ASSET ALLOCATION REPORT

for the

City of Miami Beach
Employees' Retirement Plan

October 29, 2013

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City of Miami Beach Employees' Retirement Plan

Asset Allocation Study

SUMMARY

Milliman has conducted this asset allocation study for the Miami Beach Employees' Retirement Plan. We believe asset allocation is the most important investment decision made by an institutional investor. Research supports this belief: studies have found that asset allocation accounted for 95% of the variance in quarterly returns for a typical large pension fund.

We find that the Retirement Plan's current policy asset mix is reasonably efficient in that it offers near the maximum expected return for its level of risk, if the alternative portfolios considered are limited to only the currently utilized asset classes. The average public pension fund uses additional asset classes and has a slightly lower expected return than the Retirement Plan's expected return (6.7% compared to 6.8%). The average public pension fund has significantly lower asset risk than the Retirement Plan (standard deviation of 11.4% compared to 13.0%). The average public pension fund's use of alternative asset classes allows a substantial reduction in risk with only a small reduction in expected returns.

Based on Milliman's long-term capital market assumptions, the estimated 30-year annualized return (geometric mean) for the current asset allocation falls well below the actuarial expected return of 8.0%. Based on Milliman's ten-year investment planning capital market assumptions, only three asset classes considered as part of this analysis currently have an expected annual return (arithmetic mean) higher than 8.0%: Domestic equities (8.65%), International Equities (9.35%) and Global Real Estate Securities (8.15%). Using primarily these three asset classes, a portfolio could be constructed that would have an expected return (arithmetic mean, but not geometric mean) matching the assumed rate of return of 8.0%, but we would not recommended this. The portfolio would be undiversified and very high risk. We present a range of asset mixes that, while not meeting the actuarial interest rate assumption, offer improved returns, lower risk and better diversification than the current mix.

A number of potential asset allocation choices are presented along with their expected return and risk. We recommend Mix 14 as the proposed target mix. It offers a more diversified portfolio with higher expected return than the current policy asset mix, a lower level of overall risk and an only slightly higher Total Plan Risk.

The Model

Our proprietary model integrates the Plan's liabilities into an asset allocation framework, considering volatility of assets in combination with liabilities as well as the volatility of the asset returns alone. The model solves for asset mixes that provide the lowest possible Total Plan Risk for a given level of return. Total Plan Risk measures the volatility of the Plan's net funded position on a market value basis: the market value of assets less the present value of Plan obligations, where the present value is measured by discounting projected benefit payments using the yields on high quality corporate bonds matching the maturity of the benefit payments. Although the Plan uses an expected long-term return on the Plan's asset portfolio as the discount rate to determine the funding requirements (an assumption that may be adjusted infrequently even as interest rates and other market factors change), the market value based approach used to measure Total Plan Risk provides a more market sensitive measure of the changing values of the assets and the liabilities, allowing us to develop asset mixes that are expected to better track the Plan's liabilities as market conditions change over time. An optimization based only on asset

returns would select a portfolio of 100% short-term Treasury Bills as the lowest risk portfolio, but T-bills do not represent the lowest risk mix due to the duration mismatch between T-bills and the Plan's liabilities. The duration of the liabilities is 13.7 years. The present value of the liabilities, due to their long duration, changes dramatically with changes in the discount rate, while the present value of T-bills does not change due to their short duration. A portfolio comprised mostly of bonds with a similar duration to the liabilities – and therefore a similar sensitivity to changes in interest rates – would better fund the liabilities and provide a lower funding risk, or Total Plan Risk.

Inputs to the Model

We have projected expected returns, standard deviations and correlations for each asset class, as well as correlations and the volatility for the Plan's liabilities. Our projections are based on historical data, Milliman's proprietary research, and projections by outside sources. We evaluate the inputs as a whole to ensure their reasonableness. We look at the risk-return characteristics of each asset class relative to the other asset classes as a check on our inputs and our view of the relative attractiveness of the asset classes.

To develop appropriate risks and correlations for the liabilities, we consider the Plan's projected benefit obligations for active and retired members as provided by the Plan's actuary, Gabriel Roeder Smith & Company. We calculated the duration of these projected benefit payment streams. The longer the duration, the more sensitive the liabilities are to changes in interest rates. We also assessed the sensitivity of the Plan's liabilities to changes in inflation and real interest rates. Based on this analysis, we are able to estimate how the liabilities will react to various changes in economic conditions. We then project the standard deviation and correlation of the liabilities with each of the asset classes, adjusting for the Plan's current funding ratio. We calculate a present funding ratio of 58.8% based on the June 30, 2013 Plan's asset balance of $451.8 million.

The Output

Using our optimization program, we generate an Efficient Frontier of asset mixes. Each asset mix is optimal on a risk/reward basis, meaning that the highest return is achieved for any given level of risk based upon the constraints that we have placed upon the model. The asset mixes range from a low risk/low return mix to a high risk/high return mix. The lowest risk mix has the lowest funding variability due to a higher correlation with the liabilities. The highest risk mix has the highest expected return but also has the greatest uncertainty in return and liability funding.

Selecting an Appropriate, Optimal Asset Mix

All of the asset mixes on the Efficient Frontier are optimal for their particular level of risk. Other asset class combinations close to the Frontier would also be suitable. The risk aversion of the Board and the implications of possible mixes' funding status are the dominant factors in selecting the appropriate, optimal asset mix. To assist in this decision, we present the sensitivity of the Plan's funded status to changes in the assumed inflation rate and the assumed real rate of return.

In addition to the Board's risk tolerance and the implications for achieving required returns, adopting a new asset allocation target requires taking into account the Plan's current asset allocation and the costs of changing the asset mix. The expected cost of implementing a new

asset mix must be considered relative to the expected benefit of the mix.

With the above considerations thoroughly evaluated, a "Recommended" asset mix is suggested to facilitate the Board's selection of an appropriate optimal asset mix.

Conclusion

We conclude from our analysis that the current asset mix is less than efficient, and also that it will not deliver an adequate expected return in light of the current actuarial interest rate assumption of 8.0%. We propose the adoption of Mix 14 which offers a slightly higher expected return with a significantly lower level of risk.

The Plan's Current Actual asset allocation, Current Policy asset allocation and Recommended Mix asset allocation are detailed below.

Asset Mix Alternatives

Asset	Current Actual Portfolio	Current Policy 1	Proposed Policy Portfolio Mix 14
Domestic Equities	53%	51%	44%
International Equities	17%	18%	15%
Domestic Fixed Income	30%	31%	12%
Domestic Long Gvt/Crdt Bonds	0%	0%	0%
High Yield Fixed Income	0%	0%	5%
Global Real Estate Securities	0%	0%	5%
Hedge Funds	0%	0%	5%
Liquidity Allocation	0%	0%	14%
Cash and Equivalents	0%	0%	0%
Total	100%	100%	100%
Expected:			
Arithmetic Mean 10-Year Return	6.8	6.7	6.8
Geometric Mean 10-Year Return	6.1	6.1	6.1
Annual Std Dev of Asset Returns	13.0	12.9	12.6
Total Plan Risk (Std Dev of Surplus)	17.0	16.9	17.0
30-Year Geometric Mean Return	6.8	6.8	6.6

The recommended Mix 14 has the same proportional allocation to asset categories as the current Policy Portfolio, but it is more diversified from an overall perspective, with an allocation to High Yield Fixed Income, Global Real Estate Securities, and Hedge Funds. Mix 14 also has a 14% Liquidity Allocation intended to cover the Plan's net cash flow deficit over the next five years.

LIABILITY ANALYSIS

Overview

Our analysis of the liabilities is based on projections from the Employees Retirement Plan actuary, Gabriel Roeder Smith & Company. The actuary's projection of benefits to members incorporates numerous assumptions regarding future salaries, mortality rates, termination rates, disability rates, the inflation rate and asset returns, etc. General inflation was projected at 4.0% per year by the actuary, while earnings on assets (used to discount future liabilities) were projected at 8.0% per year.

At our request, Gabriel Roeder Smith & Company projected the payments to be made to retired, deferred vested as well as current Plan members related to past and future service. We have included projected payments related to future wage inflation and wage growth. This information was used to develop the liability assumptions in this report. Payments related to future wage inflation and growth will be funded with future contributions invested in future assets. By including these projected payments in our liability assumptions, we have given our study a more forward-looking perspective.

Our process is to estimate the volatility of the liabilities and their correlation with each of the proposed asset classes. Appropriate estimates of these variables allow us to determine asset mixes that best fund the Plan's liabilities. Total Plan Risk can be reduced by selecting assets which behave more like the liabilities through fluctuations in financial markets and therefore help to offset the volatility of the liabilities.

For the baseline projection case, we used an inflation rate of 4.0% per year, and a real return of 4.0% per year, resulting in a discount rate of 8.0%. Although the 4.0% inflation rate is above that experienced over the past few years, it is representative of an average rate of inflation over longer time periods. The real return assumption used in our discount rate represents the expected return above inflation for a moderate-risk asset and is representative of a long-term historical average.

Analysis of Retired and Inactive Plan Members

Our liability analysis begins with a review of the retired and deferred vested (inactive vested) Plan members. All promised benefits payable to this group have already been accrued, so projected benefits are quite predictable. We calculate the present value of projected benefits to retired and deferred vested members to be $448.4 million, after discounting the benefits at an 8.0% annual rate. In our presentation to the Board on November 5, 2013, we will discuss this further and contrast the present value of retired and inactive member benefits versus prior studies.

Figure 1 on the following page shows graphically the benefit payment projections for retired and deferred vested members. Actual benefits paid to current retirees begin declining immediately due to mortality. Discounted benefits – the present value of benefits (shown in Figure 2) – also decline immediately at an average rate of 6.7% per year, as the 8.0% discount rate and mortality assumptions decrease the present value of benefits, and will have fallen to half their value in

roughly nine years. Thirty-five years into the future, the discounted benefits to current retirees are relatively insignificant. The average benefit is paid 8.8 years in the future.[1] This gives an indication of the sensitivity of the present value of these liabilities to changes in interest rates. A 1% change in interest rates would result in an expected 8.8% change in retired and inactive member liabilities.

Future Benefit Payments
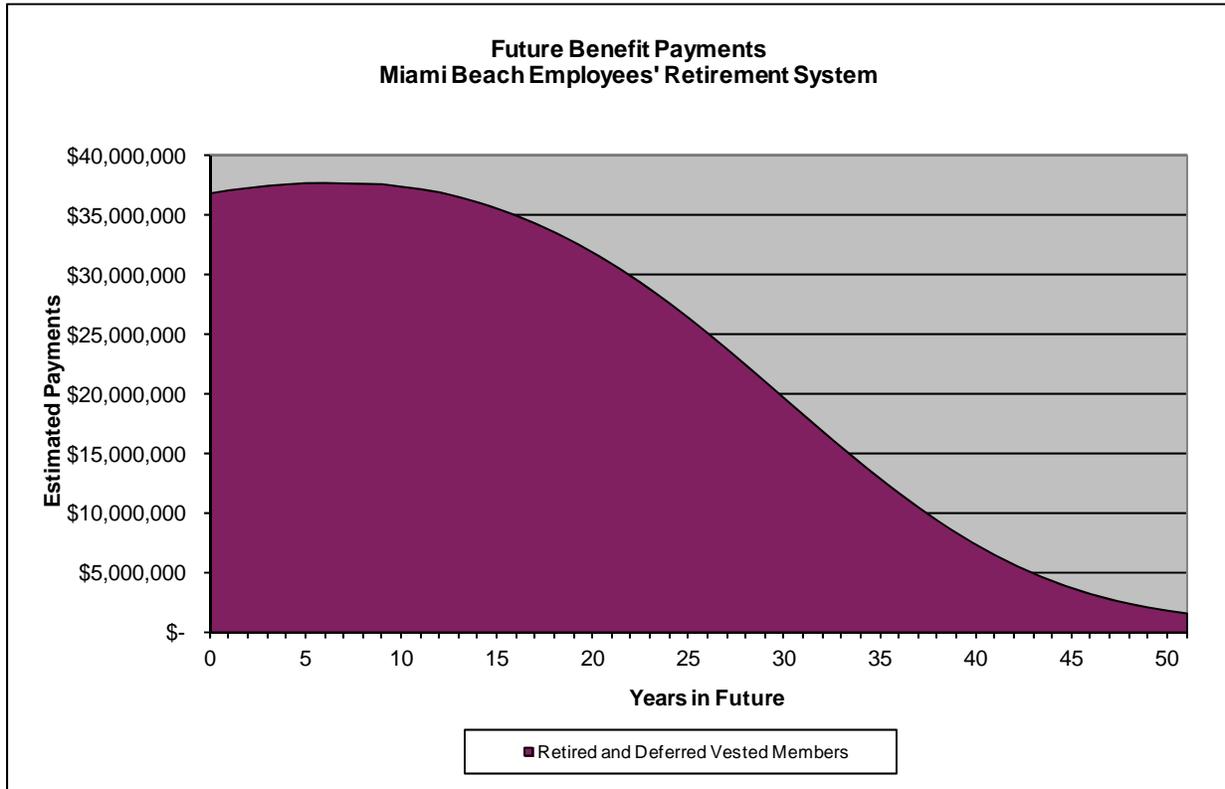**Miami Beach Employees' Retirement System**

Figure 1

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[1] In computing the average payment, we weight discounted payments by the number of years in the future. This is identical to the computation of a Macaulay bond duration.

Present Value of Future Benefit Payments
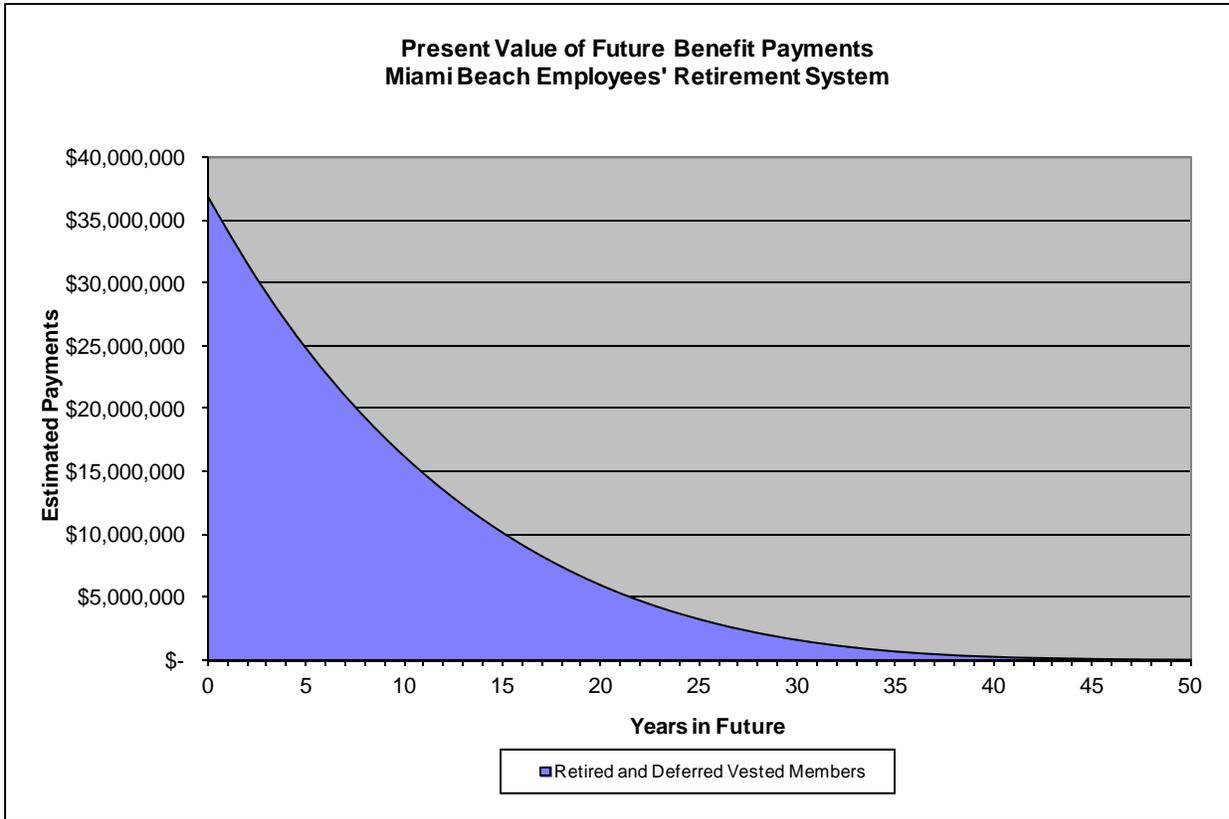**Miami Beach Employees' Retirement System**

Figure 2

We have also investigated the impact of a lower expected rate of inflation – 3.0% instead of the 4.0% baseline assumption. We held the expected real return constant at 4.0%, so the discount rate dropped from 8.0% to 7.0% in this sensitivity test. Decreasing the inflation rate by 1% causes the present value of the retired and deferred vested members' liabilities to increase 9.4% to $490.3 million.

We also investigated the impact of a lower expected real rate of return: decreasing this rate expands the cost of funding future payments by decreasing the discount rate. By decreasing the projected real rate of return from 4.0% to 3.0% per year, the discount rate falls to 7.0%. While actual payments to retirees are unchanged, this causes the present value of benefits to rise 9.4% to $490.3 million, the same effect as a 1% change in the inflation assumption since the cash flows to the retired and inactive members are largely determined.

Analysis of Active Plan Members

In contrast to retired member benefits, active members will earn a large fraction of their projected benefits in the future. These future benefits can be broken down into three components:
1. Accrued and future service only without wage growth (this is the measure that we have historically used for active member liabilities)
2. Future wage increases due to inflation
3. Future real wage growth above inflation

In the analysis below, we treat projected payments related to future service separate from wage inflation and real wage growth, which will be examined in the final analysis.
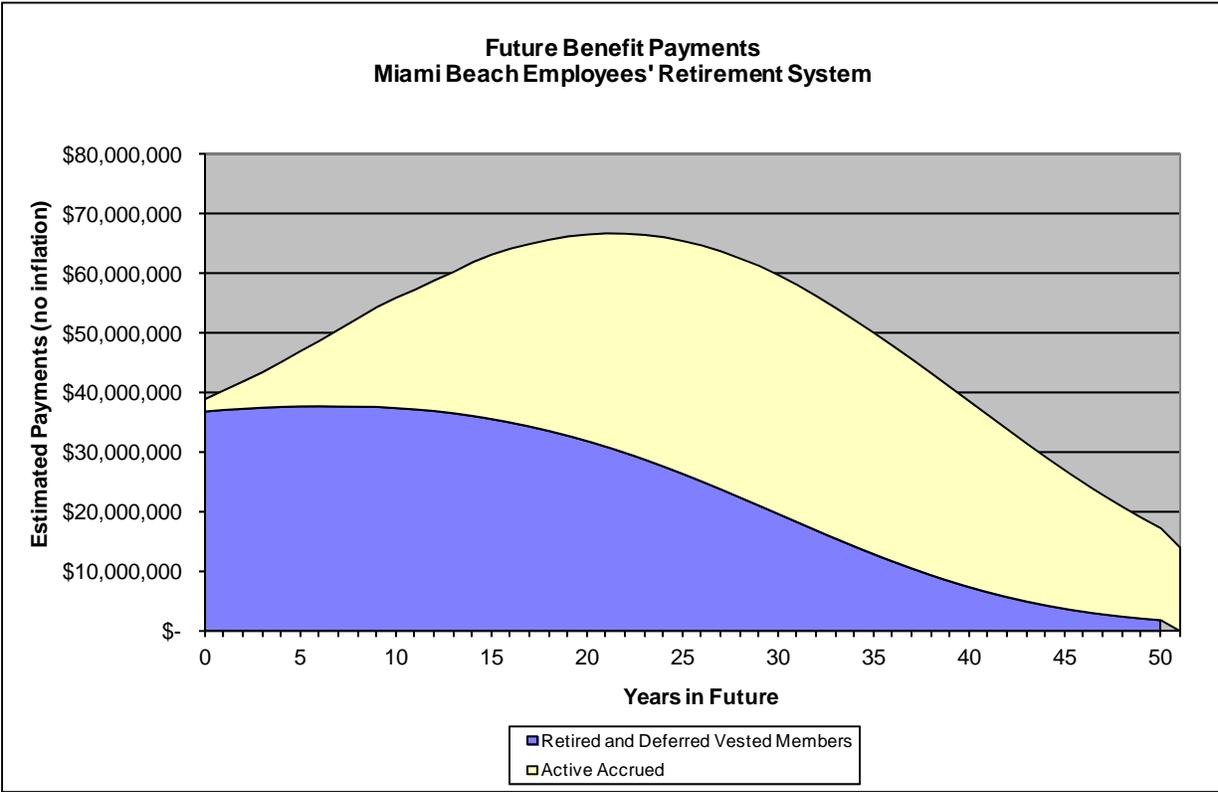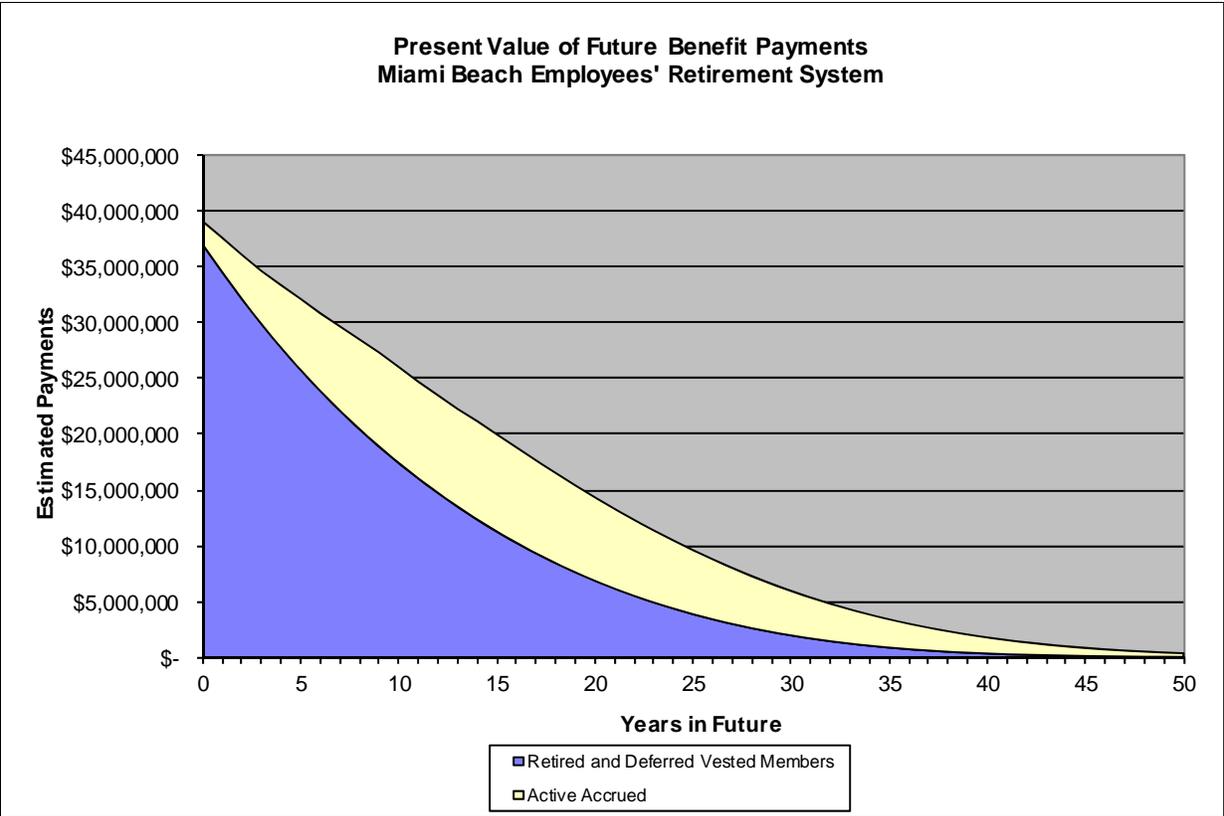

Figure 3

Present Value of Future Benefit Payments
Miami Beach Employees' Retirement System

Figure 4

As with current retirees, discounting active members' liabilities shifts the impact of the distribution towards the present and reduces it substantially, since payments far in the future have a much lower present value than future value. The peak in discounted liabilities occurs 15 years in the future and these liabilities become insignificant 45 years in the future (please see Figure 4 above). The present value of the estimated benefits to active members for accrued and future service is $238.4 million and the average payment (duration) occurs 18.2 years in the future.

When we reflect future assumed inflation and real wage growth, the active members' liabilities increase to $319.4 million with a duration of 19.9 years. As we did for retired and deferred vested members, we prepared a sensitivity analysis for active members considering changes in inflation and the real rate of return. We decreased the inflation assumption by 1%, from 4.0% to 3.0%. Lower inflation decreases final salaries – and therefore, benefits – due to the diminished salary growth over many years. However, to maintain a constant "real" rate of return the discount rate is also decreased to 7.0%, which increases the present value of the benefits. Our lower-inflation scenario resulted in a present value of $361.6 million, 13.2% higher than the baseline. The decreases resulting from lower inflation are more than offset by the increases resulting from the lower discount rate, so the benefits are more expensive to fund.

Changes in real returns have a somewhat greater impact than changes in the inflation rate: if we decrease the assumed real rate of return from 4.0% to 3.0% while maintaining our 4.0% inflation

assumption, the liabilities' present value increases 21.0% to $386.6 million. Because inflation is constant instead of decreasing, future salaries are not lower; while the discount rate decreases due to the change in the real rate of return.

Analysis of All Members — Retired, Inactive, Active and Future Growth

Combining the projected payments to retired and inactive members with the projected payments to active members for accrued and future service, future wage inflation and future real wage growth, all members' benefits have an estimated $767.8 million present value (discounted by the 8.0% baseline assumption), with a calculated duration of 13.7 years.
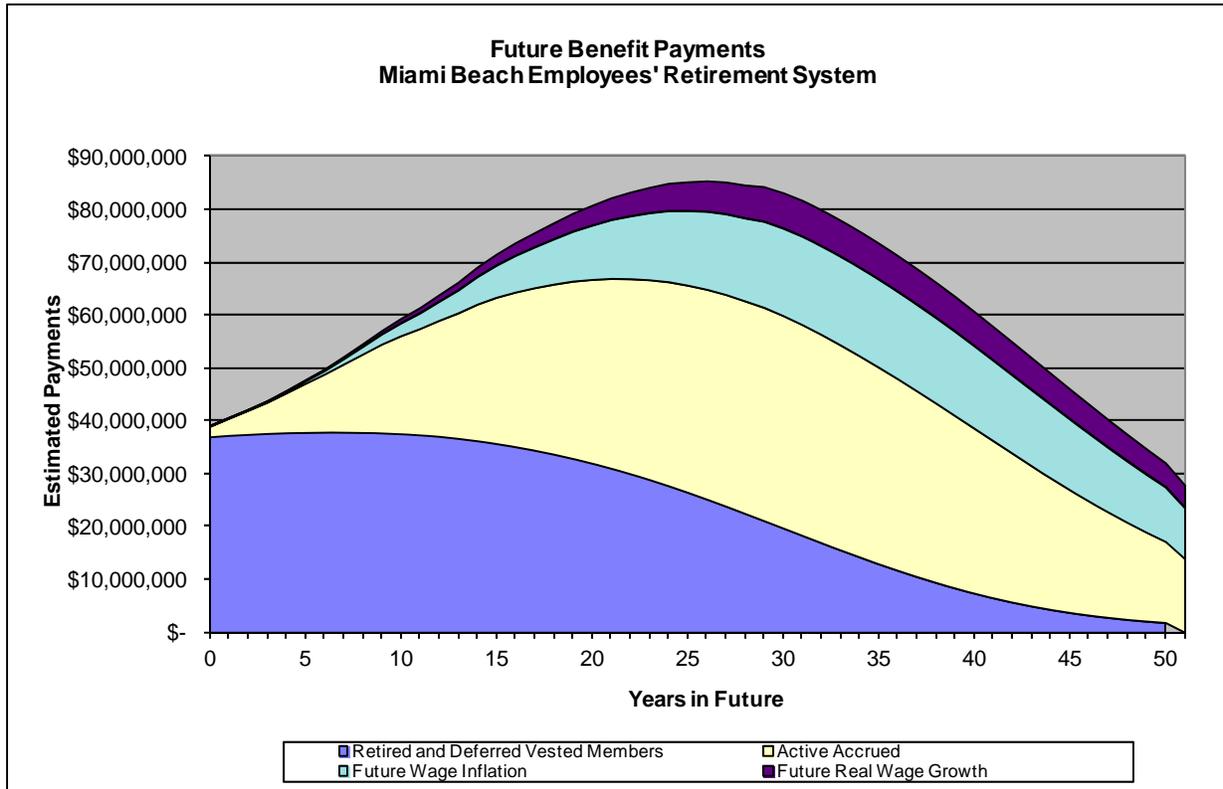

Future Benefit Payments
Miami Beach Employees' Retirement System

Figure 5

Present Value of Future Benefit Payments
Miami Beach Employees' Retirement System

Legend: Retired and Deferred Vested Members — Active Accrued — Future Wage Inflation — Future Real Wage Growth
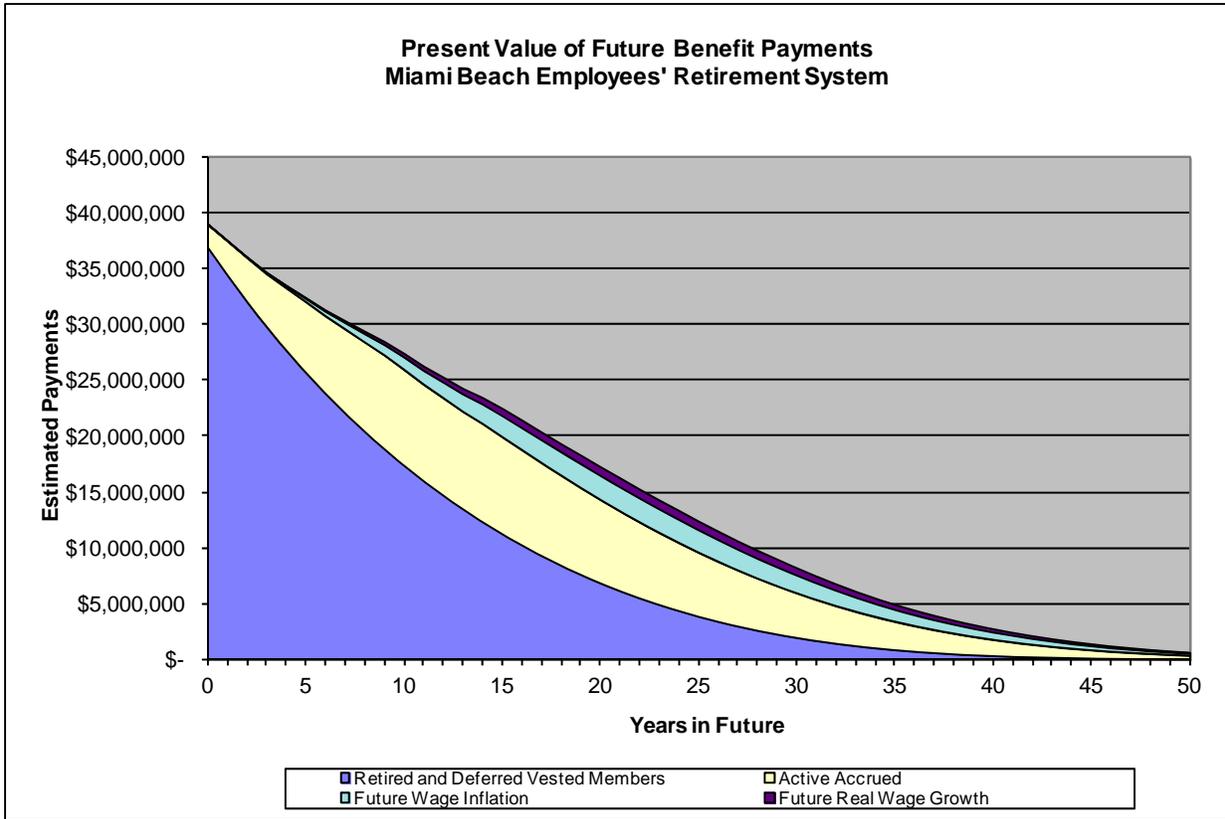
Figure 6

The long duration of the Plan's liabilities makes them highly sensitive to changes in the inflation rate and real rate of return. Absent a change in expected real returns, a 1% decrease in the inflation assumption increases the present value of liabilities to $851.9 million, a 11.0% increase. Decreasing the real return assumption from 4.0% to 3.0% without an offsetting change in inflation increases the present value of liabilities by 14.2% to $876.9 million.

Funding Ratio Implications

In our analysis, we consider the funded status – the value of the liabilities relative to the assets. When liabilities are larger than assets, the assets must move more than the liabilities in market value to maintain the same dollar funded status. For example, if liabilities are $100 and assets are $80 and the liabilities increase 10% to $110, the assets must increase 12.5% to $90 to maintain the same $20 under-funded status; the same is true for negative returns.

The Plan's assets as of September 30, 2012 were $423.4 million, less than the projected present value of the liabilities of $767.8 million. We adjusted the funded status volatility estimate upward to reflect this ratio.

Our projected value of the liabilities is close to the actuarial present value of all projected

benefits of $741.8 million calculated by Gabriel Roeder Smith & Company[2] using an 8.0% assumed rate of return. Our projected liability value implies a 57.1% funding ratio as of September 30, 2012.

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[2] Gabriel Roeder Smith & Company Actuarial Valuation Report as of October 1, 2012

Liabilities Summary

We undertook a review of the Plan's liabilities to consider the time-horizon of payments and the sensitivity of the liabilities to factors that can also cause asset values to vary.

Payments to all current members are expected to be paid on average 13.7 years into the future. These payments have characteristics similar to a long-term bond. This 13.7 year duration indicates that the value of the Plan's liabilities is exposed to substantial volatility from changes in the assumed discount rate: a 1% decrease in inflation causes an increase of 11.0% in the liabilities' present value, while a 1% decrease in the real return causes a more substantial increase of 14.2% in the value of the liabilities.

The liability characteristics developed in this section are used in the following section to develop the relationship of the liabilities with the asset classes.

Comparison to Prior Studies

General Employees' Retirement Plan

Liabilities	Retired Members		Active Members		Combined Members	
	Present Value	Duration	Present Value	Duration	Present Value	Duration
1996	$101.1 mm	8.7	$46.1 mm	17.4	$147.1 mm	11.4
2005	$176.6 mm	8.6	$133.5 mm	19.6	$310.1 mm	13.3

Unclassified Employees' Retirement Plan

Liabilities	Retired Members		Active Members		Combined Members	
	Present Value	Duration	Present Value	Duration	Present Value	Duration
2005	$59.4 mm	8.6	$46.4 mm	16.7	$105.8 mm	12.2

Merged Employees' Retirement Plan

Liabilities	Retired Members		Active Members		Combined Members	
	Present Value	Duration	Present Value	Duration	Present Value	Duration
2007*	$271.8 mm	8.7	$192.3 mm	16.7	$464.1 mm	12.0
2007**	$271.8 mm	8.7	$272.3 mm	18.7	$544.1 mm	13.7
2013	$448.4 mm	9.3	$319.4 mm	19.9	$767.8 mm	13.7

*The first 2007 row shows data calculated using the same methodology as the prior studies.
**The second 2007 row shows data incorporating future wage and service growth, which is somewhat more consistent with the valuation approach utilized by Gabriel Roeder Smith & Co.

ASSET ALLOCATION ALTERNATIVES

Introduction

If it were possible to create an asset mix that matched the liabilities' uncertainties in all regards, there would be no uncertainty about funding – the Plan could project future funding ratios exactly, based on contribution levels. It is possible to build a dedicated bond portfolio which would fund projected benefit payments virtually exactly. We do not believe the Plan should pursue this "riskless" goal, for the following reasons:

- No asset or combination of assets match the sensitivity of the Plan's liabilities exactly because projected benefits are only estimates subject to revision. A bond portfolio with a 13.7 year duration would come close, but using such a portfolio would concentrate the Plan in a small fraction of available investment-grade assets. This would be an undiversified portfolio and would be an unwise asset mix.

- By selecting assets, especially domestic or international stocks, with other patterns of variability, the Plan may be able to get a significantly higher return from its assets. This may be preferred to a less volatile, lower-return mix.

- Liability matching is not the only goal of asset allocation. Very long duration bond portfolios exhibit high absolute price volatility which could prove damaging to a fund in the short-term even though matching the liabilities.

For these reasons we use the total U.S. bond market rather than only very long duration bonds as our U.S. fixed income asset class, and believe a higher return with a mix of different asset classes is preferable to an all bond portfolio/asset mix.

In the following section of the asset allocation study we construct asset mixes which are optimal – the highest expected return for a given amount of uncertainty – incorporating inflation and other sources of uncertainty given the constraints that we have imposed upon the model. The lowest-risk mix best matches the characteristics of the liabilities and thus has the lowest Total Plan Risk; higher-return mixes show additional uncertainty.

Liquidity Allocation

We have modeled the net cash outflows for the next five years and reserved this amount of assets to be invested in matching duration fixed income instruments. Annually, as these bonds mature, new bonds with a five year maturity will be purchased.

This strategy assures that maturing bonds will provide cash to meet liabilities without disturbing the longer time horizon investments. Forced liquidation into a disrupted market would provide poorer returns than we are projecting for our return-seeking assets.

We forecast cumulative negative cash flow of $64 million over the next five years. Given the Plan's assets as of June 30, 2013 were $451.8 million, the Liquidity Allocation represents 14% of total assets.

Asset Categories

This study incorporates three new asset classes not currently included in the Retirement Plan portfolio. We have included real estate (via publically traded REITs), high yield fixed income and hedge funds as enhancements to the Plan's current asset structure. We find it necessary to introduce these asset classes due to their higher expected returns.

To study the asset categories, we selected a representative index for each that captures both the characteristics of the category and is well defined. The asset classes and relevant indexes are listed below:

(1)   Domestic Equities (Russell 3000® Index)
(2)   International Equities (MSCI ACWI ex-USA Investable Market Index)
(3)   Domestic Fixed Income (Barclays Aggregate Bond Index)
(4)   Domestic Long Government/Credit Bonds (Barclays US Long
          Government/Credit Bond Index)
(5)   High Yield Fixed Income (Bank of America Merrill Lynch High Yield Index)
(6)   Real Estate (FTSE EPRA/NAREIT Global Real Estate Index)
(7)   Hedge Funds (Hedge Fund Research, Inc. MultiStrategy)
(8)   Liquidity Allocation (Barclays 1-3 Year Government/Corporate Bond Index)
(9)   Cash and Equivalents (91-day Treasury Bills); and
(10)   Plan Liabilities as developed in the *Liability Analysis* section of this report, shown
          as a negative asset, which other assets serve to offset.

Expected Returns and Uncertainty

Our model uses the expected annual return and the uncertainty of returns (standard deviation) for each asset class. Below are our projections for each asset class:

Asset Class	10-Year Geometric Return	10-Year Arithmetic Return	10-Year Std Dev
Domestic Equities	6.85%	8.25%	18.65%
International Equities	7.15%	9.00%	21.50%
Domestic Fixed Income	2.85%	2.95%	4.45%
Domestic Long Gvt/Crdt Bonds	3.45%	3.85%	9.65%
High Yield Fixed Income	5.75%	6.25%	11.05%
Global Real Estate Securities	6.00%	6.60%	12.00%
Hedge Funds	6.95%	7.25%	8.75%
Liquidity Allocation	2.40%	2.40%	2.35%
Cash and Equivalents	2.80%	2.80%	1.30%
Liabilities	N/A	N/A	15.45%

The table above shows:
Expected Geometric Mean 10-Year Return
Expected Annual Arithmetic Mean 10-Year Return
Expected 10-Year Asset Annual Standard Deviation

The assets' return and risk estimates are taken from Milliman's ten-year investment planning capital market assumptions. The liabilities' uncertainty was derived from their characteristics, primarily the sensitivity of benefit payments to changes in interest rates (duration).

The projections reflect our assessment of returns and risks over the next ten years, and we believe they also approximate how investors in aggregate would expect these assets to perform.

Correlations

The following "correlation matrix[3]" indicates the extent to which we project an increase (or decrease) in the value of one asset class will match an increase (or decrease) in the value of another. For example, the boldface **"0.85"** shows that roughly 85% of increases or decreases in international equity returns can be explained by the behavior of US equity returns.

	US Equity	Int'l Equity	Dom Bonds	Long Bonds	High Yield	Real Estate	Hedge Funds	Liquidity Reserve	Cash	Liab.
US Equity	****									
Int'l Equity	**0.85**	****								
Domestic Bond	-0.12	-0.10	****							
Dometic Long Gvt/Crdt Bond	-0.14	-0.11	0.91	****						
High Yield	0.69	0.64	0.06	0.00	****					
Global Real Estate Securities	0.70	0.80	0.05	0.01	0.65	****				
Hedge Funds	0.81	0.75	-0.13	-0.17	0.66	0.63	****			
Liquidity Allocation	-0.15	-0.16	0.86	0.62	0.00	-0.04	-0.07	****		
Cash	0.00	-0.10	0.26	0.07	-0.11	-0.13	0.15	0.57	****	
Liabilities	-0.05	-0.02	0.75	0.90	0.08	0.09	-0.10	0.48	-0.02	****

The correlations used in this study take into consideration their recent historical values. Correlations to the liabilities are derived by analyzing the sensitivities in the previous section.

Since the present value of pension liabilities is determined most importantly by interest rates, the correlation of domestic bonds to liabilities is high: 75%. Equity values are more sensitive to the changes in perceived real returns. Some of the equity volatilities are also due to changing interest rates, as shown by their correlation to bonds. Additionally, equity returns significantly depend achieved economic and profit growth as well as investor perceptions of future economic growth. These factors have limited impact on our liability computations. International equities have a modest positive correlation to the liabilities through their similarity to domestic equity returns. Hedge funds are designed to be relatively uncorrelated to traditional asset classes, but do have some correlation as shown above.

Constraints

A maximum of 5% was specified for High Yield Fixed Income, Global Real Estate Securities and Hedge Funds. This constraint was put in place to limit the model's allocation as we establish an Efficient Frontier for consideration.

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[3] From Milliman's Capital Market Assumptions published 6/30/2013

Comparison to Other Public Funds

We have also reviewed surveys of the asset allocations of various public funds. We have modeled a representative public fund allocation as shown below. This data is based upon a survey conducted by Pension & Investments of the 1,000 largest US defined benefit plans.[4]

	Public Fund Average
Domestic stock	27.5%
International stock	17.1
Global stock	2.6
Domestic Fixed Income	27.1
Global Fixed Income	2.0
Cash	2.0
Private Equity	9.4
Real Estate Equity	6.5
Alternatives	4.6
Other	1.2

For the purposes of modeling these allocations in our system, several adjustments were made:

- Global allocations were allocated proportionally to domestic and international segments
- Cash was allocated proportionally to all asset categories
- Global Fixed income was allocated to Domestic Fixed Income
- Private Equity and Other Assets are included in Alternatives
- The Expected Return, Standard Deviation and Correlation for Hedge Funds is used for the Alternatives category to calculate the Public Fund Portfolio's Expected Return, Total Plan Risk and Standard Deviation

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[4] Asset allocation for the top 1,000 defined benefit plans as of September 30, 2011 per Pension & Investments. Published 2/6/2012.

The following table compares the public fund average to the Plan's current Policy Portfolio[5].

Asset Class	Current Policy	Public Fund Average
Domestic Equities	51%	30%
Int'l Equities	18	18
US Fixed Income	31	30
Global Real Estate Securities	0	7
Private Equity	0	0
Cash & Equivalents	0	0
Hedge Funds/Alternatives	0	15
Expected:		
Arithmetic Mean 10-Year Return	6.8	6.7
Geometric Mean 10-Year Return	6.1	6.1
Annual Std Dev of Asset Returns	13.0	11.4
30-Year Geometric Mean Return	6.8	6.5

30-Year Return is based on Milliman's Long Term Capital Market Assumptions

This analysis indicates that the Public Fund average asset allocation offers a slightly lower expected return with a significantly lower risk than the current Retirement Plan Policy Portfolio asset allocation.

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[5] City of Miami Beach Employees' Retirement Plan Asset Targets as of 6/30/2013.

Broad Risk/Reward Analysis of Efficient Frontier

The "Efficient Frontier" is a risk/reward plot of optimal portfolios. The Efficient Frontier identifies the asset mixes with the lowest level of risk for a given expected return.

For this study, we have developed the Efficient Frontier based on asset return risk. We also calculate the Total Plan Risk for each portfolio so we can compare this alternative risk measure across the different portfolios.

We begin our analysis with a broad range of the Efficient Frontier, moving from a portfolio with a high percentage of the portfolio allocated to fixed income to a portfolio with a low allocation to fixed income. Later in this section we will consider a narrow range of the Efficient Frontier and portfolio mixes which are variations on the current Policy Portfolio.

Optimal Asset Mixes for Given Risk Levels: Broad Risk/Reward Range

Broad Range Asset Mix Alternatives

Asset	*Limits* min	max	*6/30/13* Actual	*Current* Policy	*A*	*B*	*C*	*D*	*E*	*F*	*G*
Domestic Equities	0%	100%	53%	51%	17%	21%	25%	28%	31%	34%	37%
International Equities	0%	100%	17%	18%	10%	12%	15%	20%	26%	32%	39%
Domestic Fixed Income	0%	100%	30%	31%	38%	22%	0%	0%	0%	0%	0%
Domestic Long Gvt/Crdt Bonds	0%	100%	0%	0%	21%	35%	50%	40%	30%	19%	9%
High Yield Fixed Income	0%	5%	0%	0%	5%	5%	5%	5%	5%	5%	5%
Global Real Estate Securities	0%	5%	0%	0%	0%	0%	0%	1%	4%	5%	5%
Hedge Funds	0%	5%	0%	0%	5%	5%	5%	5%	5%	5%	5%
Liquidity Allocation	0%	100%	0%	0%	4%	0%	0%	0%	0%	0%	0%
Cash and Equivalents	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
			100%	100%	100%	100%	100%	100%	100%	100%	100%
Expected:											
Arithmetic Mean 10-Year Return			6.8	6.7	5.0	5.5	6.0	6.5	7.0	7.5	8.0
Geometric Mean 10-Year Return			6.1	6.1	4.8	5.2	5.7	6.0	6.4	6.7	6.9
Annual Std Dev of Asset Returns			13.0	12.9	6.6	7.8	9.1	10.5	12.3	14.2	16.2
Total Plan Risk (Std Dev of Surplus)			17.0	16.9	14.1	14.0	13.9	14.8	15.8	16.8	17.9

Mixes A–G in the above Broad Asset Mix Alternatives table make up the range of optimal portfolio asset mixes—the Efficient Frontier. Each of the mixes offers the highest possible expected return for a given level of asset risk.

The mixes above range from Mix A, the most conservative (lowest risk, lowest expected return), to Mix G, the most aggressive (highest risk, highest expected return). The least-uncertain asset mix shown, Mix A, is comprised primarily of bonds, the asset class with the lowest expected return and risk; the highest-return mix is comprised mostly of international equities, the asset class with the highest expected return and risk. The most-uncertain mix, Mix G, has substantially

more uncertainty, but 3.0% per year higher expected return than Mix A. The Current Policy Portfolio has an expected return similar to Mix D above, but has no allocation to High Yield Fixed Income, Real Estate or Hedge Funds. While the expected return of the current mix is similar to Mix D, the current target has a higher level of volatility and asset risk.

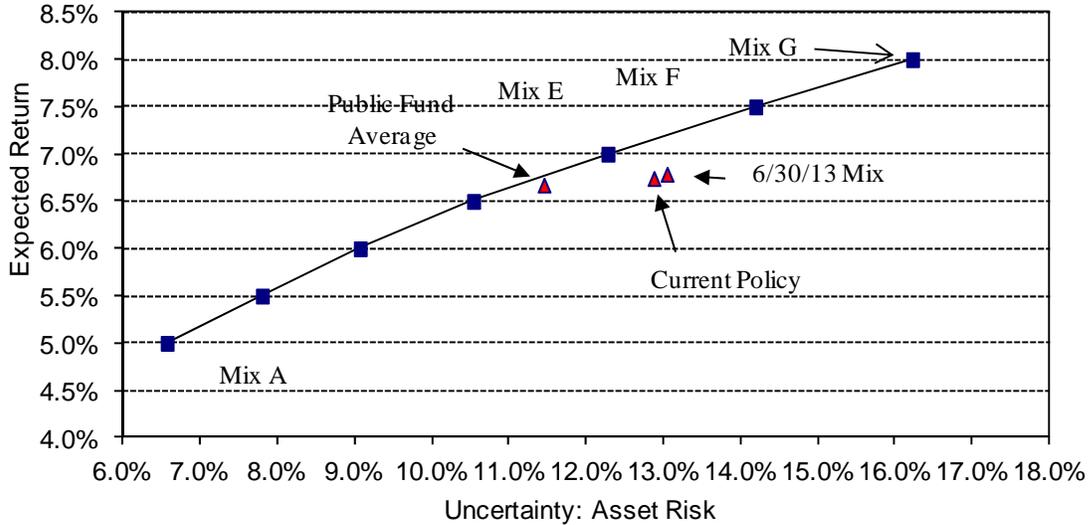## Efficient Frontier of Broad Range of Asset Mixes

Figure 7

In Figure 7 above, seven broad "optimal" asset mixes are plotted on a risk/return graph against the risk of the assets only, independent of any expected change in the liabilities displayed. Points are plotted for the Plan's actual 6/30/2013 portfolio, the Plan's current Policy Portfolio and the average public pension plan portfolio asset mixes. Based on this analysis, the current Policy Portfolio falls close to our Efficient Frontier. We will focus on the range of possible mixes between Mix E and Mix F above in the next section of the report because these are the mixes that are projected to generate returns that are closer to the actuarial interest rate and will provide a well-diversified asset mix.

While the output of our model specifies seven optimal assets mixes in the Broad Risk/Reward Range, there are virtually an infinite number of efficient asset mixes. Between each risk-reward point in the above table there are many slightly different efficient risk/reward asset mix portfolios. Because the Mixes A through D and G seem inappropriate, we derived additional efficient mixes within the range of Mixes E through F. The results are shown below:

Optimal Asset Mixes for Given Risk Levels: Variances from Current Policy (Target) Portfolio

Asset Mix Alternatives

Asset	Current Actual Portfolio	Current Policy 1	2	3	4	5	6	7	8	9	10	11	12	13	14
Domestic Equities	53%	51%	49%	49%	49%	46%	46%	44%	51%	49%	49%	49%	46%	46%	44%
International Equities	17%	18%	17%	17%	17%	16%	16%	15%	18%	17%	17%	17%	16%	16%	15%
Domestic Fixed Income	30%	31%	29%	29%	29%	28%	28%	26%	17%	15%	15%	15%	14%	14%	12%
Domestic Long Gvt/Crdt Bonds	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
High Yield Fixed Income	0%	0%	5%	0%	0%	5%	0%	5%	0%	5%	0%	0%	5%	0%	5%
Global Real Estate Securities	0%	0%	0%	5%	0%	5%	5%	5%	0%	0%	5%	0%	5%	5%	5%
Hedge Funds	0%	0%	0%	0%	5%	0%	5%	5%	0%	0%	0%	5%	0%	5%	5%
Liquidity Allocation	0%	0%	0%	0%	0%	0%	0%	0%	14%	14%	14%	14%	14%	14%	14%
Cash and Equivalents	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Expected:															
Arithmetic Mean 10-Year Return	6.79	6.74	6.74	6.86	6.79	6.81	6.86	6.85	6.67	6.66	6.78	6.71	6.73	6.78	6.78
Geometric Mean 10-Year Return	6.08	6.05	6.07	6.13	6.12	6.12	6.17	6.19	5.98	5.99	6.06	6.05	6.04	6.10	6.11
Annual Std Dev of Asset Returns	13.03	12.86	12.70	13.20	12.66	12.86	12.82	12.66	12.85	12.69	13.19	12.65	12.85	12.81	12.65
Total Plan Risk (Std Dev of Surplus)	16.99	16.92	16.88	16.98	16.92	16.87	16.90	16.86	17.08	17.04	17.14	17.08	17.03	17.07	17.03
30-Year Geometric Mean Return	6.78	6.77	6.79	6.81	6.74	6.80	6.76	6.77	6.63	6.64	6.67	6.60	6.66	6.62	6.63

30-Year Return is based on Milliman's Long Term Capital Market Assumptions

The table above shows several portfolios which are variations from the current Policy (target) portfolio mix for consideration. (As a new asset class is added, all other weights reduced proportionally.) A description for the various portfolios is shown below:

1. Current Policy portfolio mix
2. Current Policy mix with 5% High Yield Fixed Income
3. Current Policy mix with 5% Real Estate
4. Current Policy mix with 5% Hedge Funds
5. Current Policy mix with 5% High Yield Fixed Income and 5% Real Estate
6. Current Policy mix with 5% Real Estate and 5% Hedge Funds
7. Current Policy mix with 5% High Yield Fixed Income and 5% Real Estate and 5% Hedge Funds
8. Current Policy mix with fixed income allocation split into a 5-year net payout matched portfolio
9. Current Policy mix with fixed income allocation split into a 5-year net payout matched portfolio with 5% High Yield Fixed Income
10. Current Policy mix with fixed income allocation split into a 5-year net payout matched portfolio with 5% Real Estate
11. Current Policy mix with fixed income allocation split into a 5-year net payout matched portfolio and "other fixed income" with 5% Hedge Funds

12. Current Policy mix with fixed income allocation split into a 5-year net payout matched portfolio and "other fixed income" with 5% High Yield Fixed Income and 5% Real Estate
13. Current Policy mix with fixed income allocation split into a 5-year net payout matched portfolio and "other fixed income" with 5% Real Estate and 5% Hedge Funds
14. Current Policy mix with fixed income allocation split into a 5-year net payout matched portfolio and "other fixed income" with 5% High Yield Fixed Income and 5% Real Estate and 5% Hedge Funds

The alternative portfolios shown above are all variations on the current Policy Portfolio to illustrate how introducing other asset classes would impact risk and return. We show both 10-Year Returns and 30-Year returns in the table above. Because interest rates are currently very low, expected 10-Year returns for fixed income investments are lower than expected 30-Year returns. Over a 10-year investment horizon, as interest rates rise, returns from fixed income investments will be low, or even negative, for some periods reducing expected 10-year returns. After interest rates returns to more normal levels we expect fixed income investment returns to be larger and positive. Therefore, expected 30-year returns are higher than expected 10-year returns.

Within the set of mix alternatives including the Liquidity Allocation, Mix 14 is the highest return mix with an expected return of 6.78% and a Total Plan Risk of 17.03%. The asset mix alternatives in the narrowed asset mix table provide more appropriate options for the Retirement Plan, given the return objectives described above, the risk tolerance implied by the Plan's current (actual) asset mix, and the risk/return posture of the current asset mix of the Plan.
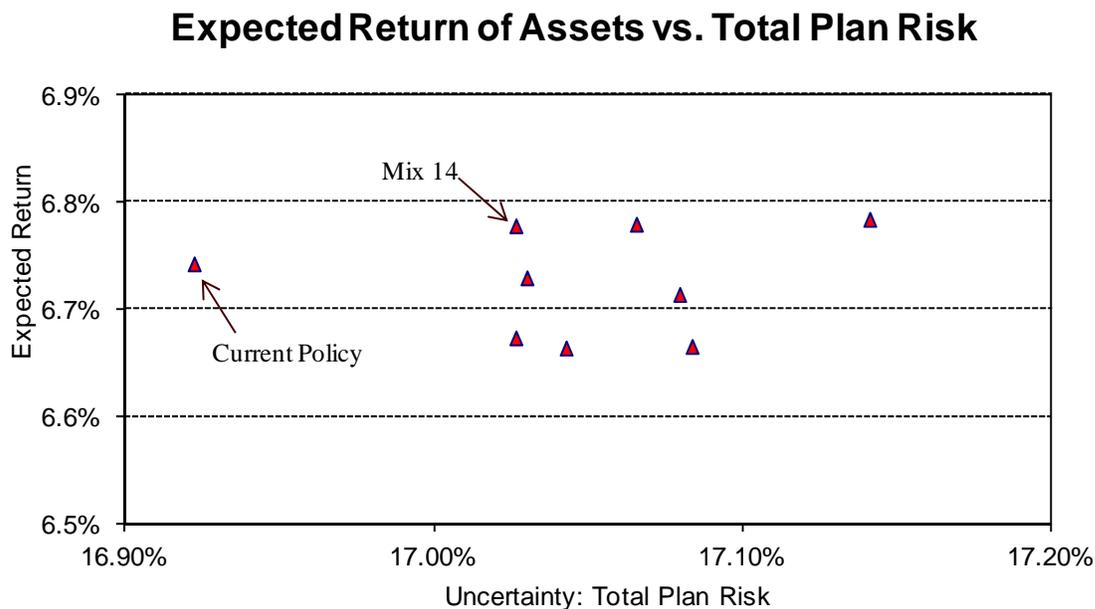

Figure 8

Figure 8 above zooms in and isolates the proposed asset mixes which include the Liquidity Allocation plotted on the Efficient Frontier for expected return and Total Plan Risk.
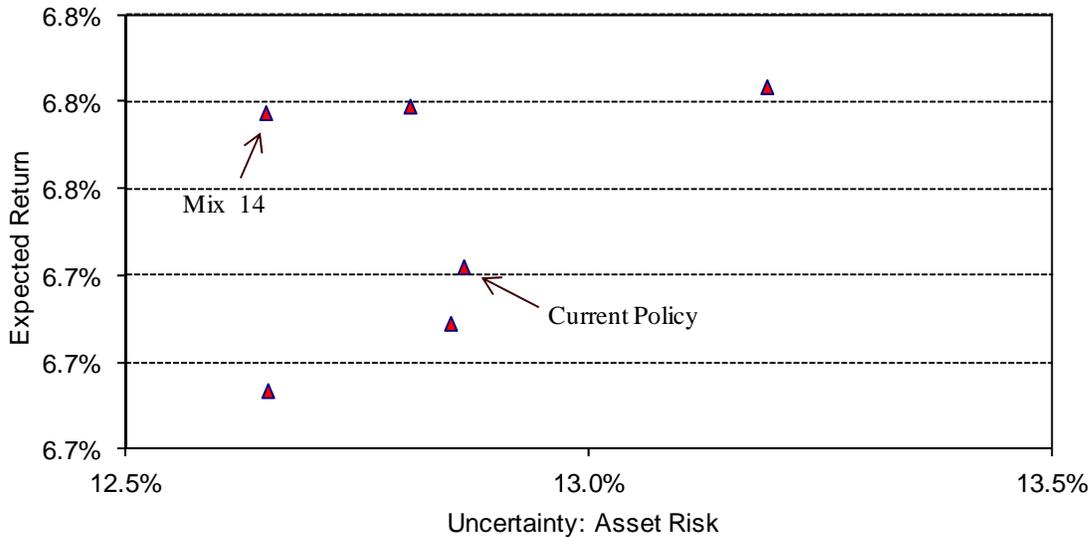
Expected Return of Assets vs. Asset Risk

Figure 9

Figure 9 above zooms in and isolates the proposed asset mixes which include the Liquidity Allocation plotted on the Efficient Frontier for expected return and the risk of the assets only, independent of any expected change in the liabilities.

Asset Allocation Summary

Using the expected return, risk and correlation numbers developed in this section, we identified the Efficient Frontier for the Miami Beach Employees' Retirement Plan, taking into account the Plan's liabilities. We determined that the current asset mix of the Plan is reasonably efficient on a risk/return basis, but offers less diversification and expected return than other mixes, and falls well short of the actuarial interest rate. We have presented a number of other possible mixes for the Retirement Plan's consideration.

Tactical Asset Allocation

This asset allocation study uses long-term (ten year horizon) expected returns. There may be times when these expected returns have changed. For example, if equities decline in value by 50%, the long-term expected return should increase and a higher allocation to equities may be justified.

While we generally recommend a new asset allocation study every 3-5 years, volatile markets may necessitate reviewing asset allocation to take advantage of opportunities.

RECOMMENDATION AND CONCLUSION

A case could be made why the Miami Beach Employees' Retirement Plan might wish to adopt a number of different asset mixes. We propose the adoption of Mix 14 which offers a reasonable return, lower risk and is better diversified than the current asset mix.

The Retirement Plan current Policy Portfolio, Proposed Mix and Proposed Asset Ranges are detailed below.

Asset	Current Policy Portfolio	Proposed Policy Portfolio Mix 14	Proposed Asset Range for Mix 14
Domestic Equities	53%	44%	40-50%
International Equities	17%	15%	12-18%
Domestic Fixed Income	30%	12%	10-14%
Domestic Long Gvt/Crdt Bonds	0%	0%	0%
High Yield Fixed Income	0%	5%	2-7%
Global Real Estate Securities	0%	5%	2-7%
Hedge Funds	0%	5%	2-7%
Liquidity Allocation	0%	14%	14%
Cash and Equivalents	0%	0%	0-2%
	100%	100%	100%

Expected:		
Arithmetic Mean 10-Year Return	6.7	6.8
Geometric Mean 10-Year Return	6.1	6.1
Annual Std Dev of Asset Returns	12.9	12.6
Total Plan Risk (Std Dev of Surplus)	16.9	17.0
30-Year Geometric Mean Return	6.8	6.6

30-Year Return is based on Milliman's Long Term Capital Market Assumptions

RISK: AN AREA FOR FUTURE ANALYSIS

There are areas outside the scope of this asset allocation study that merit consideration for further research. This analysis would quantify risk under various historical economic scenarios, such as the 2008/2009 financial crisis, periods of rising interest rates, etc. Also, an analysis of the portfolio's sensitivity to risk factors such as inflation, slow economic growth, etc. would help quantify expectations under various scenarios.

APPENDIX — HISTORICAL RETURNS

The historical returns for the last 1, 5, 10, and 20 year periods for the portfolios examined in this study are presented below. The green shaded returns indicate the asset mix with the best performance over the time period (highest return, lowest volatility, highest Sharpe ratio). The red shaded returns indicate the asset mix with the worst performance over the time period.

Asset Class	Current Actual Portfolio	Current Policy 1	2	3	4	5	6	7	8	9	10	11	12	13	14
Domestic Equities	53%	51%	49%	49%	49%	46%	46%	44%	51%	49%	49%	49%	46%	46%	44%
International Equities	17%	18%	17%	17%	17%	16%	16%	15%	18%	17%	17%	17%	16%	16%	15%
Domestic Fixed Income	30%	31%	29%	29%	29%	28%	28%	26%	17%	15%	15%	15%	14%	14%	12%
High Yield Fixed Income	0%	0%	5%	0%	0%	5%	0%	5%	0%	5%	0%	0%	5%	0%	5%
Global Real Estate Securities	0%	0%	0%	5%	0%	5%	5%	5%	0%	0%	5%	0%	5%	5%	5%
Hedge Funds	0%	0%	0%	0%	5%	0%	5%	5%	0%	0%	0%	5%	0%	5%	5%
Liquidity Allocation	0%	0%	0%	0%	0%	0%	0%	0%	14%	14%	14%	14%	14%	14%	14%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Historical Information based on Quarterly Returns on Representative Benchmarks for Periods Ending September 30, 2013:

Annualized Return:

	Current Actual Portfolio	Current Policy 1	2	3	4	5	6	7	8	9	10	11	12	13	14
Last Year	13.51%	13.23%	13.03%	13.23%	13.03%	12.80%	12.79%	12.60%	13.59%	13.39%	13.60%	13.39%	13.16%	13.16%	12.96%
Last 5 Years	8.98%	8.90%	9.16%	8.92%	8.74%	9.14%	8.72%	8.98%	8.45%	8.71%	8.47%	8.29%	8.69%	8.28%	8.54%
Last 10 Years	7.66%	7.64%	7.72%	7.83%	7.57%	7.88%	7.73%	7.81%	7.38%	7.46%	7.57%	7.32%	7.62%	7.48%	7.56%
Last 20 Years	7.94%	7.89%	7.91%	8.01%	7.97%	8.01%	8.07%	8.09%	7.68%	7.71%	7.81%	7.76%	7.80%	7.86%	7.89%

Annualized Standard Deviation:

	Current Actual Portfolio	Current Policy 1	2	3	4	5	6	7	8	9	10	11	12	13	14
Last Year	6.04%	5.95%	5.81%	5.96%	5.83%	5.76%	5.78%	5.66%	5.76%	5.62%	5.76%	5.65%	5.56%	5.58%	5.45%
Last 5 Years	15.20%	15.00%	15.00%	15.80%	14.76%	15.58%	15.33%	15.34%	15.12%	15.12%	15.91%	14.88%	15.69%	15.45%	15.45%
Last 10 Years	12.23%	12.09%	12.06%	12.68%	11.92%	12.48%	12.34%	12.31%	12.13%	12.10%	12.72%	11.96%	12.52%	12.38%	12.35%
Last 20 Years	11.99%	11.82%	11.67%	12.12%	11.68%	11.80%	11.80%	11.66%	11.86%	11.71%	12.16%	11.72%	11.84%	11.84%	11.69%

Sharpe Ratio:

	Current Actual Portfolio	Current Policy 1	2	3	4	5	6	7	8	9	10	11	12	13	14
Last Year	1.067	1.061	1.071	1.060	1.065	1.060	1.056	1.064	1.123	1.135	1.123	1.129	1.128	1.122	1.133
Last 5 Years	0.316	0.317	0.325	0.305	0.316	0.315	0.306	0.314	0.301	0.309	0.291	0.300	0.300	0.291	0.299
Last 10 Years	0.263	0.265	0.268	0.262	0.265	0.267	0.264	0.268	0.254	0.258	0.252	0.255	0.257	0.254	0.257
Last 20 Years	0.223	0.223	0.226	0.224	0.228	0.228	0.230	0.233	0.214	0.217	0.215	0.220	0.219	0.222	0.225

Best performance
Worst performance