## Attachment 1: CalSTRS Fixed Income Net Zero Emissions Reduction Analysis

Overview of Fixed Income Management and Active Emissions Reduction

CalSTRS Fixed Income assets represent 12% of the Total Fund's target allocation and are invested to improve the diversification of the total investment portfolio and enhance its risk-adjusted total return. As can be seen in Chart 1, over one-third of Fixed Income assets are invested in credit-related securities consisting primarily of investment grade, high yield, and emerging market corporate bonds. It is in the credit allocation where carbon emissions can be reasonably measured, and Fixed Income believes this is where emissions data and analytical tools exist that can support emissions reduction efforts.

Chart 1: CalSTRS Fixed Income Management
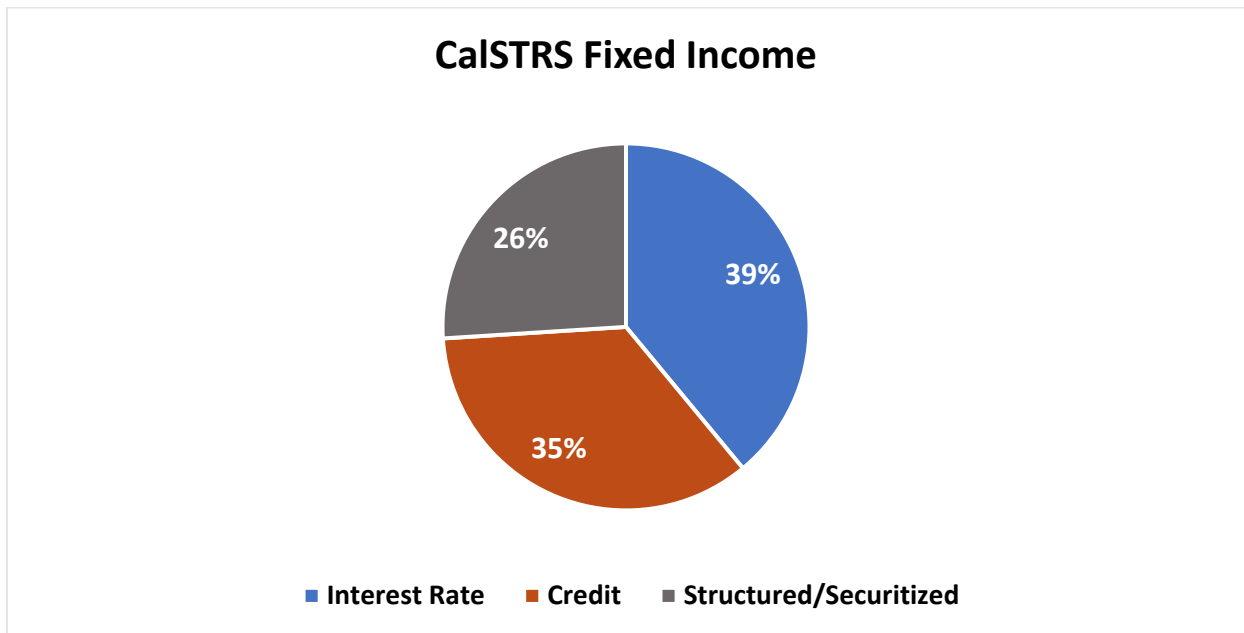
Currently, the majority of CalSTRS Fixed Income assets are actively managed in-house. Fixed Income (Staff) utilizes an enhanced indexing approach to manage these assets. Enhanced indexing is a portfolio strategy which seeks to generate moderate excess returns relative to the benchmark with significant active risk (i.e. tracking error) constraints. For Fixed Income, active risk is managed within an annualized forecasted range of 10 basis points (bps) to 60 bps. In addition, all Fixed Income portfolios (ex-leveraged loans) are currently benchmarked off of their respective Bloomberg Fixed Income indexes as approved by the Investment Committee.

Selecting a Carbon Reduction Strategy for Fixed Income

Since the Investment Committee's adoption of the net zero pledge, Fixed Income has been considering carbon reduction strategies that support the goals of achieving net zero portfolio emissions by 2050 or sooner. Three distinct strategies for reducing portfolio carbon emissions were identified and researched over the past year with staff recommending strategy 1:

1) **Utilize Bloomberg index low-carbon optimization.**

   Late last year Bloomberg introduced its carbon emissions reduction index feature. Bloomberg utilizes an index optimizer function to generate indices that are designed to reduce carbon emission exposure while preserving current index metrics such as yield, duration, industry sectors, issuers, and the number of securities. Applying this framework allows us to reduce carbon emission without the need to change our benchmarks. This approach gives us the intended reduction of emissions with only a slight increase in active risk to the Fixed Income portfolio.

2) **Active discretionary approach to reducing portfolio emissions.**

   For this strategy, staff would actively, and on a discretionary basis, reduce exposure to high carbon industry-specific sectors and issuers and rotate into lower emissions industry sectors and issuers. This would be done while making no changes to current benchmarks. Staff found that this approach did reduce emissions but added a significant amount of active risk to the portfolio.

3) **Replace current Bloomberg indices with MSCI low-carbon indices.**

   At the start of staff's analysis, MSCI was the only index provider offering low-carbon benchmarks. Staff modeled the impact of switching from Bloomberg to MSCI index, but found that this strategy also introduced a large amount of active risk.

As part of the analysis, staff compared the expected changes to active risk and carbon reduction that each of these three strategies would provide relative to CalSTRS' current investment grade index. Staff also considered the expected changes to active risk and carbon reduction from integrating various levels of emissions reduction into existing Bloomberg indices. As can be seen in Chart 2, there is considerable variance in the levels of emissions reduction and additional risk each potential strategy would provide.

Chart 2: Carbon Emission Reduction Strategy Comparison: Investment Grade Bonds

Active Risk & Carbon Emissions Reduction vs CalSTRS Investment Grade Bond Index
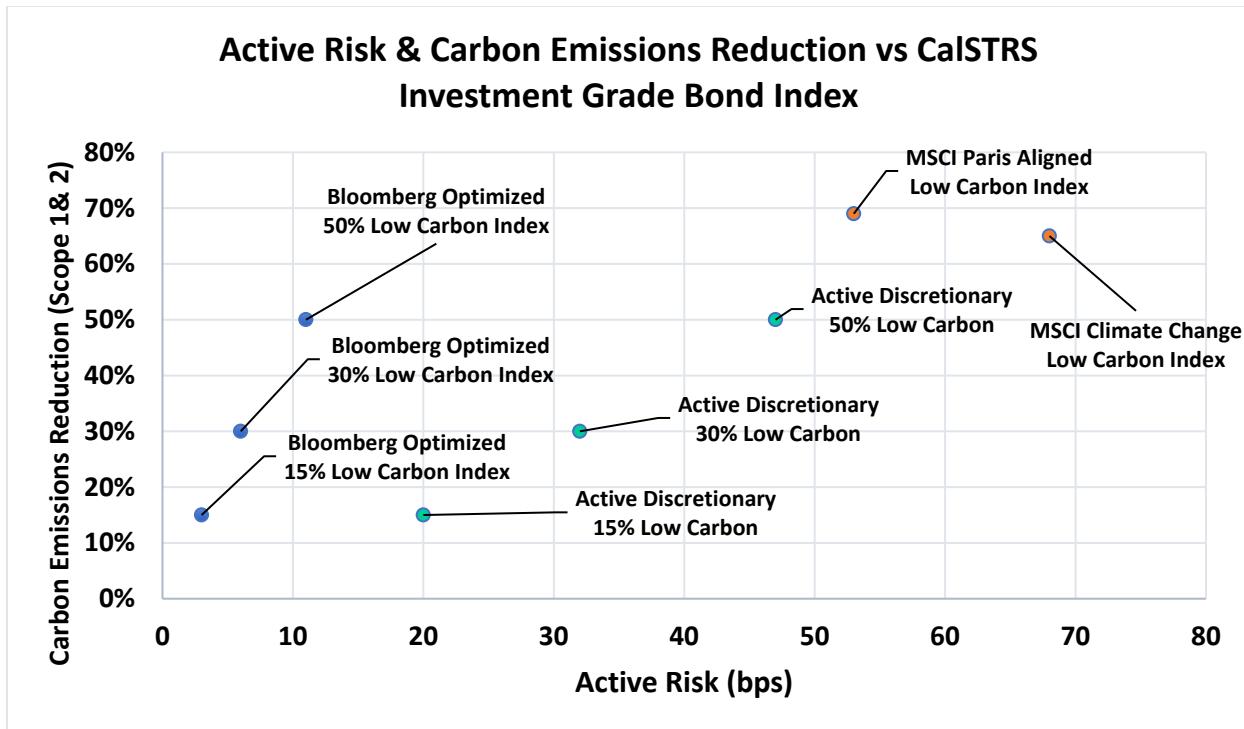
Bloomberg Index Optimization

Staff believes utilizing Bloomberg Index optimization for carbon reduction is the appropriate choice for CalSTRS Fixed Income. This approach reduces carbon emissions most effectively as it produces the highest carbon emissions reduction per unit of active risk and maintains existing index metrics against current indices. This selection allows staff to continue its enhanced indexing approach with a relatively low level of additional active risk compared to the other strategies considered. Lastly, the optimized index reflects similar risk and return characteristics to existing, Investment Committee approved benchmarks. Tables 1 and 2 below compare current vs. low-carbon credit-related indices and reflect little to no change in key index metrics.

Table 1: Investment Grade: Comparison of Current and Low-Carbon Optimized Bond Indices

Index	Yield To Worst	OAS (basis points)	Duration (years)	Issuers	Cusips
CalSTRS Bloomberg Investment Grade Bond Index	5.42%	112	6.97	1019	8246
Bloomberg IG 15% Low Carbon Index (Optimized)	5.41%	112	6.96	1019	8246
Bloomberg IG 30% Low Carbon Index (Optimized)	5.41%	112	6.92	1019	8246
Bloomberg IG 50% Low Carbon Index (Optimized)	5.41%	111	6.86	1019	8246

Source: Bloomberg

Table 2: High Yield: Comparison of Current and Low-Carbon Optimized Bond Indices

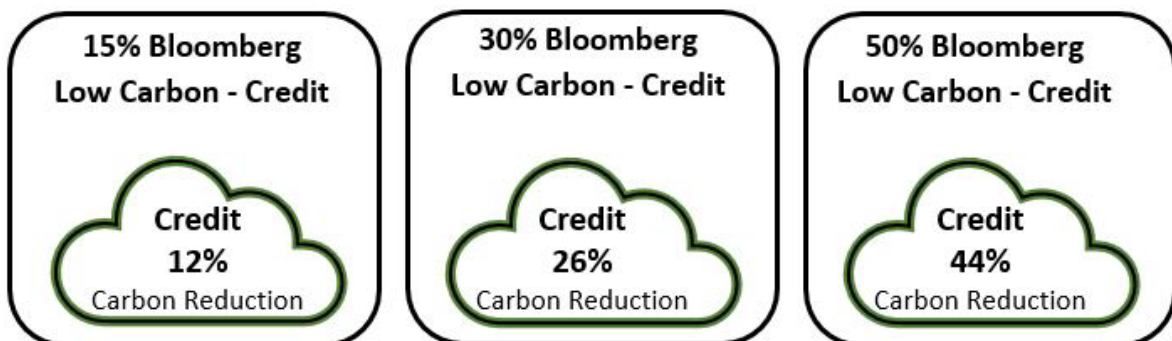| Index	Yield To Worst	OAS (basis points)	Duration (years)	Issuers	Cusips
CalSTRS Bloomberg High Yield Bond Index	8.54%	398	3.99	908	2032
Bloomberg HY 15% Low Carbon Index (Optimized)	8.52%	397	3.98	908	2032
Bloomberg HY 30% Low Carbon Index (Optimized)	8.53%	398	3.97	908	2032
Bloomberg HY 50% Low Carbon Index (Optimized)	8.56%	403	3.99	908	2032

Source: Bloomberg

Bloomberg Index Optimization for Carbon Emissions Reduction:

Staff then considered the level of carbon emissions reduction that should be applied to the index optimization. Strategies of 15%, 30% and 50% carbon emissions reductions were considered. Throughout this exercise, staff's analysis centered around two fundamental variables/principals:

(1) The optimized index should allow for a meaningful level of emissions reduction.

(2) The optimized index should allow staff to maintain its current portfolio strategy and benchmarking.

The following graphic shows the level of credit portfolio emissions reduction expected under each of the three optimized low-carbon indices considered.

15% Bloomberg Low Carbon - Credit — Credit 12% Carbon Reduction

30% Bloomberg Low Carbon - Credit — Credit 26% Carbon Reduction

50% Bloomberg Low Carbon - Credit — Credit 44% Carbon Reduction

Impact on Active Risk

Chart 3 below details Fixed Income's active risk measurement associated with the current index compared to the expected tracking error associated with indices incorporating 15%, 30% and 50% carbon reductions.

Chart 3: Carbon Emission Reduction Strategy Impact on Fixed Income Active Risk:
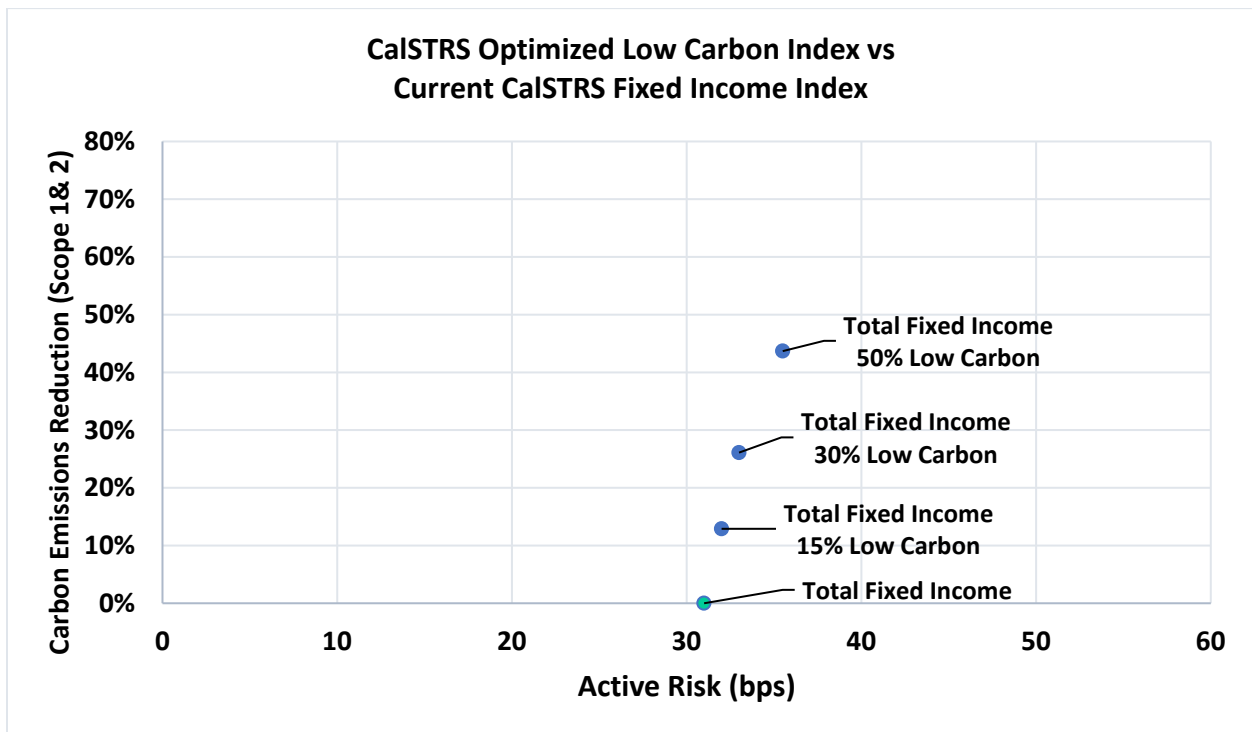
While the introduction of 15%, 30% and 50% lower emissions indices do not impact Fixed Income's overall active risk exposure too significantly, there is a material impact to the composition of active risk within the credit-related portfolios. In other words, staff's credit-related portfolio skews to factors such as value, industry sector, issuer and individual security selection and these intentional tilts would be increasingly impacted and distorted as greater emission reductions are introduced into the index. This could potentially alter staff's active decisions relative to the index along with the potential impact to excess returns versus the policy benchmark. While any allocation to the low-carbon indices could skew Fixed Income's portfolio characteristics, staff believes an initial 15% carbon reduction index to be manageable and provide reasonable expectations that Fixed Income portfolio profile and returns could be preserved.

Impact to Funding Levels

CalSTRS overall funding levels and contribution rates were examined in the context of the recommended Fixed Income benchmarks. The Investment Strategy & Risk team, along with Actuarial Resources, modeled the recommendations and found negligible effects on the funding plan, including the likelihood of full funding, the risk of low funding, and the risk of high contribution rates.