterly basis. This review process will summarize the detailed reporting used by the Investment Committee and also include the ranges and targets outlined in **Appendix B**.

Management

Aside from liquidity management responsibilities assigned to the CIO in the Plan's IPS, the Board retains full authority and responsibility for ensuring adherence of the Investment Program to this Risk Policy.

The Plan's risk management function is expected to evolve through time. The objective of the risk management function is to ensure the Plan operates within the Board's agreed risk tolerance and limits. The main goals of the risk management function are:

- A. Identify: risks that will impact the plan's ability to meet its goals and objectives;
- B. Estimate the significant risks to which the plan is exposed;
- C. Manage: risk must be managed and should be commensurate with the rewards;
- D. Communicate: risks must be reported and monitored on a regular basis.

To a large extent, many factors that impact future benefits and contributions are uncontrollable, however, the potential impacts are considered in strategy development. The Plan uses three approaches (actuarial valuation, asset/liability studies, and asset allocation studies, as discussed above) to address and manage risk.

The Board may delegate authority to the CIO and Staff for certain functions as detailed below. Delegation of authority will be coordinated with workflow, compliance and reporting procedures that are clearly defined, reviewed, and approved. The Board shall be notified timely of all investment decisions made by the CIO and their implications to the Plan.

A. Rebalancing

Portfolio rebalancing may occur by adjusting allocations to individual investment strategies or managers or through the use of an overlay provider using derivatives.

B. Relative Risk

While the Board recognizes that the majority of investment risk over the long term is dependent on the asset allocation decision, it recognizes the cost of precisely matching the strategic asset allocation is considerable and not always optimal. In addition to asset class weightings versus policy, annualized tracking error will be used to measure the disparity of returns between the actual positions in the Investment Program compared

to the strategic asset allocation. Annualized tracking error, as measured quarterly by the RC, shall adhere to the targets and ranges outlined in **Appendix C**.

IX. Investment Costs

The Board members intend to monitor and control investment costs at every level of the San Jose Police and Fire Department Retirement Plan.

- A.** Professional fees will be negotiated whenever possible.
- B.** Where appropriate, passive portfolios will be used to minimize management fees and portfolio turnover.
- C.** If possible, assets will be transferred in-kind during manager transitions and Plan restructurings to eliminate unnecessary turnover expenses.
- D.** Managers will be instructed to minimize brokerage and execution costs.

APPENDIX A⁸

ASSET ALLOCATION TARGETS⁹ [AS OF MARCH 3, 2022]

	Target (%)	SAAP Asset Class Benchmarks	LCPP Asset Class Benchmarks	Tracking Error Target Range (basis points)
Growth	69			
Public Equity	42	Custom Public Equity Benchmark ¹⁰	LCPP Custom Public Equity Benchmark ⁹	0 - 400
Total Private Markets	25	Actual Return		NA
Private Equity	9		Russell 3000	
Venture/Growth Capital	4		Russell 3000	
Private Debt	4		Bloomberg Barclays Aggregate	
Growth Real Estate	4		Global NAREIT	
Private Real Assets	4		S&P Global Natural Resources	
Emerging Market Bonds	2	50/50 JPM EMBI GD/JPM GBI-EM GD	50/50 JPM EMBI GD/JPM GBI-EM GD	0 - 300
High Yield Bonds	2	Bloomberg Barclays High Yield	Bloomberg Barclays High Yield	0 - 300
Low Beta	16			
Market Neutral Strategies	3	SOFR + 1.5%	SOFR	0 – 1,000
Immunized Cash Flows	5	Actual Return	Bloomberg Barclays Gov/Credit 1-3 Year	NA
Cash	8	Actual Return	ICE BofA 91 Days T-Bills TR	NA
Other	13			
TIPS	2	Bloomberg Barclays 0-5 Year TIPS	Bloomberg Barclays 0-5 Year TIPS	0 – 100
Core Real Estate	5	NCREIF ODCE Cap Weighted – Net (Lagged 1 quarter)	Global NAREIT	0 – 400
Investment Grade Bonds	4.5	Custom IG Bonds Benchmark ¹¹	Custom IG Bonds Benchmark ¹⁰	0 - 200
Long-Term Government Bonds	1.5	Bloomberg Barclays US Long Treasury	Bloomberg Barclays US Long Treasury	0-100

⁸ Appendix A shall be revised as new Asset Allocation targets are approved by the Board.

⁹ Approved by the Board of Administration on March 3, 2022.

¹⁰ 57.1% MSCI US IMI, 26.2% MSCI World ex US IMI Net, 16.7% MSCI EM IMI Net.

¹¹ 78% US Aggregate, 22% US Securitized MBS/ABS/CMBS.

Commodities	0	Bloomberg Commodities Index	Bloomberg Commodities Index	0-700
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LIABILITY BENCHMARK PORTFOLIO: Bloomberg Barclays U.S. Long Treasury Index.

APPENDIX B

SCHEDULE OF OPERATING RANGES AND LIMIT TARGETS

Characteristic	Measurement	Operating Range		Board Approved Limit
		Min.	Max.	
Funded ratio	Probability that the Actuarial funded ratio will fall below the Board Approved Limit	80%	n.m.	5% probability of falling below 60%
Sponsor contributions	Probability that Sponsor contributions in a single year will exceed a specified limit	\$160mm	\$220mm	5% probability of exceeding \$335mm
Interest on UAL	Probability that the Interest cost of unfunded actuarial liability will increase above a specified limit	\$35mm	\$80mm	5% probability of exceeding \$150mm
Total fund absolute volatility	Forecast Annualized standard deviation of returns of the actual portfolio	8%	10%	12%
Total fund relative volatility	Forecast Tracking error of the actual portfolio vs. the strategic asset allocation policy index	1%	2%	4%
Drawdown exposure	Average of three worst historical scenario drawdown events	n/a	n/a	-30%
Liquidity	Liquidity Coverage Ratio (LCR) 5-yr projection	2.0	3.0	1.2

APPENDIX C

FORECASTED RISK OPERATING ZONES

Risk Guideline	CIO	IC	Board
Total Portfolio Forecast Risk	8-11%	<8%; 11-12%	>12%
Total Portfolio Forecast Beta	0.5-0.8	0.3-0.5; 0.8-1	<0.3; >1
Total Portfolio Duration	0-3 years	3-5 years	>5 years
Total Portfolio Credit Spread Duration	0-3 years	3-5 years	>5 years
Total Portfolio Relative Risk	< 10%	10% - 20%	> 20%
Equity Factor Relative Risk	< 10%	10% - 20%	> 20%
Interest Rate Factor Relative Risk	< 10%	10% - 20%	> 20%
Credit Factor Relative Risk	< 10%	10% - 20%	> 20%
Currency Factor Relative Risk	< 10%	10% - 20%	> 20%
Portfolio Active Risk	0.5%-3%	0-0.5%; 3-4%	>4%
Average Drawdown risk	0-25%	25-30%	<-30%

APPENDIX D

DEFINITIONS

Actuarial Assumptions: Assumptions made by the actuary that influence the valuation of liabilities

Active risk: measures the volatility of an investment strategy versus its benchmark.

Concentration Risk: Lack of diversification in exposure to markets or managers.

Confidence Interval: a range of values so defined that there is a specified probability that the value of a parameter lies within it.

Counterparty Risk: The risk that a party in a transaction does not fulfill its contractual obligation. Both sides of a contract are exposed to this risk

Credit Risk: Also referred to as default risk. This is the risk the borrower fails to repay a loan or meet a contractual obligation.

Currency Risk: The potential loss on the price of an asset due to fluctuating foreign currency exchange rates.

Drawdown: a measure of both returns and time over which an investment experienced a decline in value from a peak to a trough. It is based on actual historical results.

Duration: measures how long (in years) it takes to be repaid the bond's price by the bond's total cash flows. This measure is used to determine the interest rate sensitivity of the portfolio.

Funded Ratio: The ratio of assets to liabilities. Assets can be defined in terms of the market value of assets or the actuarial value of assets. Liabilities are defined as all future benefit payments discounted at the actuarial assumed return,

Funding Risk: Also referred to as surplus risk, this is the risk of assets and liabilities not matching

Inflation Risk: The risk that general prices of goods and services are rising, which erodes the purchasing power of money.

Interest Rate Risk: The risk that an investment will decline in value as a result of a change in interest rates. This risk is measured by its duration

Investment Risk: the risk associated with investing in capital markets

Liquidity: Is comprised of both the time required to complete the transaction and the impact that the transaction has on the price of the asset. There are two types of liquidity risk: Market liquidity risk and funding liquidity risk. Market liquidity risk refers to the risk that an asset cannot be sold without loss of value. Funding liquidity risk refers to the risk that the plan will not be able to meet financial obligations as they come due.

Liquidity Coverage Ratio: The ratio of liquidity available to liquidity needs.

Portfolio Construction Engine: A software program relying on mean-variance optimization. Portfolio optimization requires inputs of asset class returns, standard deviations, and correlations in order to develop an output of total portfolio expected returns and standard deviations, which can be compared along with their Sharpe Ratios.

Risk: the uncertainty of an event occurring

Standard Deviation: The square root of the average squared deviation of the returns from its mean

Strategic Asset Allocation: The asset classes and weights that are targeted for the policy benchmark

Tail Risk: Tail-risk measures both the probability and expected returns of a significant loss. When assuming normally distributed returns, tail-risk is the left tail of the return distribution. The normal distribution used for mean-variance optimization underestimates the risk of rare events when markets exhibit fat tails (for example, during the Global Financial Crisis).

Volatility: the standard deviation of returns. Standard deviation (SD) is the square root of the average squared deviation of the returns from its mean.