METROPOLITAN WATER RECLAMATION DISTRICT RETIREMENT FUND

ACTUARIAL EXPERIENCE STUDY

December 18, 2023

FOSTER & FOSTER
ACTUARIES AND CONSULTANTS

December 18, 2023

Board of Trustees
Metropolitan Water Reclamation District Retirement Fund
111 E. Erie St.
Chicago, IL 60611

Re: Draft Actuarial Experience Study

Dear Board:

The following report presents the results of an actuarial experience study of the assumptions and methods used for actuarial valuation purposes for the Metropolitan Water Reclamation District Retirement Fund. In the course of the analysis, we compiled plan experience from December 31, 2017 through December 31, 2022. While we cannot verify the accuracy of all the information provided, the supplied information used for performance of the annual actuarial valuations or compiled from prior year annual reports was reviewed for consistency and reasonableness. As a result of this review, we have no reason to doubt the substantial accuracy of the information and believe it has produced appropriate results.

The report includes a review of demographic and economic experience, a comparison of this experience to current actuarial assumptions, our recommendations for consideration regarding changes in assumptions or methods to be effective for the December 31, 2023 actuarial valuation, and the estimated actuarial impact of these suggested changes. We believe implementing the recommended changes will assist in achieving the objective of developing costs that are stable, predictable, and represent our best estimate of anticipated experience.

It is important to remember that the ultimate cost of your retirement plan is independent of any actuarial assumptions or methods used throughout the valuation process. This cost will be the sum of the benefits paid from the fund and the administrative expenses incurred, less any net investment gains received. Future actuarial measurements may differ significantly from current measurements due to such factors as: plan experience differing from that anticipated by assumptions; changes in assumptions; increases or decreases expected as part of the natural operation of the methodology used (such as the end of an amortization period); changes in plan provisions or applicable law.

The actuarial measurements included in this report are based on actuarial asset values as of December 31, 2022 and would be different if market asset values were used instead of actuarial asset values. The difference between actuarial asset values and market asset values does not change any of recommendations on the assumptions.

Our analysis used third-party software to model (calculate) the underlying liabilities and costs. These results are reviewed in the aggregate and for individual sample lives. The output from the software is either used directly or input into internally developed models that apply the funding and accounting rules to generate the results. All internally developed models are reviewed as part of the valuation process. As a result of this review, we believe that the models have produced reasonable results. We do not believe

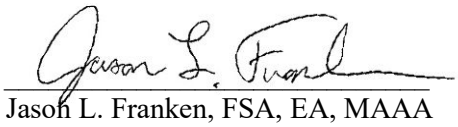
there are any material inconsistencies among assumptions or unreasonable output produced due to the aggregation of assumptions.

Foster & Foster does not provide legal, investment or accounting advice. Thus, the information in this report is not intended to supersede or supplant the advice or the interpretations of the plan or its affiliated legal, investing or accounting partners.

The undersigned is familiar with the immediate and long-term aspects of pension valuations and meet the Qualification Standards of the American Academy of Actuaries necessary to render the actuarial opinions contained herein. All sections of this report are considered an integral part of the actuarial opinions.

Respectfully submitted,

FOSTER & FOSTER INC.

By: 

Jason L. Franken, FSA, EA, MAAA

INTRODUCTION

The purpose of this study is to review the current economic and demographic assumptions used in the actuarial valuations of the Plan to determine which changes, if any, are necessary to achieve the objective of developing costs that are stable, predictable, and represent our best estimate of anticipated future experience.

The ultimate cost of any defined benefit pension plan for the plan sponsor is the sum of the benefits paid from the plan and the administrative expenses incurred, less member contributions and net investment gains received. Therefore, the actual cost of the plan will only be known after all benefits accrued by the members are paid to the members or their beneficiaries. Since members who retire, become disabled, terminate or die are continuously replaced by new employees, the exact cost to the System cannot be determined at any one point in time. To assure that adequate assets will accumulate to meet current and future benefit obligations, the actuary must make certain demographic and economic assumptions about future contingent events to determine the funding requirements necessary to meet the actual cost. Economic assumptions include salary growth and investment growth, both of which include inflation as a component. The demographic assumptions include rates of retirement, withdrawal, disability, and mortality.

Although the ultimate cost is independent of the actuarial assumptions used to determine funding requirements, the assumptions should reflect the actuary's best estimate of future plan experience. If the assumptions are inappropriate or do not reflect the long-term plan experience, the plan will incur experience gains (over-funding) or experience losses (under-funding) which will exceed or fall short of the actual long-term plan cost. If the contributions determined based upon these assumptions are paid as required, and if the assumptions are in accordance with the actual experience of the plan, then sufficient assets will accumulate to pay the actual cost.

The specific assumptions investigated throughout the remainder of this study are as follows:

- Retirement Rates
- Withdrawal Rates
- Disability Rates
- Mortality Rates
- Reciprocal Benefits Load
- Spousal Assumptions
- Investment Return
- Salary Increases
- Inflation/Tier 2 Annual Increase Adjustment
- Payroll Growth Rate

ACTUARIAL STANDARDS OF PRACTICE

The Actuarial Standards Board (ASB) is responsible for determining which actuarial activities are the best representations of generally accepted actuarial principles, and is also responsible for issuing guidance in the form of Actuarial Standards of Practice (ASOPs) to help actuaries in various practice areas deliver results and recommendations that are consistent with those representations. Generally speaking, ASOPs identify what the actuary should consider, document, and disclose when performing actuarial assignments.

The experience study and related measurements of benefit obligations for the plan are subject to the "coordinated guidance" provided in various ASOPs, including but not limited to:

- ASOP No. 4, *Measuring Pension Obligations and Determining Pension Plan Costs or Contributions*, which ties together the standards shown below, provides guidance on actuarial cost methods, and addresses overall considerations for measuring pension obligations and determining plan costs or contributions
- ASOP No. 23, *Data Quality*
- ASOP No. 25, *Credibility Procedures*
- ASOP No. 27, *Selection of Economic Assumptions for Measuring Pension Obligations*
- ASOP No. 35, *Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations*
- ASOP No. 44, *Selection and Use of Asset Valuation Methods for Pension Valuations*
- ASOP No. 51, *Assessment and Disclosure of Risk Associated with Measuring Pension Obligations and Determining Pension Plan Contributions*
- ASOP No. 56, *Modeling*

This report refers to ASOPs by number (e.g. ASOP No. 4) throughout. It is important to keep in mind that this experience study report only reflects the guidance provided in the final releases of the above-mentioned ASOPs issued by the ASB on or before the date of this report. The results provided in this report reflect the requirements of, and are consistent with, the applicable above-mentioned Actuarial Standards of Practice. When applicable, details from the relevant ASOP will be provided in the report section associated with a particular analysis or topic.

EXPERIENCE REVIEW SUMMARY

Foster & Foster performed an experience study on valuation data for the years December 31, 2017 through December 31, 2022. The purpose of this study is to review and update the assumptions used by the District for the Pension Fund. Below is a summary of our key findings and recommended changes. The remainder of the document provides details of our analysis and documents our recommendations. The impact on the accrued liabilities for each assumption change is summarized on page 44 of this document.

- **Retirement Rates**: We recommend increasing retirement rates at most ages to better reflect experience.
- **Withdrawal Rates**: We propose modest modifications to the withdrawal rates for both tables.
- **Disability Rates:** We recommend no changes to the disability rates.
- **Mortality Rates**: We recommend updating the mortality rates to currently available public tables with mortality improvements projected through 2023.
- **Reciprocal Benefits Load**: We propose no change to the current reciprocal benefits load of 1.50%.
- **Spousal Assumptions**: We recommend lowering the spousal age difference from 4 to 3.
- **Investment Return**: We recommend lowering the investment return assumption from 7.25% to 7.00%.
- **Salary Increases:** We recommend updating the salary increase rates to reflect lower expected increases at some service levels.
- **Payroll Growth Rate**: We recommend lowering this assumption from 3.00% to either 2.75% or 2.50%.
- **Tier 2 Annual Increase Adjustment**: We recommend no change to the current 1.25% assumption.

REVIEW OF DEMOGRAPHIC/OTHER ASSUMPTIONS

ASOP No. 35, *Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations*, provides guidance to actuaries in selecting (including giving advice on selecting) demographic and other noneconomic assumptions for measuring obligations under defined benefit pension plans.

Throughout the remainder of this section, we have used the standards set forth in ASOP No. 35 as a guideline for reviewing and if applicable, selecting recommended changes to the following demographic and other noneconomic actuarial assumptions:

- Retirement Rates
- Withdrawal Rates
- Mortality Rates
- Disability Rates
- Reciprocal Benefits Load

Generally, demographic assumptions are based on actual plan experience with additional consideration for current trends. ASOP No. 35 states "the actuary should use professional judgment to estimate possible future outcomes based on past experience and future expectations and select assumptions based upon application of that professional judgment. For any given measurement, the actuary will typically be able to identify two or more reasonable assumptions for the same contingency."

Demographic trends generally remain consistent over time, absent significant changes in plan provisions. Therefore, the best true indicator of future experience is past experience. For each assumption, this analysis compares actual experience for the studied time period to the current assumptions used for purposes of the actuarial valuations. Note that actuarial assumptions reflect average experience over long periods of time. A change in actuarial assumptions generally occurs when experience over a period of years indicates a consistent pattern.

Retirement Rates

Overview

A retirement rate is the associated probability at a specific point in time that a member will retire, given that they have attained the eligibility requirements for retirement. The associated cost due to retirement experience is determined by the age at which members actually retire. Higher rates of retirement at earlier ages generally result in higher costs to the plan.

The current requirements for Normal Retirement eligibility are as follows:

1. Members hired prior to January 1, 2011 (Tier 1): Age 60 and 5 years of service
2. Member hired on and after January 1, 2011 (Tier 2): Age 67 and 10 years of service

The current requirements for Early Retirement eligibility are as follows:

1. Members hired prior to January 1, 2011 (Tier 1): Age 55 (50 if hired before June 13, 1997) and 10 years of service
2. Member hired on and after January 1, 2011 (Tier 2): Age 62 and 10 years of service

Current Assumption

The current retirement rate assumption for the plan reflects one age-based table for Tier 1 and Tier 2 members. The rates vary from 7% at age 50 for eligible Tier 1 members with rate increases at age 60 (normal retirement eligible age for Tier 1 members) and age 67 (normal retirement eligible age for Tier 2 members). All members are assumed to retire by age 75.

Experience

The charts and graphs on the following pages illustrate the relationship between actual retirement experience over the last five years and expected experience based on the current assumption. Over the period studied, the number of Tier 2 members eligible to retire and be included in the retirement experience was not significant. Therefore, we do not illustrate experience separated by benefit tiers. The "Eligible Members" column sums the total number of members eligible to retire at each age for each year of experience.

In total, when comparing these assumptions to the actual experience shown on the following graphs, the current retirement assumption was lower than the actual experience incurred during the studied period. The total expected number of retirements was 367.4 and the actual number of retirements was 435. Actual retirement experience was heavier than expected at most ages.

- Table 1: Retirement Experience
- Graph 1: Retirement Experience

Recommended Assumption
In general, we recommend increasing retirement rates at most ages. Because the number of retirement eligible members at age 75 represent less than 1% of total eligible retirees, we recommend keeping the 100% retirement age as age 75. The weighted average retirement age decreases from 65.44 to 64.48 as a result of this change.

An illustration of the expected retirements using the proposed rates is included in the charts listed below:

- Table1: Retirement Experience
- Graph 1: Retirement Experience

Metropolitan Water Reclamation District
Retirement Fund

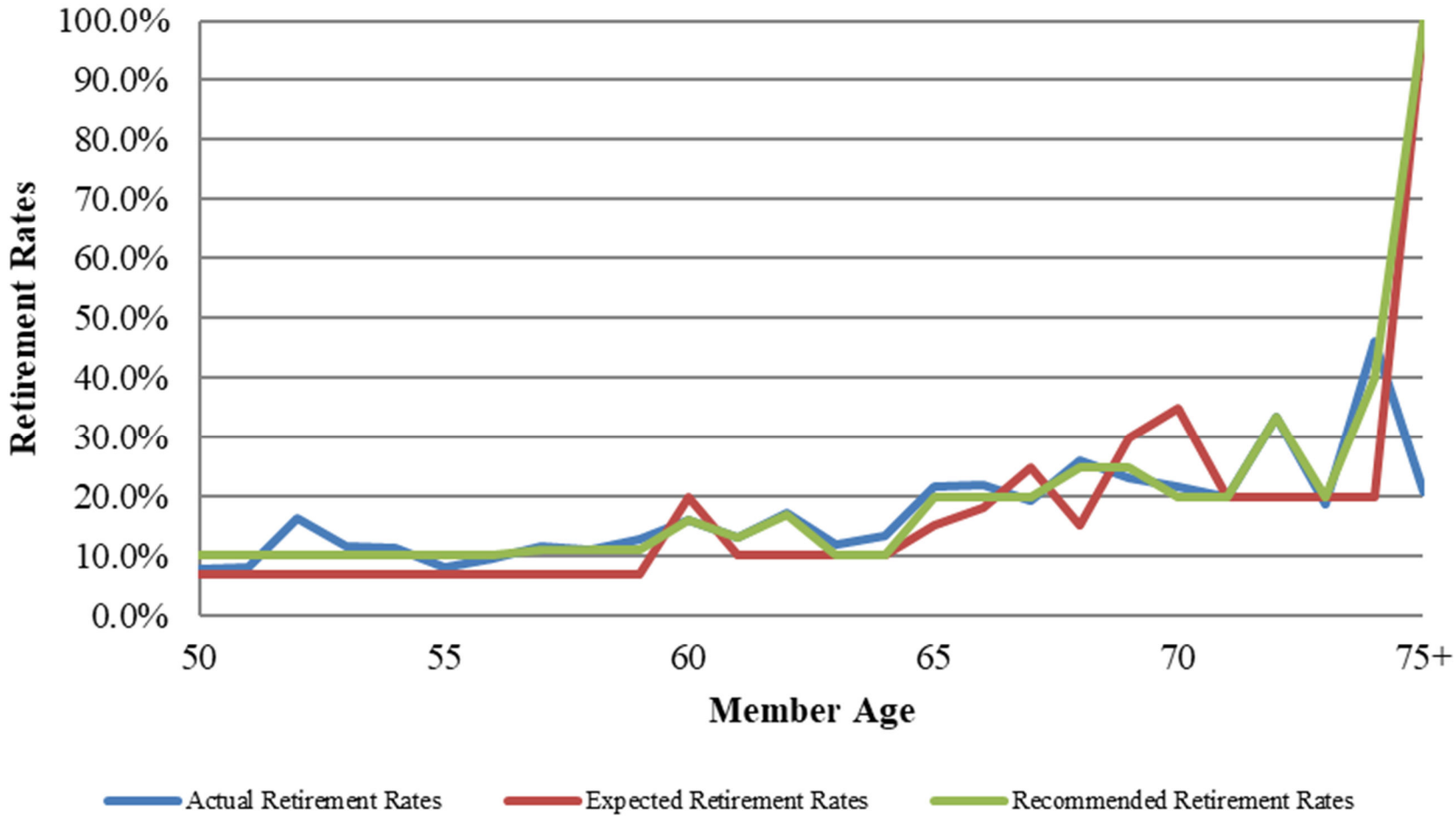
Table 1 - Retirement Experience*

Age	Eligible Members	Actual Retirements	Expected Retirements	Proposed Retirements	Actual Retirement Rates	Expected Retirement Rates	Recommended Retirement Rates
50	64	5	4.5	6.4	7.8%	7.0%	10.0%
51	73	6	5.1	7.3	8.2%	7.0%	10.0%
52	73	12	5.1	7.3	16.4%	7.0%	10.0%
53	77	9	5.4	7.7	11.7%	7.0%	10.0%
54	89	10	6.2	8.9	11.2%	7.0%	10.0%
55	238	19	16.7	23.8	8.0%	7.0%	10.0%
56	251	24	17.6	25.1	9.6%	7.0%	10.0%
57	241	28	16.9	26.5	11.6%	7.0%	11.0%
58	246	27	17.2	27.1	11.0%	7.0%	11.0%
59	233	30	16.3	25.6	12.9%	7.0%	11.0%
60	220	35	44.0	35.2	15.9%	20.0%	16.0%
61	198	26	19.8	25.7	13.1%	10.0%	13.0%
62	187	32	18.7	31.8	17.1%	10.0%	17.0%
63	168	20	16.8	16.8	11.9%	10.0%	10.0%
64	150	20	15.0	15.0	13.3%	10.0%	10.0%
65	125	27	18.8	25.0	21.6%	15.0%	20.0%
66	101	22	18.2	20.2	21.8%	18.0%	20.0%
67	83	16	20.8	16.6	19.3%	25.0%	20.0%
68	69	18	10.4	17.3	26.1%	15.0%	25.0%
69	52	12	15.6	13.0	23.1%	30.0%	25.0%
70	37	8	13.0	7.4	21.6%	35.0%	20.0%
71	30	6	6.0	6.0	20.0%	20.0%	20.0%
72	24	8	4.8	8.0	33.3%	20.0%	33.3%
73	16	3	3.2	3.2	18.8%	20.0%	20.0%
74	13	6	2.6	5.2	46.2%	20.0%	40.0%
75+	29	6	29.0	29.0	20.7%	100.0%	100.0%
Total**	**3,087**	**435**	**367.4**	**441**	**14.1%**	**11.9%**	**14.3%**
Total (50 - 74)	**3,058**	**429**	**338.4**	**412**	**14.0%**	**11.1%**	**13.5%**

*Data from December 31, 2017 through December 31, 2022.

**Total rates are based on the number of incidences divided by the number of exposures and do not represent an average of the numbers above.

Graph 1: Retirement Experience
Met Water Reclamation Retirement Fund



Withdrawal Rates

Overview
The withdrawal rate, or termination rate, is the probability that a member will separate employment from a cause other than disability, death, or retirement. This includes members who terminate and receive a refund of contributions.

Current Assumption
The current withdrawal assumption reflects separate tables of rates for male and female members that vary by service.

Experience
The following charts compare actual termination experience to the current assumption. In total, for both male and female members, actual termination experience was slightly lighter than expected.

- Table 2: Withdrawal Experience – Male Members
- Graph 2: Withdrawal Experience – Male Members
- Table 3: Withdrawal Experience – Female Members
- Graph 3: Withdrawal Experience – Female Members

Recommended Assumption
We are proposing small decreases to the withdrawal rates for both tables. The recommended rates are detailed in the experience charts.

Metropolitan Water Reclamation District Retirement Fund

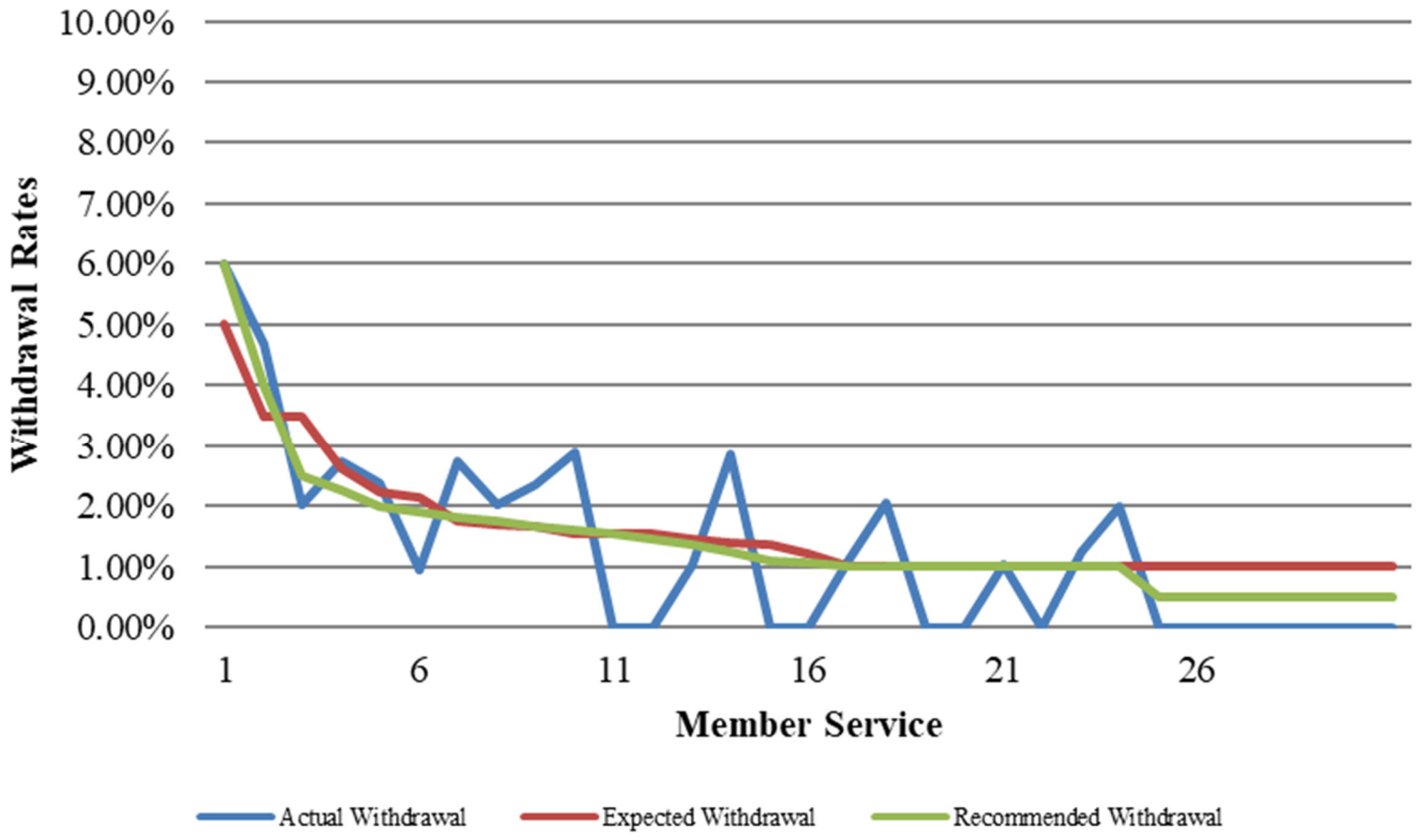
Table 2: Withdrawal Experience - Male Members *

Service	Exposures	Actual Terminations	Expected Terminations	Actual Withdrawal	Expected Withdrawal	Recommended Withdrawal
0	100	6	5.0	6.00%	5.00%	6.00%
1	363	17	12.7	4.68%	3.50%	4.00%
2	348	7	12.2	2.01%	3.50%	2.50%
3	364	10	9.5	2.75%	2.60%	2.25%
4	335	8	7.5	2.39%	2.24%	2.00%
5	317	3	6.8	0.95%	2.15%	1.90%
6	257	7	4.5	2.72%	1.75%	1.80%
7	198	4	3.4	2.02%	1.70%	1.75%
8	171	4	2.8	2.34%	1.65%	1.65%
9	139	4	2.2	2.88%	1.55%	1.60%
10	129	0	2.0	0.00%	1.55%	1.55%
11	176	0	2.7	0.00%	1.55%	1.45%
12	194	2	2.8	1.03%	1.45%	1.35%
13	175	5	2.4	2.86%	1.40%	1.25%
14	152	0	2.1	0.00%	1.35%	1.10%
15	123	0	1.5	0.00%	1.20%	1.05%
16	92	1	0.9	1.09%	1.00%	1.00%
17	98	2	1.0	2.04%	1.00%	1.00%
18	96	0	1.0	0.00%	1.00%	1.00%
19	108	0	1.1	0.00%	1.00%	1.00%
20	97	1	1.0	1.03%	1.00%	1.00%
21	96	0	1.0	0.00%	1.00%	1.00%
22	81	1	0.8	1.23%	1.00%	1.00%
23	50	1	0.5	2.00%	1.00%	1.00%
24	29	0	0.3	0.00%	1.00%	0.50%
25	17	0	0.2	0.00%	1.00%	0.50%
26	7	0	0.1	0.00%	1.00%	0.50%
27	9	0	0.1	0.00%	1.00%	0.50%
28	5	0	0.1	0.00%	1.00%	0.50%
29	3	0	0.0	0.00%	1.00%	0.50%
30+	1	0	0.0	0.00%	1.00%	0.50%
Total	**4,330**	**83**	**87.9**	**1.92%**	**2.03%**	**1.92%**

*Data from December 31, 2017 through December 31, 2022.

Graph 2: Withdrawal Experience - Male

Met Water Reclamation District Retirement Fund



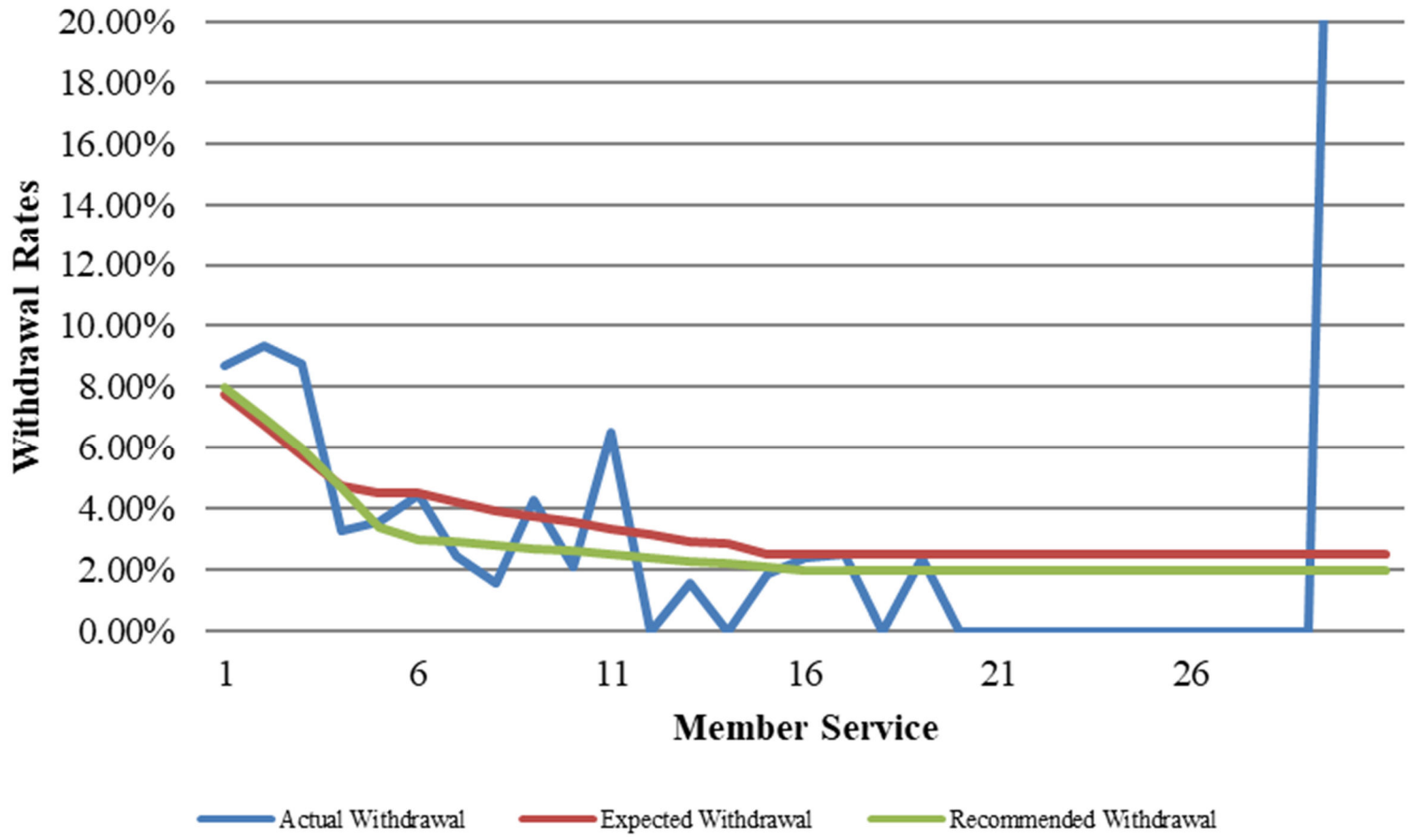
Metropolitan Water Reclamation District
Retirement Fund

Table 3: Withdrawal Experience - Female Members*

Service	Exposures	Actual Terminations	Expected Terminations	Actual Withdrawal	Expected Withdrawal	Recommended Withdrawal
0	46	4	3.6	8.70%	7.75%	8.00%
1	139	13	9.4	9.35%	6.75%	7.00%
2	126	11	7.2	8.73%	5.75%	6.00%
3	122	4	5.8	3.28%	4.75%	4.70%
4	112	4	5.1	3.57%	4.52%	3.40%
5	112	5	5.0	4.46%	4.49%	3.00%
6	82	2	3.4	2.44%	4.19%	2.90%
7	64	1	2.5	1.56%	3.94%	2.80%
8	47	2	1.8	4.26%	3.74%	2.70%
9	48	1	1.7	2.08%	3.54%	2.60%
10	46	3	1.5	6.52%	3.34%	2.50%
11	60	0	1.9	0.00%	3.14%	2.40%
12	64	1	1.9	1.56%	2.94%	2.30%
13	62	0	1.8	0.00%	2.85%	2.20%
14	53	1	1.3	1.89%	2.52%	2.10%
15	42	1	1.1	2.38%	2.52%	2.00%
16	40	1	1.0	2.50%	2.52%	2.00%
17	37	0	0.9	0.00%	2.52%	2.00%
18	42	1	1.1	2.38%	2.52%	2.00%
19	43	0	1.1	0.00%	2.52%	2.00%
20	49	0	1.2	0.00%	2.52%	2.00%
21	47	0	1.2	0.00%	2.52%	2.00%
22	33	0	0.8	0.00%	2.52%	2.00%
23	25	0	0.6	0.00%	2.52%	2.00%
24	18	0	0.5	0.00%	2.52%	2.00%
25	2	0	0.1	0.00%	2.52%	2.00%
26	3	0	0.1	0.00%	2.52%	2.00%
27	4	0	0.1	0.00%	2.52%	2.00%
28	1	0	0.0	0.00%	2.52%	2.00%
29	2	1	0.1	50.00%	2.52%	2.00%
30+	2	1	0.1	50.00%	2.52%	2.00%
Total	**1,573**	**57**	**64**	**3.62%**	**4.05%**	**3.49%**

*Data from December 31, 2017 through December 31, 2022.

Graph 3: Withdrawal Experience - Female
Met Water Reclamation District Retirement Fund



Disability Rates

The disability rate assumption is the probability that a member will become disabled while an active participant in the plan. Currently, the valuation uses an age-based table.

The disability benefits represent about 0.48% of the actuarial accrued liability. Given the lack of credible data and the immateriality of the benefits, we recommend no changes to the disability assumption.

Mortality Rates

Overview

The rate of mortality is the probability of death at a given age. While mortality is a contingency for both the active and retiree populations, it has the greatest cost implications for retirees. If retirees live longer than anticipated by the assumptions, benefits will be paid longer than expected and experience losses will develop. If retirees do not live as long as anticipated by the assumptions, experience gains will develop.

The actuarial profession has increasingly become more focused on the issue of future mortality improvement. Mortality rates have declined over time as advances in medical care have evolved. The extent of future mortality improvement will impact the magnitude of pension costs and liabilities for future benefit commitments. ASOP No. 35 discusses the importance of actuaries considering mortality improvements when measuring pension obligations. Specifically, an actuary should make and disclose a specific recommendation with respect to future mortality improvement after the measurement date. Mortality improvement can be accounted for with static or generational mortality tables. A static table includes a projection of the base mortality rates to a specific date or equivalently for a specific number of years. The same mortality rates at any given age apply to everyone. A generational table anticipates future improvements in mortality by using a different static mortality table for each year of birth, with the tables for later years of birth assuming lower mortality than the tables of earlier years of birth.

Credibility procedures employed in our analysis used a statistical approach to combine actual mortality experience with standard mortality tables to improve the estimate of future mortality.

Current Assumption

The current mortality assumption is the RP-2000 Combined Healthy Mortality, with generational mortality improvements using Scale AA. Female rates are adjusted by a factor of 1.04 and male rates are unadjusted.

Experience and Analysis

Experience was reviewed for annuitants and actives separately. For a plan to develop a mortality table based solely on its own experience it must have hundreds of thousands of lives and thousands of deaths at each age and sex. However, many plans provide enough credible experience to adjust a published table by multiplying the mortality rates in the published table by the ratio of actual to expected deaths. We employed this methodology by first identifying a standard table with mortality rates that are similar to those shown by the actual plan membership. Since the rate at each age in the mortality table will be a multiple of the rate at that age from the standard table, close attention was given to the shape of the standard table in making the selection.

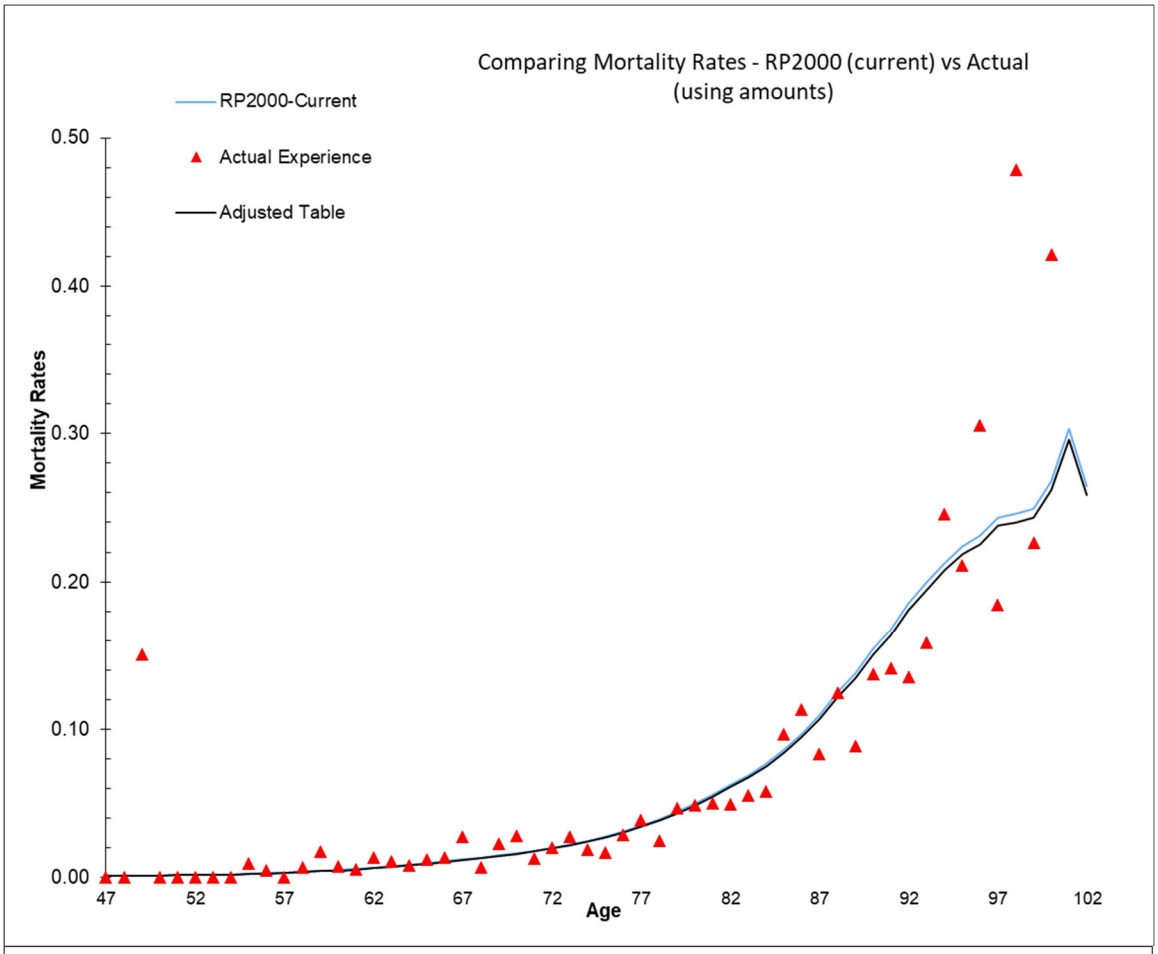
Once the appropriate standard table was selected, we determined the multiple using the limited fluctuation approach to credibility, as described in the Society of Actuaries Credibility Educational Resource for Pension Actuaries, issued in August 2017. Using this approach, for the selected amount-weighted table, about 1,600 deaths are needed to provide full credibility based on a 90% confidence level and a 5% margin of error. If the experience data is fully credible, then the rates from the standard table are multiplied by the ratio of the actual to expected deaths from the standard table. Where there are fewer

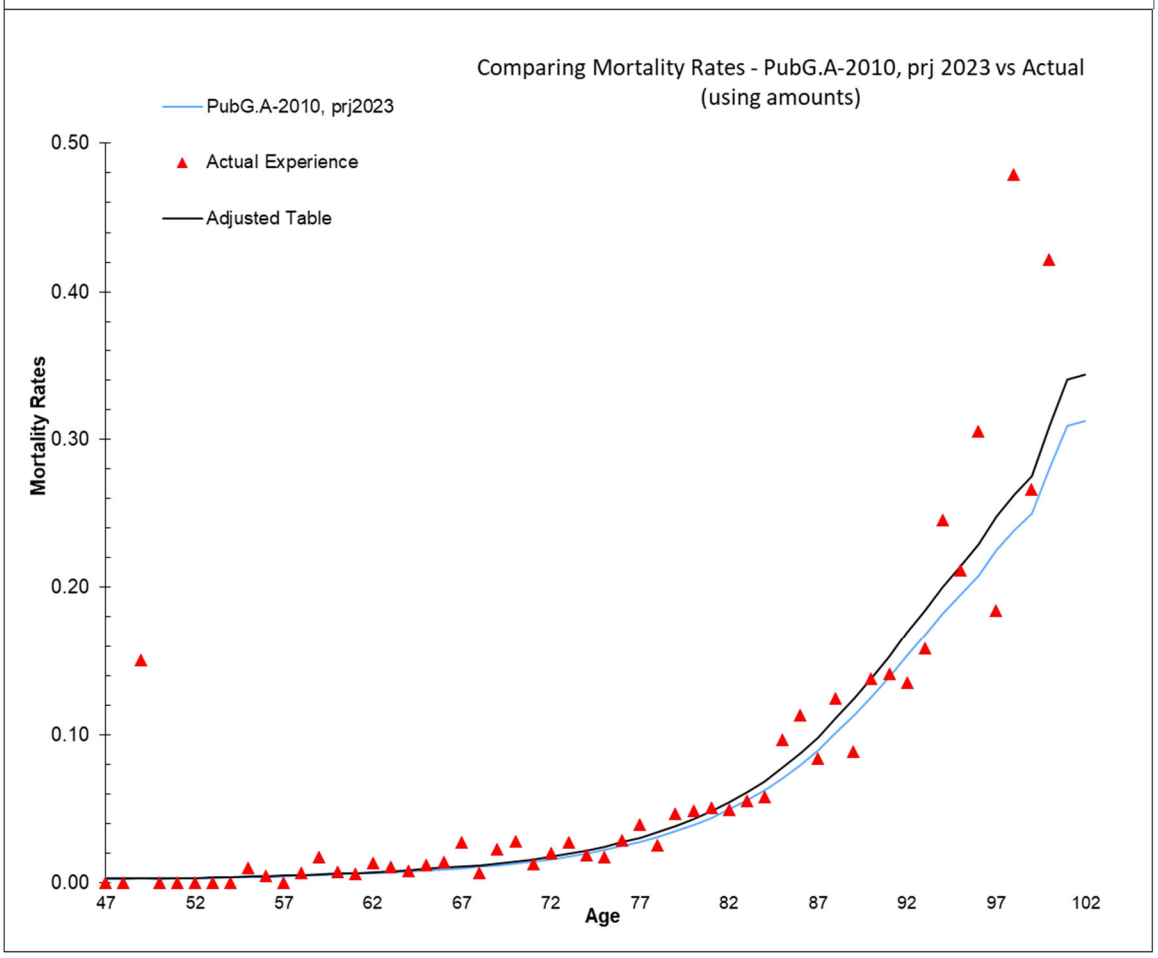
than the 1,600 deaths needed for full credibility, the limited fluctuations approach allows some of the plan's actual experience to be used to adjust the standard table.

Annuitants:
Mortality rates for retirees and survivors are much more significant to the valuation since mortality rates are significantly higher for this group. Using the credibility approach described above, we found that with 309 deaths for male annuitants, the experience was 46.7% credible. For female annuitants, the plan experienced 256 deaths and is 39.2% credible. In selecting a standard table, we considered the PubG.A-2010 Public Retirement Plans Mortality Table published by the Society of Actuaries for both male annuitants and female annuitants.

We found that the current RP-2000 Combined Healthy tables provided a closer match to the total Actual/Expected (A/E) ratio of deaths. The blended A/E ratio (amount-weighted) for all male annuitants was 1.06 and 1.00 for female annuitants. For male annuitants, the actual mortality experience was still heavier than predicted by the current table. The corresponding ratios using the PubG.A-2010 Public Retirement Plans Mortality Tables were 1.04 and 1.16 for male and female annuitants, respectively. Despite the RP-2000 table being a better fit for the number of female deaths, the rates in Public tables better fit the general pattern of rates experienced by the plan. The graphs on the on the following page illustrate this fit. The top graph compares actual mortality rates with expected mortality rates under the current assumption and the bottom graph compares actual mortality rates with the expected mortality rates based on the PubG.A-2010 tables. The red triangles represent actual experience and the solid blue and black lines represent the rates according to the tables. As you can see, particularly between the ages of 82 and 97, the rates for the Public tables follow the actual experience more smoothly.

The standard mortality tables will be blended with actual plan experience. The resulting tables will reflect heavier mortality rates than the published tables, but still allow for mortality improvements. The blue line on the bottom table represents the PubG.A-2010 mortality rates (with mortality improvements to 2023 using Scale MP-2021) and the black line represents the rates blended with actual experience. A summary of adjustment factors can be found under the recommended mortality assumptions.


Comparing Mortality Rates - RP2000 (current) vs Actual
(using amounts)
RP2000-Current
Actual Experience
Adjusted Table
Mortality Rates
0.50
0.40
0.30
0.20
0.10
0.00
47
52
57
62
67
72
77
82
87
92
97
102
Age


Comparing Mortality Rates - PubG.A-2010, prj 2023 vs Actual
(using amounts)
PubG.A-2010, prj2023
Actual Experience
Adjusted Table
Mortality Rates
0.50
0.40
0.30
0.20
0.10
0.00
47
52
57
62
67
72
77
82
87
92
97
102
Age

Active Mortality:
Mortality rates for active members are much less significant to the valuation since mortality rates are significantly lower for active members than for retirees. The low number of active member deaths results in an insufficient number of deaths needed to provide fully credible experience on which to develop the system's mortality rates. Using a head-count credibility approach, we found that with 56 deaths for males, the plan's experience was only 22.1% credible (credibility factor). The number of female deaths during the study period was 3, which resulted in a credibility factor of 5.3%. Given the low credibility ratings of the data and minimal impact of active mortality experience on liabilities, we recommend using the PubG.A-2010 employee table as published.

Disability Retiree Mortality:
Over the studied period, the annuitants receiving disability benefits were not isolated on the data. Given this limited experience, we recommend using the PubG.A-2010 disabled retiree table as published.

Future Mortality Improvement:
The plan has experienced mortality gains (heavier than expected mortality) over the last 10 years, indicating that mortality improvements experienced in the general population have not been realized for the plan. This is illustrated on Tables 6a and 6b (Mortality Comparison) on the pages following. These tables summarize the actual death experience compared to expected experience under the current and proposed tables. Over the studied period, actual deaths exceeded the expected deaths under the current RP-2000 table. For example, for male annuitants, the plan experienced 309 deaths versus 292 expected deaths. This illustrates that the RP2000 rates already reflected some improvements (fewer deaths) relative to the actual population. If the valuation reflected the PubG.A-2010 tables and no projected mortality improvements the number of deaths is 269. This table, without any further projection of mortality improvements, already includes additional room for future mortality improvements. As a comparison, if the PubG.A-2010 tables were adjusted to reflect mortality improvements through 2023 (the end of the studied period), the expected deaths is 242—well below the actual experience. Given the mortality experienced by the plan does not reflect the trend of mortality improvements realized by the general population, we recommend reflecting mortality improvements only through 2023.

The tables and graphs 4, 5 and 7 listed below compare actual experience to expected experience using the current and recommended assumption tables. Experience is summarized separately for female annuitants and for male annuitants in items 4 and 5. Tables 6a and 6b summarizes the actual death experience compared to expected experience under the current and proposed tables. The active mortality experience is limited and is summarized in total in item 7.

- Table 4a: Female Mortality Experience - Annuitants (Current Table)
- Graph 4a: Female Mortality Experience - Annuitants (Current Table)
- Table 4b: Male Mortality Experience – Annuitants (Current Table)
- Graph 4b: Male Mortality Experience – Annuitants (Current Table)
- Table 5a: Female Mortality Experience - Annuitants (Proposed Table)
- Graph 5a: Female Mortality Experience - Annuitants (Proposed Table)
- Table 5b: Male Mortality Experience – Annuitants (Proposed Table)
- Graph 5b: Male Mortality Experience – Annuitants (Proposed Table)
- Table 6a: Female Mortality Comparison
- Table 6b: Male Mortality Comparison
- Table 7: Active Mortality Experience
- Graph 7: Active Mortality Experience

Recommended Assumption
We recommend updating to the most recently published SOA PubG.A-2010 tables for a better fit to actual mortality experience and adjusting the published rates to blend the heavier actual plan experience. In addition, we recommend projecting mortality improvements to 2023 with Scale MP-2021 and no additional projected improvements.

The proposed base tables and adjustment factors are summarized below:

Population	Amount-weighted Table	Male Adj.	Female Adj.
Actives	Pub-2010 General Employees	1.000	1.000
Retirees	Pub-2010 General Retirees	1.067	1.061
Survivors	Pub-2010 General Survivors	0.973	1.075
Disabled	Pub-2010 General Disabled Retirees	1.000	1.000

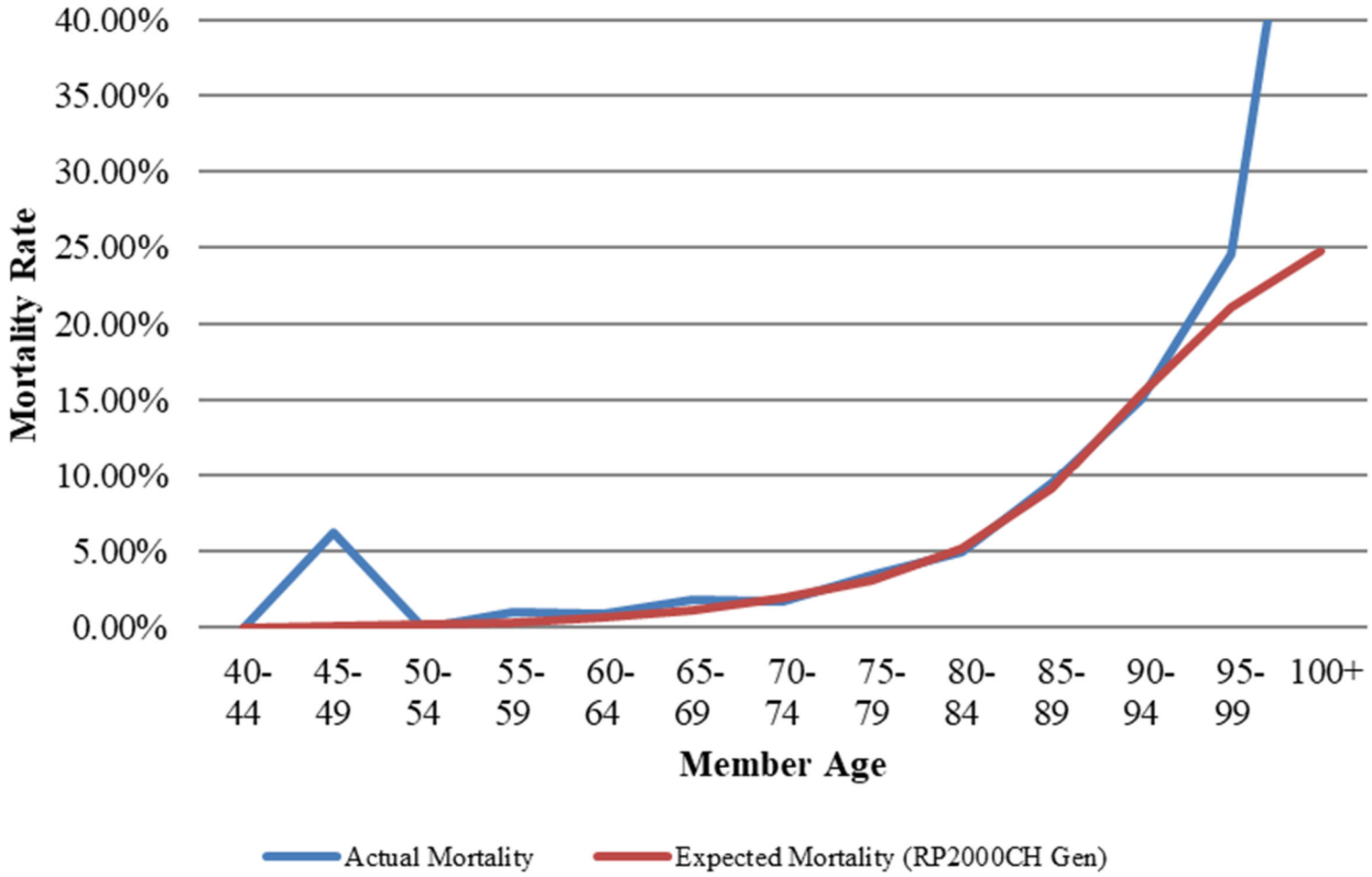
Metropolitan Water Reclamation District Retirement Fund

Table 4a: Female Mortality Experience - Annuitants - Current Assumption*

Age	Exposures	Actual Deaths	Expected Deaths**	Actual Mortality	Expected Mortality**
40-44	6	0	0.0	0.00%	0.00%
45-49	16	1	0.0	6.25%	0.13%
50-54	108	0	0.2	0.00%	0.18%
55-59	287	3	1.0	1.05%	0.34%
60-64	452	4	2.9	0.88%	0.65%
65-69	613	11	7.2	1.79%	1.18%
70-74	829	14	16.0	1.69%	1.93%
75-79	727	25	22.5	3.44%	3.09%
80-84	736	36	38.3	4.89%	5.21%
85-89	582	55	53.2	9.45%	9.14%
90-94	387	58	59.3	14.99%	15.33%
95-99	159	39	33.5	24.53%	21.06%
100+	16	10	4.0	62.50%	24.75%
Total	**4,919**	**256**	**238.1**	**5.20%**	**4.84%**

*Data from December 31, 2017 through December 31, 2022.
**Current assumption: RP-2000 Combined Healthy Mortality (w/adjustments), Fully Generational with Scale AA.

Graph 4a: Female Mortality Experience
Met Water Reclamation District Retirement Fund



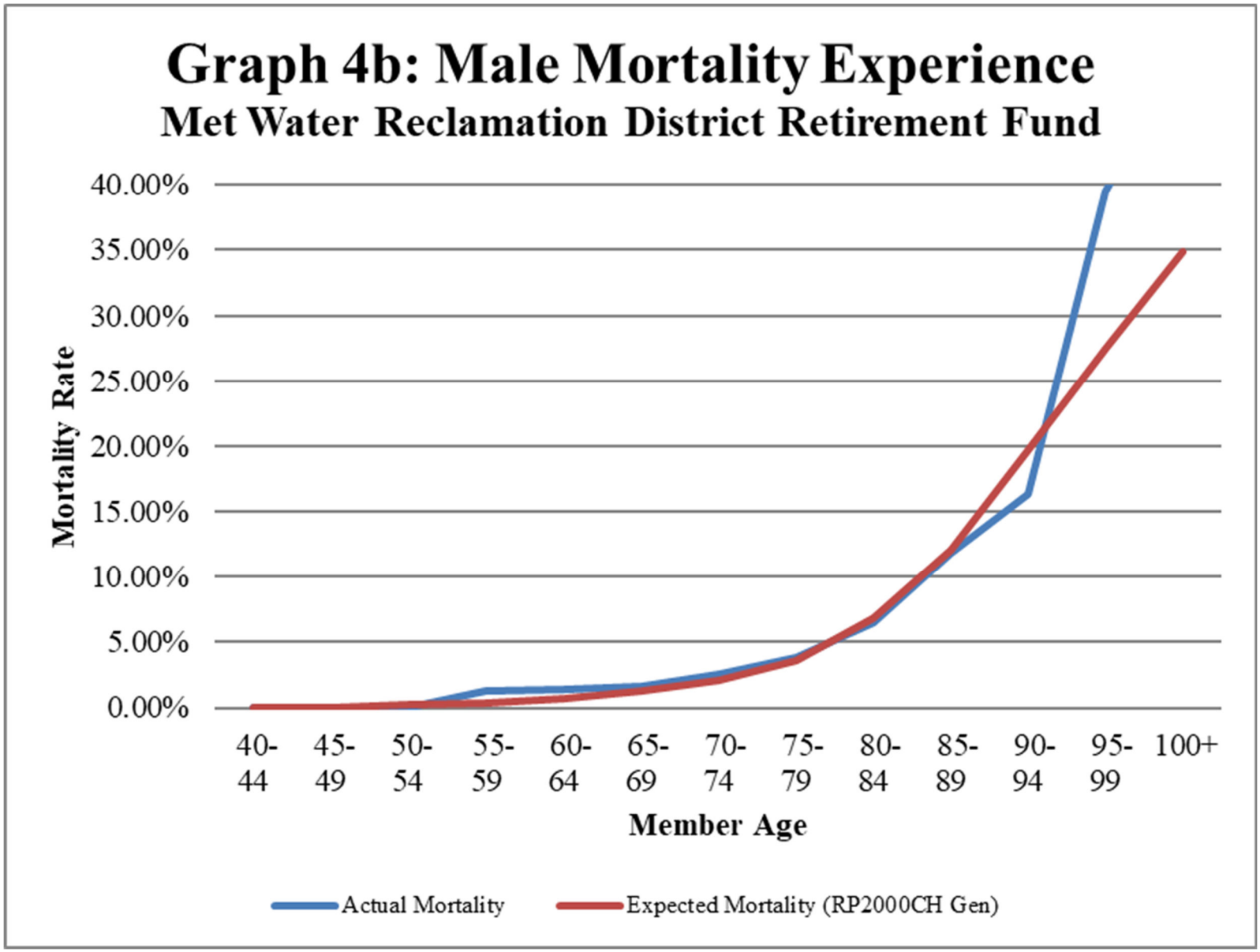
Metropolitan Water Reclamation District Retirement Fund

Table 4b: Male Mortality Experience - Annuitants - Current Assumption*

Age	Exposures	Actual Deaths	Expected Deaths**	Actual Mortality	Expected Mortality**
40-44	0	0	0.0	0.00%	0.00%
45-49	0	0	0.0	0.00%	0.00%
50-54	89	0	0.2	0.00%	0.20%
55-59	408	5	1.5	1.23%	0.37%
60-64	887	12	6.2	1.35%	0.70%
65-69	1,243	20	15.6	1.61%	1.25%
70-74	1,596	41	33.4	2.57%	2.09%
75-79	1,350	52	49.1	3.85%	3.64%
80-84	845	55	57.6	6.51%	6.82%
85-89	522	62	62.7	11.88%	12.02%
90-94	269	44	52.9	16.36%	19.67%
95-99	38	15	10.4	39.47%	27.45%
100+	6	3	2.1	50.00%	34.83%
Total	**7,253**	**309**	**291.7**	**4.26%**	**4.02%**

*Data from December 31, 2017 through December 31, 2022.
**Current assumption: RP-2000 Combined Healthy Mortality (w/adjustments), Fully Generational with Scale AA.

Graph 4b: Male Mortality Experience
Met Water Reclamation District Retirement Fund



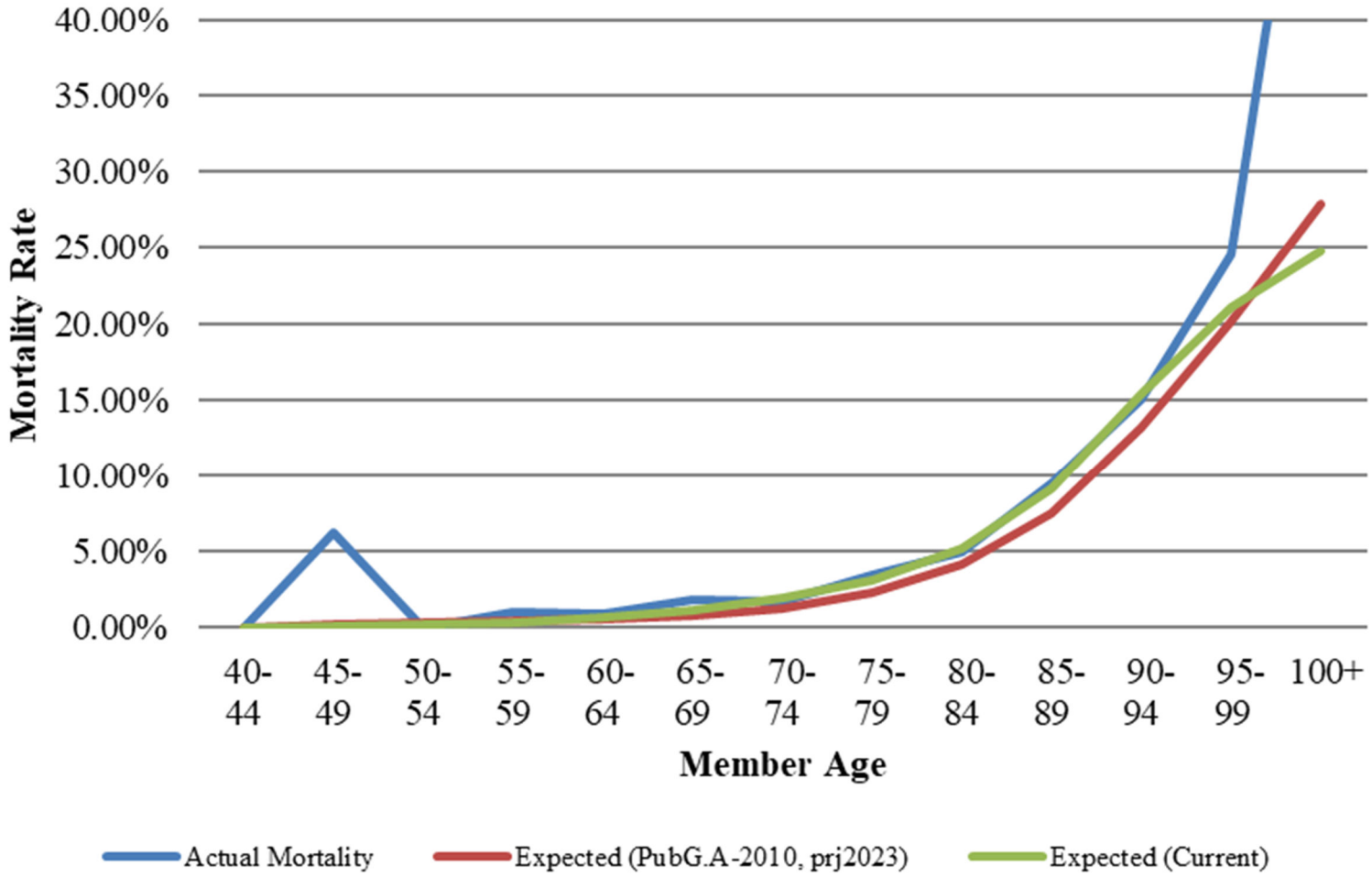
Metropolitan Water Reclamation District Retirement Fund

Table 5a: Female Mortality Experience - Annuitants - Proposed Assumption*

Age	Exposures	Actual Deaths	Expected Deaths**	Actual Mortality	Expected Mortality**
40-44	6	0	0.0	0.00%	0.00%
45-49	16	1	0.0	6.25%	0.25%
50-54	108	0	0.3	0.00%	0.29%
55-59	287	3	1.1	1.05%	0.38%
60-64	452	4	2.4	0.88%	0.54%
65-69	613	11	4.9	1.79%	0.80%
70-74	829	14	10.5	1.69%	1.27%
75-79	727	25	16.3	3.44%	2.24%
80-84	736	36	30.5	4.89%	4.15%
85-89	582	55	43.7	9.45%	7.51%
90-94	387	58	50.9	14.99%	13.14%
95-99	159	39	32.0	24.53%	20.14%
100+	16	10	4.5	62.50%	27.94%
Total	**4,919**	**256**	**197.1**	**5.20%**	**4.01%**

*Data from December 31, 2017 through December 31, 2022.
**Proposed assumption: PubG-2010 Mortality, adjusted for credibility analysis, Prj to 2023 with MP-2021

Graph 5a: Female Mortality Experience
Met Water Reclamation District Retirement Fund



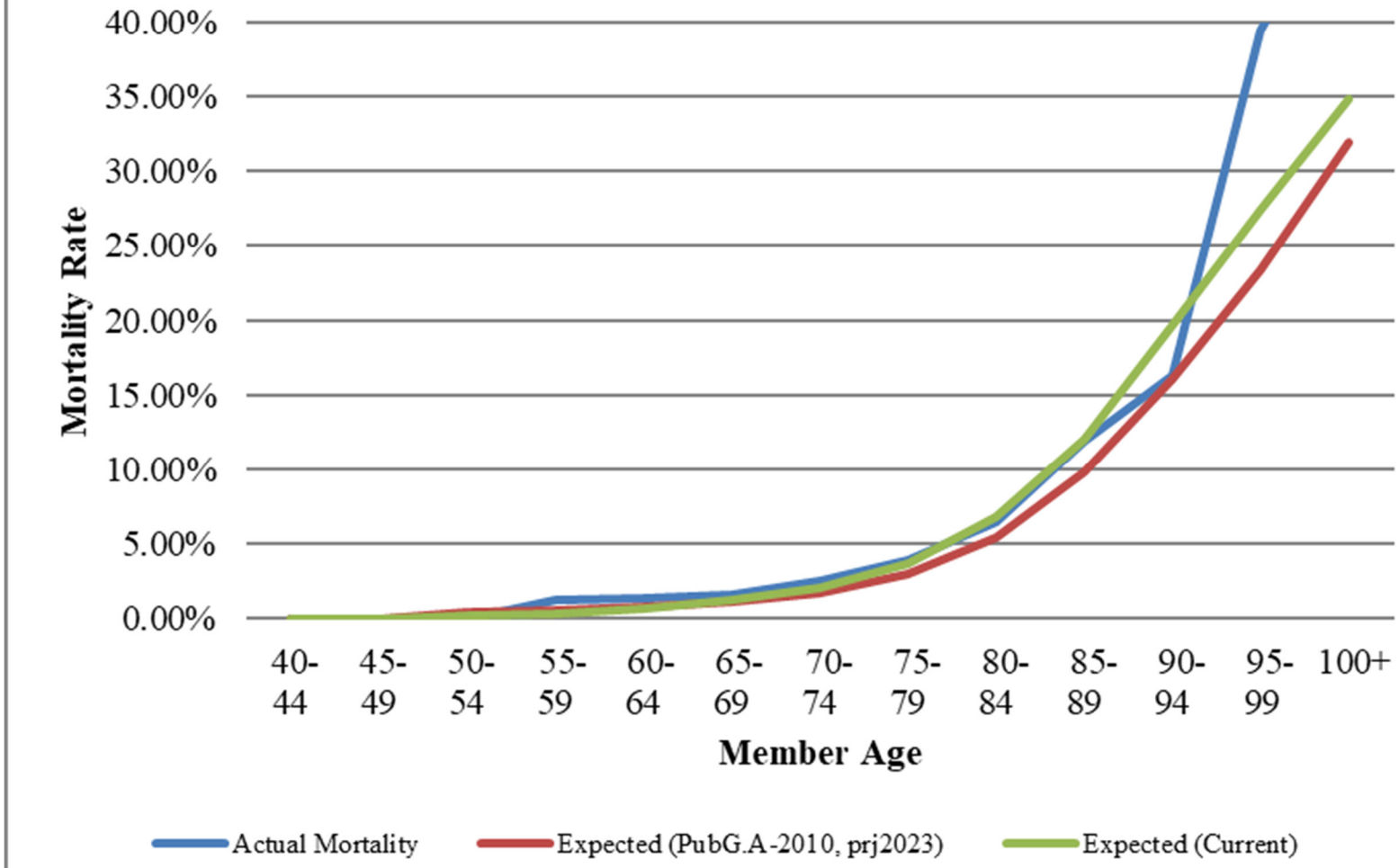
Metropolitan Water Reclamation District Retirement Fund

Table 5b: Male Mortality Experience - Proposed Assumption*

Age	Exposures	Actual Deaths	Expected Deaths**	Actual Mortality	Expected Mortality**
40-44	0	0	0.0	0.00%	0.00%
45-49	0	0	0.0	0.00%	0.00%
50-54	89	0	0.3	0.00%	0.38%
55-59	408	5	2.1	1.23%	0.52%
60-64	887	12	6.7	1.35%	0.75%
65-69	1,243	20	13.6	1.61%	1.10%
70-74	1,596	41	28.0	2.57%	1.75%
75-79	1,350	52	40.0	3.85%	2.97%
80-84	845	55	45.9	6.51%	5.43%
85-89	522	62	51.1	11.88%	9.78%
90-94	269	44	43.3	16.36%	16.08%
95-99	38	15	8.9	39.47%	23.34%
100+	6	3	1.9	50.00%	32.00%
Total	**7,253**	**309**	**241.8**	**4.26%**	**3.33%**

*Data from December 31, 2017 through December 31, 2022.
**Proposed assumption: PubG-2010 Mortality, adjusted for credibility analysis, Prj to 2023 with MP-2021

Graph 5b: Male Mortality Experience
Met Water Reclamation District Retirement Fund



Metropolitan Water Reclamation District Retirement Fund

Table 6a: Female Mortality Experience - Annuitants - Comparison

Age	Exposures	Actual Deaths	Expected Deaths Current	Expected Deaths PubG2010	Expected Deaths PubG2010 Prj 2023
40-44	6	0	0.0	0.0	0.0
45-49	16	1	0.0	0.1	0.0
50-54	108	0	0.2	0.4	0.3
55-59	287	3	1.0	1.1	1.1
60-64	452	4	2.9	2.5	2.4
65-69	613	11	7.2	5.6	4.9
70-74	829	14	16.0	12.7	10.5
75-79	727	25	22.5	19.2	16.3
80-84	736	36	38.3	34.6	30.5
85-89	582	55	53.2	48.4	43.7
90-94	387	58	59.3	55.9	50.9
95-99	159	39	33.5	35.2	32.0
100+	16	10	4.0	4.9	4.5
Total	**4,919**	**256**	**238.1**	**220.5**	**197.1**

*Data from December 31, 2017 through December 31, 2022.

Metropolitan Water Reclamation District Retirement Fund

Table 6b: Male Mortality Experience - Annuitants - Comparison

Age	Exposures	Actual Deaths	Expected Deaths Current	Expected Deaths PubG2010	Expected Deaths PubG2010 Prj 2023
40-44	0	0	0.0	0.0	0.0
45-49	0	0	0.0	0.0	0.0
50-54	89	0	0.2	0.4	0.3
55-59	408	5	1.5	2.2	2.1
60-64	887	12	6.2	6.7	6.7
65-69	1,243	20	15.6	14.4	13.6
70-74	1,596	41	33.4	31.7	28.0
75-79	1,350	52	49.1	46.3	40.0
80-84	845	55	57.6	52.1	45.9
85-89	522	62	62.7	56.6	51.1
90-94	269	44	52.9	47.2	43.3
95-99	38	15	10.4	9.7	8.9
100+	6	3	2.1	2.1	1.9
Total	**7,254**	**309**	**291.7**	**269.1**	**241.8**

*Data from December 31, 2017 through December 31, 2022.

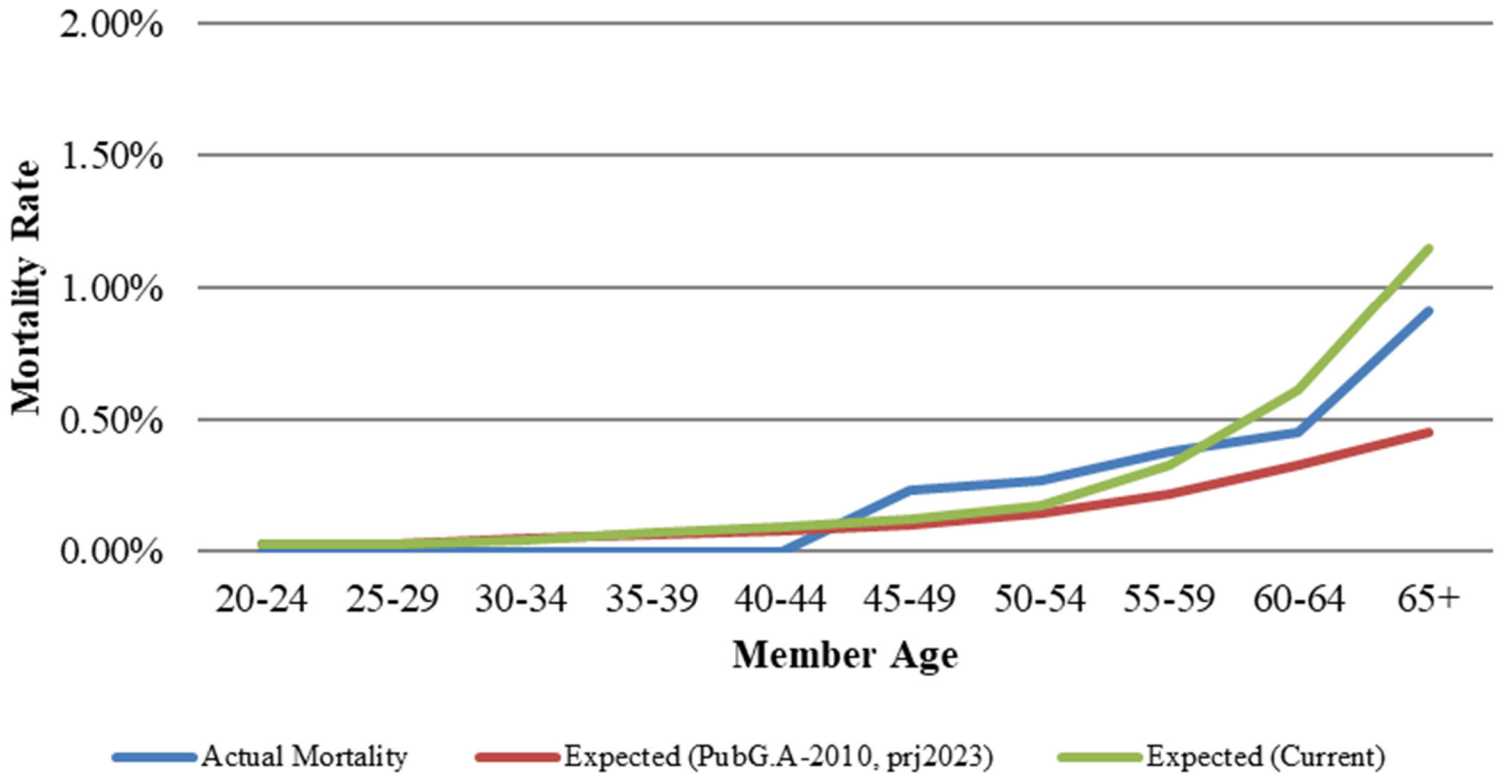
Metropolitan Water Reclamation District Retirement Fund

Table 7: Active Mortality Experience

Age	Exposures	Actual Deaths	Expected Current	Actual Mortality	Expected Mortality**
20-24	40	0	0.0	0.00%	0.03%
25-29	236	0	0.1	0.00%	0.03%
30-34	568	0	0.3	0.00%	0.05%
35-39	898	0	0.6	0.00%	0.07%
40-44	1,090	0	1.0	0.00%	0.08%
45-49	1,294	3	1.6	0.23%	0.10%
50-54	1,492	4	2.6	0.27%	0.14%
55-59	1,595	6	5.2	0.38%	0.22%
60-64	1,115	5	6.8	0.45%	0.32%
65+	662	6	7.6	0.91%	0.45%
Total	**8,991**	**24**	**25.8**	**0.27%**	**0.17%**

*Data from December 31, 2017 through December 31, 2022.
**Proposed assumption: PubG.A-2010 table, Prj to 2023 with MP-2021

Graph 7: Active Mortality Experience
Met Water Reclamation District Retirement Fund



Reciprocal Benefits Load

Overview

The reciprocal benefits load assumption adjusts the results to reflect the eventual reciprocal benefits paid from the fund.

Current Assumption

Currently, the fund assumes a load of 1.50% to active liabilities and normal costs to reflect the reciprocal benefits.

Experience

To assess the reasonability of the current assumption, we analyzed the reciprocal benefits payable for new retirees over the course of the studied period. For each year of the study, we determined the ratio of the sum of the annuity amounts for all new retirees including the reciprocal amounts to the sum of the annuity amounts for all new retirees without the reciprocal amounts. We then determined the average ratio over the 5-year period. The results are as follows:

New Retirees during year:	Ratio of Sum of New Retiree Annuities with Reciprocal amounts/ New Retiree Annuities without Reciprocal amounts
2018	1.0112
2019	1.0022
2020	1.0071
2021	1.0040
2022	1.0167
5-year average	**1.0082**

Recommended Assumption

While the average increase of 0.82% is lower than the current 1.50% assumption, we propose keeping the reciprocal benefits load assumption at 1.50% given the variability of reciprocal amounts over the studied time period. The actual experience for the studied period does not warrant a change to the assumption currently.

Spousal Assumptions

Overview

The valuation reflects actual spousal data for current retirees. Since the spousal benefits are based on the member's spouse at retirement, the valuation reflects assumptions for the percentage of members who are married and the spousal age difference.

Current Assumption

Currently, the fund assumes 76% of members are married. Male spouses are assumed to be 4 years older than female spouses.

Experience

Based on the data for the studied period, about 65% of retirees are married. Male spouses are on average 3 years older than female spouses.

Recommended Assumption

We recommend keeping the assumed percentage of married members at 76%. While the actual percentage is lower, an assumption of 75% to 80% is more in line with the general population. We recommend adjusting the spousal age difference to 3 years. This is also in line with the broader population.

REVIEW OF ECONOMIC ASSUMPTIONS

ASOP No. 27, *Selection of Economic Assumptions for Measuring Pension Obligations,* provides guidance to actuaries in selecting (including giving advice on selecting) economic assumptions – primarily investment return, discount rate, post-retirement benefit increases, inflation, and compensation increases – for measuring obligations under defined benefit pension plans.

Throughout the remainder of this section, we have used the standards set forth in ASOP No. 27 as a guideline for reviewing and if applicable, selecting recommended changes to the following economic actuarial assumptions:

- Investment Return
- Salary Increases
- Inflation/Tier 2 Annual Increase Adjustment
- Payroll Growth Rate

Please keep in mind that ASOP No. 27 (and ASOP No. 35) recognizes a range of reasonable assumptions and states "the actuary should recognize the uncertain nature of the items for which assumptions are selected and, as a result, may consider several different assumptions reasonable for a given measurement. The actuary should also recognize that different actuaries will apply different professional judgment and may choose different reasonable assumptions. As a result, a range of reasonable assumptions may develop both for an individual actuary and across actuarial practice."

Investment Return Assumption

Overview

The investment return assumption is critical in the actuarial valuation since it determines the portion of assets that will come from investment income rather than contributions from the plan sponsor and its participants. The investment return assumption should be determined based on the long-term rate of return (net of investment-related fees) the plan expects to earn over the life of the plan.

The decision to modify the investment return assumption shall be made based upon input from your investment professionals, reflecting any significant changes to the asset allocation, and their judgment of capital market returns. Keep in mind, however, that this assumption should reflect the best estimate of investment returns expected to be realized until no participants remain, which could be 50+ years from now.

Current Assumption

The current assumption is 7.25% net of investment-related expenses.

Experience and Analysis

Historical Returns

ASOP No. 27 provides that in developing a reasonable assumption, the actuary may consider a broad range of data and other inputs, including the judgment of investment professionals. The data that may be considered includes: current yields to maturity of fixed income securities; forecasts of inflation, GDP growth, and total returns for each asset class; historical and current investment data (including real and nominal returns); the inflation and inflation risk components implicit in the yield of inflation-protected securities; dividend yields, earnings yields, real estate capitalization rates; and historical plan performance.

Over the past 5 years, the average net-of-fee return is 3.2%, but the average 10-year return is 6.70%. During those 10 years, the annual net-of-fee return has exceeded the 7.25% assumption 60% of the time.

Expected Return from Investment Consultant

For purposes of reviewing the investment return assumption, a building block approach is often used, whereby the actuary determines the weighted average expected real rate of return for the plan's target investment portfolio and then adjusts for inflation and expenses not reflected in the real rates of return. Foster & Foster is an actuarial firm, and we do not have the required expertise to produce our own capital market assumptions. As a result, we worked with your investment consultant, Marquette Associates, Inc. (Marquette), to determine the Fund's expected return.

The Fund's current investment policy statement is based on recommendations of Marquette. The current target allocations are as follows:

Asset Class	Target Allocation
U.S. Equity	38.0%
Non-U.S. Equity	20.0%
Global Low Volatility	5.0%
Fixed Income	27.0%
Real Estate	10.0%
Cash	0.0%
Total	**100.0%**

Based on this target allocation and Marquette's 30-year capital market assumptions, the average annualized net-of-fee return is 7.24% with an average volatility of 11.91%.

Below, we have calculated various expected returns based on the long-term investment policy. We believe the 40th to 60th percentiles are a reasonable range for the assumption. The 50th percentile is the midpoint, with half of the results expected to exceed and half the results expected to fall short of that level.

Distribution of Geometric Returns

	Marquette
40th Percentile	6.56%
45th Percentile	6.90%
50th Percentile	7.24%
55th Percentile	7.57%
60th Percentile	7.91%

Other Investment Consultants

We referenced Horizon Actuarial Services, LLC, 2022 survey of other consulting firms to assess how Marquette's return expectations compare to other consulting firms. The 2022 survey is based upon the capital market assumptions of 40 investment advisors participating in the survey, one of which is Marquette. Of the participating advisors, 16 provided one set of assumptions for 10 years. The remaining 24 advisors provided assumptions over both shorter-term (10 years) and longer-term (20 years) horizons. The survey refers to the longer term returns as 20-year assumptions and states that the longer-term horizon is more appropriate for mature ongoing pension plans without solvency issues.

We mapped the District's target portfolio allocation to the average 20-year survey assumptions. Using the survey's average expected returns for all asset categories, and the associated standard deviation and covariance matrix, but substituting the District's inflation assumption of 2.80%, the resulting expected long-term nominal return is 6.76%. The returns in the survey are generally considered to be indexed and net of fees, so they are comparable to the assumptions used to determine the expected return of 7.24% described above.

Finally, we should consider the trend in the investment return assumptions of other similarly situated pension plans across the country. Each year, the National Association of State Retirement Administrators (NASRA) releases a survey of the investment return assumptions used by about 130 of the largest public pension systems in the country. NASRA released updated information in July 2023 to their ongoing summary of investment return assumptions used by public employers.

Figure 1 below, taken from NASRA's website, shows that an assumption from 7.0% to 7.5% is most common among respondents. Figure 2 shows how discount rates are trending down over the last 22 years, with a current median of 7.00%.

Figure 1

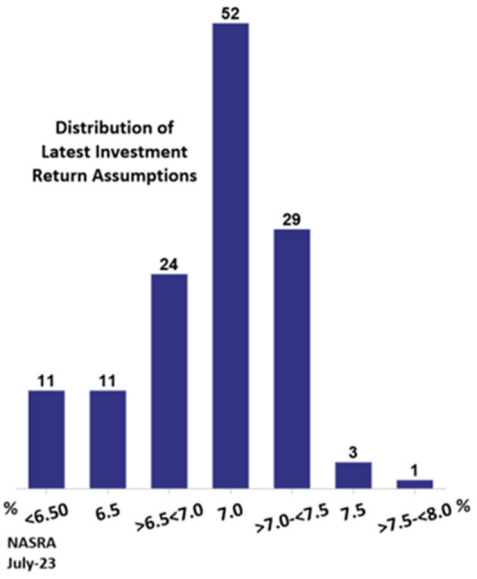
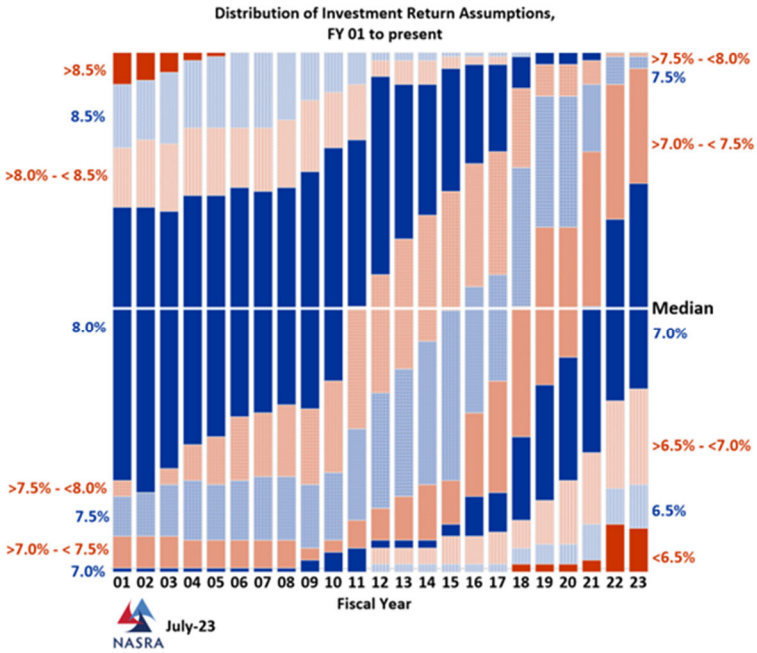


Figure 2



As part of this survey, the following Illinois public pension funds are included. Below is a summary of their recently published interest rate assumptions based on an updated NASRA survey:

- Illinois Municipal Retirement Fund 7.25%
- Illinois State Employees' Retirement System 6.75%
- Teachers' Retirement System of Illinois 7.00%
- State Universities Retirement System 6.50%

The average investment return assumption for all of the funds created by the Illinois Pension Code is 6.89%.

When setting any assumption, it is important to consider the concept of intergenerational equity. If you are too aggressive in your assumption setting, you are giving current taxpayers a break relative to their future counterparts. Similarly, if you are too conservative, you are asking current taxpayers to bear an unreasonable burden of the expense so that future taxpayers pay less. This is why it is so critical to set this assumption based actual expectations, given the data available. You want the burden to be shared equally among current and future taxpayers, and the best way to do this is to set an assumption that is the best expectation of future experience.

Recommended Assumption

We recommend lowering the assumption to 7.00% net of investment-related expenses.

Salary Increases

Overview

The salary increase assumption is used to project a participant's compensation while actively employed, from the valuation date until the assumed retirement age. This allows the actuary to estimate the pension benefit the member will be entitled to at retirement. Generally, a participant's compensation will increase over the long term in accordance with inflation, productivity growth, and merit adjustments.

Current Assumption

Currently, the valuation assumes a service-related salary scale with rates grading from 7.00% to 3.50%.

Experience

On the following pages, we have included a service-based chart that compares the actual experience to the current assumption. The average salary increases over the studied period was 4.28%, which was less than the assumed 4.63% increase. As can be seen in the following table and graph, members received higher salary increases in 5-year service increments as expected. With lower than expected salary increases at all other service amounts.

- Table 8: Average Salary Increases by Service
- Graph 8: Average Salary Increases by Service

Recommended Assumption

Given these results, we propose retaining the current salary increase table structure to reflect bumps in salary at 5-year service increments and overall lowering the assumed increases at other service amounts. On average, the assumed rate of increase is 4.34%.

Metropolitan Water Reclamation District Retirement Fund

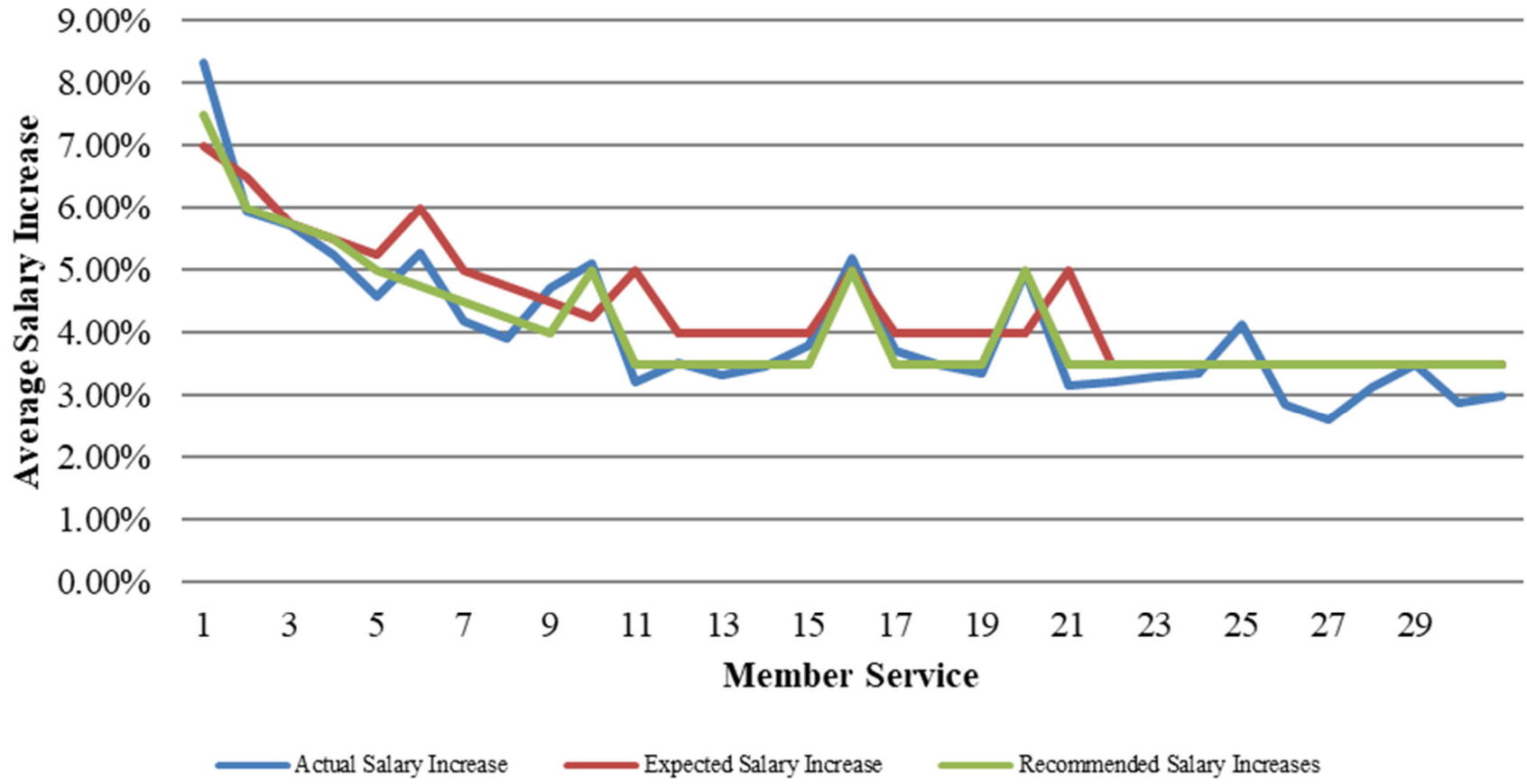
Table 7: Average Salary Increases by Service*

Service	Eligible Members	Prior Year Salary	Actual Salary	Expected Salary	Actual Salary Increase	Expected Salary Increase	Recommended Salary Increase
0	607	46,793,084	50,685,106	50,068,600	8.32%	7.00%	7.50%
1	456	38,766,035	41,062,928	41,285,827	5.93%	6.50%	6.00%
2	472	41,234,622	43,591,719	43,605,613	5.72%	5.75%	5.75%
3	436	39,299,965	41,361,083	41,461,463	5.24%	5.50%	5.50%
4	432	40,389,831	42,240,278	42,510,297	4.58%	5.25%	5.00%
5	342	33,203,725	34,956,411	35,195,948	5.28%	6.00%	4.75%
6	267	26,438,565	27,545,662	27,760,493	4.19%	5.00%	4.50%
7	228	23,274,276	24,185,117	24,379,804	3.91%	4.75%	4.25%
8	206	20,719,099	21,695,828	21,651,458	4.71%	4.50%	4.00%
9	237	23,295,722	24,484,931	24,285,790	5.10%	4.25%	5.00%
10	334	33,777,614	34,860,831	35,466,494	3.21%	5.00%	3.50%
11	363	37,904,025	39,238,923	39,420,186	3.52%	4.00%	3.50%
12	351	37,243,996	38,480,486	38,733,756	3.32%	4.00%	3.50%
13	320	34,577,457	35,776,439	35,960,555	3.47%	4.00%	3.50%
14	264	29,297,817	30,411,789	30,469,729	3.80%	4.00%	3.50%
15	220	24,482,817	25,749,659	25,706,958	5.17%	5.00%	5.00%
16	235	26,473,626	27,460,072	27,532,571	3.73%	4.00%	3.50%
17	241	27,677,822	28,642,752	28,784,934	3.49%	4.00%	3.50%
18	278	31,772,894	32,838,336	33,043,810	3.35%	4.00%	3.50%
19	295	34,186,835	35,885,298	35,554,309	4.97%	4.00%	5.00%
20	307	37,174,209	38,345,434	39,032,919	3.15%	5.00%	3.50%
21	266	33,475,183	34,552,712	34,646,814	3.22%	3.50%	3.50%
22	186	23,863,797	24,650,767	24,699,030	3.30%	3.50%	3.50%
23	148	18,855,647	19,486,901	19,515,595	3.35%	3.50%	3.50%
24	124	14,973,733	15,591,069	15,497,813	4.12%	3.50%	3.50%
25	126	15,980,060	16,437,356	16,539,362	2.86%	3.50%	3.50%
26	176	21,844,508	22,415,648	22,609,066	2.61%	3.50%	3.50%
27	162	20,007,549	20,633,569	20,707,813	3.13%	3.50%	3.50%
28	96	11,004,123	11,388,910	11,389,267	3.50%	3.50%	3.50%
29	115	14,429,389	14,845,415	14,934,418	2.88%	3.50%	3.50%
30+	101	11,926,676	12,282,179	12,344,109	2.98%	3.50%	3.50%
Total	**8,391**	**874,344,700**	**911,783,606**	**914,794,804**	**4.28%**	**4.63%**	**4.34%**

*Data from December 31, 2017 through December 31, 2022.

Graph 7: Average Salary Increases

Met Water Reclamation District Retirement Fund



Inflation/Tier 2 Annual Increase Adjustment

Overview

The annual increase adjustment provisions for the fund vary by benefit Tier. Currently, for Tier 1 members, the annual increase adjustment for the plan is a flat 3.00%, and the valuation does not require an annual increase assumption for this Tier. The 3.00% increases specified in the statute are valued.

However, the pension changes introduced in 2011 provide for the following annual increase for Tier 2 members: An annual increase each January 1 equal to the lesser of 3.00% or one-half of the annual unadjusted percentage increase in the Consumer Price Index-Urban (CPI-U) for the 12 months ending with the September proceeding each November 1. The annual increase is applied to the original pension amount after the first anniversary of the pension start date. Since the annual increase will vary depending on the value of the CPI-U, valuations reflect an annual increase assumption for Tier 2 members.

Current Assumption

Currently, the fund assumes a 2.50% inflation assumption, resulting in a 1.25% annual increase for Tier 2 members.

Historical Inflation

Inflation has been increasing over the past 20 years, particularly over the last five years. The table below shows the average annual historical change in the CPI-U, over various periods.

Average Annual Increase Consumer Price Index - All Urban Consumers Periods Ending December 2022	
Last 5 years	3.8%
Last 10 years	2.6%
Last 20 years	2.5%

Forecasts of Inflation

The Federal Reserve Bank of Philadelphia conducts a quarterly survey of the Society of Professional Forecasters and publishes a mid-term expectation. Their most recent forecast (second quarter of 2023) predicts average inflation over the next ten years (2023-2032) will be 2.36%. The Philadelphia Fed's Livingston Survey summarizes the forecasts of economists from industry, government, banking, and academia. The June 2023 report shows an average 10-year inflation expectation of 2.40%.
The Social Security Administration's 2023 Trustees Report includes the Office of the Chief Actuary's projection of ultimate long-term (75 year) average annual inflation. The intermediate cost assumption is 2.40%. The report provides a low-to-high range of 1.80% to 3.00%.

Forecasts from Investment Consulting Firms

Marquette Associates, the plan's investment consultant currently uses an inflation assumption of 2.80% as of 4th quarter 2022.

Horizon Actuarial Services, LLC, compiles and summarizes expected returns and volatility by asset class for 40 different investment consulting firms. The results of the survey are provided in a report titled Horizon Survey of Capital Market Assumptions: 2022 Edition. Twenty-four of the participating firms provided short-term and long-term assumptions. The report defines the short-term horizon as 10-years and the long-term horizon as 20-years. The average inflation assumption used by these 24 firms for the short-term horizon is 2.51%, while the average inflation assumption used for the long-term horizon is 2.44%.

Recommended Assumption

The historical inflation over the last five years has been in excess of the current 2.50% assumption. However, the 10-year forecasts and longer-term forecasts are cohesive among multiple sources that inflation is projected to come back down. Therefore, we recommend retaining the 2.50% long-term inflation assumption, resulting in a 1.25% Tier 2 annual increase assumption.

Payroll Growth Rate

Overview

The payroll growth rate is the assumption used to predict how the aggregate payroll of a fund will increase on average from one year to the next. It is a necessary assumption when valuing a pension fund because it is used for purposes of amortizing the unfunded actuarial liabilities. Currently, the payroll growth assumption is equal to 3.00% per year.

The payroll growth assumption should reflect factors other than the expected individual salary increases year over year. In addition, it is important to consider the growth (or reduction) in the active population for a Fund. For example, if each active member of a population happens to receive a 5.50% salary increase, but in that same time no members terminate employment and 5 additional members are hired onto the workforce, then the payroll will have grown by greater than 5.50% for that year. Likewise, the aggregate payroll of a fund could decrease from one year to the next if several people retire or terminate over the course of the year. The payroll for any fund is also affected as longer service members who are earning higher salaries begin to retire and are replaced with new entrants with lower pay. The purpose of the payroll growth rate is to determine a long-term expected average of the rate in which payroll will grow, even if the year-over-year experience does not always follow the pattern of the assumption.

Experience

In the course of this analysis, we have determined that the average payroll growth was 1.3% for total payroll over the studied time period and 1.2% for pensionable payroll. The active population decreased by about 5% over the studied time period.

Recommended Assumption

While the realized payroll growth over the studied period was only 1.3%, the District expects the active population to increase over the next several years. Based on the anticipated increase in the active count along with expected salary increases, we recommend lowering the payroll growth assumption from the current 3.00% assumption to either 2.75% or 2.50%.

IMPACT OF RECOMMENDED ASSUMPTIONS

Below is an analysis of the impact of the recommended valuation assumptions on the December 31, 2022 accrued liability, normal cost and actuarially determined contribution. We have included the impact for two mortality rate assumptions: PubG.A-2010 with no mortality improvements and PubG.A-2010 with mortality improvements projected to 2023 with Scale MP-2021 (the latest available table).

Impact on Accrued Liability

Assumption	Accrued Liability	Funded Ratio	$ Change	% Change
Baseline	2,811,600,986	57.8%		
Interest Rate - 7.00%	2,884,302,842	56.3%	72,701,856	2.59%
Salary Scale	2,813,649,047	57.7%	2,048,061	0.07%
Spousal Age	2,808,688,379	57.8%	(2,912,607)	-0.10%
Retirement	2,827,703,036	57.4%	16,102,050	0.57%
Termination	2,806,519,471	57.9%	(5,081,515)	-0.18%
Mortality - PubG.A	2,801,848,232	58.0%	(9,752,754)	-0.35%
Mortality - PubG.A, prj2023	2,839,102,259	57.2%	27,501,273	0.98%
All Changes - 7.25%/PubG.A	2,817,406,459	57.6%	5,805,473	0.21%
All Changes - 7.25%/PubG.A, prj2023	2,854,593,672	56.9%	42,992,686	1.53%
All Changes - 7.00%/PubG.A	2,889,330,823	56.2%	77,729,837	2.76%
All Changes - 7.00%/PubG.A, prj2023	2,928,199,078	55.5%	116,598,092	4.15%

Impact on Actuarially Determined Contribution

Assumption	Employer's Share of Normal Cost	Supp. Cost (Amort. of UAAL)	ADC	ADC as % Payroll	Change in ADC as % Payroll
Baseline	11,686,396	69,441,997	81,128,393	41.45%	
Interest Rate - 7.00%	13,616,810	71,827,634	85,444,444	43.66%	2.21%
Salary Scale	10,754,542	69,561,760	80,316,302	41.04%	-0.41%
Spousal Age	11,558,475	69,271,678	80,830,153	41.30%	-0.15%
Retirement	12,848,523	70,383,589	83,232,112	42.53%	1.08%
Termination	12,545,891	69,144,847	81,690,738	41.74%	0.29%
Mortality - PubG.A	11,183,708	68,871,690	80,055,398	40.90%	-0.55%
Mortality - PubG.A, prj2023	11,497,401	71,050,175	82,547,576	42.18%	0.73%
Payroll Growth Rate - 2.50%	11,686,396	73,177,774	84,864,170	43.36%	1.91%
Payroll Growth Rate - 2.75%	11,686,396	71,295,975	82,982,371	42.40%	0.95%
All Changes - 7.25%/PubG.A	11,060,804	73,535,521	84,596,325	43.22%	1.77%
All Changes - 7.25%/PubG.A, prj2023	11,361,365	75,827,086	87,188,451	44.55%	3.10%
All Changes - 7.00%/PubG.A/2.50%	12,926,199	76,046,425	88,972,624	45.46%	4.01%
All Changes - 7.00%/PubG.A, prj2023/2.50%	13,253,831	78,382,560	91,636,391	46.82%	5.37%
All Changes - 7.00%/PubG.A/2.75%	12,926,199	74,065,257	86,991,456	44.45%	3.00%
All Changes - 7.00%/PubG.A, prj2023/2.75%	13,253,831	76,340,530	89,594,361	45.78%	4.33%

ASSUMPTION SETS

Recommended Assumptions

Interest Rate

7.00%

Mortality Rate

Active Lives:
PubG.-2010 (amount-weighted) Employee mortality, unadjusted, projected to 2023 with MP-2021.

Inactive Lives:
PubG-2010 (amount-weighted) Healthy Retiree mortality, adjusted by a factor of 1.067 for male retirees and 1.061 for female retirees, projected to 2023 with MP-2021.

Beneficiaries:
PubG-2010 (amount-weighted) Survivor mortality, adjusted by a factor of 0.973 for male beneficiaries and adjusted by a factor of 1.075 for female beneficiaries, projected to 2023 with MP-2021.

Disabled Lives:
PubS-2010 Disabled mortality, unadjusted with no mortality improvements.

The mortality assumptions sufficiently accommodate anticipated future mortality improvements.

Salary Increases

Service	Salary Increase Rate
0	7.50%
1	6.00%
2	5.75%
3	5.00%
4	4.50%
5	5.00%
6	4.50%
7	4.00%
8	4.50%
9	5.00%
10-14	3.50%
15	5.00%
16-18	3.50%
19	5.00%
20+	3.50%

Annual Increase - Annuitants

Members Hired On Or After January 1, 2011: 1.25%
Members Hired Before January 1, 2011: 3.00%

Payroll Growth

Either 2.50% or 2.75%.

Load for Reciprocal Benefits

1.5% of active member costs and liabilities.

Percent Married

76%

Spousal Age Difference

Spouse of male member assumed to be 4 years younger than member; Spouse of female member assumed to be 4 years older than member.

Retirement Rates

Age	Retirement Rate
50-56	10%
57-59	11%
60	16%
61	13%
62	17%
63-64	10%
65-67	20%
68-69	25%
70-71	20%
72	33%
73	20%
74	40%
75+	100%

Termination Rates

Service	Male Rate	Female Rate
0	6.00%	8.00%
1	4.00%	7.00%
2	2.50%	6.00%
3	2.25%	4.70%
4	2.00%	3.40%
5	1.90%	3.00%
6	1.80%	2.90%
7	1.75%	2.80%
8	1.65%	2.70%
9	1.60%	2.60%
10	1.55%	2.50%
11	1.45%	2.40%
12	1.35%	2.30%
13	1.25%	2.20%
14	1.10%	2.10%
15	1.05%	2.00%
16-23	1.00%	2.00%
24+	0.50%	2.00%

Current Assumptions

Interest Rate

7.25%.

Mortality Rates

RP-2000 Combined Healthy Mortality Table with Generational Mortality Improvements (Scale AA). Female rates are adjusted by a factor of 1.04 and male rates are unadjusted.

Salary Increases

Service	Salary Increase Rate
0	7.00%
1	6.50%
2	5.75%
3	5.50%
4	5.25%
5	6.00%
6	5.00%
7	4.75%
8	4.50%
9	4.25%
10	5.00%
11-14	4.00%
15	5.00%
16 - 19	4.00%
20	5.00%
21+	3.50%

Annual Increase – Annuitants

Members Hired On Or After January 1, 2011: 1.25%
Members Hired Before January 1, 2011: 3.00%

Payroll Growth

3.00%

Load for Reciprocal Benefits

1.5% of active member costs and liabilities.

Percent Married

76%

Spousal Age Difference

Spouse of male member assumed to be 4 years younger than member; Spouse of female member assumed to be 4 years older than member.

Retirement Rates

Age	Retirement Rate
50 - 59	7%
60	20%
61 - 64	10%
65	15%
66	18%
67	25%
68	15%
69	30%
70	35%
71 - 74	20%
75	100%

Termination Rates

Service	Male Rate	Female Rate
0	5.00%	7.75%
1	3.50%	6.75%
2	3.50%	5.75%
3	2.60%	4.75%
4	2.24%	4.52%
5	2.15%	4.49%
6	1.75%	4.19%
7	1.70%	3.94%
8	1.65%	3.74%
9	1.55%	3.54%
10	1.55%	3.34%
11	1.55%	3.14%
12	1.45%	2.94%
13	1.40%	2.85%
14	1.35%	2.52%
15	1.20%	2.52%
16+	1.00%	2.52%

Disability Rates

Age	Disability Rates
20	0.00%
25	0.00%
30	0.01%
35	0.01%
40	0.03%
45	0.07%
50	0.12%
55	0.23%
60	0.49%
65	0.00%