

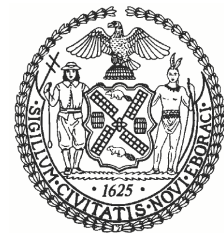
December 5, 2011

City of New York
New York City Retirement Systems
Final Audit of Employer Pension Contribution
Calculations for Fiscal Year 2010
Second Engagement

HayGroup®

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December 5, 2011

The Honorable John C. Liu
Comptroller of the City of New York
c/o The Actuarial Audit Oversight Committee
The Office of the Comptroller
The City of New York

Re: Audit of Employer Contributions to the New York City Retirement Systems (“NYCRS”)

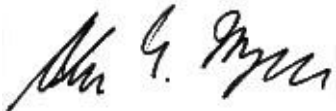
Dear Comptroller Liu:

Hay Group is pleased to submit this report on the Audit of Employer Contribution Calculations for Fiscal Year 2010, a key deliverable under our second biennial engagement to serve as Independent Actuary under Section 96 of the New York City Charter. This report provides a summary of our findings pertaining to this audit.

In general, we believe that the contributions determined by the OA for the NYCRS for fiscal year 2010 have been accurately determined, using sound actuarial assumptions and methodologies, and in accordance with generally accepted actuarial standards and practices.

We look forward to meeting with you to discuss this report.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Adam E. Meyers".

Adam E. Meyers, FSA, EA, MAAA, FCA
Vice President

A handwritten signature in black ink, appearing to read "Craig R. Graby".

Craig Graby, EA, MAAA
Senior Consultant

A handwritten signature in black ink, appearing to read "Leslie H. Richmond".

Leslie H. Richmond, ASA, EA, MAAA, FCA
Senior Principal

Contents

Introduction	5
Executive Summary.....	6
Differences in Valuation Models.....	9
The Audit Methodology	9
Review of Liability Calculations.....	9
Review of Liability Loads.....	10
Review of Actuarial Asset Valuation Method.....	11
Review of One-Year Lag Methodology	18
Data Audits.....	19
Progress on Prior Contribution Audit Recommendations.....	20
Audit Methodology Conclusions.....	20
Variable Supplements Funds.....	20
Cost of Living Adjustments.....	22
Liability Threshold Tests.....	23
Audit Results	24
I. NYCERS	24
II. TRS	29
III. BERS	34
IV. POLICE	39
V. FIRE	44

Appendix A: Detailed Comparison of Statistics and Liabilities – NYCERS.....	49
Appendix B: Detailed Comparison of Statistics and Liabilities – TRS	58
Appendix C: Detailed Comparison of Statistics and Liabilities – BERS.....	63
Appendix D: Detailed Comparison of Statistics and Liabilities – POLICE	68
Appendix E: Detailed Comparison of Statistics and Liabilities – FIRE	72

Introduction

The Office of the Comptroller, on behalf of the City of New York (the “City”), retained Hay Group in June 2008 to perform a range of actuarial audit and related review services relating to the five actuarially-funded City retirement systems (collectively “NYCRS”, or the “Systems”):

- New York City Employees’ Retirement System (“NYCERS”)
- Teachers’ Retirement System of the City of New York (“TRS”)
- Board of Education Retirement System of the City of New York (“BERS”)
- New York City Police Pension Fund (“POLICE”)
- New York City Fire Department Pension Fund (“FIRE”)

The contract covers two consecutive engagements over two biennial periods. Each engagement includes the following for each of the five Systems:

1. An Experience Study that compares actual experience with the assumptions used to calculate employer pension contributions, and comments on the appropriateness of each assumption. (The first engagement includes a review of experience data through June 30, 2007, while the second engagement includes a review of experience data through June 30, 2009.)
2. An Audit of Employer Pension Contribution Calculations (“Contribution Audit”) that confirms the computations of actuarial assets and liabilities, including the software used, and the appropriateness and legality of the actuarial assumptions and methods used. (The first engagement includes an audit of employer pension contribution calculations for Fiscal Year 2008 while the second engagement audits the same for Fiscal Year 2010.)
3. An Administrative Review of the actuarial data gathering process that reviews the data used in the actuarial valuation, the operational procedures used to compile, store and transmit the data, and comments on the quality, completeness, security and safety of the data.
4. Independent Actuary’s Statement that reviews the entire engagement and comments on the financial condition of the Systems and the appropriateness and probity of the City’s funding policies.

This is our Report on the Contribution Audit for Fiscal Year 2010 under the second biennial engagement.

Executive Summary

Based on the audit methodology outlined later in the report, Hay Group has completed its Audit of Employer Contribution Calculations for Fiscal Year 2010 under the second engagement. On the basis of our audit, we believe that the methodologies, procedures, and actuarial assumptions used by the Office of the Actuary (“OA”) were reasonable and appropriate, and in accordance with generally accepted actuarial standards and practices. The OA, which represents the City as well as each of the Systems, is responsible for determining the annual employer contributions to each System.

The following are our general conclusions:

- The valuation results and the employer contributions to the Systems for fiscal year 2010 determined by the Office of the Actuary (“OA”) for all the Systems are accurate.
- The valuation software used by the OA is properly programmed and the results produced are proper valuations of the liabilities and contributions required for each System.
- The actuarial assumptions and methods used by the Actuary are reasonable and accurately applied and, as applicable, adopted by each System’s Board of Trustees and/or promulgated by the New York State legislature.
- The valuation data used by the OA are consistent with that used for our experience studies and were further verified by sample-testing against pension-member records at the Systems.
- All material recommendations for change made in the prior Contribution Audit Report by the prior Independent Actuarial Auditor have been implemented or considered.

Hay Group validated the OA’s results by independently creating our own software, based on our independent assessment of the Systems’ benefit plans, and replicating the OA’s valuation results. If the OA’s result and our result for a liability matched within a certain pre-determined tolerance level, we considered the OA’s results to be validated. We describe later in this report our two criteria (one based strictly on the particular liability being valued, and the second based on the materiality of the liability being valued) for judging whether a given liability result is within our accuracy tolerance. Though some of the differences between Hay Group results and those of the OA for particular liability items were relatively large, none of the differences were material to the overall results, and therefore fell within our accuracy tolerance. The following table summarizes the contributions by System as calculated by the OA and by Hay Group.

Table 1
Comparison of Statutory Contribution Calculations
(\$ in millions)

	Office of the Actuary	Hay Group	Percent Difference
1. Total NYCERS Statutory Contribution:	\$2,198	\$2,255	2.62%
2. Total TRS Statutory Contribution:	\$2,484	\$2,506	0.87%
3. Total BERS Statutory Contribution:	\$147	\$147	-0.01%
4. Total POLICE Statutory Contribution:	\$1,981	\$2,014	1.69%
5. Total FIRE Statutory Contribution:	\$874	\$884	1.11%
6. Total Statutory Contribution for All Systems	\$7,684	\$7,806	1.59%

The funding of the Systems represents a significant annual cost to the City. Even relatively minor inaccuracies in the calculations can make a difference in the contribution in the millions of dollars. The calculations are very complicated, and the OA uses many procedures and methods in the valuations aimed at valuing the benefit obligations in the most reasonable way possible. We found that the OA's interpretations on how to best value the Systems' liabilities are actuarially sound. Also, while we agree that the OA's methods and calculations are accurate, we believe that there are some areas where improvements can be made. A summary of Hay Group's recommendations regarding the valuations follows.

SUMMARY OF HAY GROUP'S RECOMMENDATIONS

In the Sections of this Report which follow, we make observations and recommend topics for additional inquiry, investigation and improvement within the scope of this Contribution Audit that we believe should be addressed by the OA. Each System has its own separate Section, and issues with corresponding observations and recommendations are numbered sequentially within each Section. Below, we list a brief summary of the issues and recommendations. Please refer to the individual Sections for more detail on the issues.

The following are some general areas for possible investigation and improvement.

- Consider modifying the method for determining the liabilities of several of the Variable Supplement Funds, to reflect the expectation that their investment returns are more closely tied to general Fund investment returns.
- Consider modifying the method for calculating the liability impact of Cost of Living Adjustments.
- Consider whether the accuracy of the Post Retirement Death benefit liabilities can be enhanced with improved data and valuation techniques.

The following are System-specific areas for possible investigation and improvement.

- Consider adding additional data processes to check for hire ages less than age 15 (or some other appropriate age), to modify undefined plan codes, and to properly code certain accidental disability retirees in NYCERS.
- Consider updating the historical salary files that are used in the determination of the active valuation liabilities to reflect retroactive adjustments to the pay due to collective bargaining agreements. Pay discrepancies between the experience study data and the historical valuation data were found in TRS, BERS, POLICE, and FIRE.
- Review data grouping processes that can potentially add additional years of service to individual records. Make sure that these processes are still reasonable in light of significant data improvements in the past few years. Specific differences were found in the TRS review, but the OA should consider reviewing the data grouping processes for all Systems.
- Consider updating the TRS and BERS loss conversion factors that result from the annuitizing of Variable Fund (“VF”) and Tax Deferred Annuity (“TDA”) Fund account balances.
- Consider whether the use of truncated service is appropriate for BERS.
- Consider modifying the longevity pay adjustment factors in POLICE and FIRE. Consider whether it is more appropriate to apply adjustment factors that are based on the year in which the salary is earned, not the year in which the average is being determined for valuation purposes.
- Consider removing the dual overtime adjusted contributions from future accumulations for POLICE and FIRE since the dual overtime adjustment only applies in the year of separation due to disability or service retirement.
- Consider adjusting the interest on the required Annuity Savings Fund (“ASF”) balance so that interest is not adjusted beyond the 20th year of service for POLICE and FIRE.

Differences in Valuation Models

It is common knowledge in the actuarial profession that no two actuaries are expected to produce exactly the same actuarial valuation results because of differences in methods and procedures used in the calculations. One of the most common reasons that actuaries produce different results pertains to differences in programming of the different actuarial models that are used to value plan liabilities. For example, Buck Consultants (“Buck”), working with the OA, runs the Systems’ liabilities on their proprietary valuation system, while Hay Group uses its own system that was developed in-house.

One significant programming difference between the Buck valuation system and the Hay Group valuation system is the timing of the decrements (i.e., retirement, disability, etc.) that occur during the year. The Buck valuation system assumes decrements occur uniformly throughout the year and models these uniform occurrences by assuming decrements occur in the middle of the year. The Hay Group model assumes that decrements occur at the beginning of the year on the valuation snapshot date and each subsequent year. It is important to note that while the timing of decrements, either the beginning or middle of the year, will produce slightly different valuation results, both methods are widely used, and are each completely acceptable under professional actuarial standards. The following are generally true related to the timing of decrements:

1. Benefits estimated and valued in the valuation program are generally higher under a mid-year decrement model but are assumed to be paid for a shorter time (by ½ year); and
2. Conversely, benefits are generally valued lower under a beginning-of-year decrement model but are assumed to be paid for a longer time (by ½ year).

Thus, the impacts of the benefit amount and assumed payments largely offset each other, producing similar, but not exactly the same, results. Hay Group understands the acceptability of a mid-year decrement model and therefore sought to remove this factor as a possible source of differences between OA and Hay Group liability calculations. Therefore, Hay Group modified its valuation methodology and applied appropriate adjustments to more closely resemble a mid-year decrement model when performing its independent determination of the liabilities of each System.

The Audit Methodology

Review of Liability Calculations

Hay Group reviewed appropriate law and plan documentation (e.g. summary plan descriptions, valuation reports, etc.) for each System and created its own summary of benefits and eligibilities for each System. Hay Group used these summaries, along with the assumptions provided by the OA in its Gold Books, to independently program its model for each System. In order to understand specific differences in results

independently produced by Hay Group and the OA, Hay Group requested, and the OA provided, a wide variety of individual test cases¹ for each System.

Review of the test cases and conversations with the OA provided Hay Group historical contexts and rationales regarding a number of differences in methods and subtleties in the interpretation of plan provisions that Hay Group did not initially program. Hay Group carefully considered the OA's methods and changed its programs only when, in our professional opinion, it was deemed appropriate to do so.

Two examples of the OA methods that were found through this process are:

1. In the POLICE and FIRE Systems, service retirees are eligible for payments from Variable Supplements Funds ("VSF"). Disability retirees are not eligible for payments from VSFs. The OA assumes that members who have 20 or more years of service and who leave service under an ordinary disability will choose service retirement over ordinary disability retirement. The choice of service retirement is better for the member because the combination of the service retirement benefit plus the VSF payments is more valuable than the ordinary disability benefit alone. This method was not discussed in any of the documentation that Hay Group reviewed; however, Hay Group programmed this method because we agree that it is a more appropriate way of valuing the true liability of the System.
2. Hay Group performs a number of valuations where rates of early retirement (with a corresponding pension reduction) and rates of withdrawal are applied simultaneously. Hay Group initially programmed this simultaneous application of decrements in its valuation programs that covered Systems that offer early retirement. Upon reviewing the OA test cases, Hay Group found that the withdrawal rates were not applied when the member was eligible for either early or normal retirement. Because the OA approach reflected the way the withdrawal rates were developed, Hay Group modified its application of the withdrawal decrements to make them consistent with the development of these rates by the OA.

Review of Liability Loads

The majority of the liability for each System is based upon calculations performed to explicitly determine liabilities for each type of benefit applicable for each member of a System. In some cases, these liabilities cannot be individually determined. In these cases, in our opinion it is reasonable and appropriate for actuaries to determine estimated adjustments to the liabilities of a System. These adjustments are commonly referred to as "liability loads." Hay Group reviewed all of the liability loads used by the OA for the Systems and deems the use of these loads to be reasonable.

For example, liability loads that we deemed as reasonable included the loads added to POLICE and FIRE liabilities, which were intended to approximate the impact of World Trade Center ("WTC") death and

¹ A "test case" is a highly detailed illustration of how pension liabilities are calculated for a sample plan member. A review of test cases is a frequently used method of resolving programming differences in valuation models.

disability benefits on the liabilities. As of June 30, 2008, there was not sufficient data available to explicitly value the impact of the WTC death and disability laws for each individual. In recent years, the OA has collected a significant amount of data on individuals covered by the WTC laws so that these liabilities could be explicitly valued in the future under a set of assumptions applicable to WTC-eligible members. The OA did extensive actuarial analysis to value the impact of WTC laws on the Systems' liabilities to produce their fiscal notes attached to the laws enacting the WTC benefits. On the basis of this analysis and in the absence of credible data and/or WTC-specific actuarial assumptions, the OA adds liability loads to POLICE and FIRE. The OA will continue to use these loads until the liabilities can be valued on an explicit basis. This is expected to be part of the first actuarial valuation that incorporates new packages of actuarial assumptions and methods.

Review of Actuarial Asset Valuation Method

Hay Group has conducted a review of the Actuarial Asset Valuation Method ("AAVM") used to value the Assets for each System. In conducting its review, Hay Group:

- Assessed the accuracy of the asset data inputs into the calculations by comparing the asset values and components from the OA work papers against the recent Comprehensive Annual Financial Report ("CAFR") for each System;
- Reviewed the reasonableness of the asset valuation method itself, in terms of professional guidance, and Hay Group experience and judgment; and
- Reviewed the calculations of the Actuarial Asset Value ("AAV"), to determine whether the method is being applied correctly, and that the calculations themselves are arithmetically accurate.

Summary of the AAVM

The selection of the AAVM comes under the purview of the Chief Actuary of the OA (the "Actuary"). Effective with the June 30, 2004 (one-year lag) valuation, which was used to determine the fiscal year 2006 employer contributions, the Actuary fresh-started the AAVM at June 30, 1999 using the market value of assets. For each fiscal year following June 30, 1999, market values of assets are reconciled from beginning to end of fiscal year. Using the actuarial interest rate as the expected rate of return on System assets, and applying it to the beginning of fiscal year AAV, and the fiscal year's net cash flow, an expected investment return is computed. The difference between the expected and actual investment returns for the fiscal year is called the "unexpected investment return." The unexpected investment returns for fiscal years 2000 and later are phased into the AAV over a six-year period², as follows:

² It should be noted, however, that due to the one-year lag methodology used by the Actuary, the total time period over which unexpected investment returns are phased into the AAV is actually seven years.

Fiscal Year	Cumulative Phase-in Percentage
X (most recent)	15%
X - 1	30%
X - 2	45%
X - 3	60%
X - 4	80%
X - 5	100%

Accuracy of the Asset Data Inputs

Hay Group reviewed the accuracy of the data inputs into the AAV calculations. We checked the market value of assets, contributions, benefit payments (which included transfers to/from other Systems, and other System expenses), and investment income against those shown in recent individual System CAFRs, and the overall City audited financial statement. We took these sources of asset data to be credible, and in all cases reviewed, the asset data matched the items shown on the OA’s worksheet. Therefore, we believe that the asset data inputs used by the OA to compute the AAV are accurate.

Reasonableness of the Methodology

The AAV is not specified to be the market value of assets. In such a case, Actuarial Standard of Practice (“ASOP”) No. 44, “Selection and Use of Asset Valuation Methods for Pension Plans,” states that a reasonable actuarial method of valuing assets should include the following characteristics:

1. The asset valuation method is likely to produce actuarial values of assets that are sometimes greater than and sometimes less than the corresponding market values.
2. The asset valuation method is likely to produce actuarial values of assets that, in the actuary’s professional judgment, satisfy both of the following:
 - a. The asset values fall within a reasonable range around the corresponding market values. For example, there might be a corridor centered at market value, outside of which the actuarial value of assets may not fall, in order to assure that the difference from market value is not greater than the actuary deems reasonable.
 - b. Any differences between the actuarial value of assets and the market value are recognized within a reasonable period of time. For example, the actuary might use a method where the actuarial value of assets converges toward market value at a pace that the actuary deems reasonable, if the investment return assumption is realized in future periods.

The AAVM includes a feature whereby both unexpected asset gains and losses are phased into the AAV in exactly the same manner. Thus, we believe there is no inherent bias above or below market value in the AAVM, and therefore item (a) above is satisfied by the method.

The Actuary has exercised professional judgment in the aspects of the AAVM addressed in items (a) and (b) above. Specifically, the Actuary has elected to not use a corridor around market value to ensure that the AAV is always within a reasonable range of market value, and the Actuary has elected a six-year

period over which to recognize the difference between AAV and market value. The Actuary has also elected a moderate amount of back-loading in the phase-in of gains and losses (i.e., 15% in the first four years, and 20% in the last two years, viewed prospectively).

For private sector plans which must adhere to the Internal Revenue Service code and regulations, a corridor around market value has long been required. Historically, the corridor was such that actuarial value of assets could not be less than 80%, or more than 120%, of market value. More recently, the Pension Protection Act of 2006 (“PPA”) changed the corridor requirement to 90%/110%. Public sector plans, of course, are not bound by this rule. Further, the OA’s election to use a six-year phase-in period provides a relatively high degree of asset smoothing over a reasonably short period of time. This offsets, to some extent, the need for a corridor around market value, because the six-year smoothing should naturally prevent large deviations between the AAV and market value.³ See Table 2 below for the current status of the AAV versus market value. However, there could still be certain advantages to instituting a corridor around market value. For example, under NYCERS, the Housing Police VSF had a market value of \$0 as of June 30, 2006, but had a non-zero AAV, which seems counter-intuitive. This would have been avoided if a corridor was placed around market value. (It should be noted that the basic operation of the AAVM produced a \$0 AAV as of June 30, 2007.) Also, if a continuous pattern of asset either gains or losses occur, the AAV can deviate significantly from the market value.⁴

Table 2
New York City Retirement Systems
Ratio of AAV to Market Value as of June 30, 2008
(\$ millions)

	AAV	Market Value	AAV/MV (%)
NYCERS	\$40,722.2	\$39,716.8	102.53%
TRS	\$32,227.4	\$32,297.8	99.78%
BERS	\$2,084.1	\$2,021.9	103.08%
POLICE	\$21,393.2	\$21,061.0	101.58%
FIRE	\$6,943.0	\$6,817.3	101.84%

Before the enactment of PPA, the longest period allowed for private sector plans to recognize the differences between actuarial and market values of assets was five years. Also, the phase-in of unrecognized gains or losses tended to be evenly spread over the phase-in period. Again, public sector pension plans are not bound by these rules. ASOP No. 44 does not specify a particular limit on the length of the phase-in period, but rather leaves it to the actuary’s judgment. The ASOP is also silent on

³ This statement assumes a pattern of both asset gains and losses during the phase-in period against the expected rate of return. If there is a steady pattern of either gains or losses, the AAV can vary significantly from market value in the absence of a corridor.

⁴ If an AAVM features a corridor, and the AAV is limited by the corridor, then there may be a number of years in which the AAV moves in tandem with the market value. In this case, the purpose of using a smoothed actuarial value of assets method, namely to limit the asset volatility in the valuation, would be negated.

the issue of evenly spreading the unrecognized gains or losses over the phase-in period. Given the lack of specific guidance in the ASOP on the length of time over which to spread asset gains and losses, and the pattern of recognition, there is a range of reasonableness related to these important aspects of the actuarial valuation of assets. Therefore, we believe that the choice of a six-year smoothing method and the degree of back loading of the phase-ins are reasonable.

Accuracy of the AAV Calculations

Hay Group checked the mathematical calculations used by the OA to determine the AAV as of June 30, 2008 and we believe them to be arithmetically correct.

The AAV should produce the same results when applying the 6-year phase-in of unexpected investment gains or losses both prospectively and retrospectively. The OA's worksheets are set up to apply the phase-in retrospectively, which means that they subtract unrecognized portions of the unexpected gains/losses from the valuation date market value of assets. As another mathematical check of the OA's calculations, Hay Group calculated the June 30, 2008 AAV for each System prospectively, which means we reconciled the June 30, 2007 AAV to June 30, 2008 by adding in another year of phased-in gains/losses to the June 30, 2007 AAV, along with the other reconciliation items from year to year. We were able to match the OA's calculations of AAV as of June 30, 2008.

Based on these mathematical reviews, we believe that the OA has accurately applied the AAVM to produce the AAV for each System as of June 30, 2008.

In performing the mathematical reviews of the AAV calculations, Hay Group noted that the AAVs for TRS were different from those shown in the TRS CAFR for June 30, 2008 and prior years. This was caused by a minor change in the OA's methodology for grouping elements of TRS' investment income for purposes of the AAVM. This change recognizes as payouts instead of investment losses the amounts credited as interest on TDA Fixed Funds account balances. Hay Group agrees with this change, though we note that the impact of the AAV as of June 30, 2008 is significant (\$32.2 billion after the change, \$33.9 billion before the change). That said, we hold to our view that the OA has applied the AAVM accurately to determine the AAV for each System.

Conclusion

Based on the observations noted above, we believe that, overall, the AAVM used by the OA to calculate the AAV for each of the Systems is reasonable, is in compliance with applicable Actuarial Standards of Practice, and is accurately applied.

Review of Funding Method

Application of the Current Funding Method

The OA, as required by applicable statutes, uses the Frozen Initial Liability (“FIL”) actuarial funding method for determining the annual employer contributions to the Systems. In the general application of the FIL method, employer contributions are the sum of the Normal Cost and amortizations of unfunded actuarial accrued liabilities (“UAAL”) determined under the Entry Age Normal (“EAN”) actuarial funding method. In determining employer contributions to the Systems, the OA adds administrative and investment expenses to the contributions.

The Normal Cost is determined by (i) subtracting the Actuarial Asset Value, the present value of future member contributions, and the unamortized portion of the UAAL from the total present value of benefits⁵, and (ii) dividing the difference by a factor that will approximate the average future working lifetime of the active employee population. For pension plans (such as NYCERS) in which benefits are determined by a formula applied to members’ salaries, it is common and appropriate to determine the factor by dividing the present value of future salaries for the current active employee population by that population’s current salaries. This is the procedure being used by the OA in applying the FIL method.

UAALs are established upon certain events: plan inception, changing the funding method to FIL, and when plan amendments are enacted by New York State law⁶. In public sector pension funding, there are also instances when the UAAL is reestablished, after the funding method has been in effect for some period of time. The “frozen initial” UAAL is calculated as the difference between the EAN actuarial accrued liability and the Actuarial Asset Value as of the date of plan inception, the change in method to FIL, or the reestablishment of the UAAL. When a plan amendment occurs, the UAAL associated with it is the difference in EAN actuarial accrued liabilities before and after the plan amendment. Once the UAAL has been calculated, the length of time over which it is amortized must be established, as must the pattern of amortization. In public sector pension funding, there are no specific guidelines that pertain to the length of the amortization period, but most employers use a period of 30 years or less.⁷ The pattern of amortization can either be level dollar (much like a fixed-rate mortgage), or can increase annually at some pre-determined percentage.⁸

⁵ Though not part of the general application of FIL, the OA also subtracts the discounted value of the previous year’s contribution (due to the one-year lag methodology).

⁶ In the general application of FIL, plan amendments give rise to a UAAL. However, in NYCERS case, the method of amortizing the effect of benefit changes is sometimes specified in the law establishing the benefit change.

⁷ Before the advent of the Pension Protection Act of 2006, private sector pension plans subject to ERISA funding requirements were required to use a 30-year amortization (level dollar) for changes in UAAL attributable to plan inception, plan changes, and funding method changes. GASB 27, paragraph 10(f)(1) and GASB 25, paragraph 36 (f) (1) state that the maximum amortization period is 40 years, during the first 10 years following the effective date of GASB 25 (which was for periods beginning after June 15, 1996), and then 30 years.

⁸ The percentage increase is usually a rough approximation of estimated future salary increases.

Chapter 85 of the Laws of 2000 reestablished the UAAL as of June 30, 1999, and provided for an amortization period of 11 years beginning with fiscal year 2000, where each annual payment would be 103% of the preceding year's payment. As of June 30, 1999 only FIRE had an unfunded liability, so it was the only System for which a UAAL amortization was established. In the FIRE valuation for fiscal year 2010, the final amortization payment is made.

Chapter 69 of the Laws of 2002 established a UAAL (and the method for amortizing it) as of June 30, 2003 due to the offer of an early retirement incentive to NYCERS, TRS and BERS members. The UAAL was amortized over a 5-year period on a level-dollar basis, beginning in fiscal year 2004, in the valuations for those three Systems. Thus, as of fiscal year 2009, these amounts are fully amortized.

We find that the use of an 11-year period for the amortization for the reestablished UAALs is a reasonable amortization period, and the use of a 5-year period for the amortization of the impact of the early retirement incentive is reasonable as well. Furthermore, we find an increase rate of 3% to the reestablished UAAL amortization to be reasonable, as a simplified rough approximation to the actuarial assumption related to salary increases. Just as the Normal Cost will be a level percentage of payroll if all actuarial assumptions are realized, so will the amortization payment be approximately a level percentage of payroll by assuming a salary-scale type of annual increase to the payment.

In summary, we find that the actuarial funding method used by the OA in the NYCERS valuations is reasonable.

Funding Method Considerations

As noted above, the funding method used by the OA in performing the NYCERS valuations is reasonable based on applicable actuarial standards (the remainder of the Contribution Audit addresses whether the method is applied accurately). Funding methods in general determine the incidence of contributions that will fund the plan sponsor's (in this case, the "plan sponsor" is the City) ultimate benefit obligation, the future stream of benefits payable under the pension plan. In choosing a funding method, the plan sponsor and the actuary may have certain goals they wish to achieve pertaining to the determination and incidence of contribution payments. This section discusses various common goals in public sector pension funding, relates them back to the method used for funding NYCERS, and discusses possible alternative approaches.

1. Intergenerational equity. The idea of avoiding the situation where one generation of taxpayers subsidizes another generation is common in public sector pension funding. In terms of pension funding methods, this would suggest use of shorter amortization periods for unfunded pension liabilities, generally related to the working lifetime of the current active population, or in the case of plan amendments that have a temporary effect (an early retirement incentive, for example), over the length of the temporary period. Based on the FIL method and the amortization periods established for the UAALs, under applicable law and used by the OA in the valuations, we believe that intergenerational equity is achieved. It should be noted that other funding methods can be utilized and achieve the objective of maintaining intergenerational equity. For example, immediate gain

methods which amortize the effects of plan amendments, actuarial assumption and method changes, and actuarial gains and losses, can maintain intergenerational equity if the amortization periods approximate the future working lifetime of active employees.

2. Recognition of plan changes affecting future employees. Public sector employers often amend their pension plans so that changes only affect future hires. This is often due to constitutional or contractual protections. A possible funding goal may be to first recognize the impact of these plan changes when the changes are enacted. However, without an actuarial assumption regarding future new employees, there is no way to calculate the change to benefit liabilities as a result of such an amendment. When an actuary makes an assumption about the number and demographic composition of future (as yet unhired) employees, the funding method is called an “open group” funding method. The OA currently uses a “closed group” funding method (i.e., no assumptions are made about as yet unhired employees, so only the current population is valued for funding purposes). When an actuary uses an open group funding method, plan contributions are higher or lower than under a closed group method, depending on the nature of projected plan amendments taken into account in the valuation and the assumed demographic composition of the future employees who are not yet hired as of the valuation date. The actuary must therefore give thoughtful consideration to the demographic assumptions needed for future employees. However, if the City’s goal in funding NYCERS is to recognize benefit changes applicable to future employees in current valuations, then an open group valuation should be considered.
3. Converging methods used for pension funding and accounting. On June 16, 2010, GASB released its “Preliminary Views on major issues related to Pension Accounting and Financial Reporting by Employers.” Among the views expressed in the paper is that governmental employers should use the Entry Age Normal funding method to determine pension accounting expense. Some governmental employers wish to use the same method for funding and expense calculations, because when pension funding equals the accounting expense for the year, the change to the net pension obligation on the employer’s balance sheet is zero. If this is among the City’s goals, consideration may be given to adopting the Entry Age Normal method.
4. Use of a prevalent funding method. As noted by the prior auditor, the most prevalent funding method in use by public sector pension plan sponsors is the Entry Age Normal method. Contributions under this method are based on the sum of a “normal cost” and amortizations of unfunded liabilities arising from plan inception, plan changes, actuarial assumption changes, and actuarial gains and losses.⁹ The normal cost is determined such that benefits are funded over the full working lifetime of the individual if actuarial assumptions are realized. There is some discretion related to the amortization period and pattern. Thus, based on the amortization period chosen, funding of individuals’ benefits may extend beyond their working lifetime. Some plan sponsors may include among their goals that the funding method used be prevalent. We believe that the choice of funding method be driven by goals related to timing and pattern of expected contributions, and some

⁹ This is as opposed to the FIL method, where the impact of actuarial assumption changes and actuarial gains and losses are reflected in the normal cost, implying that these items would be funded over the working lifetime of the active population, and not beyond.

of the other considerations mentioned above, and that the use of a prevalent method be only a secondary concern.

5. Explicit identification of actuarial gains and losses. Some plan sponsors wish to be able to explicitly identify sources of actuarial gains and losses, so that they can better understand the drivers of pension plan cost changes. Immediate gain funding methods, such as entry age normal and projected unit credit, lend themselves to this type of analysis. If this is a goal of the City, then these funding methods should be considered.

Conclusion

In our opinion, the current actuarial funding method, as applied by the OA to calculate pension contributions for NYCERS, is reasonable. The FIL method in general provides for funding of pension obligations over the working lifetime of employees. To date, the amortization periods that have been used for funding the UAALs are of a sufficiently short period to support the idea of maintaining intergenerational equity. The addition of investment and administrative expenses to the employer contribution determined under the FIL method is a reasonable explicit method of funding these expenses (for those which are initially paid from the trusts).¹⁰

Depending on the City's goals, other funding methods may be preferable. For example, if the City wishes to use the same funding method for accounting (as noted under GASB's Preliminary Views) and funding, a prevalent funding method, and one that lends itself to explicit identification of actuarial gains and losses, then the use of the entry age normal method should be considered. Entry age normal can maintain intergenerational equity as long as the amortization periods approximate the future working lifetime of active employees.

Review of One-Year Lag Methodology

The OA uses a "one-year lag" methodology to calculate the contributions which fund the benefits payable from each System. Under this methodology, an Employer Contribution for FY 2010 is determined based on census and asset data as of June 30, 2008. Thus, the cost for benefits accruing (the "normal cost") during FY 2009 for new entrants to a System on June 30, 2008 is spread, as a level percent of pay, over the remaining expected working lifetime of these new entrants. In effect, since the first contribution (for FY 2009) is skipped for new entrants, higher subsequent contributions are made - during the remaining expected working lifetime of these members - to fully fund the expected cost of future benefits. If all actuarial assumptions are met, the entire cost of an individual's benefit will be fully funded during his or her working lifetime. From this perspective, the one-year lag methodology is

¹⁰ The alternative would be an implicit method of funding these expenses, such as by reducing the AIR assumption.

actuarially sound and an acceptable actuarial method for funding governmental plans.¹¹ The analysis that Hay Group has performed on this methodology has confirmed that the OA's method exhibits this fundamental characteristic of actuarial soundness.

Data Audits

The OA performs a significant number of data checks and has made considerable improvements to the data processes over recent years. Every individual is accounted for through the OA's reconciliation process. This process maximizes data accuracy, ensures that records are not lost, and ensures that liabilities are not undervalued.

Hay Group performed a variety of reasonableness checks and found some minor data issues. The two main discrepancies that we found were hire and birth dates that were inconsistent (e.g. members hired at age zero) and some accidental disability retirees that were coded as service retirements. The impact of the first issue is very small because the records get "fixed" as part of the data grouping process. The second issue has been fixed in the June 30, 2009 valuation data and likely resulted in a very slight overstatement of the liability for this population.

As part of the Administrative Review, the data processes and procedures were reviewed. These processes and procedures include data transferred from the Systems to the OA and from the OA to Buck. More information on this review is included in the Administrative Review report.

It is our opinion that the data used to value the liabilities for each System is reasonable and accurate for these liability determinations.

¹¹ Actuaries use a variety of mathematical models to fund pension plans ("funding methods"). In Revenue Ruling 2003-83, the Internal Revenue Service (IRS) determined that the Aggregate Entry Age funding method could no longer be used for private sector valuations because the funding method was not sound. It is important to note that Aggregate Entry Age is different than both the Individual Entry Age (commonly referred to as simply "Entry Age") and the Aggregate funding methods. The Aggregate Entry Age funding method was deemed unsound because it could produce gains or losses even when all actuarial assumptions were met. These gains and losses are also referred to as "spurious" gains and losses.

Even though the one-year lag methodology is actuarially sound, Hay Group believes that it may not meet the IRS definition of a sound funding method because, by its design, it produces spurious gains and losses. Since there is no explicit funding of the first normal cost for the employee, there is always an actuarial loss in the first year that is followed by actuarial gains in subsequent years when all actuarial assumptions are met.

It should further be noted, however, that the standard the IRS applied to the Aggregate Entry Age funding method does not apply to governmental plans. The American Academy of Actuaries considered opining on the spurious gains and losses related to the Aggregate Entry Age funding method but decided against opining based on feedback from the actuarial profession. Therefore, the one-year lag methodology is an actuarially acceptable method for funding governmental plans.

Progress on Prior Contribution Audit Recommendations

The prior auditor made a number of recommendations for improvements in methods and also made a number of assumption change recommendations. The OA is continually reviewing its processes and procedures to the extent that it has available resources. For example, Segal recommended that the OA produce formal valuation reports for NYCERS, TRS, and BERS like it currently produces for POLICE and FIRE (and Hay Group concurred with this recommendation in the Administrative Review). A significant amount of work is required to create these individual reports and the OA does not currently have the resources to undertake these projects, so the publication of these additional valuation reports remains a goal for the OA.

The prior auditor recommended a significant number of assumption changes as documented in their Experience Study report. The current plan is for the Actuary to set new methods and assumptions during 2011 using information available through June 30, 2010. This information will include data from both the Segal and Hay Group Experience Studies along with other pertinent data. The new assumptions are expected to be effective in Fiscal Year 2012.

Audit Methodology Conclusions

Based on our audit methodology, we believe that the OA is using sound actuarial methodologies and that the OA is properly applying assumptions. Where applicable, these methods and assumptions are consistent with those adopted by each System's Board of Trustees and the laws promulgated by the State Legislature. It is also our opinion that the valuation software used by the OA and Buck is properly programmed and the results produced are proper valuations of the liabilities and contributions required for each System.

Variable Supplements Funds ("VSF")

Eligibility for a VSF Payment

Eligible Service Retirements who retire from active service with 20 or more years of service are eligible to receive a VSF payment as long as there are sufficient funds in the VSF or as long as the payment is guaranteed under applicable law. Anyone retiring under Disability Retirement or terminating and deferring retirement until they would have reached 20 years of service is not eligible for the VSF payments. The following are the nine VSFs:

1. New York City Police Officers' VSF
2. New York City Police Superior Officers' VSF
3. New York City Fire Department Firefighters' VSF
4. New York City Fire Department Fire Officers' VSF
5. New York City Housing Police Officers' VSF
6. New York City Housing Police Superior Officers' VSF
7. New York City Transit Police Officers' VSF

8. New York City Transit Police Superior Officers' VSF
9. New York City Corrections Officers' VSF

The POLICE and FIRE VSFs cover open groups (i.e. can accept new members) that include both current and future retirees. The Housing Police and Transit Police VSFs are closed retiree groups since all active Housing Police and Transit Police are now POLICE members and are covered by the POLICE VSFs.

The Corrections Officers' VSF is an open group; however, it is not currently paying a supplement because there are insufficient funds to make a payment. In 2019, the payments in the Corrections' VSF become guaranteed and will be paid prospectively only to all eligible retirees.

VSF Payment

For calendar years 2007 and beyond, the VSF payment is \$12,000 per year. Depending on the VSF, the entire \$12,000 payment is made on either December 15 (at the end of the calendar year) or January 31 (in the next calendar year).

VSF Offset

The VSF payments are offset by any post-1988 Supplementations and all automatic COLAs through the later of the completion of age 61 and of the completion of calendar year 2006. For calendar year 2007 and later, the only offset is for supplementations and COLAs through the completion of age 61. The VSF payment is reduced by the entire post-1988 Supplementation or COLA (but the VSF Offset cannot exceed the VSF payment).

VSF DROP

Effective January 1, 2002, any active member of POLICE or FIRE who has 20 or more years of service is eligible for a lump sum payment upon becoming a Service Retiree. The VSF DROP payment is equal to the VSF payments that could have been received if the member had become a Service Retiree at 20 years of service. The VSF payment in 2002 was \$9,500, increasing \$500 per year until reaching \$12,000 in 2007.

Special Handling of Certain VSF Groups

Included in the Service Retirements are members of POLICE and FIRE with 20 or more years of service who would have otherwise retired under Ordinary Disability but instead are assumed to elect Service Retirement (primarily because these members get better benefits with the inclusion of the VSF payment). A similar approach for Corrections may be appropriate when the VSF payments become guaranteed in 2019.

Conclusion

We believe that the OA’s overall approach to valuing the VSF liabilities is actuarially sound and accurate. However, there may be some room for improvement in the interest rate assumed for VSF calculations. The OA values all of the NYCERS VSF liabilities using a 4% interest assumption because the funds are invested in a manner that provides lower, more guaranteed, investment returns. For VSF plans that have sufficient assets to cover benefits, this is a reasonable assumption. However, as of June 30, 2008, the Corrections VSF did not have sufficient funds to make VSF payments subsequent to that date and the other four NYCERS Housing and Transit VSFs were close to running out of funds. (Three of the four Housing and Transit VSFs do not have Market Assets and the one that does, Transit Police Officers’ VSF, is making its payments but does not have sufficient funds to cover all liabilities.) When these funds are depleted, transfers from the NYCERS Fund will be made to the VSF Funds so that guaranteed payments can be made. Since the assets for the VSFs are mostly residing in the main fund, they are likely to earn investment returns that more closely resemble the 8% investment return assumed for the NYCERS Fund. Depending on the manner in which the funds are transferred to the VSFs, the use of 4% for the NYCERS VSF liability determinations may result in an overstatement of the cost of these plans.

We estimate that the liability associated with the VSFs in NYCERS would be reduced by about 50% if the interest rate were increased from 4% to 8%.

Cost of Living Adjustments (“COLAs”)

The COLA payable is based on the year-over-year inflation (from March to March) as measured by the Consumer Price Index (“CPI”). The COLA is equal to 50% of the CPI rounded up to the next 0.1%. There is a corridor around the COLA that guarantees that the actual COLA is not less than 1.0% and not greater than 3.0% and the COLA only applies to the first \$18,000 of annual benefit (computed on a maximum benefit basis). The OA assumes that CPI increases will average 2.5% per year and that COLAs will average 1.3% per year based on 50% of 2.5% rounded up to the nearest 0.1%.

The COLA is determined using the March CPIs and is first payable at the end of September. The OA publishes the COLA increase in a memo in mid-April.

Type of Recipient	Eligibility Criteria
Service Retirees and Deferred Retirees	The EARLIER of: (1) age 62 and retired 5 or more years or (2) age 55 and retired for at least 10 years
Disability Retiree	Retired 5 or more years
Accidental Death Survivors	Receiving benefits for 5 or more years
Surviving Spouse from J&S Benefit	½ the COLA the retiree would have received if living (for any J&S %)

The COLA for Tier 3 retirements differs from the basic COLA. However, no one is assumed to retire under Tier 3, so this COLA is not valued. We believe that the OA approach to handling Tier 3 members is reasonable and actuarially sound for the June 30, 2008 (lag) valuation.

The base annuity plus all COLAs and Supplementations are added together and then limited to \$18,000 per year before applying a COLA. Once the total annual annuity reaches \$18,000, the COLA is effectively a simple COLA.

Conclusion

We believe that the OA's overall approach to valuing the plan COLAs is actuarially sound and reasonable. However, there may be some room for improvement in the 1.3% COLA assumption. Because the actual COLA percent cannot be less than 1% and not greater than 3%, there is higher likelihood that the average of the future COLAs will be skewed upward because of this corridor. As a simple example, we can use CPIs of 5% and 0%. The COLAs based on these two CPIs would be 2.5% and 1.0%, respectively. The simple average of these two CPIs is 2.5% while the simple average of the two COLAs is 1.75%, well in excess of the 1.3% average that we would have expected. The OA should consider adding a margin to the COLA assumption to reflect the corridor's potential upward impact.

Liability Threshold Tests

Hay Group found it appropriate to apply a dual threshold test approach for verifying the actuarial liabilities calculated for each of the five Systems. This approach is appropriate because it recognizes both the importance of verifying all components of the total liability and the fact that a relatively large difference in an individual liability calculation may have very little impact on the overall Statutory Contributions.

In order to pass the first threshold test, Hay Group's determination of the liability must be within 5 percent of the OA-calculated liability for any particular "line item" (i.e., each separately-calculated portion of the total liability). This test is called the "Liability Line Item Difference – 5% Test" in the tables for each System.

In order to pass the second threshold test, the difference between the Hay Group determination of the liability and the OA-calculated liability must be less than 0.5 percent of the total liability of the System that is being reviewed. This test is called the "Total Liability Difference – 0.5% Test" in the tables for each System. Adding this second test helps us gauge whether the liability differences are likely to have a material impact on the overall Statutory Contributions.

If either threshold test is passed, the overall result for that line item is a "Pass".

Audit Results

I. NYCERS

A. Hay Group Determination of OA Liabilities – Threshold test results

The following table summarizes the threshold test results of Hay Group's determination of the OA June 30, 2008 liabilities underlying the NYCERS statutory contribution requirements.

Table I-1					
Summary of NYCERS Liability Threshold Tests – June 30, 2008					
	Liability Line Item Difference - 5% Test	5% Test Result	Total Liability Difference - 0.5% Test	0.5% Test Result	Overall Result
Active Liability Components					
Service Retirement	1.01%	PASS	0.47%	PASS	PASS
Ordinary Disability	-1.42%	PASS	-0.03%	PASS	PASS
Accidental Disability	3.36%	PASS	0.02%	PASS	PASS
Ordinary Death	-1.87%	PASS	-0.01%	PASS	PASS
Accidental Death	-6.42%	FAIL	0.00%	PASS	PASS
Vested Deferred	-2.94%	PASS	-0.08%	PASS	PASS
Return of Contributions	-1.36%	PASS	0.00%	PASS	PASS
Total Active*					PASS
Active-Inactive Liability	-1.77%	PASS	-0.02%	PASS	PASS
Terminated Vested Liability	9.94%	FAIL	0.07%	PASS	PASS
Retiree/Beneficiary Liability Components					
(A) Fixed Benefit Liability Components					
Service Retirees	-0.76%	PASS	-0.25%	PASS	PASS
Ordinary Disability Retirees	-1.01%	PASS	-0.02%	PASS	PASS
Accidental Disability Retirees	-1.01%	PASS	-0.01%	PASS	PASS
Beneficiaries	4.41%	PASS	0.07%	PASS	PASS
(B) Supplemental (COLA) Benefit Liability	4.30%	PASS	0.22%	PASS	PASS
Total Retirees*					PASS
Liability for Pensioners due Variable Funds Benefits	1.33%	PASS	0.03%	PASS	PASS
Post Retirement Death Benefit Liability	3.45%	PASS	0.01%	PASS	PASS
Designated Annuitants	0.49%	PASS	0.00%	PASS	PASS

* The Total Active and Total Retirees items pass based on all subparts passing.

As the table above shows, the OA's June 30, 2008 results were validated by Hay Group's independent determination of liabilities – each liability item passed the overall test. The results of the Liability Line Item Difference – 5% Test produced two failures. These were for accidental deaths and for the terminated vested liability.

Hay Group uses a methodology of projecting a fixed benefit amount to an assumed retirement age. The OA methodology runs the terminated vested employee through the active valuation program. Although the OA method is not the most commonly used method by actuaries, it is an acceptable method for valuing terminated vested liability.

Even though the accidental death and the terminated vested liability both failed the Liability Line Item Difference – 5% Test, they both easily passed the Total Liability Difference – 0.5% Test with a 0.00% difference for accidental deaths and a 0.07% difference for terminated vested liability.

B. Hay Group Determination of the Statutory Contribution Requirement

The following table summarizes Hay Group's independent determination of the NYCERS contribution requirement certified by the OA.

Table I-2 Development of Total NYCERS FY 2010 Statutory Contribution (\$ in thousands)			
	Office of the Actuary	Hay Group	Percent Difference
1. Present Value of Future Benefits (including VSF)	\$60,312,173	\$60,591,071	0.46%
2. VSF Assets	\$47,932	\$47,932	0.00%
3. Total PVB including Future VSF Transfers: (1)-(2)	\$60,264,240	\$60,543,139	0.46%
4. Actuarial Value of Assets (Non-VSF)	\$40,722,228	\$40,722,228	0.00%
5. Present Value of FY2009 Contributions	2,069,260	2,069,260	0.00%
6. Present Value of Future UAAL Contributions	0	0	0.00%
7. Present Value of Future Employee Contributions	2,009,470	2,021,598	0.60%
8. Sum of Items 4 through 7: (4)+(5)+(6)+(7)	\$44,800,958	\$44,813,086	0.03%
9. Present Value of Future Employer Normal Contributions: (3)-(8)	\$15,463,283	\$15,730,053	1.73%
10. Present Value of Future Salaries (Projected for Lag Methodology)	\$83,387,084	\$82,080,305	-1.57%
11. Employer Normal Cost Rate: (9) / (10)	18.544%	19.164%	3.34%
12. Annual Salaries (Projected 1 year under Lag Methodology)	10,849,891	10,799,557	-0.46%
13. Statutory Employer Normal Contribution	\$2,012,004	\$2,069,627	2.86%
14. Consolidated UAAL Contribution	0	0	0.00%
15. Administrative Expense Contribution	51,204	51,204	0.00%
16. Investment Expense Contribution	134,509	134,509	0.00%
17. Total NYCERS Pension Fund Statutory Contribution: (13)+(14)+(15)+(16)	\$2,197,717	\$2,255,340	2.62%

Items 2 and 4 in the table above are actuarial values of assets that Hay Group recreated using NYCERS' Comprehensive Annual Financial Report (the "NYCERS CAFR") asset values and historical information from the OA's work papers.

Item 5 is equal to the normal contribution and the administrative and investment expense contributions that were included in the FY 2009 Employer Contributions (based on the June 30, 2007 valuation), discounted ½ year. The FY 2009 Employer Contributions (June 30, 2007 valuation) will be made, on average, on or about December 31, 2008. Therefore, this

contribution needs to be reflected as a prospective asset when determining the FY 2010 Employer Contribution.

Items 6 and 14 were part of the June 30, 2006 (lag) valuation and had resulted from the liability associated with Part A of ERI02 (Chapter 69 of the Laws of 2002). The final amortization payment occurred in the June 30, 2006 (lag) valuation and was made around January 1, 2008. Therefore, in the June 30, 2008 (lag) valuation, items 6 and 14 are now zero.

Items 15 and 16 were checked against the NYCERS CAFR.

C. Observations and Recommended Areas and Topics for Additional Improvement, Inquiry, and Investigation

1. It is our understanding that EMT Tier 2, Plan J Elected should be valued using retirement rates for members who elected an improved retirement program. The OA is valuing these members under Plan C. The OA indicated that this group may be valued differently when they convert to a new valuation software program.
2. There were 265 records with a hire age of less than age 15. Of these, 193 were age 0 with a birth date equal to, or very close to, hire date. These records are “fixed” as part of the data grouping process. Since the records are valued and because these defective records make up 0.14% of the total NYCERS active population of 183,654, the impact of these defective records is negligible.
3. In the June 30, 2006 data there were 654 records with a plan code of 0 (zero). The OA defaulted each of these members the general plan for each subsystem. In the June 30, 2008 data, there were no records with a plan code of 0.
4. The OA values first eligibility for a number of 20 year plans as 25 years rather than 20 years. For example, DAI Tier 2 Plan W (DA Investigators – 20 Year Plan) would first be eligible for retirement at 20 years of service. Instead the OA values first eligibility at 25 years. The OA should consider valuing first eligibility at 20 years for the 20 year plans. Hay Group did value these plans assuming 20 years as first eligibility. This caused some differences when comparing the Hay Group and OA present values of future benefits and salaries but did not have a large enough impact to cause failures in the overall NYCERS liability tests.
5. The retiree records contain a Retirement Cause code where a 1 indicates that the retirement cause is Accidental Disability. The Hay Group counts, benefit levels, and liability are higher than the OA values. It appears that some of these records are being coded in the OA valuations as Service Retirements. We reviewed a specific case with the OA and found that the record was not properly categorized in the June 30, 2006 data but we understand that the methodology for handling this issue has been corrected in the June 30, 2009 data. The impact of valuing a small group of Accidental Disabilities as Service Retirements would likely overstate the liability for this group. However, the size of this group is small and would have little impact on the overall contribution.

II. TRS

A. Hay Group Determination of OA Liabilities – Threshold test results

The following table summarizes the threshold test results of Hay Group’s determination of the OA June 30, 2008 liabilities underlying the TRS statutory contribution requirements.

Table II-1 Summary of TRS Liability Threshold Tests – June 30, 2008					
	Liability Line Item Difference - 5% Test	5% Test Result	Total Liability Difference - 0.5% Test	0.5% Test Result	Overall Result
Active Liability Components					
Service Retirement	0.21%	PASS	0.08%	PASS	PASS
Ordinary Disability	0.95%	PASS	0.01%	PASS	PASS
Accidental Disability	1.85%	PASS	0.00%	PASS	PASS
Ordinary Death	1.57%	PASS	0.01%	PASS	PASS
Accidental Death	0.00%	PASS	0.00%	PASS	PASS
Vested Deferred	3.82%	PASS	0.06%	PASS	PASS
Return of Contributions	0.65%	PASS	0.00%	PASS	PASS
Total Active*					PASS
Active-Inactive Liability	-0.20%	PASS	0.00%	PASS	PASS
Terminated Vested Liability	-6.66%	FAIL	-0.05%	PASS	PASS
Retiree/Beneficiary Liability Components					
(A) Fixed Benefit Liability Components					
Service Retirees	0.67%	PASS	0.23%	PASS	PASS
Ordinary Disability Retirees	0.13%	PASS	0.00%	PASS	PASS
Accidental Disability Retirees	0.12%	PASS	0.00%	PASS	PASS
Accidental Death Beneficiaries	0.00%	PASS	0.00%	PASS	PASS
Beneficiaries	1.84%	PASS	0.01%	PASS	PASS
(B) Supplemental (COLA) Benefit Liability	4.04%	PASS	0.13%	PASS	PASS
Total Retirees*					PASS
Liability for Pensioners due Variable Funds Benefits	0.24%	PASS	0.03%	PASS	PASS
Designated Annuitant Liability	-0.07%	PASS	0.00%	PASS	PASS
Post Retirement Death Benefit Liability	0.02%	PASS	0.00%	PASS	PASS

* The Total Active and Total Retirees items pass based on all subparts passing.

As the table above shows, the OA's June 30, 2008 results were validated by Hay Group's independent determination of liabilities – each liability item passed the overall test. The results of the Liability Line Item Difference – 5% Test produced one failure. This was for the terminated vested liability. Hay Group uses a methodology of projecting a fixed benefit amount to an assumed retirement age. The OA methodology runs the terminated vested employee through the active valuation program. Although the OA method is not the most commonly used method by actuaries, it is an acceptable method for valuing terminated vested liability.

Even with the large percentage difference in this particular line item, the difference in liability is immaterial with respect to the total liability of the System. The results of the Liability Line Item Difference – 5% Test failed due to the -6.66% difference; however, this line item easily passed the Total Liability Difference – 0.5% Test with a -0.05% difference.

B. Hay Group Determination of the Statutory Contribution Requirement

The following table summarizes Hay Group's independent determination of the TRS contribution requirement certified by the OA.

Table II-2 Development of Total TRS FY 2010 Statutory Contribution (\$ in thousands)			
	Office of the Actuary	Hay Group	Percent Difference
1. Total Present Value of Future Benefits	\$58,372,551	\$58,672,875	0.51%
2. Actuarial Value of Assets	\$32,227,375	\$32,227,375	0.00%
3. Present Value of FY2009 Contributions	2,139,702	2,139,702	0.00%
4. Present Value of Future UAAL Contributions	0	0	0.00%
5. Present Value of Future Employee Contributions	994,472	995,812	0.13%
6. Due from the TDA Program	-283,159	-283,159	0.00%
7. Sum of Items 3 through 6: (3)+(4)+(5)+(6)	\$35,078,391	\$35,079,730	0.00%
8. Present Value of Future Employer Normal Contributions: (1)-(7)	\$23,294,160	\$23,593,144	1.28%
9. Present Value of Future Salaries (Projected for Lag Methodology)	\$77,901,942	\$78,368,853	0.60%
10. Employer Normal Cost Rate: (8) / (9)	29.902%	30.105%	0.68%
11. Annual Salaries (Projected 1 year under Lag Methodology)	7,852,595	7,871,507	0.24%
12. Statutory Employer Normal Contribution	\$2,348,083	\$2,369,717	0.92%
13. Consolidated UAAL Contribution	0	0	0.00%
14. Administrative Expense Contribution	37,384	37,384	0.00%
15. Investment Expense Contribution	98,606	98,606	0.00%
16. Total TRS Statutory Contribution: (12)+(13)+(14)+(15)	\$2,484,074	\$2,505,708	0.87%

Item 2 in the table above is the actuarial value of assets that Hay Group recreated using the TRS Comprehensive Annual Financial Report (the "TRS CAFR") asset values and historical information from the OA's work papers.

Item 3 is equal to the normal contribution and the administrative and investment expense contributions that were included in the FY 2009 Employer Contributions (based on the June 30, 2007 valuation), discounted ½ year. It is assumed that the FY 2009 Employer Contributions (June 30, 2007 valuation) will be made, on average, on or about December 31, 2008. Therefore, this contribution needs to be reflected as a prospective asset when determining the FY 2010 Employer Contribution under the one-year lag methodology.

Items 4 and 13 were part of the June 30, 2006 (lag) valuation and had resulted from the liability associated with Part A of ERI02 (Chapter 69 of the Laws of 2002). The final amortization payment occurred in the June 30, 2006 (lag) valuation and was made on or about January 1, 2008. Therefore, in the June 30, 2008 (lag) valuation, items 4 and 13 are now zero.

Items 14 and 15 were checked against the TRS CAFR.

C. Observations and Recommended Areas and Topics for Additional Improvement, Inquiry, and Investigation

1. The OA maintains a historical salary file that is used in the determination of the active valuation liabilities. We compared the salaries from this historical salary file to the historical salaries used in the experience study and found that many of the salary amounts did not match. We discussed this difference with the OA and were told that there were likely retroactive adjustments to the pay due to collective bargaining agreements and the historical valuation salary file was not updated. The OA should consider updating the historical salary file when any significant adjustments are made to salaries. Since most benefits are valued using a highest 3 consecutive years' average, the liability difference comes predominantly from those who are assumed to commence benefits within the first two years after the valuation date.
2. When reviewing test cases during the first engagement, Hay Group noticed that a number of the OA test cases had one additional year of service than Hay Group's test cases. The TRS valuation data is grouped together, based on certain characteristics, using a program created by Buck. Because of historical data issues, this program has the potential to override the service amount in the current year if the service field in the data has a blank or zero number of months. This program assumes that a blank or zero month field may be the result of missing data, so it adds one to the number of years and months in the prior year's data file. If this prior service plus one year exceeds the current service, then the current service is overridden. None of the sample lives in the second engagement set for TRS showed any additional service being added.
3. TRS retirees can annuitize Variable Fund ("VF") and Tax Deferred Annuity ("TDA") Fund account balances. There is an actuarial loss that results from this conversion. A February 16, 2000 memo from the Actuary to the "File" contains a description of much of the process for estimating the conversion loss. The factors presented in that memo are the same factors that were used in the June 30, 2008 valuation of liabilities. The prior auditor, Segal Company, recommended that the OA update the adjustments being applied to estimate the conversion loss. Hay Group concurs with Segal's recommendation and recommends that the OA consider updating the conversion factors. Also, in light of recent financial market declines, the OA should also consider whether more retirees may annuitize their funds in the future. For purposes of this audit, we used the same adjustment as the OA.

III. BERS

A. Hay Group Determination of OA Liabilities – Threshold test results

The following table summarizes the threshold test results of Hay Group’s determination of the OA June 30, 2008 liabilities underlying the BERS statutory contribution requirements.

Table III-1 Summary of BERS Liability Threshold Tests – June 30, 2008					
	Liability Line Item Difference - 5% Test	5% Test Result	Total Liability Difference - 0.5% Test	0.5% Test Result	Overall Result
Active Liability Components					
Service Retirement	-0.70%	PASS	-0.37%	PASS	PASS
Ordinary Disability	-1.75%	PASS	-0.04%	PASS	PASS
Accidental Disability	-1.04%	PASS	0.00%	PASS	PASS
Ordinary Death	0.40%	PASS	0.00%	PASS	PASS
Accidental Death	0.00%	PASS	0.00%	PASS	PASS
Vested Deferred	1.36%	PASS	0.04%	PASS	PASS
Return of Contributions	1.84%	PASS	0.00%	PASS	PASS
Total Active*					PASS
Active-Inactive Liability	-2.63%	PASS	-0.06%	PASS	PASS
Terminated Vested Liability	10.39%	FAIL	0.04%	PASS	PASS
Retiree/Beneficiary Liability Components					
(A) Fixed Benefit Liability Components					
Service Retirees	0.72%	PASS	0.21%	PASS	PASS
Ordinary Disability Retirees	0.52%	PASS	0.01%	PASS	PASS
Accidental Disability Retirees	1.02%	PASS	0.00%	PASS	PASS
Accidental Death Beneficiaries	2.53%	PASS	0.00%	PASS	PASS
Beneficiaries	1.38%	PASS	0.02%	PASS	PASS
(B) Supplemental (COLA) Benefit Liability	1.33%	PASS	0.05%	PASS	PASS
Total Retirees*					PASS
Liability for Pensioners due Variable Funds Benefits	0.77%	PASS	0.01%	PASS	PASS
Post Retirement Death Benefit Liability	0.11%	PASS	0.00%	PASS	PASS

* The Total Active and Total Retirees items pass based on all subparts passing.

As the table above shows, the OA's June 30, 2008 results were validated by Hay Group's independent determination of liabilities – each liability item passed the overall test. The results of the Liability Line Item Difference – 5% Test produced one failure. This was for the terminated vested liability. Hay Group uses a methodology of projecting a fixed benefit amount to an assumed retirement age. The OA methodology runs the terminated vested employee through the active valuation program. Although the OA method is not the most commonly used method by actuaries, it is an acceptable method for valuing terminated vested liability.

Even with the large percentage difference in this particular line item, the difference in liability is immaterial with respect to the total liability of the System. The results of the Liability Line Item Difference – 5% Test failed due to the 10.39% difference; however, this line item easily passed the Total Liability Difference – 0.5% Test with a 0.04% difference.

B. Hay Group Determination of the Statutory Contribution Requirement

The following table summarizes Hay Group's independent determination of the BERS contribution requirement certified by the OA.

Table III-2 Development of Total BERS FY 2010 Statutory Contribution (\$ in thousands)			
	Office of the Actuary	Hay Group	Percent Difference
1. Total Present Value of Future Benefits	\$3,432,926	\$3,430,005	-0.09%
2. Actuarial Value of Assets	\$2,084,116	\$2,084,116	0.00%
3. Present Value of FY2009 Contributions	129,158	129,158	0.00%
4. Present Value of Future UAAL Contributions	0	0	0.00%
5. Present Value of Future Employee Contributions	154,230	154,153	-0.05%
6. Due from the TDA Program	11,627	11,627	0.00%
7. Sum of Items 3 through 6: (3)+(4)+(5)+(6)	\$2,379,130	\$2,379,053	0.00%
8. Present Value of Future Employer Normal Contributions: (1)-(7)	\$1,053,796	\$1,050,952	-0.27%
9. Present Value of Future Salaries (Projected for Lag Methodology)	\$6,502,415	\$6,495,025	-0.11%
10. Employer Normal Cost Rate: (8) / (9)	16.206%	16.181%	-0.16%
11. Annual Salaries (Projected 1 year under Lag Methodology)	820,098	821,238	0.14%
12. Statutory Employer Normal Contribution	\$132,905	\$132,885	-0.02%
13. Consolidated UAAL Contribution	0	0	0.00%
14. Administrative Expense Contribution	9,161	9,161	0.00%
15. Investment Expense Contribution	5,283	5,283	0.00%
16. Total BERS Statutory Contribution: (12)+(13)+(14)+(15)	\$147,349	\$147,328	-0.01%

Item 2 in the table above is the actuarial value of assets that Hay Group recreated using the BERS Comprehensive Annual Financial Report (the "BERS CAFR") asset values and historical information from the OA's work papers.

Item 3 is equal to the normal contribution and the administrative and investment expense contributions that were included in the FY 2009 Employer Contributions (based on the June 30, 2007 valuation), discounted ½ year. The FY 2009 Employer Contributions (June 30, 2007 valuation) will be made, on average, on or about December 31, 2008. Therefore, this contribution needs to be reflected as a prospective asset when determining the FY 2010 Employer Contribution under the one-year lag methodology.

Items 4 and 13 were part of the June 30, 2006 (lag) valuation and had resulted from the liability associated with Part A of ERI02 (Chapter 69 of the Laws of 2002). The final amortization payment occurred in the June 30, 2006 (lag) valuation and was made around January 1, 2008. Therefore, in the June 30, 2008 (lag) valuation, items 4 and 13 are now zero.

Items 14 and 15 were checked against the BERS CAFR.

C. Observations and Recommended Areas and Topics for Additional Improvement, Inquiry, and Investigation

1. The OA maintains a historical salary file that is used in the determination of the active valuation liabilities. We compared the salaries from this historical salary file to the historical salaries used in the experience study and found that many of the salary amounts did not match. We discussed this difference with the OA and were told that there were likely retroactive adjustments to the pay due to collective bargaining agreements and the historical valuation salary file was not updated. The OA should consider updating the historical salary file when any significant adjustments are made to salaries. Since most benefits are valued using a highest 3 consecutive years' average, the liability difference comes predominantly from those who commence benefits within the first two years after the valuation date.
2. For all of the Systems except for NYCERS, the OA has years and months of service on the June 30, 2008 active valuation data files. In order to group the valuation data for TRS, POLICE, and FIRE, total years of service used to value the plans are created using the years plus the rounded value of the months divided by 12. The use of rounding is appropriate and, in general, produces grouped results that are in line with individual non-rounded results. The grouping of the valuation data for BERS ignores all months and only the year is used. This truncating of the months produces grouped results that have, on average, ½ year of service less than the individual non-truncated results. In light of the high number of part time employees covered by BERS, the use of truncated service may be appropriate, but this use should be investigated further.
3. In the first engagement, while reviewing a test case for a BERS member who entered the plan before age 20, we noticed that the salary scale multiplier in the OA's valuation program reduced to zero after 50 years of service. The OA has now extended the scale beyond 50 years (as is done in TRS).
4. BERS retirees can annuitize Variable Fund ("VF") and Tax Deferred Annuity ("TDA") Fund account balances. There is an actuarial loss that results from this conversion. A February 16, 2000 memo from the Actuary to the "File" contains a description of much of the process for estimating the conversion loss. The factors presented in that memo are the same factors that were used in the June 30, 2008 valuation of liabilities. The prior auditor, Segal Company, recommended that the OA update the adjustments being applied to estimate the conversion loss. Hay Group concurs with Segal's recommendation and recommends that the OA consider updating the conversion factors. Also, in light of recent financial market declines, the OA should also consider whether more retirees may annuitize their funds in the future. For purposes of this audit, we used the same adjustment as the OA.

IV. POLICE

A. Hay Group Determination of OA Liabilities – Threshold test results

The following table summarizes the threshold test results of Hay Group's determination of the OA June 30, 2008 liabilities underlying the POLICE statutory contribution requirements.

Table IV-1					
Summary of POLICE Liability Threshold Tests – June 30, 2008					
	Liability Line Item Difference - 5% Test	5% Test Result	Total Liability Difference - 0.5% Test	0.5% Test Result	Overall Result
Active Liability Components					
Service Retirement	0.74%	PASS	0.22%	PASS	PASS
Ordinary Disability	3.92%	PASS	0.07%	PASS	PASS
Accidental Disability	1.62%	PASS	0.15%	PASS	PASS
Ordinary Death	1.38%	PASS	0.01%	PASS	PASS
Accidental Death	-0.58%	PASS	0.00%	PASS	PASS
Vested Deferred	3.63%	PASS	0.03%	PASS	PASS
Return of Contributions	0.56%	PASS	0.00%	PASS	PASS
Total Active*					PASS
Active-Inactive Liability	-0.01%	PASS	0.00%	PASS	PASS
Terminated Vested Liability	-12.41%	FAIL	-0.02%	PASS	PASS
Retiree/Beneficiary Liability Components					
(A) Fixed Benefit Liability Components					
Service Retirees	0.06%	PASS	0.01%	PASS	PASS
Ordinary Disability Retirees	0.34%	PASS	0.01%	PASS	PASS
Accidental Disability Retirees	0.06%	PASS	0.01%	PASS	PASS
Accidental Death Beneficiaries	4.21%	PASS	0.01%	PASS	PASS
Beneficiaries	1.92%	PASS	0.00%	PASS	PASS
(B) Supplemental (COLA) Benefit Liability	0.90%	PASS	0.05%	PASS	PASS
Total Retirees*					PASS
Active VSF Liability	0.67%	PASS	0.03%	PASS	PASS
Retiree VSF Liability	0.43%	PASS	0.03%	PASS	PASS

* The Total Active and Total Retirees items pass based on all subparts passing.

As the table above shows, the OA's June 30, 2008 results were validated by Hay Group's independent determination of liabilities – each liability item passed the overall test. The results of the Liability Line Item Difference – 5% Test produced one failure. The failure was for Terminated Vested liabilities. Hay Group valued this liability line item using an alternative methodology. Even with the large percentage difference in this particular line item, the difference in liability is immaterial with respect to the total liability of the System. The results of the Liability Line Item Difference – 5% Test failed due to the -12.41% difference; however, this line item easily passed the Total Liability Difference – 0.5% Test with a -0.02% difference.

B. Hay Group Determination of the Statutory Contribution Requirement

The following table summarizes Hay Group's independent determination of the POLICE contribution requirement certified by the OA.

Table IV-2			
Development of Total POLICE Pension Fund FY 2010 Statutory Contribution			
(\$ in thousands)			
	Office of the Actuary	Hay Group	Percent Difference
1. Present Value of Future Benefits (including VSF)	\$39,356,388	\$39,589,674	0.59%
2. VSF Assets	2,042,361	2,042,361	0.00%
3. Total PVB including Future VSF Transfers: (1)-(2)	\$37,314,027	\$37,547,313	0.63%
4. Actuarial Value of Assets (Non-VSF)	\$21,393,152	\$21,393,152	0.00%
5. Present Value of FY2009 Contributions	1,859,212	1,859,212	0.00%
6. Present Value of Future UAAL Contributions	0	0	0.00%
7. Present Value of Future Employee Contributions	388,974	388,781	-0.05%
8. Sum of Items 4 through 7: (4)+(5)+(6)+(7)	\$23,641,338	\$23,641,145	0.00%
9. Present Value of Future Employer Normal Contributions: (3)-(8)	\$13,672,689	\$13,906,167	1.71%
10. Present Value of Future Salaries (Projected for Lag Methodology)	\$22,561,116	\$22,552,326	-0.04%
11. Employer Normal Cost Rate: (9) / (10)	60.603%	61.662%	1.75%
12. Annual Salaries (Projected 1 year under Lag Methodology)	3,100,203	3,101,170	0.03%
13. Statutory Employer Normal Contribution	\$1,878,816	\$1,912,243	1.78%
14. Consolidated UAAL Contribution	0	0	0.00%
15. Administrative Expense Contribution	17,735	17,735	0.00%
16. Investment Expense Contribution	84,445	84,445	0.00%
17. Total POLICE Pension Fund Statutory Contribution: (13)+(14)+(15)+(16)	\$1,980,996	\$2,014,424	1.69%

Items 2 and 4 in the table above are actuarial values of assets that Hay Group recreated using POLICE's Comprehensive Annual Financial Report (the "POLICE CAFR") asset values and historical information from the OA's work papers.

Item 5 is equal to the normal contribution and the administrative and investment expense contributions that were included in the FY 2009 Employer Contributions (based on the June 30, 2007 valuation), discounted ½ year. The FY 2009 Employer Contributions (June 30, 2007 valuation) will be made, on average, on or about December 31, 2008. Therefore, this

contribution needs to be reflected as a prospective asset when determining the FY 2010 Employer Contribution.

Items 6 and 14 do not apply to POLICE (because the initial unfunded liability was zero), and items 15 and 16 were checked against the POLICE CAFR.

C. Observations and Recommended Areas and Topics for Additional Improvement, Inquiry, and Investigation

1. The OA maintains a historical salary file that is used in the determination of the active valuation liabilities. We compared the salaries from this historical salary file to the experience study salaries and found that the 2004 salary amounts did not match. We discussed this difference with the OA and were told that there was likely a retroactive adjustment to the pay due to a collective bargaining agreement and the historical salary file was not updated. This salary difference has little impact on the valuation results and would only affect members who have a death benefit based on a five-year average salary and employees who had 20 or more years of service prior to 2004.
2. A final average salary adjustment is made in the POLICE valuation program in order to account for certain longevity pay that is earned but is not included in the determination of final average salary for benefit purposes. The final average salary is determined and then a single adjustment is applied to the entire final average salary based on the employee's years of service at the point the final average salary is being determined. Therefore, the same adjustment is being applied to the final average 1-year salary and the final average 5-year salary even though different longevity adjustments could apply to a 1-year period versus a 5-year period. The OA should consider whether the exclusion of this type of longevity should be based on the year in which the salary is earned, not the year in which the average is being determined for valuation purposes. This has only a small impact on the valuation results.
3. In the OA's valuation model, the Annuity Savings Fund (ASF) and Increased Take Home Pay (ITHP) contributions are determined based on a salary adjusted for dual overtime. Dual overtime is the assumption used by the OA to reflect higher overtime pay preceding service retirement and lower overtime pay preceding disability retirement. Using pay with a dual overtime adjustment to calculate the ASF and ITHP contributions introduces dual overtime adjustments into future accumulations of ASF and ITHP. The OA should consider whether the dual overtime adjusted contributions should not be projected into the future accumulations since this adjustment only applies in the year of separation due to disability or service retirement. This has only a small impact on the valuation results.
4. In the OA's valuation model, the required ASF balance is given an extra half year of interest to year of service 20.5 which reduces the difference between the actual and required ASF after 20 years of service. The OA should consider whether the required ASF balance should not be adjusted with interest beyond the 20th year of service. This has only a small impact on the valuation results.
5. In the first engagement we found that the portion of the pension formula that provides for 1/60th of pay after 20 years of service was valued as 0.017 in the OA's valuation system. We found that the OA is now using 0.01667, which more accurately reflects the actual benefit calculation.

V. FIRE

A. Hay Group Determination of OA Liabilities – Threshold test results

The following table summarizes the threshold test results of Hay Group's determination of the OA June 30, 2008 liabilities underlying the FIRE statutory contribution requirements.

Table V-1					
Summary of FIRE Liability Threshold Tests – June 30, 2008					
	Liability Line Item Difference - 5% Test	5% Test Result	Total Liability Difference - 0.5% Test	0.5% Test Result	Overall Result
Active Liability Components					
Service Retirement	0.39%	PASS	0.07%	PASS	PASS
Ordinary Disability	1.41%	PASS	0.03%	PASS	PASS
Accidental Disability	-0.03%	PASS	-0.01%	PASS	PASS
Ordinary Death	0.64%	PASS	0.00%	PASS	PASS
Accidental Death	-0.27%	PASS	0.00%	PASS	PASS
Vested Deferred	1.63%	PASS	0.00%	PASS	PASS
Return of Contributions	0.61%	PASS	0.00%	PASS	PASS
Total Active*					PASS
Active-Inactive Liability	-2.14%	PASS	0.00%	PASS	PASS
Terminated Vested Liability	0.75%	PASS	0.00%	PASS	PASS
Retiree/Beneficiary Liability Components					
(A) Fixed Benefit Liability Components					
Service Retirees	0.64%	PASS	0.08%	PASS	PASS
Ordinary Disability Retirees	0.81%	PASS	0.02%	PASS	PASS
Accidental Disability Retirees	0.55%	PASS	0.15%	PASS	PASS
Accidental Death Beneficiaries	-0.83%	PASS	-0.01%	PASS	PASS
Beneficiaries	2.24%	PASS	0.01%	PASS	PASS
(B) Supplemental (COLA) Benefit Liability	1.74%	PASS	0.09%	PASS	PASS
Total Retirees*					PASS
Active VSF Liability	1.28%	PASS	0.04%	PASS	PASS
Retiree VSF Liability	0.58%	PASS	0.02%	PASS	PASS

* The Total Active and Total Retirees items pass based on all subparts passing.

As the table above shows, the OA's June 30, 2008 results were validated by Hay Group's independent determination of liabilities – each liability item passed the overall test. The results of the Liability Line Item Difference – 5% Test produced no failures.

B. Hay Group Determination of the Statutory Contribution Requirement

The following table summarizes Hay Group's independent determination of the FIRE contribution requirement certified by the OA.

Table V-2
Development of Total FIRE Pension Fund FY 2010 Statutory Contribution
(\$ in thousands)

	Office of the Actuary	Hay Group	Percent Difference
1. Present Value of Future Benefits (including VSF)	\$16,000,683	\$16,078,610	0.49%
2. VSF Assets	892,193	892,193	0.00%
3. Total PVB including Future VSF Transfers: (1)-(2)	\$15,108,490	\$15,186,417	0.52%
4. Actuarial Value of Assets (Non-VSF)	\$6,942,992	\$6,942,992	0.00%
5. Present Value of FY2009 Contributions	789,762	789,762	0.00%
6. Present Value of Future UAAL Contributions	43,251	43,251	0.00%
7. Present Value of Future Employee Contributions	120,686	120,595	-0.08%
8. Sum of Items 4 through 7: (4)+(5)+(6)+(7)	\$7,896,691	\$7,896,600	0.00%
9. Present Value of Future Employer Normal Contributions: (3)-(8)	\$7,211,799	\$7,289,818	1.08%
10. Present Value of Future Salaries (Projected for Lag Methodology)	\$9,298,455	\$9,292,652	-0.06%
11. Employer Normal Cost Rate: (9) / (10)	77.559%	78.447%	1.14%
12. Annual Salaries (Projected 1 year under Lag Methodology)	1,064,664	1,064,980	0.03%
13. Statutory Employer Normal Contribution	\$825,743	\$835,445	1.17%
14. Consolidated UAAL Contribution	23,696	23,696	0.00%
15. Administrative Expense Contribution	0	0	0.00%
16. Investment Expense Contribution	24,892	24,892	0.00%
17. Total FIRE Pension Fund Statutory Contribution: (13)+(14)+(15)+(16)	\$874,331	\$884,033	1.11%

Items 2 and 4 in the table above are actuarial values of assets that Hay Group recreated using FIRE's Comprehensive Annual Financial Report (the "FIRE CAFR") asset values and historical information from the OA's work papers.

Item 5 is equal to the normal and investment expense contributions that were included in the FY 2009 Employer Contributions (based on the June 30, 2007 valuation), discounted ½ year. The FY 2009 Employer Contributions (June 30, 2007 valuation) will be made, on average, on or about December 31, 2008. Therefore, this contribution needs to be reflected as a prospective asset when determining the FY 2010 Employer Contribution.

Items 6 and 14 are related to the initial unfunded actuarial accrued liability that is being funded through amortization payments that began in Fiscal Year 2000. Using the June 30, 2008 outstanding balance and the amortization payments that increase 3 percent per year, we were able to verify that the outstanding balance will be paid off when the last payment is made in Fiscal Year 2010.

Item 16 was checked against the FIRE CAFR. There are no administrative expenses paid from the pension fund for FIRE since it is not corpus funded.

C. Observations and Recommended Areas and Topics for Additional Improvement, Inquiry, and Investigation

1. The OA maintains a historical salary file that is used in the determination of the active valuation liabilities. We compared the salaries from this historical salary file to the experience study salaries and found that the 2004 salary amounts did not match. We discussed this difference with the OA and were told that there was likely a retroactive adjustment to the pay due to a collective bargaining agreement and the historical salary file was not updated. This salary difference has little impact on the valuation results and would only affect members who have a death benefit based on a five-year average salary and employees who had 20 or more years of service prior to 2004.
2. A final average salary adjustment is made in the FIRE valuation program in order to account for certain longevity pay that is earned but is not included in the determination of final average salary for benefit purposes. The final average salary is determined and then a single adjustment is applied to the entire final average salary based on the employee's years of service at the point the final average salary is being determined. Therefore, the same adjustment is being applied to the final average 1-year salary and the final average 5-year salary even though different longevity adjustments could apply to a 1-year period versus a 5-year period. The OA should consider whether the exclusion of this type of longevity should be based on the year in which the salary is earned, not the year in which the average is being determined for valuation purposes. This has only a small impact on the valuation results.
3. In the OA's valuation model, the Annuity Savings Fund (ASF) and Increased Take Home Pay (ITHP) contributions are determined based on a salary adjusted for dual overtime. Dual overtime is the assumption used by the OA to reflect higher overtime pay preceding service retirement and lower overtime pay preceding disability retirement. Using pay with a dual overtime adjustment to calculate the ASF and ITHP contributions introduces dual overtime adjustments into future accumulations of ASF and ITHP. The OA should consider whether the dual overtime adjusted contributions should not be projected into the future accumulations since this adjustment only applies in the year of separation due to disability or service retirement. This has only a small impact on the valuation results.
4. In the OA's valuation model, the required ASF balance is given an extra half year of interest to year of service 20.5 which reduces the difference between the actual and required ASF after 20 years of service. The OA should consider whether the required ASF balance should not be adjusted with interest beyond the 20th year of service. This has only a small impact on the valuation results.
5. In the first engagement we found that the portion of the pension formula that provides for 1/60th of pay after 20 years of service was valued as 0.017 in the OA's valuation system. We found that the OA is now using 0.01667, which more accurately reflects the actual benefit calculation.

Appendix A: Detailed Comparison of Statistics and Liabilities – NYCERS

Table A-1
NYCERS Active Statistics (All Employers) – June 30, 2008
(\$ in thousands)

Active Liability by Decrement	Tier 1			Tier 2			Tiers 3 and 4			Total		
	Office of the Actuary	Hay Group	Percent Difference	Office of the Actuary	Hay Group	Percent Difference	Office of the Actuary	Hay Group	Percent Difference	Office of the Actuary	Hay Group	Percent Difference
Active Employees												
Count	2,286	2,286	0.00%	1,850	1,850	0.00%	179,518	179,518	0.00%	183,654	183,654	0.00%
Total Payroll	\$164,125	\$164,125	0.00%	\$130,487	\$130,487	0.00%	\$11,011,362	\$11,011,362	0.00%	11,305,974	11,305,974	0.00%
PV Future Salary	490,636	500,593	2.03%	579,461	570,717	-1.51%	93,003,455	91,718,821	-1.38%	94,073,552	92,790,132	-1.36%
Active Inactives												
Count	100	100	0.00%	86	86	0.00%	24,079	24,079	0.00%	24,265	24,265	0.00%
Terminated Vested Members												
Count	56	56	0.00%	143	143	0.00%	8,575	8,575	0.00%	8,774	8,774	0.00%

Table A-2
NYCERS Annuitant Statistics – June 30, 2008
(\$ in thousands)

	Fixed Dollar Benefit			Supplemental (COLA) Benefit			Total Benefit		
	Office of the Actuary	Hay Group	Percent Difference	Office of the Actuary	Hay Group	Percent Difference	Office of the Actuary	Hay Group	Percent Difference
Annuitant Statistics									
Retiree Count							130,479	130,477	0.00%
Annual Benefits Payable:									
Service Retirees	\$2,305,577	\$2,305,577	0.00%	\$239,808	\$239,808	0.00%	\$2,545,385	\$2,545,385	0.00%
Ordinary Disability Retirees	\$121,598	\$121,598	0.00%	\$19,056	\$19,056	0.00%	140,654	140,654	0.00%
Accidental Disability Retirees	\$93,665	\$89,930	-3.99%	\$22,100	\$22,098	-0.01%	115,765	112,027	-3.23%
Accidental Death Beneficiaries	\$1,758	\$1,758	0.00%	\$636	\$636	0.00%	2,394	2,394	0.00%
Beneficiaries	\$138,802	\$142,537	2.69%	\$40,645	\$40,648	0.01%	179,447	183,185	2.08%
Total Benefit Payable	\$2,661,400	\$2,661,400	0.00%	\$322,245	\$322,246	0.00%	\$2,983,645	\$2,983,645	0.00%

Table A-3
Comparison of Active Valuation Liabilities – NYCERS (All Employers) – June 30, 2008
(\$ in thousands)

Active Liability by Decrement	Tier 1			Tier 2			Tiers 3 and 4			Total		
	Office of the Actuary	Hay Group	Percent Difference	Office of the Actuary	Hay Group	Percent Difference	Office of the Actuary	Hay Group	Percent Difference	Office of the Actuary	Hay Group	Percent Difference
Service Retirement	\$1,139,360	\$1,132,862	-0.57%	\$759,867	\$772,516	1.66%	\$26,270,261	\$26,548,919	1.06%	28,169,488	28,454,297	1.01%
Ordinary Disability	18,310	19,024	3.90%	17,773	17,346	-2.41%	1,217,341	1,199,283	-1.48%	1,253,424	1,235,652	-1.42%
Accidental Disability	952	921	-3.29%	1,250	1,197	-4.22%	304,437	314,811	3.41%	306,638	316,929	3.36%
Ordinary Death	11,228	12,013	6.99%	4,553	4,607	1.17%	447,654	438,142	-2.12%	463,435	454,761	-1.87%
Accidental Death	41	27	-35.25%	38	39	2.43%	19,303	18,072	-6.37%	19,382	18,138	-6.42%
Vested Deferred	782	1,243	58.91%	6,881	5,436	-21.00%	1,737,443	1,687,108	-2.90%	1,745,106	1,693,786	-2.94%
Return of Contributions	0	62	21866.56%	270	172	-36.35%	48,118	47,496	-1.29%	48,389	47,730	-1.36%
Total Active Liability	\$1,170,673	\$1,166,150	-0.39%	\$790,633	\$801,312	1.35%	\$30,044,557	\$30,253,831	0.70%	\$32,005,863	\$32,221,293	0.67%
Active Inactive Liability	\$32,239	\$29,505	-8.48%	\$18,281	\$16,724	-8.52%	\$614,655	\$607,148	-1.22%	665,174	653,377	-1.77%
Terminated Vested Liability	\$11,460	\$14,300	24.78%	\$17,364	\$19,628	13.04%	\$397,820	\$435,105	9.37%	426,644	469,033	9.94%
Miscellaneous Active Valuation Liability Loads and Adjustments												
U-payroll										\$108,300	\$108,300	0.00%
Reserve for Loan Insurance										\$5,000	\$5,000	0.00%
Accumulated Employee Contribution Adjustment										\$91,782	\$91,782	0.00%
Total Active Valuation Liability										\$33,302,763	\$33,548,785	0.74%

Table A-3.1
Comparison of Active Valuation Liabilities – NYCERS (Corrections only) – June 30, 2008
(\$ in thousands)

Active Liability by Decrement	Tier 1			Tier 2			Tiers 3 and 4			Total		
	Office of the Actuary	Hay Group	Percent Difference	Office of the Actuary	Hay Group	Percent Difference	Office of the Actuary	Hay Group	Percent Difference	Office of the Actuary	Hay Group	Percent Difference
Service Retirement	\$3,927	\$3,880	-1.20%	\$5,277	\$5,629	6.66%	\$2,232,255	\$2,335,627	4.63%	2,241,459	2,345,136	4.63%
Ordinary Disability	305	312	2.18%	\$547	603	10.16%	166,822	167,845	0.61%	167,675	168,760	0.65%
Accidental Disability	79	59	-25.92%	181	148	-18.13%	146,315	152,147	3.99%	146,575	152,353	3.94%
Ordinary Death	20	20	-1.02%	24	23	-5.08%	17,790	18,325	3.01%	17,834	18,368	2.99%
Accidental Death	1	1	1.51%	2	2	-4.97%	3,668	3,044	-16.99%	3,670	3,047	-16.98%
Vested Deferred	0	0	0.00%	0	0	0.00%	166,475	207,260	24.50%	166,475	207,260	24.50%
Return of Contributions	0	0	0.00%	0	0	0.00%	1,438	2,208	53.56%	1,438	2,208	53.56%
Total Active Liability	\$4,332	\$4,271	-1.41%	\$6,032	\$6,405	6.18%	\$2,734,762	\$2,886,456	5.55%	\$2,745,126	\$2,897,132	5.54%

Table A-3.2
Comparison of Active Valuation Liabilities – NYCERS (All General) – June 30, 2008
(\$ in thousands)

Active Liability by Decrement	Tier 1			Tier 2			Tiers 3 and 4			Total		
	Office of the Actuary	Hay Group	Percent Difference	Office of the Actuary	Hay Group	Percent Difference	Office of the Actuary	Hay Group	Percent Difference	Office of the Actuary	Hay Group	Percent Difference
Service Retirement	1,005,005	996,739	-0.82%	640,654	647,381	1.05%	15,433,521	15,307,199	-0.82%	17,079,179	16,951,319	-0.75%
Ordinary Disability	16,307	16,900	3.63%	15,038	14,526	-3.41%	703,350	698,854	-0.64%	734,695	730,280	-0.60%
Accidental Disability	571	572	0.13%	630	615	-2.37%	33,272	33,224	-0.15%	34,474	34,411	-0.18%
Ordinary Death	10,126	10,866	7.31%	4,008	4,068	1.50%	288,860	287,359	-0.52%	302,993	302,292	-0.23%
Accidental Death	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%
Vested Deferred	774	1,220	57.67%	6,329	5,382	-14.96%	1,104,239	1,034,799	-6.29%	1,111,342	1,041,401	-6.29%
Return of Contributions	0	62	21866.56%	270	172	-36.35%	41,420	40,462	-2.31%	41,691	40,696	-2.39%
Total Active Liability	\$1,032,783	\$1,026,359	-0.62%	\$666,928	\$672,143	0.78%	\$17,604,663	\$17,401,898	-1.15%	\$19,304,374	\$19,100,400	-1.06%

Table A-3.3
Comparison of Active Valuation Liabilities – NYCERS (Sanitation only) – June 30, 2008
(\$ in thousands)

Active Liability by Decrement	Tier 1			Tier 2			Tiers 3 and 4			Total		
	Office of the Actuary	Hay Group	Percent Difference	Office of the Actuary	Hay Group	Percent Difference	Office of the Actuary	Hay Group	Percent Difference	Office of the Actuary	Hay Group	Percent Difference
Service Retirement	\$11,674	\$11,729	0.47%	\$14,406	\$14,471	0.46%	\$2,105,939	\$2,166,681	2.88%	2,132,019	2,192,881	2.85%
Ordinary Disability	374	383	2.47%	615	580	-5.77%	133,040	143,924	8.18%	134,029	144,887	8.10%
Accidental Disability	237	227	-4.07%	343	335	-2.39%	109,118	114,897	5.30%	109,697	115,459	5.25%
Ordinary Death	101	104	3.27%	86	77	-10.32%	27,414	27,543	0.47%	27,601	27,724	0.45%
Accidental Death	4	3	-29.23%	5	5	-4.63%	3,694	3,524	-4.60%	3,703	3,532	-4.62%
Vested Deferred	0	0	0.00%	0	0	0.00%	88,947	88,788	-0.18%	88,947	88,788	-0.18%
Return of Contributions	0	0	0.00%	0	0	0.00%	1,464	1,006	-31.29%	1,464	1,006	-31.29%
Total Active Liability	\$12,390	\$12,446	0.45%	\$15,455	\$15,468	0.08%	\$2,469,616	\$2,546,363	3.11%	\$2,497,460	\$2,574,276	3.08%

Table A-3.4
Comparison of Active Valuation Liabilities – NYCERS (TBTA only) – June 30, 2008
(\$ in thousands)

Active Liability by Decrement	Tier 1			Tier 2			Tiers 3 and 4			Total		
	Office of the Actuary	Hay Group	Percent Difference	Office of the Actuary	Hay Group	Percent Difference	Office of the Actuary	Hay Group	Percent Difference	Office of the Actuary	Hay Group	Percent Difference
Service Retirement	\$4,433	\$4,409	-0.55%	\$7,142	\$6,891	-3.51%	\$286,219	\$283,991	-0.78%	297,795	295,291	-0.84%
Ordinary Disability	79	70	-10.94%	163	167	2.53%	12,882	13,492	4.73%	13,124	13,729	4.61%
Accidental Disability	17	16	-9.37%	36	39	7.81%	2,721	2,845	4.53%	2,775	2,899	4.48%
Ordinary Death	48	49	3.70%	49	57	15.48%	5,313	5,552	4.50%	5,410	5,659	4.59%
Accidental Death	2	2	-20.07%	4	4	9.02%	670	678	1.18%	676	683	1.16%
Vested Deferred	8	17	117.62%	18	11	-40.52%	30,629	23,633	-22.84%	30,655	23,661	-22.81%
Return of Contributions	0	0	0.00%	0	0	0.00%	484	375	-22.46%	484	375	-22.46%
Total Active Liability	\$4,587	\$4,563	-0.52%	\$7,412	\$7,169	-3.28%	\$338,919	\$330,566	-2.46%	\$350,918	\$342,298	-2.46%

Table A-3.5
Comparison of Active Valuation Liabilities – NYCERS (Transit only) – June 30, 2008
(\$ in thousands)

Active Liability by Decrement	Tier 1			Tier 2			Tiers 3 and 4			Total		
	Office of the Actuary	Hay Group	Percent Difference	Office of the Actuary	Hay Group	Percent Difference	Office of the Actuary	Hay Group	Percent Difference	Office of the Actuary	Hay Group	Percent Difference
Service Retirement	\$114,320	\$116,106	1.56%	\$92,389	\$98,143	6.23%	\$6,212,327	\$6,455,421	3.91%	6,419,036	6,669,670	3.90%
Ordinary Disability	1,244	1,359	9.23%	1,410	1,470	4.27%	201,247	175,168	-12.96%	203,901	177,997	-12.70%
Accidental Disability	47	47	-0.66%	60	61	0.72%	13,010	11,699	-10.08%	13,118	11,807	-9.99%
Ordinary Death	934	973	4.19%	386	382	-1.08%	108,277	99,363	-8.23%	109,597	100,717	-8.10%
Accidental Death	35	22	-37.44%	27	28	3.52%	11,271	10,826	-3.95%	11,334	10,876	-4.04%
Vested Deferred	0	5	N/A	534	43	-91.87%	347,153	332,628	-4.18%	347,687	332,676	-4.32%
Return of Contributions	0	0	0.00%	0	0	0.00%	3,313	3,445	3.99%	3,313	3,445	3.99%
Total Active Liability	\$116,580	\$118,511	1.66%	\$94,807	\$100,128	5.61%	\$6,896,598	\$7,088,548	2.78%	\$7,107,984	\$7,307,187	2.80%

The miscellaneous active valuation liability loads and adjustments are special adjustments that the OA makes to the NYCERS active liabilities. We discussed the rationale and method for calculating these loads with the OA and are comfortable with these liability loads.

Table A-4
Comparison of June 30, 2008 Base Annuity Valuation Liabilities – NYCERS
 (\$ in thousands)

	Annuity Fund			Pension Fund			Total Fund		
	Office of the Actuary	Hay Group	Percent Difference	Office of the Actuary	Hay Group	Percent Difference	Office of the Actuary	Hay Group	Percent Difference
Base Annuity Liabilities									
Service Retirees	\$748,743	\$745,021	-0.50%	\$18,778,623	\$18,633,553	-0.77%	\$19,527,365	\$19,378,574	-0.76%
Ordinary Disability Retirees	21,734	21,591	-0.66%	1,022,891	1,012,485	-1.02%	1,044,624	1,034,076	-1.01%
Accidental Disability Retirees	13,892	13,720	-1.24%	816,046	807,797	-1.01%	829,938	821,517	-1.01%
Beneficiaries	54,653	54,593	-0.11%	931,444	975,025	4.68%	986,096	1,029,618	4.41%
Total Base Annuity Liability	\$839,021	\$834,925	-0.49%	\$21,549,003	\$21,428,860	-0.56%	\$22,388,024	\$22,263,785	-0.55%

Table A-5
Comparison of June 30, 2008 Supplemental (COLA) Valuation Liabilities - NYCERS
 (\$ in thousands)

	Office of the Actuary	Hay Group	Percent Difference
Supplemental (COLA) Liabilities			
Service Retirees	\$2,448,159	\$2,554,018	4.32%
Ordinary Disability Retirees	248,705	260,606	4.79%
Accidental Disability Retirees	217,206	221,520	1.99%
Beneficiaries (Regular Plus Accidental Death)	241,460	255,036	5.62%
Total Supplemental and Automatic COLA Liabilities	\$3,155,529	\$3,291,180	4.30%

Table A-6
June 30, 2008 NYCERS Other Liabilities
(\$ in thousands)

	Office of the Actuary	Hay Group	Percent Difference
Pending Revisions	29,361	29,504	0.49%
Designated Annuitants	15,000	15,000	0.00%
Post-Retirement Death Benefit	112,967	116,864	3.45%
Housing Police Superior Officers' VSF	36,894	36,999	0.28%
Transit Police Superior Officers' VSF	40,440	40,577	0.34%
Corrections' VSF	1,146,286	1,163,171	1.47%
Housing Police Officers' VSF	30,077	30,185	0.36%
Transit Police Officers' VSF	54,831	55,021	0.35%

Appendix B: Detailed Comparison of Statistics and Liabilities – TRS

Table B-1
TRS Active Statistics – June 30, 2008
(\$ in thousands)

Active Liability by Decrement	Tier 1			Tier 2			Tiers 3 and 4			Total		
	Office of the Actuary	Hay Group	Percent Difference	Office of the Actuary	Hay Group	Percent Difference	Office of the Actuary	Hay Group	Percent Difference	Office of the Actuary	Hay Group	Percent Difference
Active Employees												
Count	2,836	2,836	0.00%	1,344	1,344	0.00%	108,292	108,292	0.00%	112,472	112,472	0.00%
Total Payroll	\$284,308	284,308	0.00%	\$139,033	139,033	0.00%	\$7,503,307	7,503,307	0.00%	7,926,648	7,926,648	0.00%
PV Future Salary	1,004,178	1,003,788	-0.04%	649,600	650,123	0.08%	83,818,446	84,317,307	0.60%	85,472,223	85,971,219	0.58%
Active Inactives												
Count	87	87	0.00%	37	37	0.00%	10,766	10,766	0.00%	10,890	10,890	0.00%
Terminated Vested Members												
Count	351	351	0.00%	164	164	0.00%	6,565	6,565	0.00%	7,080	7,080	0.00%

Table B-2
TRS Annuitant Statistics – June 30, 2008
(\$ in thousands)

	Fixed Dollar Benefit			Supplemental (COLA) Benefit			Total Benefit		
	Office of the Actuary	Hay Group	Percent Difference	Office of the Actuary	Hay Group	Percent Difference	Office of the Actuary	Hay Group	Percent Difference
Annuitant Statistics									
Retiree Count							69,598	69,600	0.00%
Annual Benefits Payable:									
Service Retirees	\$2,119,868	2,119,918	0.00%	\$134,118	134,120	0.00%	\$2,253,986	\$2,254,038	0.00%
Ordinary Disability Retirees	30,310	30,327	0.06%	4,357	4,359	0.04%	34,667	34,685	0.05%
Accidental Disability Retirees	16,236	16,237	0.00%	2,250	2,250	0.00%	18,486	18,486	0.00%
Accidental Death Beneficiaries	0	0	0.00%	0	0	0.00%	0	0	0.00%
Beneficiaries	61,851	61,813	-0.06%	11,661	11,658	-0.03%	73,512	73,470	-0.06%
Total Benefit Payable	\$2,228,265	\$2,228,294	0.00%	\$152,386	\$152,386	0.00%	\$2,380,652	\$2,380,680	0.00%

Table B-3
Comparison of June 30, 2008 Active Valuation Liabilities – TRS
(\$ in thousands)

Active Liability by Decrement	Tier 1			Tier 2			Tiers 3 and 4			Total		
	Office of the Actuary	Hay Group	Percent Difference	Office of the Actuary	Hay Group	Percent Difference	Office of the Actuary	Hay Group	Percent Difference	Office of the Actuary	Hay Group	Percent Difference
Service Retirement	\$1,843,251	1,792,710	-2.74%	\$861,593	878,109	1.92%	\$21,403,750	21,487,344	0.39%	24,108,594	24,158,164	0.21%
Ordinary Disability	13,122	13,564	3.37%	7,550	7,379	-2.26%	317,316	320,243	0.92%	337,988	341,187	0.95%
Accidental Disability	3,247	3,482	7.26%	1,935	1,889	-2.39%	115,216	117,259	1.77%	120,398	122,631	1.85%
Ordinary Death	16,835	16,861	0.15%	3,820	3,713	-2.81%	268,115	272,738	1.72%	288,770	293,311	1.57%
Accidental Death	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%
Vested Deferred	868	753	-13.32%	881	1,003	13.81%	925,987	961,376	3.82%	927,737	963,132	3.82%
Return of Contributions	0	0	0.00%	0	0	0.00%	24,564	24,725	0.66%	24,564	24,725	0.65%
Total Active Liability	\$1,877,323	\$1,827,370	-2.66%	\$875,779	\$892,093	1.86%	\$23,054,949	\$23,183,685	0.56%	\$25,808,051	\$25,903,149	0.37%
Active Inactive Liability	\$25,785	23,419	-9.18%	\$5,598	5,003	-10.64%	\$155,093	157,682	1.67%	186,477	186,104	-0.20%
Terminated Vested Liability	\$57,085	62,346	9.22%	\$26,304	27,432	4.29%	\$346,300	311,288	-10.11%	429,689	401,066	-6.66%
Miscellaneous Active Valuation Liability Loads and Adjustments												
Active Liability Adjustment for Variable A and B balances										\$1,704,507	1,704,507	0.00%
Revision to Active Liability										\$493,556	493,556	0.00%
Reserve for Loan Insurance										700	700	0.00%
Accumulated Employee Contribution Adjustment										180,109	180,109	0.00%
Total Active Valuation Liability										\$28,803,089	\$28,869,191	0.23%

The miscellaneous active valuation liability loads and adjustments are special adjustments that the OA makes to the TRS active liabilities. We discussed the rationale and method for calculating these loads with the OA and are comfortable with these liability loads.

Table B-4
Comparison of June 30, 2008 Base Annuity Valuation Liabilities - TRS
(\$ in thousands)

	Annuity Fund			Pension Fund			Total Fund		
	Office of the Actuary	Hay Group	Percent Difference	Office of the Actuary	Hay Group	Percent Difference	Office of the Actuary	Hay Group	Percent Difference
Base Annuity Liabilities									
Service Retirees	\$740,018	744,335	0.58%	\$19,192,633	19,322,121	0.67%	\$19,932,651	\$20,066,456	0.67%
Ordinary Disability Retirees	9,861	9,862	0.01%	274,014	274,384	0.13%	283,875	284,246	0.13%
Accidental Disability Retirees	2,827	2,809	-0.63%	145,096	145,286	0.13%	147,923	148,095	0.12%
Accidental Death Beneficiaries	0	0	0.00%	0	0	0.00%	0	0	0.00%
Beneficiaries	16,985	17,944	5.64%	445,957	453,521	1.70%	462,942	471,465	1.84%
Total Base Annuity Liability	\$769,690	\$774,950	0.68%	\$20,057,700	\$20,195,312	0.69%	\$20,827,390	\$20,970,262	0.69%

Table B-5
Comparison of June 30, 2008 Supplemental (COLA) Valuation Liabilities - TRS
(\$ in thousands)

	Office of the Actuary	Hay Group	Percent Difference
Supplemental (COLA) Liabilities			
Service Retirees	\$1,727,965	1,795,240	3.89%
Ordinary Disability Retirees	54,720	56,998	4.16%
Accidental Disability Retirees	25,107	25,630	2.08%
Beneficiaries (Regular Plus Accidental Death)	73,827	79,821	8.12%
Total Supplemental and Automatic COLA Liabilities	\$1,881,620	\$1,957,689	4.04%

Table B-6
June 30, 2008 TRS Other Liabilities
 (\$ in thousands)

	Office of the Actuary	Hay Group	Percent Difference
Present Value of the Annuitying of Variable Funds	\$387,378	387,378	0.00%
Retroactive Wage Adjustments	\$2,000	2,000	0.00%
Liability for Pensioners Due Variable Fund Benefits	\$6,363,109	6,378,399	0.24%
Designated Annuitant Liability	\$36,657	36,630	-0.07%
Post-Retirement Death Benefit	\$71,308	71,325	0.02%
Total Other Liabilities	\$6,860,452	\$6,875,733	0.22%

The Other Liabilities are a combination of liability adjustments and explicitly valued liabilities. Hay Group reviewed the memo related to the Annuitying of Variable Funds and discussed the other liability loads with the OA. Hay Group is comfortable with these liability loads.

Appendix C: Detailed Comparison of Statistics and Liabilities – BERS

Table C-1
BERS Active Statistics – June 30, 2008
(\$ in thousands)

Active Liability by Decrement	Tier 1			Tier 2			Tiers 3 and 4			Total		
	Office of the Actuary	Hay Group	Percent Difference	Office of the Actuary	Hay Group	Percent Difference	Office of the Actuary	Hay Group	Percent Difference	Office of the Actuary	Hay Group	Percent Difference
Active Employees												
Count	170	170	0.00%	88	88	0.00%	22,471	22,471	0.00%	22,729	22,729	0.00%
Total Payroll	\$9,962	9,962	0.00%	\$5,403	5,403	0.00%	\$836,741	836,741	0.00%	852,106	852,106	0.00%
PV Future Salary	32,293	32,160	-0.41%	23,073	23,328	1.11%	7,249,078	7,249,140	0.00%	7,304,443	7,304,628	0.00%
Active Inactives												
Count	50	50	0.00%	26	26	0.00%	3,923	3,923	0.00%	3,999	3,999	0.00%
Terminated Vested Members												
Count	3	3	0.00%	3	3	0.00%	277	277	0.00%	283	283	0.00%

Table C-2
BERS Annuitant Statistics – June 30, 2008
(\$ in thousands)

	Fixed Dollar Benefit			Supplemental (COLA) Benefit			Total Benefit		
	Office of the Actuary	Hay Group	Percent Difference	Office of the Actuary	Hay Group	Percent Difference	Office of the Actuary	Hay Group	Percent Difference
Annuitant Statistics									
Retiree Count							13,196	13,196	0.00%
Annual Benefits Payable:									
Service Retirees	\$124,268	124,275	0.01%	\$9,944	9,944	0.00%	\$134,212	\$134,219	0.01%
Ordinary Disability Retirees	5,580	5,580	0.01%	306	306	0.00%	5,886	5,886	0.01%
Accidental Disability Retirees	1,447	1,449	0.15%	231	231	0.00%	1,678	1,680	0.13%
Accidental Death Beneficiaries	12	12	0.03%	18	18	0.00%	31	31	0.01%
Beneficiaries	7,238	7,238	0.01%	1,408	1,408	0.00%	8,646	8,646	0.01%
Total Benefit Payable	\$138,545	\$138,555	0.01%	\$11,907	\$11,907	0.00%	\$150,452	\$150,462	0.01%

Table C-3
Comparison of June 30, 2008 Active Valuation Liabilities – BERS
(\$ in thousands)

Active Liability by Decrement	Tier 1			Tier 2			Tiers 3 and 4			Total		
	Office of the Actuary	Hay Group	Percent Difference	Office of the Actuary	Hay Group	Percent Difference	Office of the Actuary	Hay Group	Percent Difference	Office of the Actuary	Hay Group	Percent Difference
Service Retirement	\$68,321	66,395	-2.82%	\$36,333	35,794	-1.48%	\$1,744,428	1,734,031	-0.60%	1,849,082	1,836,221	-0.70%
Ordinary Disability	1,123	1,142	1.66%	775	761	-1.82%	72,531	71,226	-1.80%	74,429	73,129	-1.75%
Accidental Disability	39	40	1.46%	26	26	-0.53%	3,400	3,364	-1.08%	3,466	3,430	-1.04%
Ordinary Death	691	744	7.71%	185	197	6.70%	30,101	30,159	0.19%	30,977	31,101	0.40%
Accidental Death	0	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%
Vested Deferred	139	106	-23.65%	76	99	30.20%	93,912	95,199	1.37%	94,127	95,404	1.36%
Return of Contributions	1	13	873.71%	0	0	0.00%	3,752	3,810	1.54%	3,754	3,823	1.84%
Total Active Liability	\$70,315	\$68,439	-2.67%	\$37,396	\$36,878	-1.38%	\$1,948,124	\$1,937,790	-0.53%	\$2,055,834	\$2,043,107	-0.62%
Active Inactive Liability	\$4,245	4,158	-2.05%	\$3,001	2,521	-16.01%	\$64,738	63,412	-2.05%	71,984	70,091	-2.63%
Terminated Vested Liability	\$1,007	1,346	33.56%	\$649	929	43.11%	\$12,327	13,162	6.77%	13,984	15,437	10.39%
Miscellaneous Active Valuation Liability Loads and Adjustments												
Active Liability Adjustment for Variable A and B balances										\$5,112	5,112	0.00%
Transfer Liability										\$3,000	3,000	0.00%
Reserve for Loan Insurance										400	400	0.00%
Accumulated Employee Contribution Adjustment										20,463	20,463	0.00%
Total Active Valuation Liability										\$2,170,777	\$2,157,609	-0.61%

The miscellaneous active valuation liability loads and adjustments are special adjustments that the OA makes to the BERS active liabilities. We discussed the rationale and method for these loads with the OA and are comfortable with these liability loads and adjustments.

Table C-4
Comparison of June 30, 2008 Base Annuity Valuation Liabilities – BERS
(\$ in thousands)

	Annuity Fund			Pension Fund			Total Fund		
	Office of the Actuary	Hay Group	Percent Difference	Office of the Actuary	Hay Group	Percent Difference	Office of the Actuary	Hay Group	Percent Difference
Base Annuity Liabilities									
Service Retirees	\$49,898	50,255	0.72%	\$940,223	947,006	0.72%	\$990,121	\$997,261	0.72%
Ordinary Disability Retirees	869	876	0.81%	44,757	44,988	0.52%	45,626	45,864	0.52%
Accidental Disability Retirees	221	222	0.63%	10,963	11,076	1.03%	11,184	11,298	1.02%
Accidental Death Beneficiaries	0	0	0.00%	106	109	2.53%	106	109	2.53%
Beneficiaries	3,321	3,351	0.90%	47,198	47,868	1.42%	50,520	51,219	1.38%
Total Base Annuity Liability	\$54,309	\$54,704	0.73%	\$1,043,248	\$1,051,047	0.75%	\$1,097,557	\$1,105,751	0.75%

Table C-5
Comparison of June 30, 2008 Supplemental (COLA) Valuation Liabilities - BERS
(\$ in thousands)

	Office of the Actuary	Hay Group	Percent Difference
Supplemental (COLA) Liabilities			
Service Retirees	\$122,778	123,871	0.89%
Ordinary Disability Retirees	6,318	6,255	-1.00%
Accidental Disability Retirees	2,489	2,568	3.17%
Beneficiaries (Regular Plus Accidental Death)	9,320	10,084	8.20%
Total Supplemental and Automatic COLA Liabilities	\$140,905	\$142,778	1.33%

Table C-6 June 30, 2008 BERS Other Liabilities (\$ in thousands)			
	Office of the Actuary	Hay Group	Percent Difference
Present Value of the Annuitizing of Variable Funds	\$102	102	0.00%
Liability for Pensioners Due Variable Fund Benefits	\$23,315	23,495	0.77%
Post-Retirement Death Benefit	\$270	270	0.11%
Total Other Liabilities	\$23,687	\$23,867	0.76%

The Other Liabilities are a combination of liability adjustments and explicitly valued liabilities. Hay Group reviewed the memo related to the Annuitizing of Variable Funds.

Appendix D: Detailed Comparison of Statistics and Liabilities – POLICE

Table D-1
POLICE Active Statistics – June 30, 2008
(\$ in thousands)

	Tier 1			Tier 2			Total		
	Office of the Actuary	Hay Group	Percent Difference	Office of the Actuary	Hay Group	Percent Difference	Office of the Actuary	Hay Group	Percent Difference
Active Employees									
Count	69	69	0.00%	35268	35,268	0.00%	35,337	35,337	0.00%
Total Payroll	\$10,354	\$10,354	0.00%	\$3,085,550	\$3,085,550	0.00%	\$3,095,904	\$3,095,904	0.00%
PV Future Salary	16,444	16,432	-0.07%	25,522,612	25,512,405	-0.04%	25,539,056	25,528,836	-0.04%
Active Inactives									
Count	0	0	0.00%	2,168	2,168	0.00%	2,168	2,168	0.00%
Terminated Vested Members									
Count	0	0	0.00%	813	813	0.00%	813	813	0.00%

Table D-2
POLICE Annuitant Statistics – June 30, 2008
(\$ in thousands)

	Fixed Dollar Benefit			Supplemental (COLA) Benefit			Total Benefit		
	Office of the Actuary	Hay Group	Percent Difference	Office of the Actuary	Hay Group	Percent Difference	Office of the Actuary	Hay Group	Percent Difference
Annuitant Statistics									
Retiree Count							44,290	44,290	0.00%
Annual Benefits Payable:									
Service Retirees	\$905,648	\$905,606	0.00%	\$94,196	\$94,196	0.00%	\$999,844	\$999,802	0.00%
Ordinary Disability Retirees	88,892	88,885	-0.01%	21,959	21,959	0.00%	110,850	110,844	-0.01%
Accidental Disability Retirees	458,589	458,571	0.00%	61,744	61,744	0.00%	520,333	520,315	0.00%
Accidental Death Beneficiaries	6,880	6,880	0.00%	2,255	2,255	0.00%	9,136	9,135	0.00%
Beneficiaries	11,001	10,964	-0.34%	3,333	3,333	0.00%	14,334	14,297	-0.26%
Total Benefit Payable	\$1,471,011	\$1,470,906	-0.01%	\$183,487	\$183,487	0.00%	\$1,654,498	\$1,654,393	-0.01%

Table D-3
Comparison of June 30, 2008 Active Valuation Liabilities - POLICE
(\$ in thousands)

Active Liability by Decrement	Tier 1			Tier 2			Total		
	Office of the Actuary	Hay Group	Percent Difference	Office of the Actuary	Hay Group	Percent Difference	Office of the Actuary	Hay Group	Percent Difference
Service Retirement	\$67,715	\$65,422	-3.39%	\$11,457,662	\$11,544,994	0.76%	\$11,525,377	\$11,610,416	0.74%
Ordinary Disability	12,298	12,187	-0.90%	671,561	698,449	4.00%	683,859	710,636	3.92%
Accidental Disability	13,990	14,014	0.17%	3,557,371	3,615,141	1.62%	3,571,361	3,629,154	1.62%
Ordinary Death	1,280	1,281	0.05%	166,025	168,331	1.39%	167,305	169,612	1.38%
Accidental Death	17	18	6.99%	17,441	17,338	-0.59%	17,458	17,356	-0.58%
Vested Deferred	0	0	0.00%	316,599	328,084	3.63%	316,599	328,084	3.63%
Return of Contributions	0	0	0.00%	4,688	4,714	0.56%	4,688	4,714	0.56%
Total Active Liability	\$95,300	\$92,922	-2.50%	\$16,191,347	\$16,377,051	1.15%	\$16,286,647	\$16,469,972	1.13%
Active Inactive Liability	\$0	\$0	0.00%	\$109,682	\$109,667	-0.01%	\$109,682	\$109,667	-0.01%
Terminated Vested Liability	\$0	\$0	0.00%	\$77,501	\$67,880	-12.41%	\$77,501	\$67,880	-12.41%
Miscellaneous Active Valuation Liability Loads and Adjustments									
Transfer Liability and WTC Liability							\$279,631	\$279,631	0.00%
Reserve for Loan Insurance							3,400	\$3,400	0.00%
Accumulated Employee Contribution Adjustment							50,555	\$50,555	0.00%
Total Active Valuation Liability							\$16,807,417	\$16,981,105	1.00%

The miscellaneous active valuation liability loads and adjustments are special adjustments that the OA makes to the POLICE active liabilities. We discussed the rationale and method for calculating these loads and adjustments with the OA, and reviewed appropriate work papers, and are comfortable with these liability loads and adjustments.

Table D-4
Comparison of June 30, 2008 Base Annuity Valuation Liabilities - POLICE
(\$ in thousands)

	Annuity Fund			Pension Fund			Total Fund		
	Office of the Actuary	Hay Group	Percent Difference	Office of the Actuary	Hay Group	Percent Difference	Office of the Actuary	Hay Group	Percent Difference
Base Annuity Liabilities									
Service Retirees	\$241,537	\$203,679	-15.67%	\$9,025,574	\$9,069,058	0.48%	\$9,267,111	\$9,272,737	0.06%
Ordinary Disability Retirees	19,822	19,231	-2.98%	692,468	695,464	0.43%	712,290	714,695	0.34%
Accidental Retirees	109,192	94,307	-13.63%	4,508,209	4,525,745	0.39%	4,617,401	4,620,052	0.06%
Accidental Death Beneficiaries	4	4	-3.66%	68,232	71,107	4.21%	68,236	71,111	4.21%
Beneficiaries	2,873	2,948	2.61%	85,709	87,338	1.90%	88,582	90,286	1.92%
Unprocessed Pension Fund Adjustment (1/.85 adjustment)	N/A	N/A	N/A	N/A	N/A	N/A	485,801	485,801	0.00%
Sal Adjustment Unprocessed	N/A	N/A	N/A	N/A	N/A	N/A	339,000	339,000	0.00%
Total Base Annuity Liability	\$373,428	\$320,169	-14.26%	\$14,380,193	\$14,448,712	0.48%	\$15,578,421	\$15,593,682	0.10%

The unprocessed pension fund adjustment and the salary adjustment for unprocessed pensions are liability loads that are documented in the OA's work papers. We have reviewed these calculations and are comfortable with these liability loads.

Table D-5 Comparison of June 30, 2008 Supplemental (COLA) Valuation Liabilities - POLICE (\$ in thousands)			
	Office of the Actuary	Hay Group	Percent Difference
Supplemental (COLA) Liabilities			
Service Retirees	\$1,036,688	\$1,038,118	0.14%
Ordinary Disability Retirees	207,428	211,481	1.95%
Accidental Disability Retirees	722,492	730,145	1.06%
Beneficiaries (Regular Plus Accidental Death)	45,682	50,659	10.89%
Total Supplemental and Automatic COLA Liabilities	\$2,012,290	\$2,030,403	0.90%

Table D-6 June 30, 2008 POLICE VSF Liabilities (\$ in thousands)			
	Office of the Actuary	Hay Group	Percent Difference
Active VSF Liability	\$1,983,430	\$1,996,754	0.67%
Retiree VSF Liability	2,974,830	\$2,987,730	0.43%
Total VSF Liability	\$4,958,260	\$4,984,484	0.53%

Appendix E: Detailed Comparison of Statistics and Liabilities – FIRE

Table E-1
FIRE Active Statistics – June 30, 2008
(\$ in thousands)

	Tier 1			Tier 2			Total		
	Office of the Actuary	Hay Group	Percent Difference	Office of the Actuary	Hay Group	Percent Difference	Office of the Actuary	Hay Group	Percent Difference
Active Employees									
Count	48	48	0.00%	11,526	11,526	0.00%	11,574	11,574	0.00%
Total Payroll	\$6,814	\$6,814	0.00%	\$1,044,777	\$1,044,777	0.00%	\$1,051,592	\$1,051,592	0.00%
PV Future Salary	9,329	9,323	-0.07%	10,304,444	10,298,752	-0.06%	10,313,773	10,308,074	-0.06%
Active Inactives									
Count	2	2	0.00%	51	51	0.00%	53	53	0.00%
Terminated Vested Members									
Count	0	0	0.00%	32	32	0.00%	32	32	0.00%

Table E-2
FIRE Annuitant Statistics – June 30, 2008
(\$ in thousands)

	Fixed Dollar Benefit			Supplemental (COLA) Benefit			Total Benefit		
	Office of the Actuary	Hay Group	Percent Difference	Office of the Actuary	Hay Group	Percent Difference	Office of the Actuary	Hay Group	Percent Difference
Annuitant Statistics									
Retiree Count							17,404	17,404	0.00%
Annual Benefits Payable:									
Service Retirees	\$216,965	\$217,008	0.02%	\$31,259	\$31,259	0.00%	\$248,223	\$248,266	0.02%
Ordinary Disability Retirees	51,651	51,652	0.00%	8,023	8,035	0.15%	59,673	59,686	0.02%
Accidental Disability Retirees	455,205	455,211	0.00%	40,457	40,457	0.00%	495,662	495,668	0.00%
Accidental Death Beneficiaries	18,865	18,866	0.00%	2,309	2,309	0.00%	21,174	21,174	0.00%
Beneficiaries	5,828	5,828	0.00%	2,736	2,736	0.00%	8,564	8,565	0.00%
Total Benefit Payable	\$748,514	\$748,565	0.01%	\$84,783	\$84,795	0.01%	\$833,297	\$833,360	0.01%

Table E-3
Comparison of Active Valuation Liabilities – FIRE
(\$ in thousands)

Active Liability by Decrement	Tier 1			Tier 2			Total		
	Office of the Actuary	Hay Group	Percent Difference	Office of the Actuary	Hay Group	Percent Difference	Office of the Actuary	Hay Group	Percent Difference
Service Retirement	\$34,584	\$33,539	-3.02%	\$2,740,184	\$2,751,972	0.43%	\$2,774,768	\$2,785,511	0.39%
Ordinary Disability	5,575	5,556	-0.34%	330,636	335,394	1.44%	336,212	340,951	1.41%
Accidental Disability	17,934	18,007	0.41%	3,299,213	3,298,232	-0.03%	3,317,146	3,316,240	-0.03%
Ordinary Death	597	597	0.07%	118,622	119,385	0.64%	119,219	119,982	0.64%
Accidental Death	279	301	7.89%	78,725	78,490	-0.30%	79,003	78,791	-0.27%
Vested Deferred	0	0	0.00%	35,320	35,895	1.63%	35,320	35,895	1.63%
Return of Contributions	0	0	0.00%	190	191	0.61%	190	191	0.61%
Total Active Liability	\$58,968	\$58,000	-1.64%	\$6,602,891	\$6,619,560	0.25%	\$6,661,859	\$6,677,560	0.24%
Active Inactive Liability	\$1,482	\$1,501	1.35%	\$7,854	\$7,634	-2.80%	\$9,336	\$9,136	-2.14%
Terminated Vested Liability	\$0	\$0	0.00%	\$3,308	\$3,333	0.75%	\$3,308	\$3,333	0.75%
Miscellaneous Active Valuation Liability Loads and Adjustments									
Transfer Liability and WTC Liability							\$295,007	\$295,007	0.00%
Reserve for Loan Insurance							800	800	0.00%
Accumulated Employee Contribution Adjustment							-19,067	-19,067	0.00%
Total Active Valuation Liability							\$6,951,243	\$6,966,769	0.22%

The miscellaneous active valuation liability loads and adjustments are special adjustments that the OA makes to the FIRE active liabilities. We discussed the rationale and method for calculating these loads and adjustments with the OA, and reviewed appropriate work papers, and are comfortable with these liability loads and adjustments.

Table E-4
Comparison of June 30, 2008 Base Annuity Valuation Liabilities – FIRE
(\$ in thousands)

	Annuity Fund			Pension Fund			Total Fund		
	Office of the Actuary	Hay Group	Percent Difference	Office of the Actuary	Hay Group	Percent Difference	Office of the Actuary	Hay Group	Percent Difference
Base Annuity Liabilities									
Service Retirees	\$51,606	\$51,462	-0.28%	\$1,880,418	\$1,892,857	0.66%	\$1,932,024	\$1,944,319	0.64%
Ordinary Disability Retirees	4,606	4,648	0.90%	356,592	359,479	0.81%	361,198	364,127	0.81%
Accidental Disability Retirees	123,227	123,953	0.59%	4,297,826	4,321,505	0.55%	4,421,054	4,445,458	0.55%
Accidental Death Beneficiaries	100	100	0.26%	203,193	201,515	-0.83%	203,293	201,615	-0.83%
Beneficiaries	842	889	5.53%	44,387	45,355	2.18%	45,229	46,244	2.24%
Unprocessed Pension Fund Adjustment (1/9 adjustment)	N/A	N/A	N/A	N/A	N/A	N/A	136,934	136,934	0.00%
Sal Adjustment Unprocessed	N/A	N/A	N/A	N/A	N/A	N/A	71,000	71,000	0.00%
Total Base Annuity Liability	\$180,381	\$181,052	0.37%	\$6,782,416	\$6,820,711	0.56%	\$7,170,732	\$7,209,697	0.54%

The unprocessed pension fund adjustment and the salary adjustment for unprocessed pensions are liability loads that are documented in the OA's work papers. We have reviewed these calculations and are comfortable with these liability loads.

Table E-5
Comparison of June 30, 2008 Supplemental (COLA) Valuation Liabilities – FIRE
(\$ in thousands)

	Office of the Actuary	Hay Group	Percent Difference
Supplemental (COLA) Liabilities			
Service Retirees	\$271,843	\$280,554	3.20%
Ordinary Disability Retirees	58,996	61,690	4.57%
Accidental Disability Retirees	414,420	414,366	-0.01%
Beneficiaries (Regular Plus Accidental Death)	45,327	47,705	5.25%
Total Supplemental and Automatic COLA Liabilities	\$790,586	\$804,315	1.74%

Table E-6
June 30, 2008 FIRE VSF Liabilities
 (\$ in thousands)

	Office of the Actuary	Hay Group	Percent Difference
Active VSF Liability	\$485,924	\$492,145	1.28%
Retiree VSF Liability	602,197	605,685	0.58%
Total VSF Liability	\$1,088,120	\$1,097,829	0.89%