London Borough of Barnet Pension Fund

2016 Actuarial Valuation

DRAFT Valuation Report

March 2017

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For and on behalf of Hymans Robertson LLP

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Hymans Robertson LLP has carried out an actuarial valuation of the London Borough of Barnet Pension Fund ("the Fund") as at 31 March 2016, details of which are set out in the report dated 9 March 2017 ("the Report"), addressed to the Administering Authority of the Fund, London Borough of Barnet ("the Client"). The Report was prepared for the sole use and benefit of our Client and not for any other party; and Hymans Robertson LLP makes no representation or warranties to any third party as to the accuracy or completeness of the Report.

The Report was not prepared for any third party and it will not address the particular interests or concerns of any such third party. The Report is intended to advise our Client on the past service funding position of the Fund at 31 March 2016 and employer contribution rates from 1 April 2017, and should not be considered a substitute for specific advice in relation to other individual circumstances.

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Executive summary

We have carried out an actuarial valuation of the London Borough of Barnet Pension Fund ('the Fund') as at 31 March 2016. The results are presented in this report and are briefly summarised below.

Funding position

The table below summarises the funding position of the Fund as at 31 March 2016 in respect of benefits earned by members up to this date (along with a comparison at the last formal valuation at 31 March 2013).

Past Service Position	31 March 2013 (£m)	31 March 2016 (£m)
Past Service Liabilities	1,000	1,256
Market Value of Assets	789	916
Surplus / (Deficit)	(211)	(339)
Funding Level	**79%**	**73%**

The deterioration in funding position between 2013 and 2016 is mainly due to the change in financial assumptions and lower than expected investment returns over the inter-valuation period. The liabilities have also increased due to a reduction in the future expected investment return, although this has been partially been offset by lower than expected pay and benefit growth (both over the inter-valuation period and continuing in the long term).

Contribution rates

The table below summarises the whole fund Primary and Secondary Contribution rates at this triennial valuation. The Primary rate is the payroll weighted average of the underlying individual employer primary rates and the Secondary rate is the total of the underlying individual employer secondary rates (before any pre-payment or capitalisation of future contributions), calculated in accordance with the Regulations and CIPFA guidance.

Contribution Rates	31 March 2016 (% of pay)
Primary Rate	TBC
Secondary Rate	TBC
Total Contribution Rate	**TBC**
Employee contribution rate	6.5%
Expenses	0.9%

At the previous formal valuation at 31 March 2013, a different regulatory regime was in force. Therefore a contribution rate that is directly comparative to the rates above is not provided.

Broadly, contributions required to be made by employers in respect of new benefits earned by members (the primary contribution rate) have increased as future expected investment returns have fallen. Changes to employer contributions targeted to fund the deficit have been variable across employers.

The minimum contributions to be paid by each employer from 1 April 2017 to 31 March 2020 are shown in the Rates and Adjustment Certificate in **Appendix H [not included in draft report]**.

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1 Introduction

We have carried out an actuarial valuation of the London Borough of Barnet Pension Fund ("the Fund") as at 31 March 2016 under Regulation 62 of The Local Government Pension Scheme Regulations 2013 ("the Regulations"). The purpose of the valuation is to assess the value of the assets and liabilities of the Fund as at 31 March 2016 and to calculate the required rate of employers' contributions to the Fund for the period from 1 April 2017 to 31 March 2020.

Valuation Report

This report records the high level outcomes of the actuarial valuation as at 31 March 2016. The valuation report is prepared by the actuary to the Fund and is addressed to London Borough of Barnet as the Administering Authority to the Fund.

Component reports

This document is part of an "aggregate" report, i.e. it is the culmination of various "component" reports and discussions, in particular:

- Correspondence relating to data including the Data Report dated TBC;
- The Initial Results report (dated 2 February 2017) which outlined the whole fund results;
- The formal agreement by the Administering Authority of the actuarial assumptions used in this document, at a meeting on 7 March 2017;
- The contribution modelling carried out for the London Borough of Barnet (as an employer), as detailed in our report and presentation to the Administering Authority of 20 February 2017;
- The Funding Strategy Statement, confirming the different contribution rate setting approaches for different types of employer or in different circumstances.

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2 Valuation Approach

The valuation is a planning exercise for the Fund, to assess the monies needed to meet the benefits owed to its members as they fall due. As part of the valuation process the Fund reviews its funding strategy to ensure that an appropriate contribution plan and investment strategy is in place.

It is important to realise that the actual cost of the pension fund (i.e. how much money it will ultimately have to pay out to its members in the form of benefits) is unknown. This cost will not be known with certainty until the last benefit is paid to the last pensioner. The purpose of this valuation is to estimate what this cost will be, so that the Fund can then develop a funding strategy to meet it.

Setting the funding strategy for an open defined benefit pension fund such as London Borough of Barnet Pension Fund is complex. Firstly, the time period is very long; benefits earned in the LGPS today will be paid out over a period of the next 80 years or more and it remains open to new joiners and accrual of benefits. Secondly, the LGPS remains a defined benefit scheme so there are significant uncertainties in the final cost of the benefits to be paid. Finally, in order to reduce employer costs, London Borough of Barnet Pension Fund invests in a return seeking investment strategy which can result in high levels of asset volatility.

Such a valuation can only ever be an estimate – as the future cannot be predicted with certainty. However, as actuaries, we can use our understanding of the Fund and the factors that affect it to set the pace of funding in conjunction with the Administering Authority. The pace of this funding can vary according to the level of prudence that is built into the valuation method and assumptions.

The valuation approach adopted recognises the uncertainties and risks posed to funding by the factors discussed above and follows the process outlined below.

Step 1: The Fund sets a funding target (or funding basis) which defines the target amount of assets to be held to meet the future cashflows. The assumptions underlying the funding target are discussed further in the next section. A measurement is made at the valuation date to compare the assets held with the funding target.

Step 2: The Fund sets the time horizon over which the funding target is to be reached

Step 3: The Fund sets contributions that give a sufficiently high likelihood of meeting the funding target over the set time horizon. More detail on this risk based approach to setting contribution rates can be found in **Appendix C**.

Our calculations identify separately the expected cost of members' benefits in respect of scheme membership completed before the valuation date ("past service") and that which is expected to be completed after the valuation date ("future service").

Past service

The principal measurement here is the comparison of the funding position at the valuation date against the funding target. The market value of the Fund's assets as at the valuation date are compared against the value placed on the Fund's liabilities in today's terms (calculated using a market-based approach). By maintaining a link to the market in both cases, this helps ensure that the assets and liabilities are valued in a consistent manner. Our calculation of the Fund's liabilities also explicitly allows for expected future pay and pension increases. The assumptions used in the assessment of the funding position at the valuation date are detailed in the next section.

The funding level is the ratio of assets to liabilities at the valuation date. A funding level of less/more than 100% implies that there is a deficit/surplus in the Fund at the valuation date against the funding target.

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Funding plans are set to eliminate any deficit (or surplus) over the set time horizon and therefore get back to a funding level of 100%. To do so, additional contributions may be required to be paid into the Fund; these contributions are known as the "secondary rate".

Future service

In addition to benefits that have already been earned by members prior to the valuation date, employee members will continue to earn new benefits in the future. The cost of these new benefits must be met by both employers and employees. The employers' share of this cost is known as the "primary rate".

The primary rates for employers are determined with the aim of meeting the funding target in respect of these new benefits at the end of the set time horizon with an appropriate likelihood of success. The primary rate will depend on the profile of the membership (amongst other factors). For example, the rate is higher for older members as there is less time to earn investment returns before the member's pension comes into payment.

The methodology for calculating the primary rate will also depend on whether an employer is open or closed to new entrants. A closed employer will have a higher rate as we must allow for the consequent gradual ageing of the workforce.

For the reasons outlined above regarding the uncertainty of the future, there is no guarantee that the amount paid for the primary rate will be sufficient to meet the cost of the benefits that accrue. Similarly, there is no guarantee that the secondary contributions will result in a 100% funding level at the end of the time horizon. Further discussion of this uncertainty is set out in **Appendix C**.

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3 Assumptions

Due to the long term nature of the Fund, assumptions about the future are required to place a value of the benefits earned to date (past service) and the cost of benefits that will be earned in the future (future service).

Broadly speaking, our assumptions fall into two categories when projecting and placing a value on the future benefit payments and accrual – financial and demographic.

Demographic assumptions typically try to forecast **when** benefits will come into payment and what form these will take. For example, when members will retire (e.g. at their normal retirement age or earlier), how long they will then survive and whether a dependant's pension will be paid. In this valuation of the Fund, we use a single agreed set of demographic assumptions which is set out below and in more detail in **Appendix E**.

Financial assumptions typically try to anticipate the **size** of these benefits. For example, how large members' final salaries will be at retirement and how their pensions will increase over time. In addition, the financial assumptions also help us to estimate how much all these benefits will cost the Fund in today's money by making an assumption about the return on the Fund's investments in the future.

For measuring the funding position, the liabilities of the Fund are reported on a single constant set of financial assumptions about the future, based on financial market data as at 31 March 2016.

However, when we assess the required employer contributions to meet the funding target, we use a model that calculates the contributions required under 5000 different possible future economic scenarios. Under these 5000 different economic scenarios, key financial assumptions about pension increases and Fund investment returns vary across a wide range. More information about these types of assumptions is set out in **Appendix F**.

Financial assumptions

Discount rate

In order to place a current value on the future benefit payments from the Fund, an assumption about future investment returns is required in order to "discount" future benefit payments back to the valuation date. In setting the discount rate the Fund is determining the extent to which it relies on future investment returns required to meet benefit payments in excess of the monies already held at the valuation date.

For a funding valuation such as this, the discount rate is required by Regulations to incorporate a degree of prudence. The discount rate is therefore set by taking into account the Fund's current and expected future investment strategy and, in particular, how this strategy is expected to outperform the returns from Government bonds over the long term. The additional margin for returns in excess of that available on Government bonds is called the Asset Outperformance Assumption (AOA).

The selection of an appropriate AOA is a matter of judgement and the degree of risk inherent in the Fund's investment strategy should always be considered as fully as possible.

There has been a downward shift in the expected returns on many asset classes held by the Fund since the 2013 valuation. Following modelling, analysis and discussion based on considerations of the investment portfolio of the Fund is satisfied that an AOA of 2.0% p.a. is a prudent assumption for the purposes of this valuation.

Price inflation / pension increases

Pension (both in payment and deferment) benefit increases and the revaluation of career-average earnings are in line with Consumer Price Index (CPI) inflation. As there continues to be no deep market for CPI linked financial instruments, the Fund derives the expected level of future CPI with reference to the Retail Price Index (RPI).

Due to further analysis of the CPI since 2013, the Fund expects the average long term difference between RPI and CPI to be 1.0% p.a. compared with 0.8% p.a. at the 2013 valuation.

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The assumption for RPI has been derived from market data as the difference between the yield on long-dated fixed interest and index-linked government bonds.

Salary increases

Due to the change to a CARE scheme from 2014, there is now a closed group of membership in the Fund with benefits linked to final salary.

Following discussions with the Administering Authority the Fund set a salary growth assumption of RPI -0.7%. This reflects both short term pay constraints and the belief that general economic growth and hence pay growth may be at a lower level than historically experienced for a prolonged period of time.

Note that this assumption is made in respect of the general level of salary increases (e.g. as a result of inflation and other macroeconomic factors). We also make a separate allowance for expected pay rises granted in the future as a result of promotion. This assumption takes the form of a set of tables which model the expected promotional pay awards based on each member's age and class. Please see **Appendix E**.

A summary of the financial assumptions underpinning the target funding basis and adopted during the assessment of the liabilities of the Fund as at 31 March 2016 (alongside those adopted at the last valuation for comparison) are shown below.

Financial assumptions	31 March 2013	31 March 2016
Discount rate		
Return on long-dated gilts	-	2.2%
Asset Outperformance Assumption	-	2.0%***
Discount rate	**6.0%****	**4.2%**
Benefit increases		
Retail Prices Inflation (RPI)	3.5%	3.2%
Assumed RPI/CPI gap	(0.8%)**	(1.0%)***
Benefit increase assumption (CPI)	**2.7%**	**2.1%**
Salary increases		
Retail Prices Inflation (RPI)	3.5%	3.2%
Increases in excess of RPI	1.0%**	(0.7%)***
Salary increase assumption	**4.5%*****	**2.4%**

** Consumer Prices Index*

*** Arithmetic addition*

**** Geometric addition*

***** Different approach to setting the discount rate, please see 2013 valuation report*

****** CPI for 2 years then long term rate shown*

Demographic assumptions

Longevity

The main demographic assumption to which the valuation results are most sensitive is that relating to the longevity of the Fund's members. For this valuation, the Fund has adopted assumptions which give the following sample average future life expectancies for members:

	31 March 2013	31 March 2016
Male		
Pensioners	22.1 years	21.9 years
Non-pensioners	24.2 years	23.9 years
Female		
Pensioners	24.4 years	24.3 years
Non-pensioners	26.8 years	26.5 years

Further details of the longevity assumptions adopted for this valuation can be found in **Appendix E**. Note that the figures for actives and deferreds assume that they are aged 45 at the valuation date.

Other demographic assumptions

We are in the unique position of having a very large local authority data set from which to derive our other demographic assumptions. We have analysed the trends and patterns that are present in the membership of local authority funds and tailored our demographic assumptions to reflect LGPS experience.

Details of the other demographic assumptions adopted by the Fund are set out in **Appendix E**.

Further comments on the assumptions

As required for Local Government Pension Scheme valuations, our approach to this valuation must include a degree of prudence. This has been achieved by explicitly allowing for a margin of prudence in the AOA.

For the avoidance of doubt, we believe that all other proposed assumptions represent the "best estimate" of future experience. This effectively means that there is a 50% chance that future experience will be better or worse than the chosen assumption.

Taken as a whole, we believe that our proposed assumptions are more prudent than the best estimate.

The rationale behind all the assumptions adopted for the 2016 valuation is explained in greater details in our paper titled "2016 Formal Valuation: Setting the Funding Target".

The actuarial assumptions underlying the Scheme Advisory Board's Key Performance Indicators are viewed as best estimate. Using these best estimate assumptions, the assessed funding position as at 31 March 2016 would have been 82%.

Assets

We have taken the assets of the Fund into account at their market value as informed to us by the Administering Authority. We have also included an allowance for the expected future payments in respect of early retirement strain and augmentation costs granted prior to the valuation date in the value of assets, for consistency with the liabilities and with the previous valuation. We have calculated the total value of these expected future payments to be £0 at 31 March 2016.

In our opinion, the basis for placing a value on members' benefits is consistent with that for valuing the assets - both are related to market conditions at the valuation date

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4 Results

The Administering Authority has prepared a Funding Strategy Statement which sets out its funding objectives for the Fund. In broad terms, the main valuation objectives are to hold sufficient assets in the Fund to meet the assessed cost of members' accrued benefits on the target funding basis ("the Funding Objective") and to set employer contributions which ensure both the long term solvency and the long term cost efficiency of the Fund ("the Contribution Objective").

Funding Position Relative to Funding Target

In assessing the extent to which the Funding Objective was met at the valuation date, we have used the actuarial assumptions described in the previous section of this report for the target funding basis and the funding method also earlier described. The table below compares the value of the assets and liabilities at 31 March 2016. The 31 March 2013 results are also shown for reference.

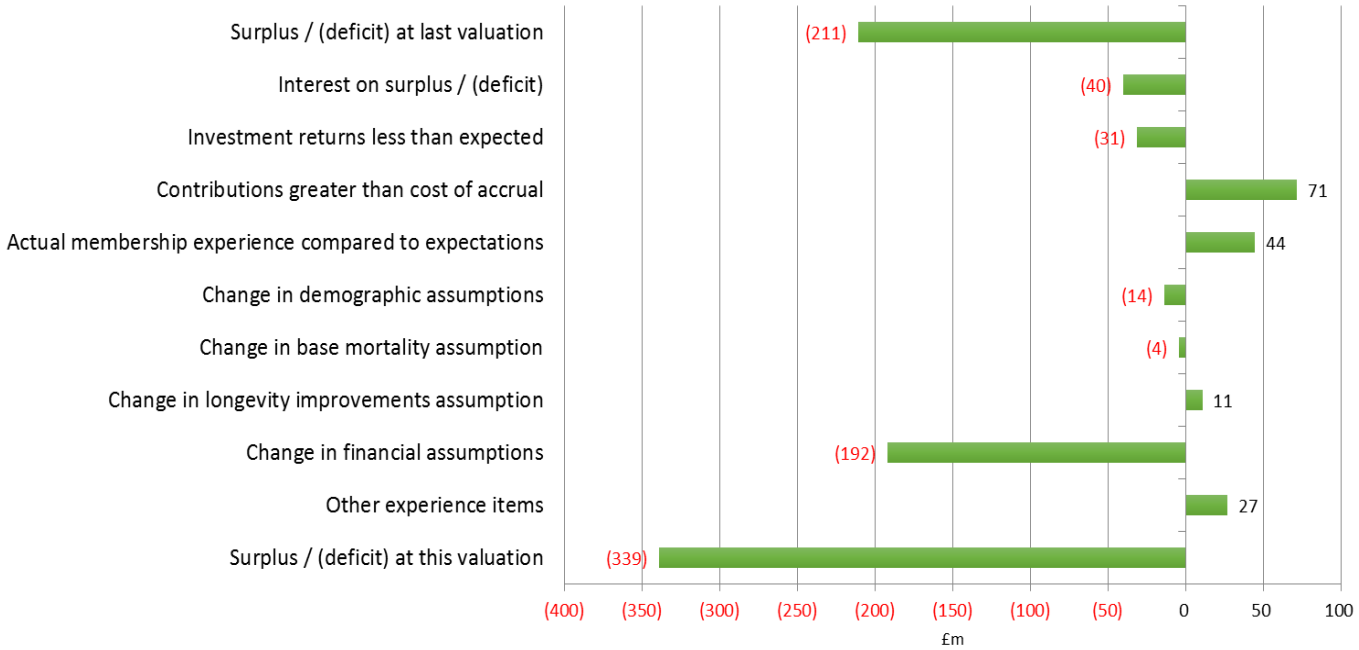
A funding level of 100% would correspond to the Funding Objective being met at the valuation date.

Valuation Date	31 March 2013	31 March 2016
Past Service Liabilities	**(£m)**	**(£m)**
Employees	311	371
Deferred Pensioners	198	282
Pensioners	490	603
Total Liabilities	**1,000**	**1,256**
Assets	**789**	**916**
Surplus / (Deficit)	**(211)**	**(339)**
Funding Level	**79%**	**73%**

The Funding Objective was not met: there was a shortfall of assets relative to the assessed cost of members' benefits on the target funding basis of £339m.

Summary of changes to the funding position

The chart below illustrates the factors that caused the changes in the funding position between 31 March 2013 and 31 March 2016:



Further comments on some of the items in this chart:

- There is an interest cost of £40m. This is broadly three years of compound interest at 6.0% p.a. applied to the previous valuation deficit of £211m (and can be thought of as the investment return that would have been achieved on the extra assets the Fund would have held if fully funded).
- Investment returns being lower than expected since 2013 lead to a loss of £31m. This is roughly the difference between the actual three-year return (13.0%) and expected three-year return (19.1%) applied to the whole fund assets from the previous valuation of £789m, with a further allowance made for cashflows during the period.
- The membership experience of the Fund has differed to the assumptions made at the 2013 valuation. The table below summarises the significant factors that underlie these differences:

	Expected	Actual	Difference	Impact
Pre-retirement experience				
Early leavers (no.of lives)	1,705	3,095	1,390	Positive
Ill-health retirements* (no.of lives)	72	37	(35)	Positive
Salary increases (p.a.)	4.7%	2.7%	(2.0%)	Positive
Post-retirement experience				
Benefit increases (p.a.)	2.7%	1.3%	(1.4%)	Positive
Pensions ceasing (£m)	3.0	2.7	(0.3)	Negative

*Tier1 and Tier 2 ill-health retirements only

- Fewer members than expected opted into the 50:50 section of the Scheme. This increased the deficit by £5.4m.
- The impact of the change in demographic assumptions has been a loss of around £14m.
- The change in mortality assumptions (baseline and improvements) has given rise to a gain of £7m. .
- The change in financial conditions since the previous valuation has led to a loss of £192m.
- Other experience items, such as changes in the membership data, have served to decrease the deficit at this valuation by around £26.8m.

Employer Contribution Rates

The Contribution Objective is achieved by setting employer contributions which are likely to be sufficient to meet both the cost of new benefits accruing and to address any funding deficit relative to the funding target over the agreed time horizon. A secondary objective is to maintain where possible relatively stable employer contribution rates.

For each employer in the Fund, to meet the Contribution Objective, a primary contribution rate has been calculated in order to fund the cost of new benefits accruing in the Fund. Additionally, if required, a secondary contribution rate has also been calculated to target a fully funded position within the employer's set time horizon. These rates have been assessed using a financial model that assesses the funding outcome for the employer under 5000 different possible future economic scenarios where the key financial assumptions about pension increases and investment returns vary. The employer contribution rates have been set to achieve the funding target over the agreed time horizon and with the appropriate likelihood of success. The time horizon and the likelihood parameters vary by employer according to each employer's characteristics. These parameters are set out in the Funding Strategy Statement and have been communicated to employers. More information about the methodology used to calculate the contribution rates is set out in **Appendix C**.

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The employer contributions payable from 1 April 2017 are given in **Appendix H**, and these have been devised in line with the Funding Strategy Statement: see **section 6**.

The table below summarises the whole fund Primary and Secondary Contribution rates at this valuation. These rates are the payroll weighted average of the underlying individual employer primary and secondary rates, calculated in accordance with the Regulations and CIPFA guidance.

Contribution Rates	31 March 2016 (% of pay)
Primary Rate	TBC
Secondary Rate	TBC
Total Contribution Rate	**TBC**
Employee contribution rate	6.5%
Expenses	0.9%

Note that the employee contribution rate includes any additional contributions being paid by employees as at 31 March 2016 into the Fund.

The table below shows the Fund "Common Contribution rate' as at 31 March 2013 for information purposes. **Although note that the change in regulatory regime and guidance on contribution rates means that a direct comparison to the whole fund rate at 2016 is not appropriate.**

Contribution Rates	31 March 2013 (% of pay)
Employer future service rate	13.0%
Past Service Adjustment	11.0%
Total employer contribution rate	**24.0%**
Employee contribution rate	6.4%

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5 Risk Assessment

The valuation results depend critically on the actuarial assumptions that are made about the future of the Fund. If all of the assumptions made at this valuation were exactly borne out in practice then the results presented in this document would represent the true cost of the Fund as it currently stands at 31 March 2016.

However, no one can predict the future with certainty and it is unlikely that future experience will exactly match the assumptions. The future therefore presents a variety of risks to the Fund and these should be considered as part of the valuation process. In particular:

- The main risks to the financial health of the Fund should be **identified**.
- Where possible, the financial significance of these risks should be **quantified**.
- Consideration should be given as to how these risks can then be **controlled** or **mitigated**.
- These risks should then be **monitored** to assess whether any mitigation is actually working.

This section investigates the potential implications of the actuarial assumptions not being borne out in practice.

Set out below is a brief assessment of the main risks and their effect on the valuation past service funding position results.

Sensitivity of past service funding position results to changes in assumptions

The table below gives an indication of the sensitivity of the funding position to small changes in two of the main financial assumptions used:

Benefit Increases & CARE Revaluation					
Discount Rates	(£m)	1.9%	2.1%	2.3%	
	4.4%	1,179	1,214	1,251	Liabilities
		916	916	916	Assets
		(262)	(298)	(335)	(Deficit)
		78%	75%	73%	Funding Level
	4.2%	1,219	1,256	1,294	Liabilities
		916	916	916	Assets
		(302)	(339)	(377)	(Deficit)
		75%	73%	71%	Funding Level
	4.0%	1,260	1,298	1,338	Liabilities
		916	916	916	Assets
		(344)	(382)	(422)	(Deficit)
		73%	71%	68%	Funding Level

The valuation results are also very sensitive to unexpected changes in future longevity. All else being equal, if longevity improves in the future at a faster pace than allowed for in the valuation assumptions, the funding level will decline and the required employer contribution rates will increase.

Recent medical advances, changes in lifestyle and a greater awareness of health-related matters have resulted in life expectancy amongst pension fund members improving in recent years at a faster pace than was originally foreseen. It is unknown whether and to what extent such improvements will continue in the future.

For the purposes of this valuation, we have selected assumptions that we believe make an appropriate allowance for future improvements in longevity, based on the actual experience of the Fund since the previous valuation.

The table below shows how the valuation results at 31 March 2016 are affected by adopting different longevity assumptions.

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	Peaked improvements	Non-peaked improvements
	(£m)	**(£m)**
Liabilities	1,256	1,309
Assets	916	916
(Deficit)	(339)	(393)
Funding Level	**73%**	**70%**

The "further improvements" are a more cautious set of improvements that, in the short term, assume the 'cohort effect' of strong improvements in life expectancy currently being observed amongst a generation born around the early and mid 1930s will continue to strengthen for a few more years before tailing off. This is known as "non-peaked".

This is not an exhaustive list of the assumptions used in the valuation. For example, changes to the assumed level of withdrawals and ill health retirements will also have an effect on the valuation results.

Note that the tables show the effect of changes to each assumption in isolation. In reality, it is perfectly possible for the experience of the Fund to deviate from more than one of our assumptions simultaneously and so the precise effect on the funding position is therefore more complex. Furthermore, the range of assumptions shown here is by no means exhaustive and should not be considered as the limits of how extreme experience could actually be.

Sensitivity of contribution rates to changes in assumptions

The employer contribution rates are dependent on a number of factors including the membership profile, current financial conditions, the outlook for future financial conditions, and demographic trends such as longevity. Changes in each of these factors can have a material impact on the contribution rates (both primary and secondary rates). We have not sought to quantify the impact of differences in the assumptions because of the complex interactions between them.

Investment risk

The Fund holds some of its assets in return seeking assets such as equities to help reduce employers' costs. However, these types of investments can result in high levels of asset volatility. Therefore, there is a risk that future investment returns are below expectations and the funding target is not met. This will require additional contributions from employers to fund any deficit.

Whilst the Fund takes steps to ensure that the level of investment risk is managed and monitored via strategy reviews and performance monitoring, it can never be fully mitigated.

Regulatory risk

One further risk to consider is the possibility of future changes to Regulations that could materially affect the benefits that members become entitled to. It is difficult to predict the nature of any such changes but it is not inconceivable that they could affect not just the cost of benefits earned after the change but could also have a retrospective effect on the past service position.

Managing the risks

Whilst there are certain things, such as the performance of investment markets or the life expectancy of members, that are not directly within the control of the pension fund, that does not mean that nothing can be done to understand them further and to mitigate their effect. Although these risks are difficult (or impossible) to eliminate, steps can be taken to manage them.

Ways in which some of these risks can be managed could be:

- Set aside a specific reserve to act as a cushion against adverse future experience (possibly by selecting a set of actuarial assumptions that are deliberately more prudent).

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- Take steps internally to monitor the decisions taken by members (e.g. 50:50 scheme take-up, commutation) and employers (e.g. relating to early / ill health retirements or salary increases) in a bid to curtail any adverse impact on the Fund.
- Pooling certain employers together at the valuation and then setting a single (pooled) contribution rate that they will all pay. This can help to stabilise contribution rates (at the expense of cross-subsidy between the employers in the pool during the period between valuations).
- Carrying out a review of the future security of the Fund's employers (i.e. assessing the strength of employer covenants) and ultimately their ability to continue to pay contributions or make good future funding deficits.
- Carry out a bespoke analysis of the longevity of Fund members and monitor how this changes over time, so that the longevity assumptions at the valuation provide as close a fit as possible to the particular experience of the Fund.
- Undertake an asset-liability modelling exercise that investigates the effect on the Fund of possible investment scenarios that may arise in the future. An assessment can then be made as to whether long term, secure employers in the Fund can stabilise their future contribution rates (thus introducing more certainty into their future budgets) without jeopardising the long-term health of the Fund.
- Purchasing ill health liability insurance to mitigate the risk of an ill health retirement impacting on solvency and funding level of an individual employer where appropriate.
- Monitoring different employer characteristics in order to build up a picture of the risks posed. Examples include membership movements, cash flow positions and employer events such as cessations.
- Regularly reviewing the Fund's membership data to ensure it is complete, up to date and accurate.

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6 Related issues

The Fund's valuation operates within a broader framework, and this document should therefore be considered alongside the following:

- the Funding Strategy Statement, which in particular highlights how different types of employer in different circumstances have their contributions calculated;
- the Statement of Investment Principles (Investment Strategy Statement from 1 April 2017) (e.g. the discount rate must be consistent with the Fund's asset strategy);
- the general governance of the Fund, such as meetings of the Pensions Committee, decisions delegated to officers, the Fund's business plan, etc;
- the Fund's risk register;
- the information the Fund holds about the participating employers.

Further recommendations

Valuation frequency

Under the provisions of the LGPS regulations, the next formal valuation of the Fund is due to be carried out as at 31 March 2019. In light of the uncertainty of future financial conditions, we recommend that the financial position of the Fund (and for individual employers in some cases) is monitored by means of interim funding reviews in the period up to this next formal valuation. This will give early warning of changes to funding positions and possible revisions to funding plans.

Investment strategy and risk management

We recommend that the Administering Authority continues to regularly review its investment strategy and ongoing risk management programme.

New employers joining the Fund

Any new employers or admission bodies joining the Fund should be referred to the Fund Actuary for individual calculation as to the required level of contribution. Depending on the number of transferring members the ceding employer's rate may also need to be reviewed.

Additional payments

Employers may make voluntary additional contributions to recover any funding shortfall over a shorter period, subject to agreement with the Administering Authority and after receiving the relevant actuarial advice.

Further sums should be paid to the Fund by employers to meet the capital costs of any unreduced early retirements, reduced early retirements before age 60 and/or augmentation (i.e. additional membership or additional pension) using the methods and factors issued by me from time to time or as otherwise agreed.

In addition, payments may be required to be made to the Fund by employers to meet the capital costs of any ill-health retirements that exceed those allowed for within our assumptions.

Cessations and bulk transfers

Any employer who ceases to participate in the Fund should be referred to us in accordance with Regulation 64 of the Regulations.

Any bulk movement of scheme members:

- involving 10 or more scheme members being transferred from or to another LGPS fund, or

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- involving 2 or more scheme members being transferred from or to a non-LGPS pension arrangement should be referred to us to consider the impact on the Fund.

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7 Reliances and limitations

Scope

This document has been requested by and is provided to London Borough of Barnet in its capacity as Administering Authority to the London Borough of Barnet Pension Fund. It has been prepared by Hymans Robertson LLP to fulfil the statutory obligations in accordance with regulation 62 of the Regulations. None of the figures should be used for accounting purposes (e.g. under FRS102 or IAS19) or for any other purpose (e.g. a termination valuation under Regulation 64).

This document should not be released or otherwise disclosed to any third party without our prior written consent, in which case it should be released in its entirety. Hymans Robertson LLP accepts no liability to any other party unless we have expressly accepted such liability.

The results of the valuation are dependent on the quality of the data provided to us by the Administering Authority for the specific purpose of this valuation. We have previously issued a separate report confirming that the data provided is fit for the purposes of this valuation and have commented on the quality of the data provided. The data used in our calculations is as per our report of TBC. However, if any material issues with the data provided are identified at a later date, then the results stated in this report may change.

Actuarial Standards

The following Technical Actuarial Standards[1] are applicable in relation to this report and have been complied with where material:

- TAS R – Reporting;
- TAS D – Data;
- TAS M – Modelling; and
- Pensions TAS.

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Gemma Sefton

Fellow of the Institute and Faculty of Actuaries

For and on behalf of Hymans Robertson LLP

9 March 2017

Peter Summers

Fellow of the Institute and Faculty of Actuaries

[1] Technical Actuarial Standards (TASs) are issued by the Financial Reporting Council (FRC) and set standards for certain items of actuarial work, including the information and advice contained in this report.

Appendix A: About the pension fund

The purpose of the Fund is to provide retirement and death benefits to its members. It is part of the Local Government Pension Scheme (LGPS) and is a multi-employer defined benefit pension scheme.

For more details please refer to the Fund's Funding Strategy Statement.

Defined benefit pension scheme

In a defined benefit scheme such as this, the nature of retirement benefits that members are entitled to is known in advance. For example, it is known that members will receive a pension on retirement that is linked to their salary (final salary and/or career average) and pensionable service (for service before 1 April 2014) according to a pre-determined formula.

However, the precise cost to the Fund of providing these benefits is **not** known in advance. The estimated cost of these benefits represents a liability to the Fund and assets must be set aside to meet this. The relationship between the value of the liabilities and the value of the assets must be regularly assessed and monitored to ensure that the Fund can fulfil its core objective of providing its members with the retirement benefits that they have been promised.

Liabilities

The Fund's liabilities are the benefits that will be paid in the future to its members (and their dependants).

The precise timing and amount of these benefit payments will depend on future experience, such as when members will retire, how long they will live for in retirement and what economic conditions will be like both before and after retirement. Because these factors are not known in advance, assumptions must be made about future experience. The valuation of these liabilities must be regularly updated to reflect the degree to which actual experience has been in line with these assumptions.

Assets

The Fund's assets arise from the contributions paid by its members and their employers and the investment returns that they generate. The way these assets are invested is of fundamental importance to the Fund. The selection, monitoring and evolution of the Fund's investment strategy are key responsibilities of the Administering Authority.

As the estimated cost of the Fund's liabilities is regularly re-assessed, this effectively means that the amount of assets required to meet them is a moving target. As a result, at any given time the Fund may be technically in surplus or in deficit.

A contribution strategy must be put in place which ensures that each of the Fund's employers pays money into the Fund at a rate which will target the cost of its share of the liabilities in respect of benefits already earned by members and those that will be earned in the future.

The long-term nature of the Fund

The pension fund is a long-term commitment. Even if it were to stop admitting new members today, it would still be paying out benefits to existing members and dependants for many decades to come. It is therefore essential that the various funding and investment decisions that are taken now recognise this and come together to form a coherent long-term strategy.

In order to assist with these decisions, the Regulations require the Administering Authority to obtain a formal valuation of the Fund every three years. Along with the Funding Strategy Statement, this valuation will help determine the funding objectives that will apply from 1 April 2017.

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Appendix B: Summary of the Fund's benefits

Provided below is a brief summary of the non-discretionary benefits that we have taken into account for active members at this valuation. This should not be taken as a comprehensive statement of the exact benefits to be paid. For further details please see the Regulations.

Provision	Benefit Structure To 31 March 2008	Benefit Structure From 1 April 2008	Benefit Structure From 1 April 2014
Normal retirement age (NRA)	Age 65.	Age 65.	Equal to the individual member's State Pension Age (minimum 65).
Earliest retirement age (ERA) on which immediate unreduced benefits can be paid on voluntary retirement	As per NRA (age 65). Protections apply to active members in the scheme immediately prior to 1 October 2006 who would have been entitled to immediate payment of unreduced benefits prior to 65, due to: The benefits relating to various segments of scheme membership are protected as set out in Schedule 2 to the Local Government Pension Scheme (Transitional Provisions) Regulations 2008 and associated GAD guidance.		As per NRA (minimum age 65). Protections apply to active members in the scheme for pensions earned up to 1 April 2014, due to: a) Accrued benefits relating to pre April 2014 service at age 65. b) Continued 'Rule of 85' protection for qualifying members. c) Members within 10 yrs of existing NRA at 1/4/12 – no change to when they can retire and no decrease in pension they receive at existing NRA.
Member contributions	Officers - 6% of pensionable pay Manual Workers – 5% of pensionable pay if has protected lower rates rights or 6% for post 31 March 1998 entrants or former entrants with no protected rights.	Banded rates (5.5%-7.5%) depending upon level of full-time equivalent pay. A mechanism for sharing any increased scheme costs between employers and scheme members is included in the LGPS regulations.	Banded rates (5.5%-12.5%) depending upon level of actual pay.
Pensionable pay	All salary, wages, fees and other payments in respect of the employment, excluding non-contractual overtime and some other specified amounts. Some scheme members may be covered by special agreements.		Pay including non-contractual overtime and additional hours.
Final pay	The pensionable pay in the year up to the date of leaving the scheme. Alternative methods used in some cases, e.g. where there has been a break in service or a drop in pensionable pay. Will be required for the statutory underpin and in respect of the final salary link that may apply in respect of certain members of the CARE scheme who have pre April 2014 accrual.		N/A

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Provision	Benefit Structure To 31 March 2008	Benefit Structure From 1 April 2008	Benefit Structure From 1 April 2014
Period of scheme membership	Total years and days of service during which a member contributes to the Fund. (e.g. transfers from other pension arrangements, augmentation, or from April 2008 the award of additional pension). For part time members, the membership is proportionate with regard to their contractual hours and a full time equivalent). Additional periods may be granted dependent on member circumstances.		N/A
Normal retirement benefits at NRA	Annual Retirement Pension - 1/80th of final pay for each year of scheme membership. Lump Sum Retirement Grant - 3/80th of final pay for each year of scheme membership.	Scheme membership from 1 April 2008: Annual Retirement Pension - 1/60th of final pay for each year of scheme membership. Lump Sum Retirement Grant – none except by commutation of pension.	Scheme membership from 1 April 2014: Annual Retirement Pension - 1/49th of pensionable pay (or assumed pensionable pay) for each year of scheme membership revalued to NRA in line with CPI. Lump Sum Retirement Grant - none except by commutation of pension.
Option to increase retirement lump sum benefit	In addition to the standard retirement grant any lump sum is to be provided by commutation of pension (within overriding HMRC limits). The terms for the conversion of pension in to lump sum is £12 of lump sum for every £1 of annual pension surrendered.	No automatic lump sum. Any lump sum is to be provided by commutation of pension (within overriding HMRC limits). The terms for the conversion of pension in to lump sum is £12 of lump sum for every £1 of annual pension surrendered.	No automatic lump sum. Any lump sum is to be provided by commutation of pension (within overriding HMRC limits). The terms for the conversion of pension in to lump sum is £12 of lump sum for every £1 of annual pension surrendered.
Voluntary early retirement benefits (non ill-health)	On retirement after age 60, subject to reduction on account of early payment in some circumstances (in accordance with ERA protections).		On retirement after age 55, subject to reduction on account of early payment in some circumstances (in accordance with ERA protections).
Employer's consent early retirement benefits (non ill-health)	On retirement after age 55 with employer's consent. Benefits paid on redundancy or efficiency grounds are paid with no actuarial reduction. Otherwise, benefits are subject to reduction on account of early payment, unless this is waived by the employer.		Benefits paid on redundancy or efficiency grounds are paid with no actuarial reduction. Employer's consent is no longer required for a member to retire from age 55. However, benefits are subject to reduction on account of early payment, unless this is waived by the employer.

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Provision	Benefit Structure To 31 March 2008	Benefit Structure From 1 April 2008	Benefit Structure From 1 April 2014
Ill-health benefits	As a result of permanent ill-health or incapacity. Immediate payment of unreduced benefits. Enhancement to scheme membership, dependent on actual membership. Enhancement seldom more than 6 years 243 days.	As a result of permanent ill-health or incapacity and a reduced likelihood of obtaining gainful employment (local government or otherwise) before age 65. Immediate payment of unreduced benefits. Enhanced to scheme membership, dependent on severity of ill health. 100% of prospective membership to age 65 where no likelihood of undertaking any gainful employment prior to age 65; 25% of prospective membership to age 65 where likelihood of obtaining gainful employment after 3 years of leaving, but before age 65; or 0% of prospective membership where there is a likelihood of undertaking gainful employment within 3 years of leaving employment	As a result of permanent ill-health or incapacity and a reduced likelihood of obtaining gainful employment (local government or otherwise) before NRA. Immediate payment of unreduced benefits. Enhanced to scheme membership, dependent on severity of ill health. 100% of prospective membership to age NRA where no likelihood of undertaking any gainful employment prior to age NRA; 25% of prospective membership to age NRA where likelihood of obtaining gainful employment after 3 years of leaving, but before age NRA; or 0% of prospective membership where there is a likelihood of undertaking gainful employment within 3 years of leaving employment

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Provision	Benefit Structure To 31 March 2008	Benefit Structure From 1 April 2008	Benefit Structure From 1 April 2014
Flexible retirement	After 5th April 2006, a member who has attained the age of 50, with his employer's consent, reduces the hours he works, or the grade in which he is employed, may elect in writing to the appropriate Administering Authority that such benefits may, with his employer's consent, be paid to him notwithstanding that he has not retired from that employment. Benefits are paid immediately and subject to actuarial reduction unless the reduction is waived by the employer.	A member who has attained the age of 55 and who, with his employer's consent, reduces the hours he works, or the grade in which he is employed, may make a request in writing to the appropriate Administering Authority to receive **all or part** of his benefits, Benefits are paid immediately and subject to actuarial reduction unless the reduction is waived by the employer.	
Pension increases	All pensions in payment, deferred pensions and dependant's pensions other than benefits arising from the payment of additional voluntary contributions are increased annually. Pensions are increased partially under the Pensions (Increases) Act and partially in accordance with statutory requirements (depending on the proportions relating to pre 88 GMP, post 88 GMP and excess over GMP).		
Death after retirement	A spouse's or civil partner's pension of one half of the member's pension (generally post 1 April 1972 service for widowers' pension and post 6 April 1988 for civil partners) is payable; plus If the member dies within five years of retiring and before age 75 the balance of five years' pension payments will be paid in the form of a lump sum; plus Children's pensions may also be payable.	A spouse's, civil partner's or nominated cohabiting partner's pension payable at a rate of 1/160th of the member's total membership multiplied by final pay (generally post 1 April 1972 service for widowers' pension and post 6 April 1988 for civil partners and nominated cohabiting partners) is payable; plus If the member dies within ten years of retiring and before age 75 the balance of ten years' pension payments will be paid in the form of a lump sum; plus Children's pensions may also be payable.	

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Provision	Benefit Structure To 31 March 2008	Benefit Structure From 1 April 2008	Benefit Structure From 1 April 2014
Death in service	A lump sum of two times final pay; plus A spouse's or civil partner's pension of one half of the ill-health retirement pension that would have been paid to the scheme member if he had retired on the day of death (generally post 1 April 1972 service for widowers' pension and post 6 April 1988 for civil partners); plus Children's pensions may also be payable.	A lump sum of three times final pay; plus A spouse's, civil partner's or cohabiting partner's pension payable at a rate of 1/160th of the member's total (augmented to age 65) membership (generally post 1 April 1972 service for widowers' pension and post 6 April 1988 for civil partners and nominated cohabiting partners), multiplied by final pay; plus Children's pensions may also be payable.	
Leaving service options	If the member has completed three months' or more scheme membership, deferred benefits with calculation and payment conditions similar to general retirement provisions; or A transfer payment to either a new employer's scheme or a suitable insurance policy, equivalent in value to the deferred pension; or If the member has completed less than three months' scheme membership, a return of the member's contributions with interest, less a State Scheme premium deduction and less tax at the rate of 20%.		If the member has completed two years or more scheme membership, deferred benefits with calculation and payment conditions similar to general retirement provisions; or A transfer payment to either a new employer's scheme or a suitable insurance policy, equivalent in value to the deferred pension; or If the member has completed less than two years scheme membership, a return of the member's contributions with interest, less a State Scheme premium deduction and less tax at the rate of 20%.
State pension scheme	From 6th of April 2016, the Fund will no longer be contracted out of the State Second Pension. Until that date, the benefits payable to each member were guaranteed to be not less than those required to enable the Fund to be contracted-out.		
Assumed pensionable pay	N/A		This applies in cases of reduced contractual pay (CPP) resulting from sickness, child related and reserve forces absence, whereby the amount added to the CPP is the assumed pensionable pay rather than the reduced rate of pay actually received.
50/50 option	N/A		Optional arrangement allowing 50% of main benefits to be accrued on a 50% employee contribution rate.

Note: Certain categories of members of the Fund are entitled to benefits that differ from those summarised above.

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Discretionary benefits

The LGPS Regulations give employers a number of discretionary powers. The effect on benefits or contributions as a result of the use of these provisions as currently contained within the Local Government Pension Scheme Regulations has been allowed for in this valuation to the extent that this is reflected in the membership data provided. No allowance has been made for the future use of discretionary powers that will be contained within the scheme from 1 April 2017.

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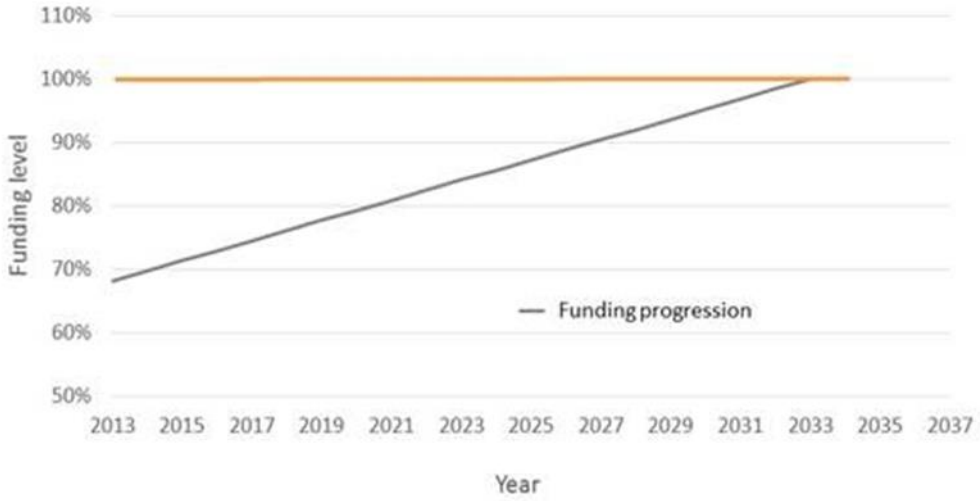
Appendix C: Risk based approach to setting contribution rates

At previous valuations we have set contribution rates by calculating them using a single set of assumptions about the future economic conditions (a 'deterministic' method). By using this deterministic method, there is an implicit assumption that the future will follow expectations (i.e. the financial assumptions used in the calculation) and the employer will return to full funding via one 'journey'. This approach is summarised in the illustrative chart below.



However, pension funding is uncertain as:

- the Fund's assets are invested in volatile financial markets and therefore they go up and down in value; and
- the pension benefits are linked to inflation which again can go up and down in value over time.

One single set of assumptions are very unlikely to actually match what happens, and therefore, the funding plan originally set out will not evolve in line with the single journey shown above. The actual evolution of the funding position could be one of many different 'journeys', and a sample of these are given below.

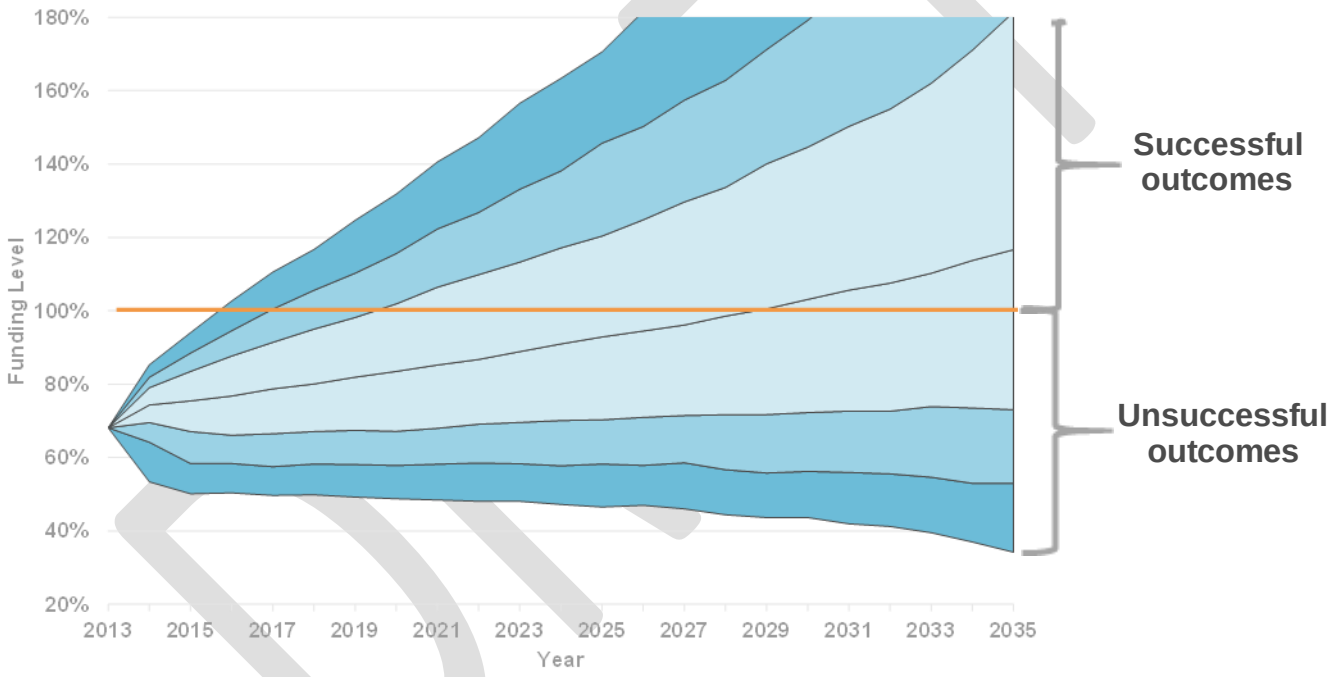
The inherent uncertainty in pension funding creates a risk that a funding plan will not be a success i.e. the funding target will not be reached over the agreed time period.

This risk can never be fully mitigated whilst invested in volatile assets and providing inflation linked benefits, however the main disadvantage of the traditional deterministic method is that it does not allow the Fund, employer, regulators or actuary to assess and understand the risk associated with the proposed funding plan and the likelihood of its success, or otherwise.

Risk Based Approach

At this valuation, we have adopted a 'risk based' approach when setting contribution rates. This approach considers thousands of simulations (or 'journeys') to be projected of how each employer's assets and liabilities may evolve over the future until we have a distribution of funding outcomes (ratio of assets to liabilities). Each simulation represents a different possible journey of how the assets and liabilities could evolve and they will vary due to assumptions about investment returns, inflation and other financial factors. Further technical detail about the methodology underlying these projections is set out in **Appendix F**.

Once we have a sufficient number of outcomes to form a statistically credible distribution (we use 5,000 outcomes), we can examine what level of contribution rate gives an appropriate likelihood of meeting an employer's funding target (usually a 100% funding level) within the agreed timeframe ('time horizon') (i.e. a sufficient number of successful outcomes). The picture below shows a sample distribution of outcomes for an employer.



Having this 'funnel' of outcomes allows the Fund to understand the likelihood of the actual outcome being higher or lower than a certain level. For example, there is 2/3rds chance the funding level will be somewhere within the light shaded area, and there is a 1 in 100 chance that the funding level will be outside the funnel altogether. Using this 'probability distribution', we then set a contribution rate that leads to a certain amount of funding outcomes being successful (e.g. 2/3rds).

Further detail on the likelihoods used in employer's funding plans is set out in the Fund's Funding Strategy Statement.

Appendix D: Data

This section contains a summary of the membership, investment and accounting data provided by the Administering Authority for the purposes of this valuation (the corresponding membership and investment data from the previous valuation, as carried out by Barnett Waddingham, is also shown for reference). For further details of the data, and the checks and amendments performed in the course of this valuation, please refer to our separate data report.

Membership data – whole fund

Employee members

	31 March 2013		31 March 2016		
	Number	Pensionable Pay* (£000)	Number	Pensionable Pay* (£000)	CARE Pot (£000)
Total employee membership	6,702	141,943	7,977	172,007	5,569

*actual pay (not full-time equivalent)

Deferred pensioners

	31 March 2013		31 March 2016	
	Number	Deferred pension (£000)	Number	Deferred pension (£000)
Total deferred membership	8,992	14,264	11,089	15,954

The figures above also include any "frozen refunds" and "undecided leavers" members at the valuation date.

Current pensioners, spouses and children

	31 March 2013		31 March 2016	
	Number	Pension	Number	Pension
Members	5,809	31,464	6,208	35,796
Dependants	929	2,367	782	2,724
Children			45	67
Total pensioner members	**6,738**	**33,831**	**7,035**	**38,587**

Note that the membership numbers in the table above refer to the number of records provided to us and so will include an element of double-counting in respect of any members who are in receipt (or potentially in receipt of) more than one benefit.

Membership Profile	Average Age (years)		FWL (years)	
	2013	2016	2013	2016
Employees (CARE)	-	49.7	not reported	9.4
Employees (Final Salary)	46.5	53.0		
Deferred Pensioners	45.8	51.4	-	-
Pensioners	70.6	67.6	-	-

The 2016 average ages are weighted by liability.

The expected future working lifetime (FWL) indicates the anticipated length of time that the average employee member will remain as a contributor to the Fund. Note that it allows for the possibility of members leaving, retiring early or dying before retirement.

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Assets at 31 March 2016

A summary of the Fund's assets provided by the Administering Authority (excluding members' money-purchase Additional Voluntary Contributions) as at 31 March 2016 and 31 March 2013 is shown below. Note that the 2013 assets and these accounts have been restated.

Asset class	31 March 2013 (Market Value) (£000)	Allocation %
Diversified Growth Fund	244	31%
Real Return Fund	253	32%
Index Linked Tracker Fund	40	5%
Corporate Bonds	250	31%
Gilts	1	0%
Cash	8	1%
Overseas Bonds	2	0%
Total	**798**	**100%**

Asset class	31 March 2016 (Market Value) (£000)	Allocation %
UK equities	0	0%
UK fixed interest gilts	0	0%
UK corporate bonds	210	23%
UK index-linked gilts	0	0%
Overseas equities	345	38%
Overseas bonds	0	0%
Pooled Multi Asset	355	39%
Cash and net current assets	6	1%
Total	**916**	**100%**

Note that, for the purposes of determining the funding position at 31 March 2016, the asset value we have used also includes the present value of expected future early retirement strain payments (amounting to £0 m).

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Accounting data – revenue account for the three years to 31 March 2016

Consolidated accounts (£000)	Year to			Total
	31 March 2014	31 March 2015	31 March 2016	
Income				
Employer - normal contributions	42,182	43,521	42,031	127,734
Employer - additional contributions	0	0	0	0
Employer - early retirement and augmentation strain contributions	0	0	0	0
Employee - normal contributions	10,025	10,414	10,269	30,708
Employee - additional contributions	0	0	0	0
Transfers In Received (including group and individual)	2,591	1,391	1,907	5,889
Other Income	24	12	31	67
Total Income	**54,822**	**55,338**	**54,238**	**164,398**
Expenditure				
Gross Retirement Pensions	38,106	39,172	41,154	118,432
Lump Sum Retirement Benefits	5,783	5,577	7,276	18,636
Death in Service Lump sum	985	792	916	2,693
Death in Deferment Lump Sum	0	0	0	0
Death in Retirement Lump Sum	0	0	0	0
Gross Refund of Contributions	8	56	113	177
Transfers out (including bulk and individual)	3,810	2,537	6,543	12,890
Fees and Expenses	1,088	1,889	1,349	4,326
Total Expenditure	**49,780**	**50,023**	**57,351**	**157,154**
Net Cashflow	**5,042**	**5,315**	**-3,113**	**7,244**
Assets at start of year	**802,578**	**834,021**	**928,903**	**802,578**
Net cashflow	**5,042**	**5,315**	**-3,113**	**7,244**
Change in value	**26,401**	**89,567**	**-9,459**	**106,509**
Assets at end of year	**834,021**	**928,903**	**916,331**	**916,331**
Approximate rate of return on assets	**3.3%**	**10.7%**	**-1.0%**	**13.2%**

Note that the figures above are based on the Fund accounts provided to us for the purposes of this valuation, which were fully audited at the time of our valuation calculations.

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Appendix E: Assumptions

Financial assumptions

Financial assumptions	31 March 2013 (% p.a.)	31 March 2016 (% p.a.)
Discount rate	6.0%	4.2%
Retail Price inflation	3.3%	3.2%
Pay increases*	4.5%	2.4%
Pension increases:		
pension in excess of GMP	2.7%	2.1%
post-88 GMP	2.7%	2.1%
pre-88 GMP	0.0%	0.0%
Revaluation of deferred pension	2.7%	2.1%
Revaluation of accrued CARE pension	2.7%	2.1%
Expenses	0.2%**	0.9%

*An allowance is also made for promotional pay increases (see table below).

**Expense allowance was previously allowed for via a reduction to the asset return.

Mortality assumptions

Longevity assumptions	31 March 2016
Longevity - baseline	Vita
Longevity - improvements	
CMI Model version used	CMI_2013
Starting rates	CMI calibration based on data from Club Vita using the latest available data as at January 2014.
Long term rate of improvement	Period effects: 1.25% p.a. for men and women. Cohort effects: 0% p.a. for men and for women.
Period of convergence	Period effects: CMI model core values i.e. 10 years for ages 50 and below and 5 years for those aged 95 and above, with linear transition to 20 years for those aged between 60 and 80. Cohort effects: CMI core i.e. 40 years for those born in 1950 or later declining linearly to 5 years for those born in 1915 or earlier.
Proportion of convergence remaining at mid point	50%

As a member of Club Vita, the baseline longevity assumptions that have been adopted at this valuation are a bespoke set of VitaCurves that are specifically tailored to fit the membership profile of the Fund. These curves are based on the data the Fund has provided us with for the purposes of this valuation. Full details of these are available on request.

We have used a longevity improvement assumption based on the industry standard projection model calibrated with information from our longevity experts in Club Vita. The starting point for the improvements has been based on observed death rates in the Club Vita data bank over the period up to 2012.

We have used the 2013 version of the Continuous Mortality Investigation (CMI) longevity improvements model, instead of the more recent 2015 version, as we do not believe the increased mortality experience factored into the

2015 model is the start of a new trend. We believe it is more appropriate to use the 2013 version of the model for the 2016 valuation.

In the short term we have assumed that the improvements in life expectancy observed up to 2010 will start to tail off immediately, resulting in life expectancy increasing less rapidly than has been seen over the last decade or two. This could be described as assuming that improvements have 'peaked'.

In the longer term we have assumed that increases in life expectancy will stabilise at a rate of increase of 0.9 years per decade for men and women. This is equivalent to assuming that longer term mortality rates will fall at a rate of 1.25% p.a. for men and women.

However, we have assumed that above age 90 improvements in mortality are hard to achieve, and so the long term rate of improvement declines between ages 90 and 120 so that no improvements are seen at ages 120 and over. The initial rate of mortality is assumed to decline steadily above age 98.

Other demographic valuation assumptions

Retirements in normal health	We have adopted the retirement age pattern assumption as specified by the Scheme Advisory Board for preparing Key Performance Indicators. Further details about this assumption are available on request.
Retirements in ill health	Allowance has been made for ill-health retirements before Normal Pension Age (see table below).
Withdrawals	Allowance has been made for withdrawals from service (see table below).
Family details	A varying proportion of members are assumed to be married (or have an adult dependant) at retirement or on earlier death. For example, at age 60 this is assumed to be 90% for males and 85% for females. Husbands are assumed to be 3 years older than wives.
Commutation	50% of future retirements elect to exchange pension for additional tax free cash up to HMRC limits for service to 1 April 2008 (equivalent 75% for service from 1 April 2008).
50:50 option	5.0% of members (uniformly distributed across the age, service and salary range) will choose the 50:50 option.

The tables below show details of the assumptions actually used for specimen ages. The promotional pay scale is an annual average for all employees at each age. It is in addition to the allowance for general pay inflation described above. For membership movements, the percentages represent the probability that an individual at each

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age leaves service within the following twelve months. The abbreviations FT and PT refer to full-time and part-time respectively.

Death in Service tables:

Age	Deaths per 1000 active members per annum Female	Male
20	0.12	0.21
25	0.12	0.21
30	0.18	0.26
35	0.30	0.30
40	0.48	0.51
45	0.77	0.85
50	1.13	1.36
55	1.49	2.13
60	1.90	3.83
65	2.44	6.38

Ill Health Early Retirements tables

Tier 1

Age	Incidence per 1000 active members per annum IH Tier 1 Female FT	IH Tier 1 Female PT	IH Tier 1 Male FT	IH Tier 1 Male PT
20	0.00	0.00	0.00	0.00
25	0.12	0.09	0.00	0.00
30	0.16	0.12	0.00	0.00
35	0.32	0.24	0.12	0.09
40	0.48	0.36	0.20	0.15
45	0.65	0.48	0.44	0.33
50	1.21	0.91	1.13	0.85
55	4.48	3.36	4.42	3.32
60	9.51	7.14	7.78	5.84
65	17.09	12.82	14.78	11.09

Tier 2

Age	Incidence per 1000 active members per annum IH Tier 2 Female FT	IH Tier 2 Female PT	IH Tier 2 Male FT	IH Tier 2 Male PT
20	0.00	0.00	0.00	0.00
25	0.10	0.07	0.00	0.00
30	0.13	0.10	0.00	0.00
35	0.26	0.19	0.10	0.07
40	0.39	0.29	0.16	0.12
45	0.51	0.39	0.35	0.27
50	1.22	0.92	1.14	0.85
55	2.60	1.95	2.56	1.92
60	2.69	2.01	2.20	1.65
65	0.00	0.00	0.00	0.00

Withdrawal

	Withdrawals per 1000 active members per annum			
Age	Female FT	Female PT	Male FT	Male PT
20	151.58	252.63	219.73	439.47
25	101.99	169.97	145.14	290.28
30	85.50	142.46	102.98	205.93
35	73.79	122.91	80.46	160.88
40	61.42	102.26	64.78	129.48
45	57.31	95.41	60.85	121.60
50	48.32	80.35	50.16	100.12
55	36.05	60.02	39.50	78.88
60	29.06	48.31	35.20	70.28
65	0.00	0.00	0.00	0.00

Promotional salary scale

Age	Promotional Salary Scale
20	105
25	117
30	131
35	144
40	150
45	157
50	162
55	162
60	162
65	162

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Appendix F: Technical appendix for contribution rate modelling

This appendix is provided for readers seeking to understand the technical methodology used in assessing the employer contribution rates.

In order to assess the likelihood of the employer's section of the Fund achieving full funding we have carried out stochastic asset liability modelling (ALM) that takes into account the main characteristics and features of each employer's share of the Fund's assets and liabilities. For stabilised employers a full ALM, known as comPASS has been used. For other employers a simplified ALM, known as TARGET has been used. Please refer to the Funding Strategy Statement to determine which method has been applied for each employer.

The following sections provide more detail on the background to the modelling.

Cash flows

In projecting forward the evolution of each employer's section of the Fund, we have used anticipated future benefit cashflows. These cashflows have been generated using the membership data provided for the formal valuation as at 31 March 2016, the demographic and financial assumptions used for the valuation and make an allowance for future new joiners to the Fund (if any employer is open to new entrants).

For comPASS we have estimated future service benefit cash flows and projected salary roll for new entrants (where appropriate) after the valuation date such that payroll remains constant in real terms (i.e. full replacement) unless otherwise stated. There is a distribution of new entrants introduced at ages between 25 and 65, and the average age of the new entrants is assumed to be 40 years. All new entrants are assumed to join and then leave service at SPA, which is a much simplified set of assumptions compared with the modelling of existing members. The base mortality table used for the new entrants is an average of mortality across the LGPS and is not specific to the Fund, which is another simplification compared to the modelling of existing members. TARGET uses a similar but simplified approach to generating new entrants. Nonetheless, we believe that these assumptions are reasonable for the purposes of the modelling given the highly significant uncertainty associated with the level of new entrants.

We do not allow for any variation in actual experience away from the demographic assumptions underlying the cashflows. Variations in demographic assumptions (and experience relative to those assumptions) can result in significant changes to the funding level and contribution rates. We allow for variations in inflation (RPI or CPI as appropriate), inflation expectations (RPI or CPI as appropriate), interest rates, yield curves and asset class returns. Cashflows into and out of the Fund are projected forward in annual increments and are assumed to occur in the middle of each financial year (April to March). Investment strategies are assumed to be rebalanced annually.

Asset liability model (comPASS)

These cashflows, and the employer's assets, are projected forward using stochastic projections of asset returns and economic factors such as inflation and bond yields. These projections are provided by the Economic Scenario Service (ESS), our (proprietary) stochastic asset model, which is discussed in more detail below.

In the modelling we have assumed that the Fund will undergo valuations every three years and a contribution rate will be set that will come into force one year after the simulated valuation date. For 'stabilised' contributions, the rate at which the contribution changes is capped and floored. There is no guarantee that such capping or flooring will be appropriate in future; this assumption has been made so as to illustrate the likely impact of practical steps that may be taken to limit changes in contribution rates over time.

Unless stated otherwise, we have assumed that all contributions are made and not varied throughout the period of projection irrespective of the funding position. In practice the contributions are likely to vary especially if the funding level changes significantly.

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Investment strategy is also likely to change with significant changes in funding level, but we have not considered the impact of this.

In allowing for the simulated economic scenarios, we have used suitable approximations for updating the projected cashflows. The nature of the approximations is such that the major financial and investment risks can be broadly quantified. However, a more detailed analysis would be required to understand fully the implications and appropriate implementation of a very low risk or 'cash flow matched' strategy.

We would emphasise that the returns that could be achieved by investing in any of the asset classes will depend on the exact timing of any investment/disinvestment. In addition, there will be costs associated with buying or selling these assets. The model implicitly assumes that all returns are net of costs and that investment/disinvestment and rebalancing are achieved without market impact and without any attempt to 'time' entry or exit.

Asset liability model (TARGET)

TARGET uses a similar, but simplified, modelling approach to that used for comPASS.

Contribution rates are inputs to the model and are assumed not to vary throughout the period of projection, with no valuation every three years or setting of 'stabilised' contribution rates.

In allowing for the simulated economic scenarios, we have used more approximate methods for updating the projected cash flows. The nature of the approximations is such that the major financial and investment risks can be broadly quantified.

When projecting forward the assets, we have modelled a proxy for the Fund's investment strategy by simplifying their current benchmark into growth (UK equity) and non-growth (index-linked gilts) allocations, and then adjusting the volatility of the resultant portfolio results to approximately reflect the diversification benefit of the Fund's investment strategy.

Economic Scenario Service

The distributions of outcomes depend significantly on the Economic Scenario Service (ESS), our (proprietary) stochastic asset model. This type of model is known as an economic scenario generator and uses probability distributions to project a range of possible outcomes for the future behaviour of asset returns and economic variables. Some of the parameters of the model are dependent on the current state of financial markets and are updated each month (for example, the current level of equity market volatility) while other more subjective parameters do not change with different calibrations of the model.

Key subjective assumptions are the average excess equity return over the risk free asset (tending to approximately 3% p.a. as the investment horizon is increased), the volatility of equity returns (approximately 18% p.a. over the long term) and the level and volatility of yields, credit spreads, inflation and expected (breakeven) inflation, which affect the projected value placed on the liabilities and bond returns. The market for CPI linked instruments is not well developed and our model for expected CPI in particular may be subject to additional model uncertainty as a consequence. The output of the model is also affected by other more subtle effects, such as the correlations between economic and financial variables.

Our expectation (i.e. the average outcome) is that long term real interest rates will gradually rise from their current low levels. Higher long-term yields in the future will mean a lower value placed on liabilities and therefore our median projection will show, all other things being equal, an improvement in the current funding position (because of the mismatch between assets and liabilities). The mean reversion in yields also affects expected bond returns.

While the model allows for the possibility of scenarios that would be extreme by historical standards, including very significant downturns in equity markets, large systemic and structural dislocations are not captured by the model. Such events are unknowable in effect, magnitude and nature, meaning that the most extreme possibilities are not necessarily captured within the distributions of results.

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Expected Rate of Returns and Volatilities

The following figures have been calculated using 5,000 simulations of the Economic Scenario Service, calibrated using market data as at 31 March 2016. All returns are shown net of fees. Percentiles refer to percentiles of the 5,000 simulations and are the annualised total returns over 5, 10 and 20 years, except for the yields which refer to the (simulated) yields in force at that time horizon. Only a subset of the asset classes are shown below.

The current calibration of the model indicates that a period of outward yield movement is expected. For example, over the next 20 years our model expects the 17 year maturity annualised real (nominal) interest rate to rise from -1.0% (2.2%) to 0.8% (4.0%).

		Annualised total returns												
		Index Linked Gilts (long dated)	UK Equity	Overseas Equity	Private Equity	Property	Senior Loans	Diversified Credit	Absolute Return Bonds (near zero duration)	Diversified Alternatives	Hedge Funds	Inflation	17 year real yield	17 year yield
5 years	16th %'ile	-2.9%	-3.7%	-5.6%	-7.2%	-3.8%	-0.8%	0.2%	-2.6%	-2.0%	-3.7%	1.2%	-1.6%	1.7%
	50th %'ile	0.5%	4.5%	4.1%	5.3%	2.0%	2.2%	2.3%	2.0%	2.6%	2.1%	2.6%	-0.7%	3.0%
	84th %'ile	4.1%	12.7%	14.3%	19.4%	8.3%	5.3%	4.5%	6.8%	7.5%	8.2%	4.2%	0.2%	4.5%
10 years	16th %'ile	-1.8%	-1.1%	-2.6%	-3.4%	-1.8%	0.7%	1.3%	-0.8%	-0.1%	-1.3%	1.4%	-1.5%	1.9%
	50th %'ile	0.3%	5.0%	4.6%	5.9%	2.8%	3.1%	3.0%	2.6%	3.4%	3.0%	2.8%	-0.3%	3.5%
	84th %'ile	2.7%	11.1%	12.1%	16.0%	7.5%	5.6%	4.7%	6.2%	7.2%	7.5%	4.5%	0.9%	5.5%
20 years	16th %'ile	-1.0%	1.3%	0.2%	0.3%	0.1%	2.1%	2.4%	1.0%	1.8%	0.7%	1.7%	-0.7%	2.3%
	50th %'ile	0.5%	5.9%	5.6%	7.0%	3.7%	4.2%	4.0%	3.6%	4.5%	4.1%	3.0%	0.8%	4.0%
	84th %'ile	2.2%	10.7%	11.2%	14.0%	7.6%	6.5%	5.8%	6.5%	7.5%	7.8%	4.4%	2.3%	6.3%
	Dispersion (1 yr)	9%	16%	19%	29%	14%	6%	6%	10%	10%	12%	1%		

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Appendix G: Events since valuation date

Post-valuation events

These valuation results are in effect a snapshot of the Fund as at 31 March 2016. Since that date, various events have had an effect on the financial position of the Fund. Whilst we have not explicitly altered the valuation results to allow for these events, a short discussion of these "post-valuation events" can still be beneficial in understanding the variability of pension funding.

In the period from the valuation date to early March 2017, the Fund asset returns have been significantly better than expected. However, global expectations for future asset returns have fallen in light of events such as the Brexit vote. Both events have roughly cancelled each other out in terms of the impact on the funding position. However, the day to day volatility is significant

Overall, employer contributions continue to be subject to upwards pressure as a result of post-valuation events.

It should be noted that the above is for information only: the figures in this report have all been prepared using membership data, audited asset information and market-based assumptions all as at 31 March 2016. In particular, we do not propose amending any of the contribution rates listed in the Rates & Adjustments Certificate on the basis of these market changes, and all employer contribution rates are based on valuation date market conditions. In addition, these rates are finalised within a risk-measured framework as laid out in the Fund's Funding Strategy Statement (FSS). We do not propose altering the FSS or valuation calculations to include allowance for post-valuation date market changes since a long term view has been taken.

Other events

Other than investment conditions changes above, I am not aware of any material changes at whole fund level or events occurring since the valuation date.

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Appendix H: Rates and adjustments certificate

In accordance with regulation 62(4) of the Regulations we have made an assessment of the contributions that should be paid into the Fund by participating employers for the period 1 April 2017 to 31 March 2020 in order to maintain the solvency of the Fund.

The method and assumptions used to calculate the contributions set out in the Rates and Adjustments certificate are detailed in the Funding Strategy Statement dated TBC and our report on the actuarial valuation dated TBC.

The required minimum contribution rates are set out below.

R&A table to follow

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Signature:

Date:	9 March 2017	
Name:	Gemma Sefton	Peter Summers
Qualification:	Fellow of the Institute and Faculty of Actuaries	Fellow of the Institute and Faculty of Actuaries
Firm:	Hymans Robertson LLP 20 Waterloo Street Glasgow G2 6DB	