Memorandum

To	State of Michigan Retirement Systems
From	RVK, Inc.
Subject	MJRS Asset/Liability Study – Executive Summary
Date	September 4, 2014

Introduction

The purpose of this memorandum is to summarize the key inferences we draw from the Asset/Liability ("A/L") study of the Michigan Judges' Retirement System ("MJRS" or the "Plan"). While this memorandum refers directly to points raised within the study, we emphasize that a full understanding of the A/L study and its implications requires a close review of the study in its entirety.

Background and Key Conclusion

As of September 30, 2013, the date of the most recent actuarial valuation and the start date of the projections in this study, the Plan was 100% funded (on a market value basis) meaning that assets were available to fully cover projected Plan liabilities as currently estimated by the Plan's actuary. As highlighted below, this study suggests that continued diversification in the investment of Plan assets is required to maintain full funding throughout the projection period. The study also cautions that the increased pursuit of higher expected returns, through even more aggressive (and hence even more volatile) asset allocations, is always beneficial. High expected return and high expected risk approaches bring with them increased risk of large declines in the value of the Plan and increased volatility in required contributions.

The Purpose of an Asset Liability Study

The central purpose of an A/L study is to examine the probable future consequences, over extended periods of time, of applying alternative asset allocation strategies to the Plan's investment assets in order to fund the liabilities created by the benefit provisions of the Plan. A/L studies are unique in their ability to combine in a single analysis the three critical factors that drive the financial health of the Plan—benefit policy (liabilities), contribution policy, and investment strategy (asset allocation). Certainly this type of forward looking study—nor any others we are aware of—cannot indicate with any reliability what will happen in any given year over this extended period of time and its insights are dependent on the assumptions used. However, we have high conviction that the study's results paint a highly reliable view of the core long-term trends in the Plan's financial health. Best practice, in our judgment, is to take the general direction suggested as most appropriate by this study with its unique consideration of liabilities, contribution policy and trending liquidity needs and refine it in an asset allocation study where implementing the Plan's structure can reflect the pragmatic considerations of investing in the capital markets present at any given point in time.

Deterministic versus Stochastic

In this study, we examined a series of related questions associated with this central purpose, projecting future outcomes under two distinctly different methodologies:

1. a **deterministic** basis (all underlying assumptions, liabilities, contributions and most critically investment returns, are achieved precisely and without variance in each and every year); and
2. a **stochastic** basis (outcomes for investment returns vary each year according to estimated volatility with contribution *requirements* following suit while *actual* contribution policy and liabilities remains in their current form).

Key Results

Below you will find a series of important findings, forecasts, and conclusions drawn from the body of the study. While the remarks are presented here to allow a quick assessment of some of the key findings, they represent only a sampling of the fundamental elements of the study. We emphasize that a solid understanding of each element requires that they be reviewed as they are presented in the study itself within their surrounding context (please note the frequent page references to the full study). This is especially important to understanding the findings which represent *probable, but not certain,* outcomes as analyzed in the stochastic section of the study.

At the Outset:

- As of September 30, 2013 (the date of the actuarial valuation used to model liabilities), the Plan's market value funded ratio (available assets to fund benefit obligations) was 100% (page 6).

- Given the Plan is closed to new entrants, the number of active members is quickly declining and is expected to be almost 0 at the end of the projection period (page 8). The mature demographics of the Plan is an important factor when considering the findings on Plan risk/return options and the projected status of Plan liquidity below.

Deterministic Analysis: A deterministic analysis assumes full certainty about the future, in particular, certainty of investment returns. Its virtues are that it is simple and that the findings reflect what will happen if the future turns out to be precisely as forecasted—no better, but also no worse.

- Benefit payments to Plan participants are expected to peak in approximately 2022 at which point they begin to decline as the number of retirees also begins to decline (page 9).

- Total annual dollar contributions (employer and employee) based on actuarially required rates are expected to decrease substantially over the next 20 years; from $4.3 million in

2013 to almost non-existent in 2033 (page 10). *Please note however*, that precise actuarially required rates as they unfold are the purview of the Plan's actuary and are affected by factors other than investment returns and resulting asset values of the Plan.

- Benefit payments currently exceed total contribution inflows annually by more than $18 million (page 11). Net cash flow, defined as contributions minus benefit payments, is projected to initially increase to approximately negative $25 million in 2022 before then starting to decline to current levels again in 2033 (page 11).

- As assets are depleted as the natural result of winding down the Plan benefit payments increase relative to assets, a larger portion of Plan assets (the corpus) must be consumed to fund annual benefit payments resulting in higher payout ratios (payout ratios are the percentage of Plan assets in any given year that must be converted to cash and expended to meet benefit payments due). Increased payout ratios, if they rise sufficiently high, can potentially impose liquidity constraints on the management of the portfolio (inhibiting the ability of the Plan to invest with a long term horizon) therefore limiting the opportunity to invest in less liquid asset classes regardless of the return or risk reducing diversification benefits they offer. The payout ratio is projected to gradually increase throughout the projection period from current levels near 9% to about 15% at the end of the projection period. These levels do not, in our opinion, materially inhibit investment opportunities for the Plan (page 12). However, in the future as this ratio inevitably climbs, there will become a point where liquidity demands on Plan assets impose a constraint on the management of the portfolio. This study does not suggest this will occur during the projection period.

- The funding ratio, on a market value basis, is expected to remain roughly constant increase to approximately 89% by 2033 from the current value of 63% (page 15).

- Experiencing a return of 100 basis points below the Plan's current assumed rate of return of 8.00% (i.e., 7.00%) each year for the 20 year projection period would result in a decline in the projected funding ratio to 85% in year 20 versus 104% at the current assumed rate of return (page 16). Additionally, under this scenario cumulative employer contributions would be $48.3 billion higher over the 20 year period. Given the widely shared concerns about the prospects for a low return environment in the capital markets over the foreseeable future, this is a conclusion that should be thoroughly understood and appreciated. In the event that capital markets do not support returns commensurate with the assumed rate of return, reliance on contributions to complete the payout of the Plan's liabilities effectively increases, especially in later years.

Stochastic Analysis: Unlike a deterministic analysis, a stochastic analysis does not assume an unvarying stream of expected investment returns year after year. Instead, it reflects the realistic view that pension plan investment returns are—like the investment markets themselves—volatile and always uncertain. This means that there are a range of possible outcomes for MJRS; some are more likely, others less likely, but still possible.

The deterministic approach is useful for gauging the general direction of change and associated consequences, but adding the element of uncertainty—more specifically year to year variability in the performance of the capital markets and the value of the Plan's assets over time—can offer additional insights, albeit along with considerable complexity.

Uncertainty in future investment returns is taken into account via a stochastic analysis of four different investment approaches (in the table below and on page 22) including a conservative (low risk, asset protective), a highly aggressive (high return seeking with substantial associated risk) approach, and the Strategic Target and Current Allocation of the Plan. The reason for testing such approaches is that at the heart of the MJRS situation is a simple question that is difficult to answer: whether the Plan is better off following a strategy that:

(A) Falls in the general category of higher prospective return with greater risk (i.e. potential for more widely varying outcomes – good or bad), or
(B) Falls in the general category of lower prospective return with concomitantly lower risk (i.e. a tighter band of likely outcomes).

	Strategic Target	Current Allocation	Conservative Portfolio	Aggressive Portfolio
Broad US Equity	28.0	30.3	0.0	35.0
Broad International Equity	16.0	16.1	0.0	20.0
Int. Duration Fixed Income	10.5	11.7	100.0	0.0
Diversified Infl Strat	4.5	4.5	0.0	0.0
Real Estate	10.0	9.3	0.0	15.0
Absolute Return Strategies	6.0	4.4	0.0	0.0
Private Equity	23.0	18.4	0.0	30.0
Cash Equivalents	2.0	5.3	0.0	0.0
Total	100	100	100	100
Capital Appreciation	67	65	0	85
Capital Preservation	13	17	100	0
Alpha	6	4	0	0
Inflation	15	14	0	15
Expected Return	7.9	7.5	4.0	8.7
Risk (Standard Deviation)	15.1	14.1	6.0	18.4
Return (Compound)	6.9	6.6	3.8	7.2
Return/Risk Ratio	0.5	0.5	0.7	0.5
RVK Expected Eq Beta (LC US Eq = 1)	0.8	0.7	0.1	0.9
RVK Liquidity Metric (T-Bills = 100)	61	67	85	56

Essential to answering this question is to ask precisely how MJRS and the Plan's broader constituencies define what "better off" means. The metrics we use for each to determine whether the Plan is "better off" under one approach versus another are as follows:

(1) The effect on funding ratio (and thus on contribution rates which decline with higher funding ratios).
(2) The effect on Plan liquidity (i.e. the Plan's ability to pay annual benefits without major disruption of its strategic asset allocation, the driver of its investment strategy).
(3) The effect on the trend line and stability of annual contributions.
(4) The risk of large, sudden, and highly disruptive short-term declines in the Plan's assets over the course of time and the associated effects on contributions and potentially investment decisions.

The results of this analysis are displayed on pages 23 through 38 of the accompanying A/L study. For purposes of this summary, the consequences of choosing A versus B, as described above, is summarized most clearly in the tables on pages 29 and 38 of the study (copied below followed by explanatory comments).

20 Years	Probability of Full Funding in 2033	Probability of less than 80% Funding in 2033	Probability of less than 60% Funding in 2033	Maximum 1 Year Portfolio Investment Loss
Strategic Target	48%	41%	22%	-38%
Current Allocation	42%	46%	24%	-34%
Conservative Portfolio	1%	96%	70%	-19%
Aggressive Portfolio	54%	37%	22%	-47%

20 Years	Actuarial Funded Ratio in Year 20			Market Funded Ratio in Year 20			Cumulative Employer Contributions in Year 20 (Millions)			Payout Ratios		
	50th	5th	95th	50th	5th	95th	50th	5th	95th	Year 20	2013-2033	
										Median	Peak	Trough
Strategic Target	93.8%	48.5%	703.9%	95.2%	42.0%	749.7%	$82.5	$269.4	$5.1	16.4%	47.1%	2.1%
Current Allocation	86.2%	49.5%	523.2%	85.8%	42.8%	553.4%	$93.3	$262.1	$5.5	18.3%	45.3%	2.8%
Conservative Portfolio	59.8%	47.7%	81.2%	54.3%	41.2%	77.6%	$187.6	$255.9	$80.6	28.9%	46.9%	8.6%
Aggressive Portfolio	107.7%	46.4%	1040.5%	111.6%	39.8%	1120.8%	$71.4	$286.6	$4.7	14.0%	51.9%	1.4%

- The median expected funding ratio for the Strategic Target is marginally below the current level at the end of the 20 year study period (page 38). The Current Allocation, with its associated lower expected return than the Strategic Target, has a median funded ratio at year 20 of 85.8%. This suggests the Plan must continue to target its actuarially assumed rate of return in order to maintain full funding throughout time.

- With the exception of the Conservative Portfolio all portfolios analyzed show a reasonable (greater than 40%) probability of full funding in 20 years (page 29). The Conservative Portfolio shows just a 1% probability of full funding in 20 years.

- While the median payout ratios for all but the Conservative Portfolio remain manageable and not of concern, each of the portfolios shows some probability of extreme payout ratios (45%+) at some point over the next 20 years. This would suggest that up to almost half of Plan asset could need to be liquidated in order to make current year benefit payments. A payout ratio at these levels would inhibit asset allocation decisions as they relate to illiquid asset classes. This is an undesirable long-term solution for investing

Plan assets. While the probability of such events is low, this is a reality the Plan should be aware of. The Conservative Portfolio shows a median payout ratio of almost 29%. This result would need to be fully understood before committing to such an investment program.

- The cumulative cost of providing the Plan's benefits is met through a combination of contributions and the investment returns on those contributions. The Conservative Portfolio requires the largest increase in cumulative contributions (i.e., the direct funding of benefits) (pages 36 and 38). Even under the very unlikely best-case scenario the Plan would have a funded ratio of about 54%, far lower than any of the other portfolios (page 38). The only redeeming virtue of such an ultra-conservative approach is that the potential for large declines in the value of the fund is significantly mitigated albeit at much higher ongoing costs (contributions) and chronic poor Plan financial health.

- The Aggressive Portfolio does appear to have the highest *probability* of producing full funding by 2033 at 54%. *However*, it also has a maximum theoretical one-year portfolio decline of 47%—a loss of almost one half of the Plan's assets, significant we believe by any standard. This likelihood of notably larger one year declines within the study period gives pause to the desirability of a far more aggressive approach simply from a quantitative viewpoint. It also suggests it may be a strategy that is extremely difficult for decision makers to sustain over a long period of time. Declines in the total fund market value of this magnitude are a disruptive event from all aspects of Plan management. Yet, the benefit of such an aggressive approach that makes it superficially attractive can only be realized with any probability if the aggressive and highly volatile approach is maintained for several decades through good times, bad times, and unnerving times. Furthermore, this type of strategy could prove difficult to maintain in future years given the very mature nature of the Plan. For all these reasons, it is not an approach that should be seriously considered without full recognition of the significant risks.

- While RVK supports the conclusions of the study using our current capital market assumptions, we also model for extreme market scenarios to stress test the results of the study. This analysis can be found in Appendices 1 and 2 (beginning on pages 39 and 56 respectively). The first test models the case of extreme market volatility by doubling the assumed standard deviations of all asset classes. The second test models converging market returns by assuming all assets are perfectly correlated (i.e. correlations equal +1.00). The results of these additional analyses show that the *relative* portfolio outcomes do not change, but that the range of potential results widens, indicating higher risk for all asset mixes given the increased systemic volatility and the reduced dampening effects of total fund diversification we assume under these stress scenarios.

Final Comments

This A/L study shows that MJRS is currently fully funded and is likely to remain close to fully funding under the most likely outcomes assuming that assets are fully invested in a diversified portfolio for the next 20 years. However, positive outcomes are extremely dependent on the

contribution policy. The study is not supportive of a long-term, ultra-conservative approach. The increasing potential for large one-year declines suggests that there is likely a limit to the net benefits of adding increased risk in pursuit of additional return. Progress should be monitored periodically through studies such as these, particularly if the Plan encounters a sustained period of lower returns in the capital markets (and thus for the Plan's assets) as well as material changes in contribution policy or benefit levels.

Additionally, this study assumes no further changes are made to the benefit policy at any point during the 20 year projection period. Such changes would fall outside the reach of an Asset/Liability study. However, we do note that even small changes to the benefit policy can have a meaningful long-term impact on the likely future outcomes of the Plan.