DIRECT TESTIMONY AND EXHIBITS OF

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ON BEHALF OF

THE SOUTH CAROLINA OFFICE OF REGULATORY STAFF

DOCKET NO. 2019-290-WS

IN RE: APPLICATION OF BLUE GRANITE WATER COMPANY FOR APPROVAL TO ADJUST RATE SCHEDULES AND INCREASE RATES

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I. INTRODUCTION

Q. STATE YOUR NAME AND OCCUPATION.

A. My name is David J. Garrett. I am a consultant specializing in public utility regulation. I am the managing member of Resolve Utility Consulting, PLLC. I focus my practice on the primary capital recovery mechanisms for public utility companies: cost of capital and depreciation.

Q. SUMMARIZE YOUR EDUCATIONAL BACKGROUND AND PROFESSIONAL EXPERIENCE.

A. I received a B.B.A. degree with a major in Finance, an M.B.A. degree, and a Juris Doctor degree from the University of Oklahoma. I worked in private legal practice for several years before accepting a position as assistant general counsel at the Oklahoma Corporation Commission in 2011, where I worked in the Office of General Counsel in regulatory proceedings. In 2012, I began working for the Public Utility Division as a regulatory analyst providing testimony in regulatory proceedings. In 2016 I formed Resolve Utility Consulting, PLLC, where I have represented various consumer groups and state agencies in utility regulatory proceedings, primarily in the areas of cost of capital and depreciation. I am a Certified Depreciation Professional with the Society of Depreciation Professionals. I am also a Certified Rate of Return Analyst with the Society of Utility and Regulatory Financial Analysts. A more complete description of my qualifications and regulatory experience is included in my curriculum vitae.[1]

Q. ON WHOSE BEHALF ARE YOU TESTIFYING IN THIS PROCEEDING?

A. I am testifying on behalf of the South Carolina Office of Regulatory Staff ("ORS").

Q. DESCRIBE THE SCOPE AND ORGANIZATION OF YOUR TESTIMONY.

A. My direct testimony addresses the depreciation studies of the water and wastewater plant assets of Blue Granite Water Company ("BGWC" or the "Company"). The Company's proposed depreciation rates are presented in these depreciation studies, which are sponsored by Company witness John J. Spanos and discussed in his direct testimony.

II. EXECUTIVE SUMMARY

Q. SUMMARIZE THE KEY POINTS OF YOUR TESTIMONY.

A. In the context of utility ratemaking, "depreciation" refers to a cost allocation system designed to measure the rate by which a utility may recover its capital investments in a systematic and rational manner over the average service life of the capital investment. I employed a depreciation system using actuarial plant analysis to statistically analyze the Company's depreciable assets and develop reasonable depreciation rates and annual

[1] Exhibit DJG-1.

accruals. In this case, Mr. Spanos conducted depreciation studies on BGWC's water and wastewater plant assets as of December 31, 2018. As discussed in detail in my testimony, the Company has not met its burden of showing that its proposed service lives and net salvage rates for many of its depreciable accounts do not result in excessive depreciation expense for customers. The following table summarizes the impact of ORS's recommended depreciation rates on the annual depreciation accrual.[2]

Figure 1:

Summary Depreciation Accrual Impact

Plant Function	Plant Balance 12/31/2018	BGWC Proposed Accrual	ORS Proposed Accrual	**ORS Adjustment**
Water Plant	$ 44,265,998	$ 1,798,816	$ 1,436,138	$ (362,678)
Wastewater Plant	51,148,886	1,700,188	1,302,630	(397,558)
Total	$ 95,414,884	$ 3,499,004	$ 2,738,768	**$ (760,236)**

As shown in the table, the depreciation rates I propose would result in an adjustment reducing the Company's proposed depreciation accrual by approximately $760,236, when applied to plant as of December 31, 2018.

Q. SUMMARIZE THE PRIMARY FACTORS DRIVING THE ORS'S ADJUSTMENT TO DEPRECIATION.

A. For several of the accounts proposed in the water and wastewater depreciation studies, BGWC has failed to meet its burden to show that its proposed depreciation rates are not excessive. Specifically, the service lives proposed by Mr. Spanos for several of the plant

[2] *See also* Exhibits DJG-1. The impacts shown in this figure apply to plant as of December 31, 2018.

accounts in the depreciation studies are too short given the evidence supporting such service life proposals. Likewise, the net salvage rates proposed by Mr. Spanos are for several accounts in the depreciation studies, lower than what is otherwise indicated by the evidence provided (if any) to support the proposed net salvage rates. Unreasonably short service lives and unreasonably low net salvage rates both contribute to the unreasonably high depreciation rates proposed by the Company. The table below compares the proposed depreciation paraments for the accounts adjusted in my testimony.[3]

[3] *See also* Exhibit DJG-3

Figure 2:

Depreciation Parameter Comparison

		BGWC Proposed					ORS Proposed				
			Iowa Curve					Iowa Curve			
Account No.	Description	Net Salvage	Type	AL	Depr Rate	Annual Accrual	Net Salvage	Type	AL	Depr Rate	Annual Accrual
	WATER PLANT										
1050	SOURCE OF SUPPLY	-5.0%	R3	50	2.76%	98,006	-5.0%	R2.5	55	2.24%	79,477
1055	WATER TREATMENT	-5.0%	R3	50	2.61%	34,468	-5.0%	R2.5	55	2.12%	28,037
1060	T&D STRUC. & IMPROV.	-5.0%	R3	50	2.19%	671	-5.0%	R2.5	55	1.95%	598
1065	GENERAL	-5.0%	R3	50	2.26%	6,303	-5.0%	R2.5	55	1.97%	5,510
1080	WELLS AND SPRINGS	-5.0%	R1.5	45	3.85%	110,830	-5.0%	R0.5	55	2.30%	66,107
1100	SOURCE OF SUPPLY	-10.0%	R0.5	30	4.53%	51,694	-5.0%	R0.5	30	4.31%	49,146
1105	WATER TREATMENT	-10.0%	R0.5	30	5.00%	101,923	-5.0%	R0.5	30	4.73%	96,524
1110	T&D PUMING EQUIP.	-10.0%	R0.5	30	4.76%	44,287	-5.0%	R0.5	30	4.53%	42,194
1115	WATER TREATMENT EQUIP.	-10.0%	R1.5	30	6.77%	123,921	-5.0%	R0.5	42	2.85%	52,234
1120	DIST. RESERVOIRS	-15.0%	S0.5	35	4.40%	316,417	-10.0%	S0	40	3.17%	227,805
1125	TRANS. AND DIST. MAINS	-10.0%	R2	70	1.85%	218,560	-5.0%	R1	95	1.10%	129,573
1130	SERVICES	-20.0%	L2	26	7.00%	375,698	-10.0%	L2	26	6.40%	343,219
1145	HYDRANTS	-15.0%	R1.5	55	2.47%	9,692	-10.0%	R1.5	55	2.35%	9,217
	WASTEWATER PLANT										
1290	COLLECTION	-5.0%	R1.5	50	3.68%	3,173	-5.0%	L1	55	2.57%	2,217
1295	PUMPING	-5.0%	R1.5	50	2.85%	53,797	-5.0%	L1	55	2.30%	43,469
1300	TREATMENT	-5.0%	R1.5	50	2.34%	114,767	-5.0%	L1	55	2.03%	99,279
1305	RECLAIM WTP	-5.0%	R1.5	50	2.24%	281	-5.0%	L1	55	1.98%	248
1310	RECLAIM WTR	-5.0%	R1.5	50	3.41%	904	-5.0%	L1	55	2.32%	616
1315	GENERAL	-5.0%	R1.5	50	2.15%	41,475	-5.0%	L1	55	1.94%	37,521
1345	FORCE MAINS	-10.0%	S0	65	1.98%	76,151	-5.0%	S0	65	1.88%	72,107
1350	GRAVITY MAINS	-10.0%	S1.5	70	1.78%	204,766	-5.0%	R1	95	1.04%	119,518
1353	MANHOLES	-10.0%	R3	65	3.37%	48,235	-5.0%	R3	65	3.21%	45,911
1360	SERVICES TO CUSTOMERS	-20.0%	S0	45	3.86%	136,283	-10.0%	L0	53	2.36%	83,507
1380	PUMPING	-10.0%	L0.5	30	4.77%	313,049	-5.0%	L0.5	30	4.54%	298,128
1385	RECLAIM WTP	-10.0%	L0.5	30	5.79%	12,881	-5.0%	L0.5	30	5.53%	12,294
1390	RECLAIM WTR	-10.0%	L0.5	30	5.49%	6,884	-5.0%	L0.5	30	5.24%	6,574
1395	LAGOON	-10.0%	R0.5	35	3.63%	76,300	-5.0%	O1	40	2.81%	58,986
1400	TREATMENT	-10.0%	R0.5	35	4.73%	547,943	-5.0%	O1	40	3.10%	358,978
1405	RECLAIM WTP	-10.0%	R0.5	35	3.31%	51	-5.0%	O1	40	2.59%	40

As shown in the table, ORS is proposing a combination of longer service lives and/or higher net salvage rates on several of the Company's water and wastewater accounts. BGWC is proposing a substantial rate increase in this case, and a significant portion of this proposed increase is driven by the Company's proposed increase to its depreciation rates. As discussed above and later in my testimony, BGWC has failed to provide sufficient evidence to meet its burden to show that its proposed depreciation rates are not excessive. Likewise, the Company has failed to provide sufficient evidence in support of its negative net salvage rate proposals. For these reasons, the Commission should approve the reasonable adjustments to BGWC's depreciation rates proposed in my direct testimony and exhibits, which would have the effect of partially mitigating the substantial impact on customer rates imposed by the Company's rate increase proposal. Based on the empirical evidence provided by the Company in this case, the depreciation rates proposed in my testimony are more accurate than those proposed in the Company's depreciation study. As the Company accumulates more accurate data over time, depreciation rates should be updated periodically based on that data.

Q. DESCRIBE WHY IT IS IMPORTANT NOT TO OVERESTIMATE DEPRECIATION RATES.

A. Under the rate-base rate of return model, the utility is allowed to recover the original cost of its prudent investments required to provide service. Depreciation systems are designed to allocate those costs in a systematic and rational manner – specifically, over the service lives of the utility's assets. If depreciation rates are overestimated (i.e., service lives are underestimated), it may unintentionally incent economic inefficiency. When an asset is fully depreciated and no longer in rate base, but still used by a utility, a utility may be incented to retire and replace the asset to increase rate base, even though the retired asset may not have reached the end of its economic useful life. If, on the other hand, an asset must be retired before it is fully depreciated, there are regulatory mechanisms that can ensure the utility fully recovers its prudent investment in the retired asset. Thus, in my opinion, it is preferable for the Commission to ensure that assets are not depreciated before the end of their economic useful lives.

III. STANDARDS

Q. DISCUSS THE STANDARD BY WHICH REGULATED UTILITIES ARE ALLOWED TO RECOVER DEPRECIATION EXPENSE.

A. In *Lindheimer v. Illinois Bell Telephone Co.*, the U.S. Supreme Court stated that "depreciation is the loss, not restored by current maintenance, which is due to all the factors causing the ultimate retirement of the property. These factors embrace wear and tear, decay, inadequacy, and obsolescence."[4] The *Lindheimer* Court also recognized that the original cost of plant assets, rather than present value or some other measure, is the proper basis for calculating depreciation expense. Moreover, the *Lindheimer* Court found:

> [T]he company has the burden of making a convincing showing that the amounts it has charged to operating expenses for depreciation have not been excessive. That burden is not sustained by proof that its general accounting system has been correct. The calculations are mathematical, but the predictions underlying them are essentially matters of opinion.[5]

Thus, the Commission must ultimately determine if BGWC has met its burden of proof by making a convincing showing that its proposed depreciation rates are not excessive.

Q. SHOULD DEPRECIATION REPRESENT AN ALLOCATED COST OF CAPITAL TO OPERATION, RATHER THAN A MECHANISM TO DETERMINE LOSS OF VALUE?

A. Yes. While the *Lindheimer* case and other early literature recognized depreciation as a

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[4] *Lindheimer v. Illinois Bell Tel. Co.*, 292 U.S. 151, 167 (1934).

[5] *Id*. at 169.

necessary expense, the language indicated that depreciation was primarily a mechanism to determine loss of value.[6] Adoption of this "value concept" requires annual appraisals of extensive utility plant and is thus not practical in this context. Rather, the "cost allocation concept" recognizes that depreciation is a cost of providing service, and that in addition to receiving a "return on" invested capital through the allowed rate of return, a utility should also receive a "return of" its invested capital in the form of recovered depreciation expense. The cost allocation concept also satisfies several fundamental accounting principles, including verifiability, neutrality, and the matching principle.[7] The definition of "depreciation accounting" published by the American Institute of Certified Public Accountants ("AICPA") properly reflects the cost allocation concept:

> Depreciation accounting is a system of accounting that aims to distribute cost or other basic value of tangible capital assets, less salvage (if any), over the estimated useful life of the unit (which may be a group of assets) in a systematic and rational manner. It is a process of allocation, not of valuation.[8]

Thus, the concept of depreciation as "the allocation of cost has proven to be the most useful and most widely used concept."[9]

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[6] *See* Frank K. Wolf & W. Chester Fitch, *Depreciation Systems* 71 (Iowa State University Press 1994).

[7] National Association of Regulatory Utility Commissioners, *Public Utility Depreciation Practices* 12 (NARUC 1996).

[8] American Institute of Accountants, *Accounting Terminology Bulletins Number 1: Review and Résumé* 25 (American Institute of Accountants 1953).

[9] Wolf *supra* n. 6, at 73.

IV. ANALYTIC METHODS

Q. DISCUSS YOUR APPROACH TO ANALYZING THE COMPANY'S DEPRECIABLE ASSETS IN THIS CASE.

A. I obtained and reviewed the same historical property data that was used to conduct BGWC's depreciation study, including plant retirement and net salvage data. I analyzed the data and calculated my proposed rates under a depreciation system designed to conform to the legal and technical standards discussed above. I then applied my proposed service life and net salvage parameters to a depreciation system in order to calculate BGWC's adjusted depreciation rates. My adjustments to service life and net salvage are discussed further in the sections below.

Q. DISCUSS THE DEFINITION AND GENERAL PURPOSE OF A DEPRECIATION SYSTEM, AS WELL AS THE SPECIFIC DEPRECIATION SYSTEM YOU EMPLOYED FOR THIS PROJECT.

A. The legal standards set forth above do not mandate a specific procedure for conducting depreciation analysis. These standards, however, direct that analysts use a system for estimating depreciation rates that will result in the "systematic and rational" allocation of capital recovery for the utility. Over the years, analysts have developed "depreciation systems" designed to analyze grouped property in accordance with this standard. A depreciation system may be defined by several primary parameters: 1) a method of allocation; 2) a procedure for applying the method of allocation; 3) a technique of applying the depreciation rate; and 4) a model for analyzing the characteristics of vintage property groups.[10] In this case, I used the straight-line method, the average life procedure, the remaining life technique, and the broad group model; this system would be denoted as an "SL-AL-RL-BG" system. This depreciation system conforms to the legal standards set forth above and is commonly used by depreciation analysts in regulatory proceedings. I provide a more detailed discussion of depreciation system parameters, theories, and equations in Appendix A.

V. SERVICE LIFE ANALYSIS

Q. DESCRIBE THE METHODOLOGY USED TO ESTIMATE THE SERVICE LIVES OF GROUPED DEPRECIABLE ASSETS.

A. The process used to study the industrial property retirement is rooted in the actuarial process used to study human mortality. Just as actuarial analysts study historical human mortality data to predict how long a group of people will live, depreciation analysts study historical plant data to estimate the average lives of property groups. The most common actuarial method used by depreciation analysts is called the "retirement rate method." In the retirement rate method, original property data, including additions, retirements, transfers, and other transactions, are organized by vintage and transaction year.[11] The retirement rate method is ultimately used to develop an "observed life table," ("OLT") which shows the percentage of property surviving at each age interval. This pattern of property retirement is described as a "survivor curve." The survivor curve derived from

[10] *See* Wolf *supra* n. 6, at 70, 140.

[11] The "vintage" year refers to the year that a group of property was placed in service (aka "placement" year). The "transaction" year refers to the accounting year in which a property transaction occurred, such as an addition, retirement, or transfer (aka "experience" year).

the observed life table, however, must be fitted and smoothed with a complete curve in order to determine the ultimate average life of the group.[12] The most widely used survivor curves for this curve fitting process were developed at Iowa State University in the early 1900s and are commonly known as the "Iowa curves."[13] A more detailed explanation of how the Iowa curves are used in the actuarial analysis of depreciable property is set forth in Appendix C.

Q. DESCRIBE HOW YOU STATISTICALLY ANALYZED BGWC'S HISTORICAL RETIREMENT DATA IN ORDER TO DETERMINE THE MOST REASONABLE IOWA CURVE TO APPLY TO EACH ACCOUNT.

A. I used the aged property data provided by the Company to create an observed life table ("OLT") for each account. The data points on the OLT can be plotted to form a curve (the "OLT curve"). The OLT curve is not a theoretical curve, rather, it is actual observed data from the Company's records that indicate the rate of retirement for each property group. An OLT curve by itself, however, is rarely a smooth curve, and is often not a "complete" curve (i.e., it does not end at zero percent surviving). In order to calculate average life (the area under a curve), a complete survivor curve is required. The Iowa curves are empirically derived curves based on the extensive studies of the actual mortality patterns of many different types of industrial property. The curve-fitting process involves selecting the best Iowa curve to fit the OLT curve. This can be accomplished through a combination of visual and mathematical curve-fitting techniques, as well as professional judgment. The first step

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[12] *See* Appendix C for a more detailed discussion of the actuarial analysis used to determine the average lives of grouped industrial property.

[13] *See* Appendix B for a more detailed discussion of the Iowa curves.

of my approach to curve-fitting involves visually inspecting the OLT curve for any irregularities. For example, if the "tail" end of the curve is erratic and shows a sharp decline over a short period of time, it may indicate that this portion of the data is less reliable, as further discussed below. After inspecting the OLT curve, I use a mathematical curve-fitting technique which essentially involves measuring the distance between the OLT curve and the selected Iowa curve to get an objective, mathematical assessment of how well the curve fits. After selecting an Iowa curve, I observe the OLT curve along with the Iowa curve on the same graph to determine how well the curve fits. As part of my analysis, I may repeat this process several times for any given account to ensure that the most reasonable Iowa curve is selected.

Q. DO YOU ALWAYS SELECT THE MATHEMATICALLY BEST-FITTING CURVE?

A. Not necessarily. Mathematical fitting is an important part of the curve-fitting process because it promotes objective, unbiased results. While mathematical curve-fitting is important, however, it may not always yield the optimum result. For example, if there is insufficient historical data in a particular account and the OLT curve derived from that data is relatively short and flat, the mathematically "best" curve may be one with a very long average life. However, when there is sufficient data available, mathematical curve fitting can be used as part of an objective service life analysis.

Q. SHOULD EVERY PORTION OF THE OLT CURVE BE GIVEN EQUAL WEIGHT?

A. Not necessarily. Many analysts have observed that the points comprising the "tail end" of the OLT curve may often have less analytical value than other portions of the curve. In fact, "[p]oints at the end of the curve are often based on fewer exposures and may be given less weight than points based on larger samples. The weight placed on those points will depend on the size of the exposures."[14] In accordance with this standard, an analyst may decide to truncate the tail end of the OLT curve at a certain percent of initial exposures, such as one percent. Using this approach puts greater emphasis on the most valuable portions of the curve. For my analysis in this case, I not only considered the entirety of the OLT curve, but also conducted further analyses that involved fitting Iowa curves to the most significant part of the OLT curve for certain accounts. In other words, to verify the accuracy of my curve selection, I narrowed the focus of my additional calculation to consider approximately the top 99% of the "exposures" (i.e., dollars exposed to retirement) and to eliminate the tail end of the curve representing the bottom 1% of exposures for some accounts, if necessary. I will illustrate an example of this approach in the discussion below.

Q. GENERALLY, DESCRIBE THE DIFFERENCES BETWEEN THE COMPANY'S SERVICE LIFE PROPOSALS AND YOUR SERVICE LIFE PROPOSALS.

A. For each of the accounts to which I propose adjustments, the Company's proposed average service life, as estimated through an Iowa curve, is too short to provide the most reasonable mortality characteristics of the account. Generally, for the accounts in which I propose a longer service life, that proposal is based on the objective approach of choosing an Iowa curve that provides a better mathematical fit to the observed historical retirement pattern derived from the Company's plant data.

[14] Wolf *supra* n. 6, at 46.

Q. DO YOU ALSO USE PROFESSIONAL JUDGMENT IN SELECTING THE BEST IOWA CURVE AS PART OF YOUR SERVICE LIFE ANALYSIS?

A. Yes. The amount of judgment I use relative to the empirical data depends primarily on the sufficiency and quality of the statistical data provided by the Company. That is, to the extent the historical data provided by the Company is sufficient to develop adequate OLT curves upon which conventional Iowa curve fitting techniques may be employed, it is preferable to focus primarily on the empirical analysis and evidence inherent in the curve fitting process rather than on subjective elements such as judgment. Another factor that should be taken into account when determining how much judgment should be used in the process of curve fitting are the legal and ratemaking standards discussed above. It is important to keep in mind that the Company bears the burden to make a convincing showing that its proposed rates are not excessive. Thus, if the Company fails to provide adequate historical data for a particular account such that it is not ideal for empirical Iowa curve fitting, it does not mean that the Company's position should be accepted merely based on the subjective elements of "judgment" used by its witnesses to justify its proposed depreciation rate for that account. Judgment is a process; it does not take the place of evidence.

Q. IN SUPPORT OF ITS SERVICE LIFE ESTIMATES, DID BGWC PRESENT SUBSTANTIAL EVIDENCE IN ADDITION TO THE HISTORICAL PLANT DATA FOR EACH ACCOUNT?

A. No. It appears that BGWC is relying primarily on its historical retirement data in order to make predictions about the remaining average life for the assets in each account. Therefore, I think the Commission should focus primarily on this historical data and objective Iowa curve fitting when assessing fair and reasonable depreciation rates for BGWC. The service lives I propose in this case are based on Iowa curves that provide better mathematical fits to BGWC's historical retirement data, and they result in more reasonable service life estimates and depreciation rates for the accounts to which I propose adjustments.[15]

A. Water Plant Accounts

1. Accounts 1050–1065 – Structures and Improvements

Q. DESCRIBE YOUR SERVICE LIFE ESTIMATE FOR THESE ACCOUNTS AND COMPARE IT WITH THE COMPANY'S ESTIMATE.

A. The OLT curve derived from the Company's data for this account is presented in the graph below. The graph also shows the Iowa curves Mr. Spanos and I selected to represent the average remaining life of the assets in this account. For these accounts, Mr. Spanos selected the R3-50 Iowa curve, and I selected the R2.5-55 Iowa curve. Both of these curves are shown in the graph below along with the OLT curve.[16]

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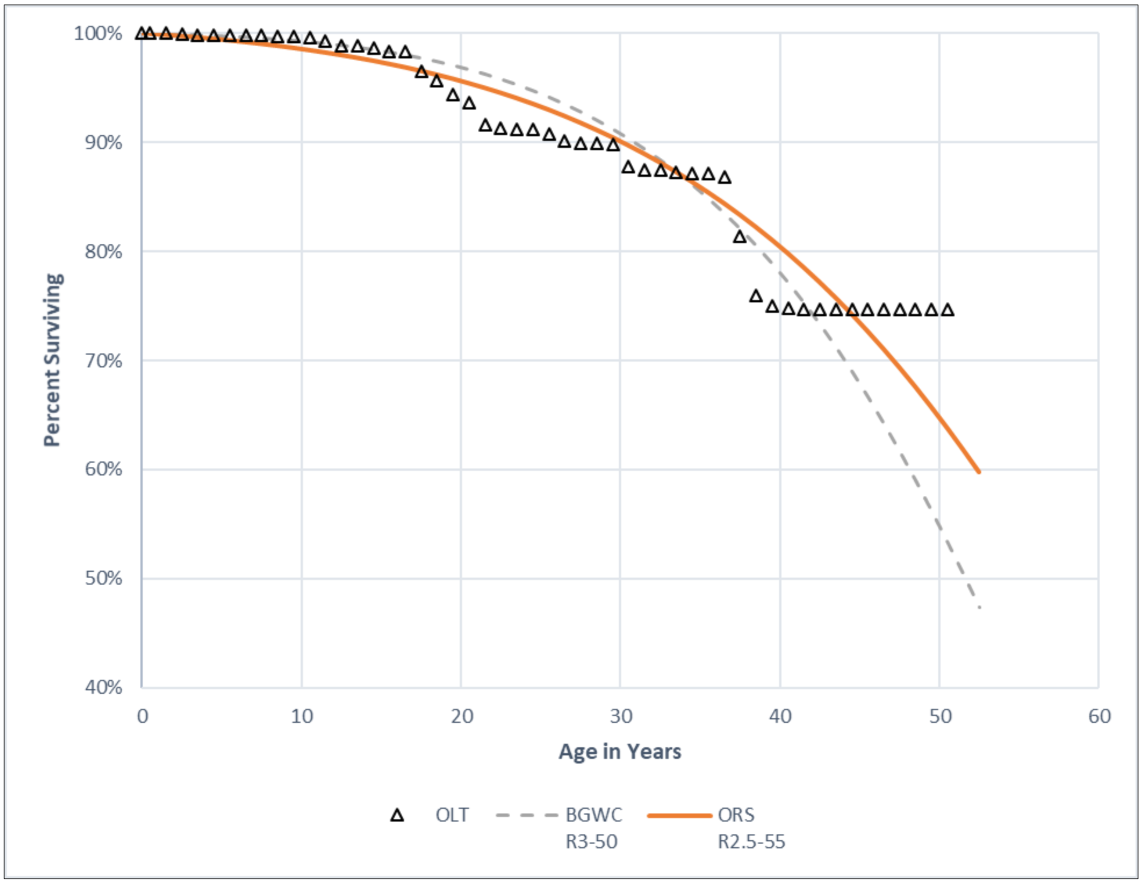
[15] *See generally* the Iowa curve fitting charts in Exhibit DJG-16.

[16] *See also* Exhibit DJG-8. Mass property service life accounts are typically analyzed individually in depreciation studies. In the water plant depreciation study conducted by Mr. Spanos for BGWC, however, the data provided for several mass property accounts were consolidated, such as it was for the Company's structures and improvements accounts (1050 – 1065). This means that the life characteristics are assumed to be the same for each of these accounts, and the same Iowa curve is used to calculate the remaining life for each account.

Figure 3:

Accounts 1050–1065 – Structures and Improvements



As shown in the graph, both Iowa curves appear to provide relatively close fits to the majority of the OLT curve. We can use mathematical calculations to determine which Iowa curve provides the closet fit to the observed data (i.e., the OLT curve)

Q. DOES YOUR SELECTED IOWA CURVE PROVIDE A BETTER MATHEMATICAL FIT TO THE RELEVANT PORTION OF THE OLT CURVE?

A. Yes. While visual curve-fitting techniques can help an analyst identify the most statistically relevant portions of the OLT curve for this account, mathematical curve-fitting techniques can help us determine which of the two Iowa curves provides the better fit (especially in cases where it is not obvious from a visual standpoint which curve provides the better fit). Mathematical curve-fitting essentially involves measuring the "distance" between the OLT curve and the selected Iowa curve. The best fitting curve from a mathematical standpoint is the one that minimizes the distance between the OLT curve and the Iowa curve, thus providing the closest fit. The distance between the curves is calculated using the "sum-of-squared differences" ("SSD") technique. In this account, the total SSD, or distance between the Company's curve and the OLT curve is 0.1646, while the total SSD between the R2.5-55 curve and the OLT curve is only 0.0505.[17] Thus, the R2.5-55 curve I selected provides a better mathematical fit to the historical data, and it also results in a more reasonable service life estimate and depreciation rate for this account.

2. <u>Account 1080 – Wells and Springs</u>

Q. DESCRIBE YOUR SERVICE LIFE ESTIMATE FOR THIS ACCOUNT AND COMPARE IT WITH THE COMPANY'S ESTIMATE.

A. Mr. Spanos selected the R1-45 curve for this account, and I selected the R0.5-55 curve. These two Iowa curves are illustrated in the graph below along with the OLT curve.[18]

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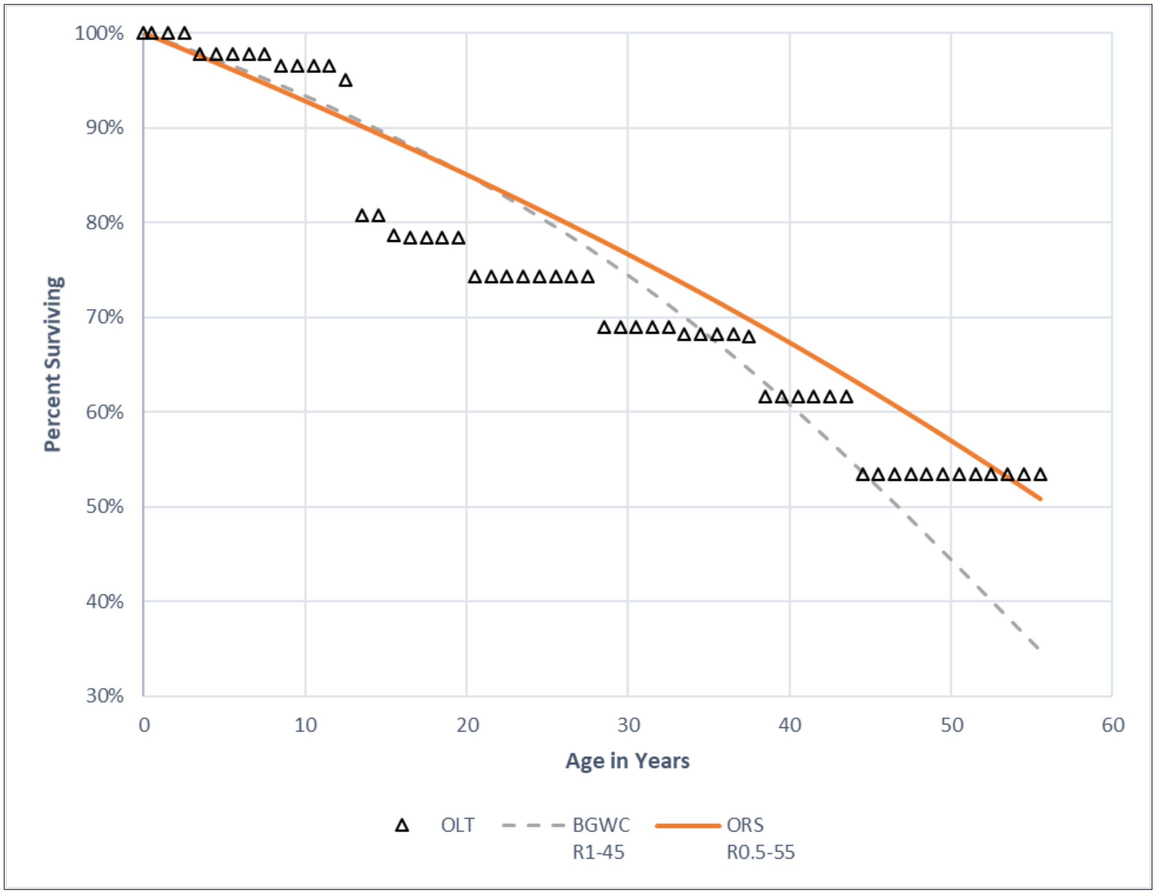
[17] Exhibit DJG-8.

[18] *See also* Exhibit DJG-9.

Figure 4:

Account 1080 – Wells and Springs



As shown in the graph, the two Iowa curves are relatively similar up to about 20; at that point, the R1-45 curve selected by Mr. Spanos declines more sharply relative to the R0.5-55 curve, and does not provide a good fit to significant portions of the OLT curve in later portions of the OLT curve.

Q. DOES YOUR SELECTED IOWA CURVE PROVIDE A BETTER MATHEMATICAL FIT TO THE RELEVANT PORTION OF THE OLT CURVE?

A. Yes. Specifically, the SSD for the curve selected by Mr. Spanos is 0.2354, and the SSD for the R0.5-55 curve I selected is only 0.1909, which makes it the better mathematical fit.[19]

3. <u>Account 1115 – Water Treatment Equipment</u>

Q. DESCRIBE YOUR SERVICE LIFE ESTIMATE FOR THIS ACCOUNT AND COMPARE IT WITH THE COMPANY'S ESTIMATE.

A. For this account, Mr. Spanos selected the R1.5-30 curve, and I selected the R0.5-42 curve. Both of these curves are shown in the graph below along with the OLT curve.[20]

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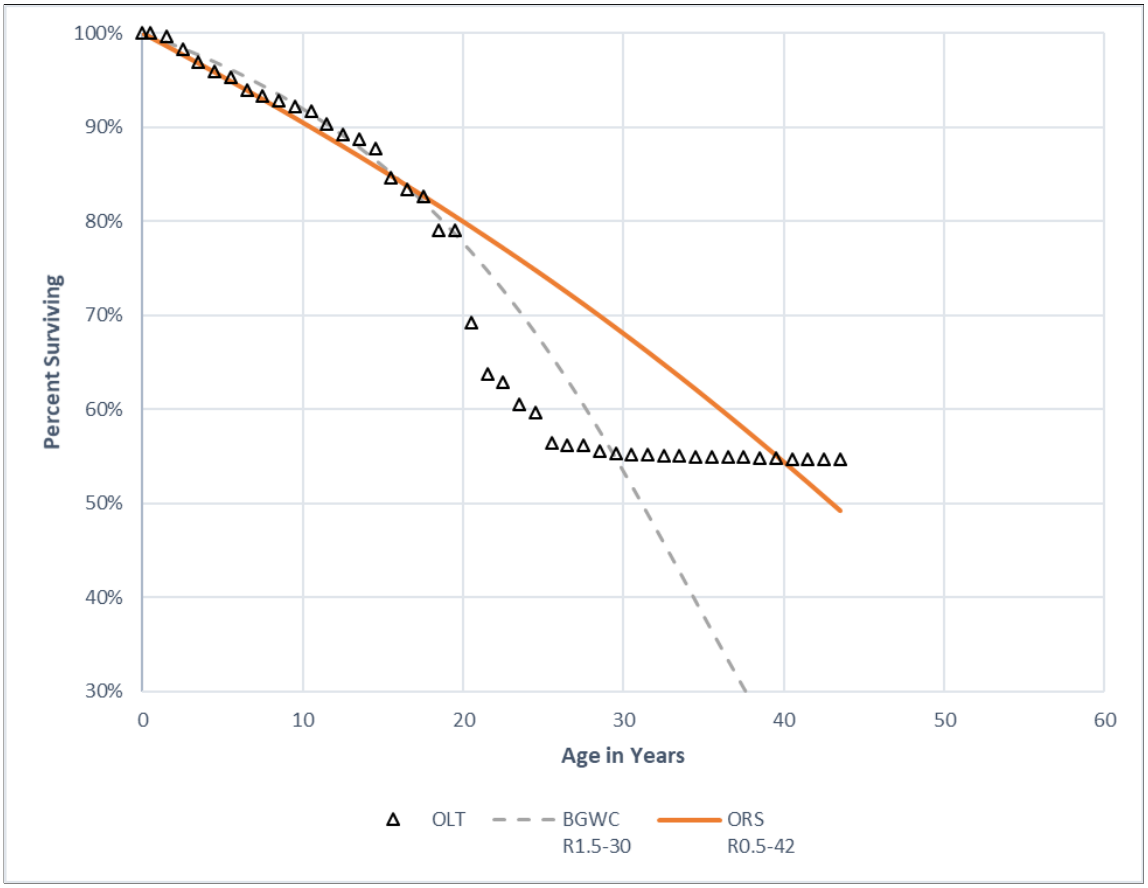
[19] Exhibit DJG-9.

[20] Exhibit DJG-10.

Figure 5:

Account 1115 – Water Treatment Equipment



As shown in the graph, both Iowa curves appear to provide reasonable fits to the OLT curve up to age 20. From that point, however, the R1.5-30 curve selected by Mr. Spanos appears to ignore statistically relevant data points past the age of 30. As a result, the Iowa curve selected by Mr. Spanos appears to be too short to provide an accurate description of the remaining life for this account.

Q. DOES YOUR SELECTED IOWA CURVE PROVIDE A BETTER MATHEMATICAL FIT TO THE OLT CURVE FOR THIS ACCOUNT?

A. Yes. The total SSD for the curve selected by Mr. Spanos is 0.7976, and the SSD for the

R0.5-42 curve I selected is only 0.2756, which makes it the better mathematical fit.[21]

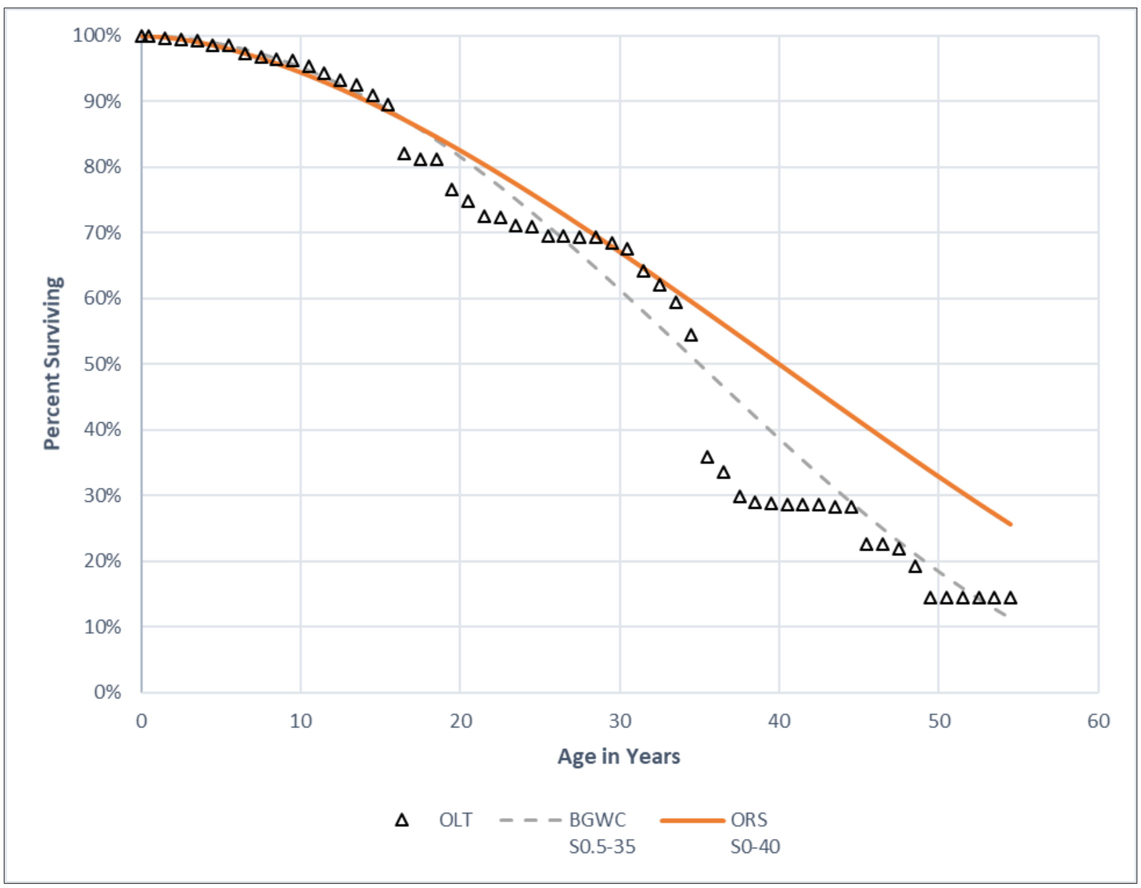
4. Account 1120 – Distribution Reservoirs and Standpipes

Q. DESCRIBE YOUR SERVICE LIFE ESTIMATE FOR THIS ACCOUNT AND COMPARE IT WITH BGWC'S ESTIMATE.

A. Mr. Spanos selected the S0.5-35 curve for this account, and I selected the S0-40 curve. Both Iowa curves are illustrated in the graph below along with the OLT curve.[22]

Figure 6:

Account 1120 – Distribution Reservoirs and Standpipes



[21] Exhibit DJG-10.

[22] Exhibit DJG-11.

As shown in the graph, the Iowa curve selected by Mr. Spanos initially appears to provide a relatively good fit to the OLT curve, particularly to the tail-end portions of the OLT curve, relative to the S0-40 Iowa curve. However, as discussed above, not all portions of every OLT curve should be given an equal amount of statistical weighting. This is where examining the dollars exposed to retirement and other figures from the observed life table can provide important insight.

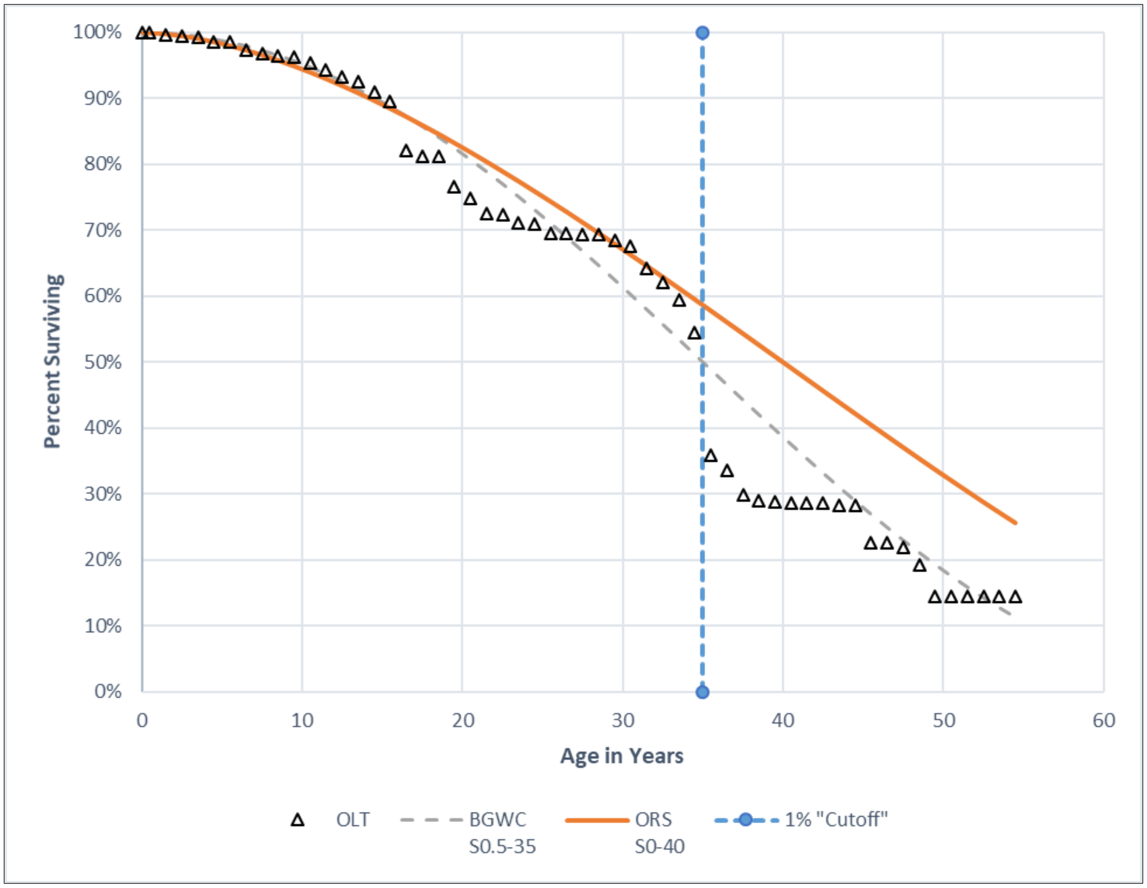
Q. SHOULD EVERY PORTION OF THE OLT CURVE FOR ACCOUNT 1120 BE GIVEN AN EQUAL AMOUNT OF STATISTICAL WEIGHTING?

A. No. An examination of the observed life table for Account 1120 shows that some data points for percent surviving (the y-axis in the graph above) are associated with dollars exposed to retirement that are relatively insignificant when compared with the initial dollars exposed to retirement in this account.[23] As a general rule, some depreciation analysts, including me, consider truncating the OLT curve at a point where the dollars exposed to retirement are less than 1% of the initial exposures. The removed, truncated portion of the OLT curve is the statistically insignificant "tail end" discussed above. For the OLT curve in Account 1120 however, a visual inspection of the curve shows a sharp drop off in the percent surviving at age 35. An inspection of the observed life table shows that the percent surviving drops from 54.52% to 35.8% in just one age interval. In my judgment, the tail end of the OLT curve for this account should be truncated at that point for statistical analysis. The graph below shows this truncation point of the OLT curve.

[23] See Exhibit DJG-11. The initial dollars exposed to retirement in this account (i.e., at age 0) is $5.8 million.

Figure 7:

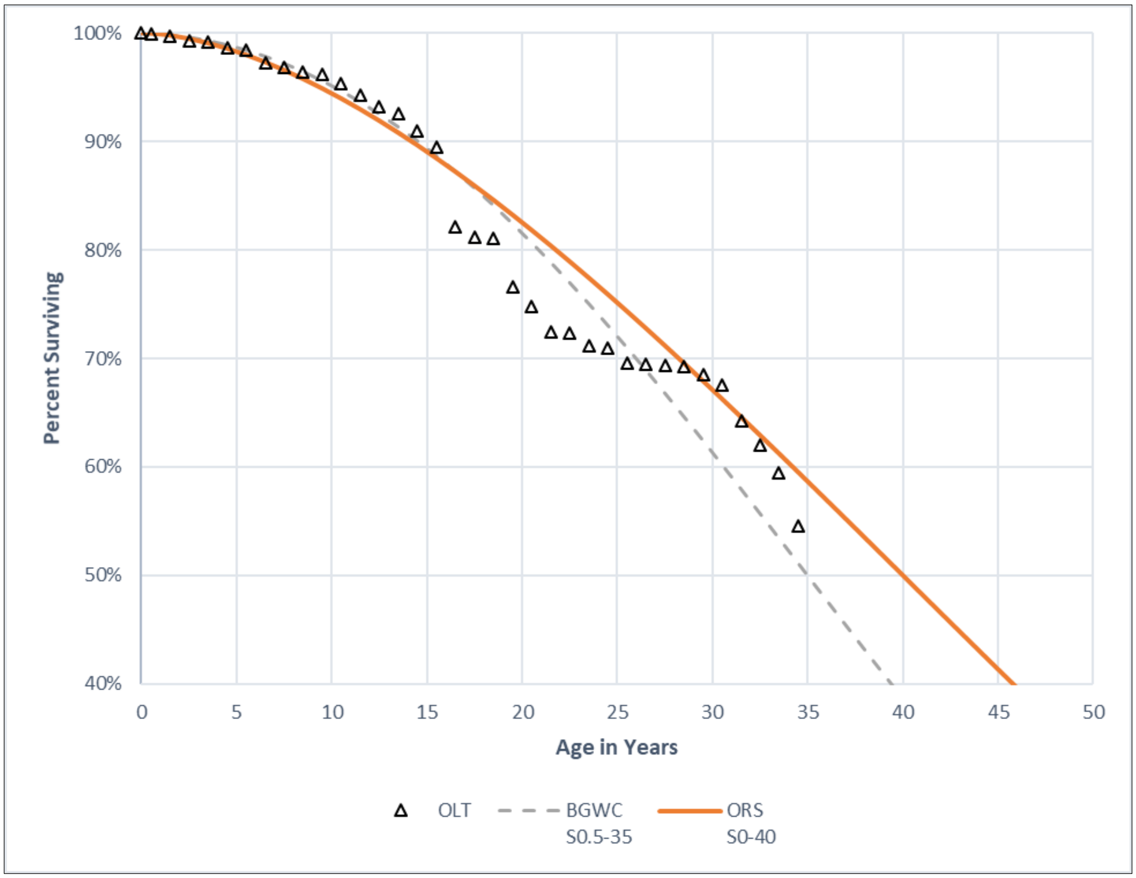
Account 1120 – Truncated OLT Curve



Using the graph above for illustration, all data points occurring to the right of the vertical dotted line should not be considered in the SSD calculation, as they are less statistically relevant. The following graph shows the revised, truncated OLT curve, along with the two selected Iowa curves for this account.

Figure 8:

Account 1120 – Truncated OLT Curve



Once the less relevant portion of the OLT curve is truncated, we can see that the S0-40 curve likely provides the better fit from a visual perspective. However, we can test the results mathematically on the truncated OLT curve.

Q. DOES YOUR SELECTED IOWA CURVE PROVIDE A BETTER MATHEMATICAL FIT TO THE RELEVANT PORTION OF THE OLT CURVE?

A. Yes. Specifically, the SSD for the curve selected by Mr. Spanos is 0.0460, and the SSD for the S0-40 curve I selected is 0.0407.[24]

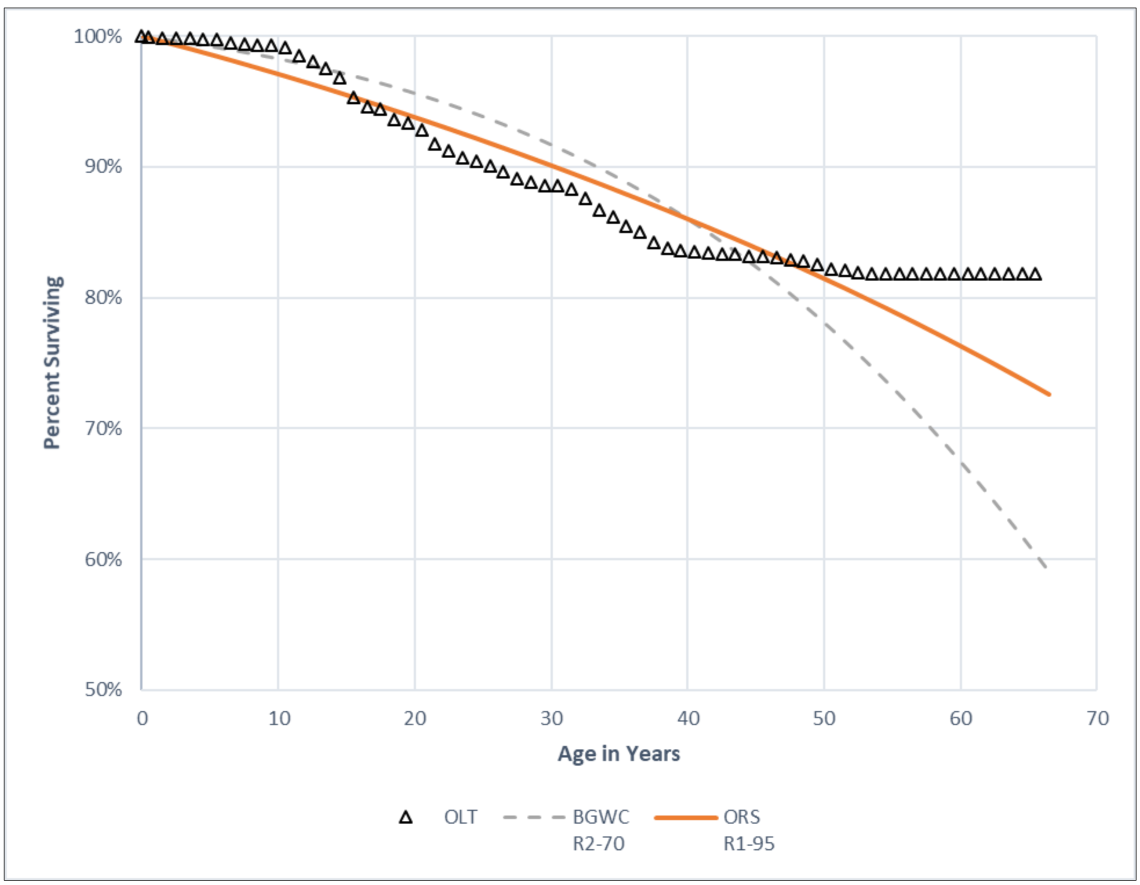
5. **Account 1125 – Transmission and Distribution Mains**

Q. DESCRIBE YOUR SERVICE LIFE ESTIMATE FOR THIS ACCOUNT AND COMPARE IT WITH THE COMPANY'S ESTIMATE.

A. For this account, Mr. Spanos selected the R2-70 curve, and I selected the R1-95 curve. Both of these curves are shown in the graph below along with the OLT curve.[25]

Figure 9:

Account 1125 – Transmission and Distribution Mains



[24] Exhibit DJG-11.

[25] Exhibit DJG-12.

As shown in the graph, the R2-70 curve appears to ignore statistically relevant data points toward the later portions of the OLT curve. Thus, the R2-70 appears to be too short to provide an accurate description of the remaining life for this account. Unreasonably short service life estimates result in unreasonably high depreciation rates.

Q. HAS MR. SPANOS RECOMMENDED AVERAGE LIVES UP TO 125 YEARS FOR TRANSMISSION AND DISTRIBUTION WATER MAINS?

A. Yes. In a depreciation study for Citizens Energy Group in Indiana (dated two years before the BGWC study), Mr. Spanos recommended an R3-125 Iowa curve for transmission and distribution mains.[26] In light of Mr. Spanos's recommendation that case, and the statistical data presented in this case for BGWC, an average service life proposal of only 95 years is reasonable.

Q. DOES YOUR SELECTED IOWA CURVE PROVIDE A BETTER MATHEMATICAL FIT TO THE OLT CURVE FOR THIS ACCOUNT?

A. Yes. The total SSD for the curve selected by Mr. Spanos is 0.3183, and the SSD for the R1-95 curve I selected is only 0.0548, which makes it the better mathematical fit.[27]

B. Wastewater Plant Accounts

1. Accounts 1290-1315 – Structures and Improvements

Q. DESCRIBE YOUR SERVICE LIFE ESTIMATE FOR THESE ACCOUNTS AND COMPARE IT WITH THE COMPANY'S ESTIMATE.

A. Mr. Spanos selected the R1.5-50 curve for these accounts, and I selected the L1-55 curve.

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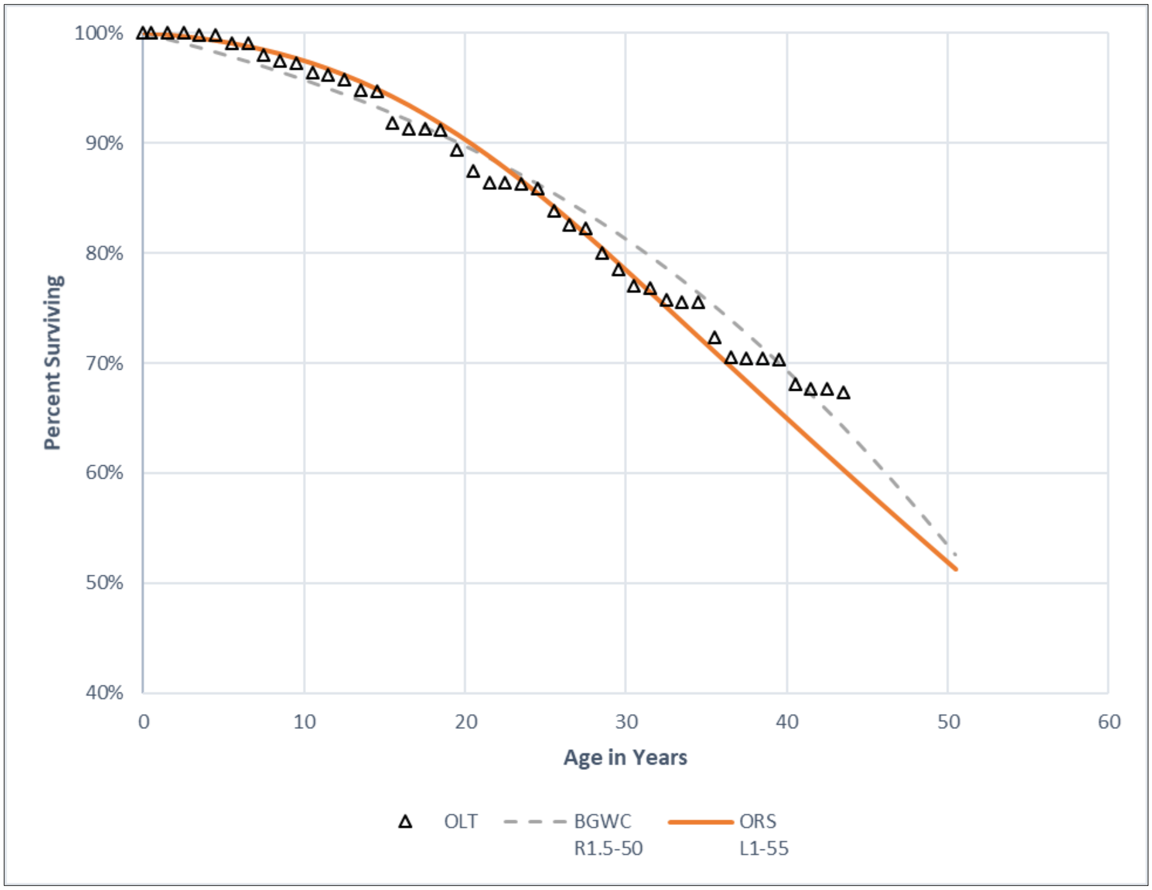
[26] Direct Testimony of John J. Spanos, Cause No. 45039 before the Indiana Utility Regulatory Commission, Attachment JJS-1, p. VI-10.

[27] Exhibit DJG-12.

These two Iowa curves are illustrated in the graph below along with the OLT curve.[28]

Figure 10:

Accounts 1290-1315 – Structures and Improvements



As shown in the graph, the two Iowa curves appear to provide relatively close fits to the OLT curve, however, the L1-55 curve appears to provide a better fit through pertinent middle portions of the OLT curve. We can use mathematical curve fitting to determine the better-fitting Iowa curve.

[28] Exhibit DJG-13.

Q. DOES YOUR SELECTED IOWA CURVE PROVIDE A BETTER MATHEMATICAL FIT TO THE RELEVANT PORTION OF THE OLT CURVE?

A. Yes. The total SSD for the curve selected by Mr. Spanos is 0.7789, and the SSD for the L1-55 curve is only 0.6677, which makes it the better mathematical fit.[29]

2. <u>Account 1350 – Gravity Mains</u>

Q. DESCRIBE YOUR SERVICE LIFE ESTIMATE FOR THIS ACCOUNT AND COMPARE IT WITH BGWC'S ESTIMATE.

A. Mr. Spanos selected the S1.5-70 curve for this account, and I selected the S1.5-95 curve. Both Iowa curves are illustrated in the graph below along with the OLT curve.[30]

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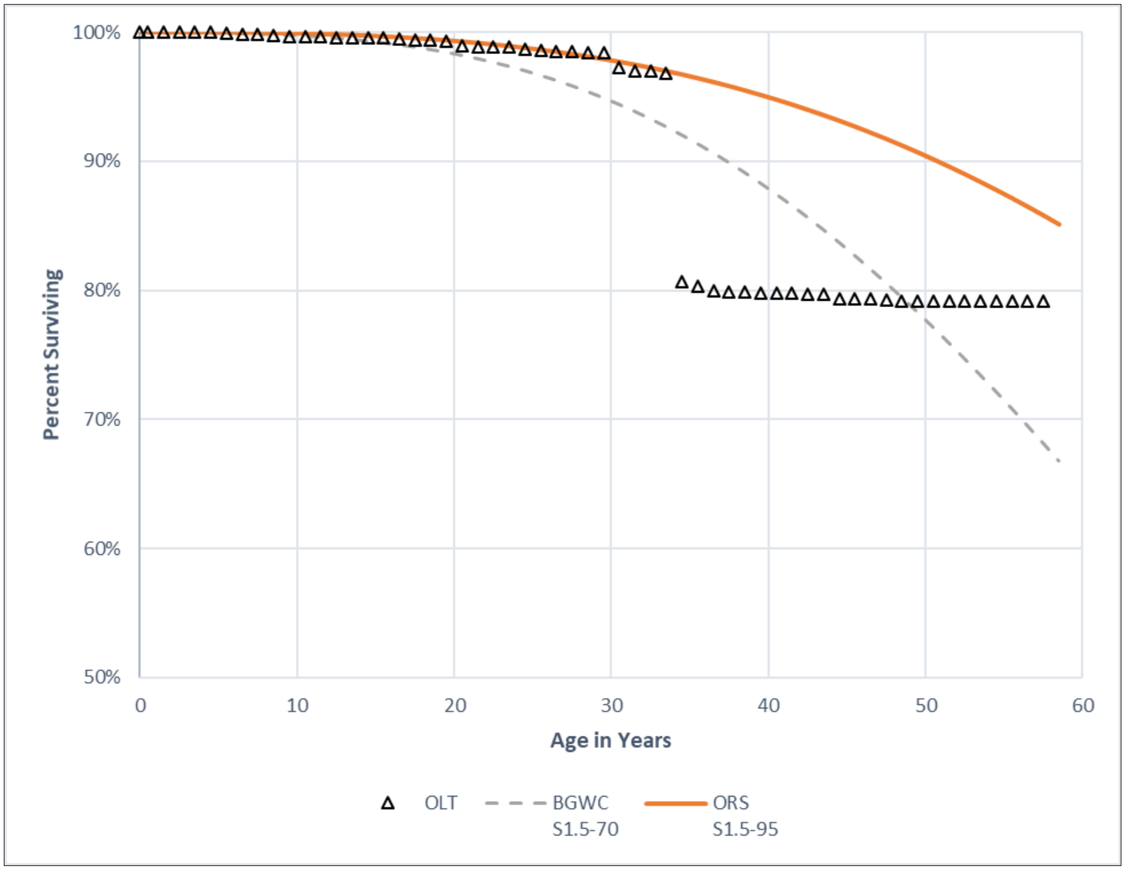
[29] Exhibit DJG-13.

[30] Exhibit DJG-14.

Figure 11:

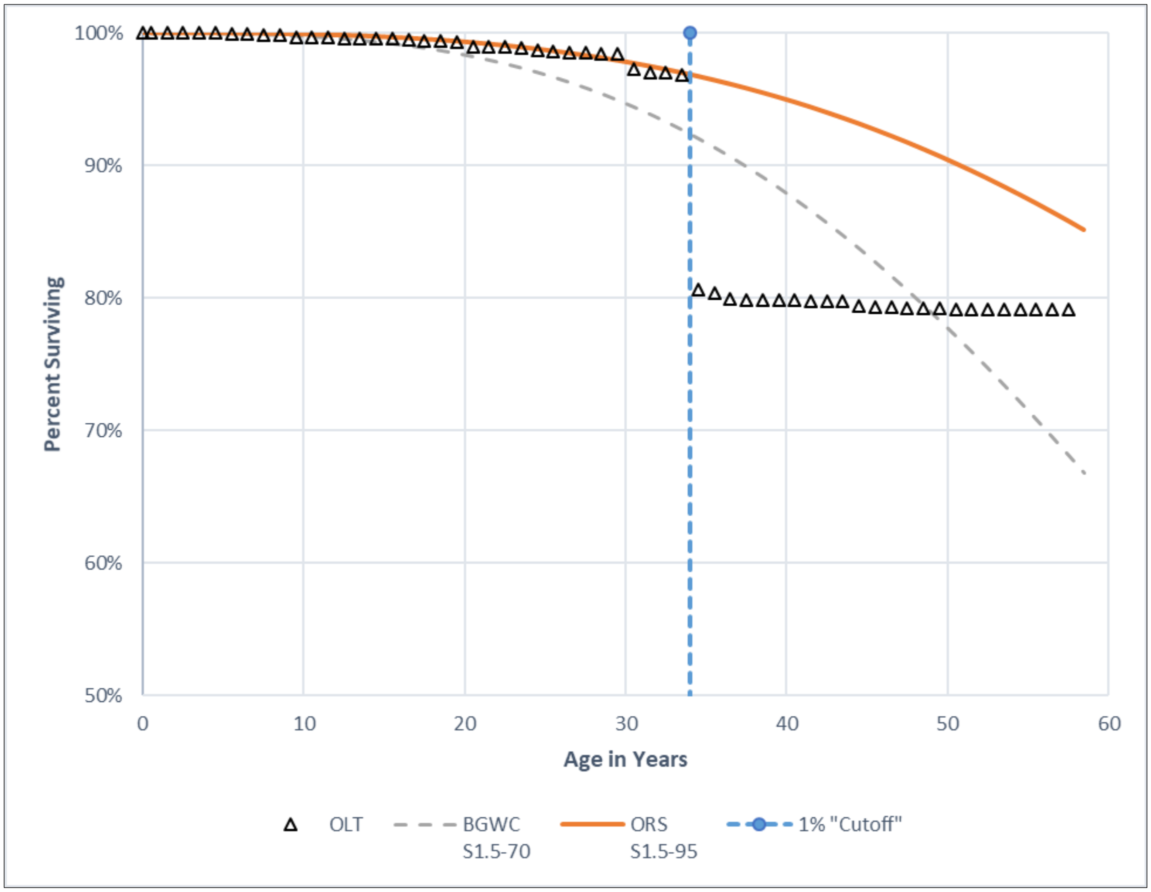
Account 1350 – Gravity Mains



The OLT curve for this account is similar to water plant Account 1120 discussed above, in that there is a sudden and significant gap in the OLT curve that arguably renders the data points occurring thereafter less statistically relevant. As discussed above, not all portions of every OLT curve should be given an equal amount of statistical weighting. For this account, the sudden and significant gap in the OLT curve at age interval 34 make this OLT curve not ideal for Iowa curve fitting. However, BGWC has not presented empirical evidence outside of the OLT curve account to support its service life proposal. Thus, similar to Account 1120 discussed above, we should conduct the statistical analysis for this account using a truncated OLT curve. The graph below shows the same curves in the graph presented above, with the addition of the truncation line at age interval 34.

Figure 12:

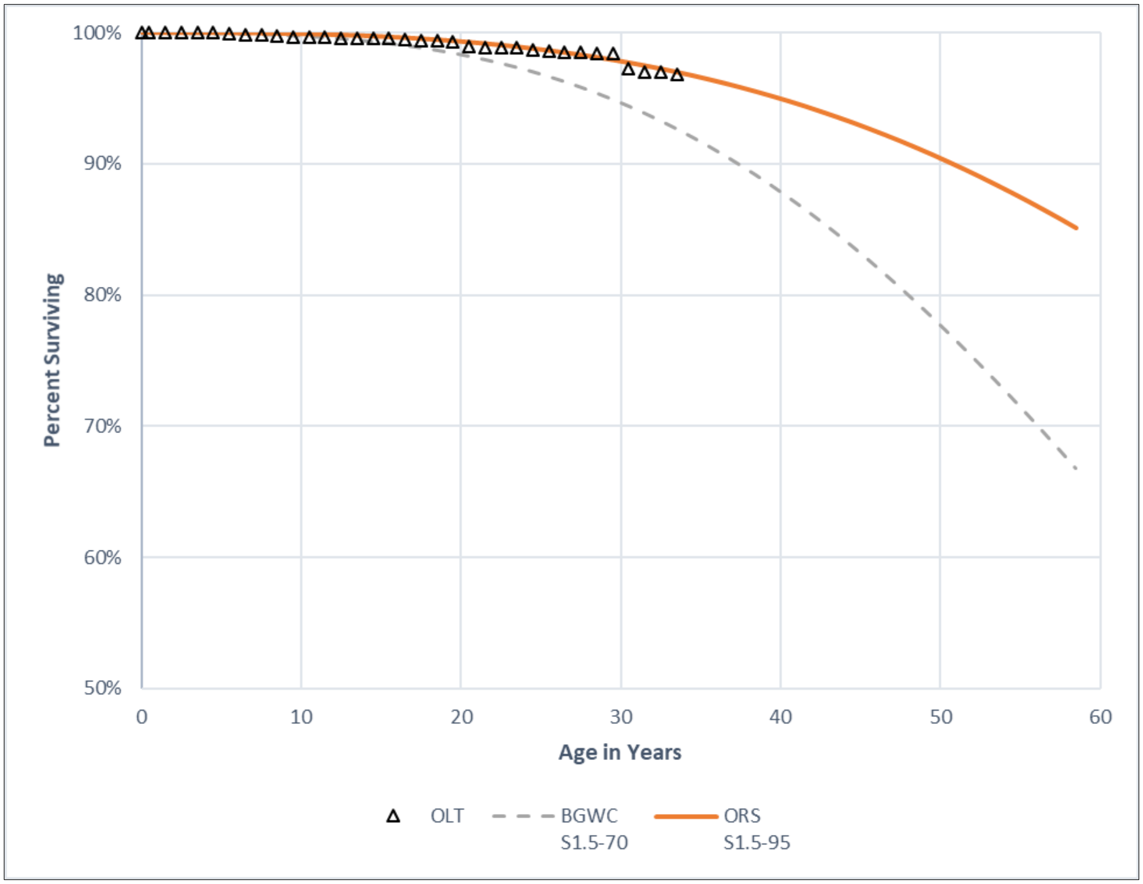
Account 1350 – Truncated OLT Curve



Using the graph above for illustration, all data points occurring to the right of the vertical dotted line should not be considered in the SSD calculation, as they are less statistically relevant, primarily due to the fact that completely distort the OLT curve. The following graph shows the revised, truncated OLT curve, along with the two selected Iowa curves for this account.

Figure 13:

Account 1350 – Truncated OLT Curve



Once the less relevant portion of the OLT curve is truncated, we can see that the S1.5-95 curve provides the better fit from a visual perspective.

Q. DOES YOUR SELECTED IOWA CURVE PROVIDE A BETTER MATHEMATICAL FIT TO THE RELEVANT PORTION OF THE OLT CURVE?

A. Yes. Using the truncated OLT curve for analysis, SSD for the Iowa curve selected by Mr. Spanos is 0.0094, and the SSD for the S1-95 curve I selected is 0.0001.[31]

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[31] Exhibit DJG-14.

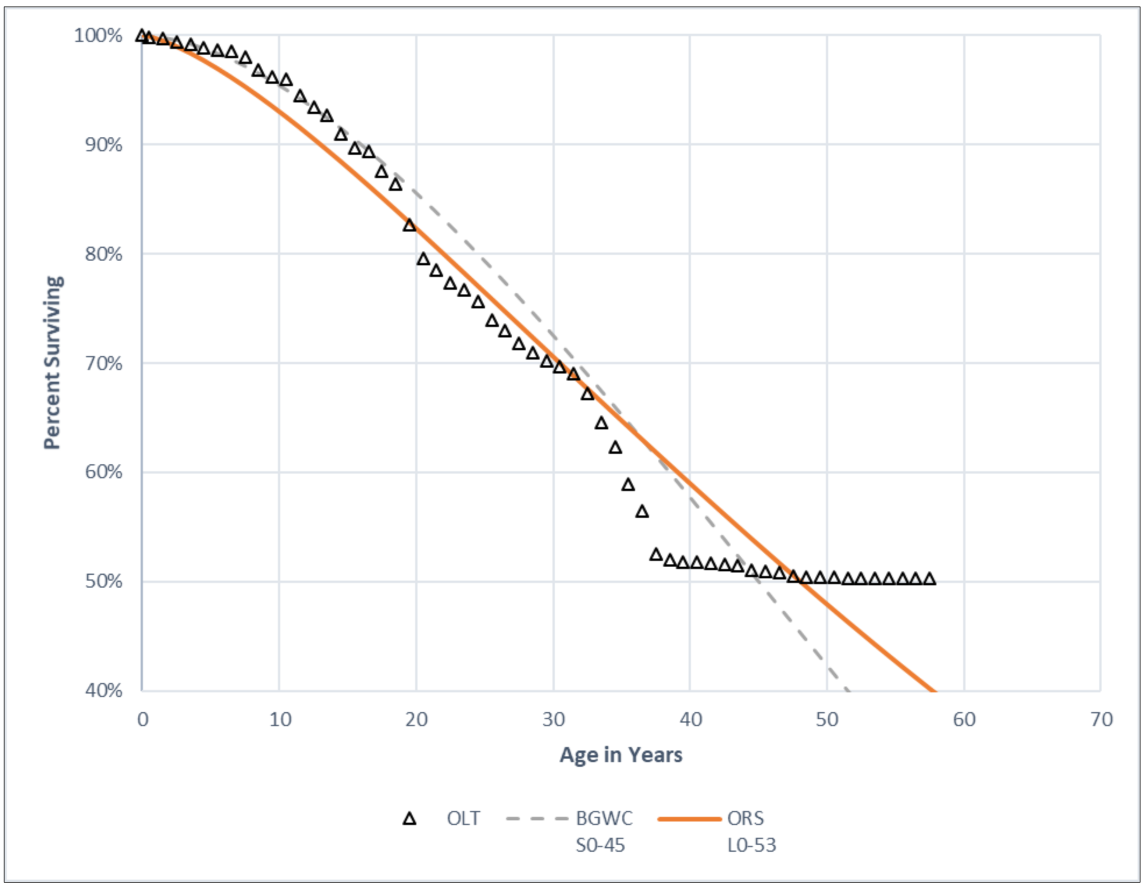
3. <u>Account 1360 – Services to Customers</u>

Q. DESCRIBE YOUR SERVICE LIFE ESTIMATE FOR THIS ACCOUNT AND COMPARE IT WITH THE COMPANY'S ESTIMATE.

A. For this account, Mr. Spanos selected the S0-45 curve, and I selected the L0-53 curve. Both of these curves are shown in the graph below along with the OLT curve.[32]

Figure 14:

Account 1360 – Services to Customers



As shown in the graph, the L0-53 curve appears to provide closer fits to the OLT curve through significant portions of the OLT curve, including statistically relevant points toward

[32] Exhibit DJG-15.

the later portions of this particular OLT curve.

Q. DOES YOUR SELECTED IOWA CURVE PROVIDE A BETTER MATHEMATICAL FIT TO THE OLT CURVE FOR THIS ACCOUNT?

A. Yes. The total SSD for the curve selected by Mr. Spanos is 0.2355, and the SSD for the L0-53 curve I selected is only 0.0951, which makes it the better mathematical fit.[33]

4. <u>Accounts 1395-1405 – Treatment and Disposal Equipment</u>

Q. DESCRIBE YOUR SERVICE LIFE ESTIMATE FOR THESE ACCOUNTS AND COMPARE IT WITH THE COMPANY'S ESTIMATE.

A. Mr. Spanos selected the R0.5-35 curve for these accounts, and I selected the O1-40 curve. These two Iowa curves are illustrated in the graph below along with the OLT curve.[34]

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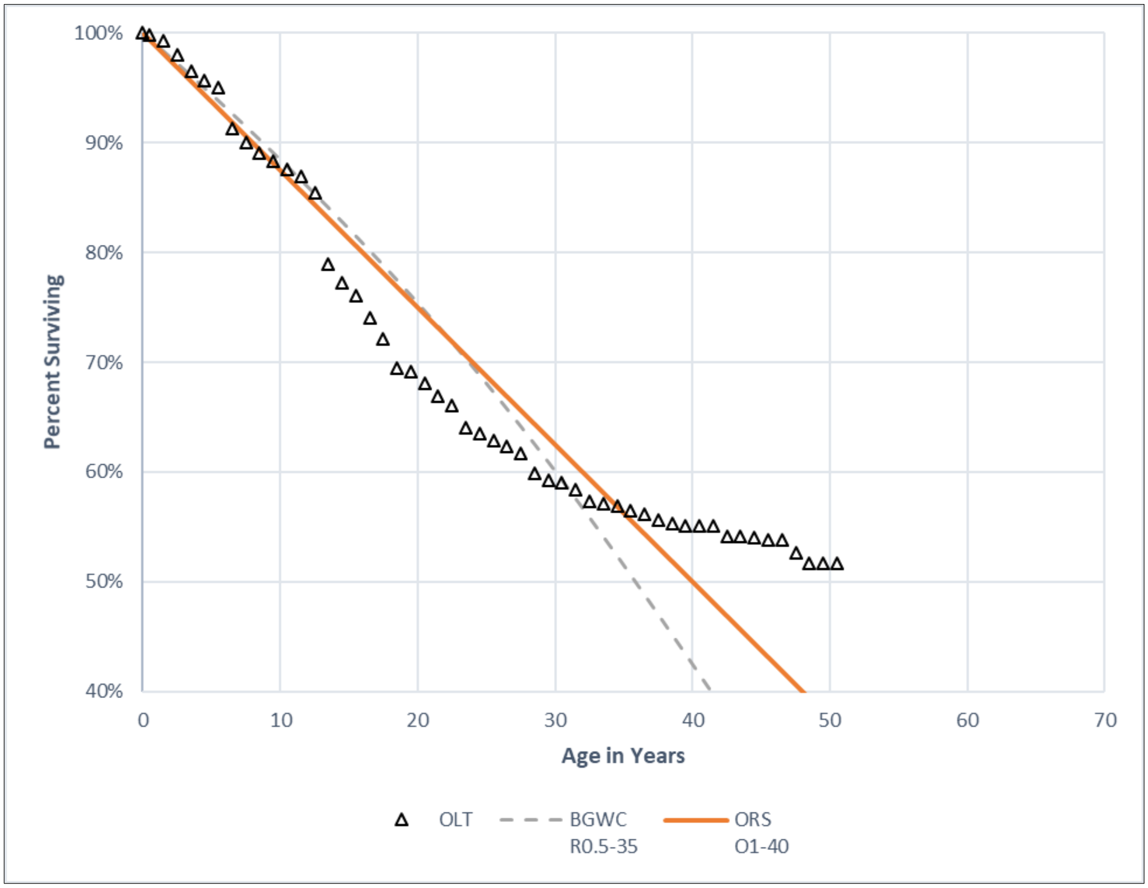
[33] Exhibit DJG-15.

[34] Exhibit DJG-13.

Figure 15:

Accounts 1395-1405 – Treatment and Disposal Equipment



As shown in the graph, the two Iowa curves appear to provide relatively close fits to the OLT curve, however, the O1-40 curve appears to provide a better fit through most portions of the OLT curve. We can use mathematical curve fitting to determine the better-fitting Iowa curve.

Q. DOES YOUR SELECTED IOWA CURVE PROVIDE A BETTER MATHEMATICAL FIT TO THE RELEVANT PORTION OF THE OLT CURVE?

A. Yes. The total SSD for the curve selected by Mr. Spanos is 0.6179, and the SSD for the

O1-40 curve I selected is only 0.2838, which makes it the better mathematical fit.[35]

VI. NET SALVAGE ANALYSIS

Q. DESCRIBE THE CONCEPT OF NET SALVAGE.

A. If an asset has any value left when it is retired from service, a utility might decide to sell the asset. The proceeds from this transaction are called "gross salvage." The corresponding expense associated with the removal of the asset from service is called the "cost of removal." The term "net salvage" equates to gross salvage less the cost of removal. Often, the net salvage for utility assets is a negative number (or percentage) because the cost of removing the assets from service exceeds any proceeds received from selling the assets. When a negative net salvage rate is applied to an account to calculate the depreciation rate, it results in increasing the total depreciable base to be recovered over a particular period of time and increases the depreciation rate. Therefore, a greater negative net salvage rate equates to a higher depreciation rate and expense, all else held constant.

Q. DESCRIBE THE TYPE OF EMPIRICAL DATA USUALLY PROVIDED IN CONNECTION WITH DEPRECIATION STUDIES TO SUPPORT THE UTILITY'S PROPOSED NET SALVAGE RATES.

A. The data typically provided to support a utility's proposed net salvage rates includes historical gross salvage and removal cost amounts by account and year. A depreciation analyst can then consider averages and trends in the data to estimate the most appropriate future net salvage rate.

Q. DID THE DEPRECIATION STUDIES IN THIS CASE INCLUDE THE TYPE OF

[35] Exhibit DJG-16.

NET SALVAGE DATA YOU DESCRIBED?

A. No. BGWC's depreciation water and wastewater studies did not include the type of empirical net salvage analysis that is required to provide adequate support for proposed net salvage rates.

Q. HAS BGWC MET ITS BURDEN TO SHOW THAT ITS PROPOSED NET SALVAGE RATES ARE NOT EXCESSIVE?

A. No. BGWC provided no empirical data or other substantial evidence (if any) in support of its proposed net salvage rates.

Q. ARE YOU SUGGESTING THAT BGWC SHOULD NOT BE ALLOWED TO RECOVER ANY NEGATIVE FUTURE NET SALVAGE IN RATES DUE TO ITS FAILURE TO SUPPORT ITS PROPOSED NET SALVAGE RATES?

A. No, not necessarily. However, I think it is within the Commission's authority to generally deny the recovery of any costs that are not supported. Negative net salvage implies that the cost to remove an asset will exceed any proceeds for selling the asset. Thus, when negative net salvage rates are built into current depreciation rates, current customers are being charged more than the cost of the asset providing service in anticipation of an additional cost to remove the asset at the end of its useful life. In this case, BGWC has failed to provide evidence supporting its negative net salvage rates.

Q. DESCRIBE YOUR NET SALVAGE RECOMMENDATIONS IN LIGHT OF THE LACK OF EVIDENCE PROVIDED BY THE COMPANY.

A. For the majority of the accounts in the depreciation studies, I do not propose net salvage adjustments. Although BGWC has not provided any empirical evidence supporting its negative net salvage rate proposals, it is not necessarily unreasonable to assume that the

Company will experience negative future net salvage for many of its accounts. However, since the Company has failed to make a convincing showing that its proposed net salvage rates are not excessive, the Commission should take a more conservative approach in setting net salvage rates in this case, particularly in light of the otherwise substantial burden that the Company's proposed rate increase would impose on customers. The following table summarizes my proposed net salvage adjustments.

Figure 16:

Net Salvage Adjustment Summary

Account No.	Description	BGWC Proposed	ORS Proposed
	WATER PLANT		
1100	SOURCE OF SUPPLY	-10.0%	-5.0%
1105	WATER TREATMENT	-10.0%	-5.0%
1110	T&D PUMING EQUIP.	-10.0%	-5.0%
1115	WATER TREATMENT EQUIP.	-10.0%	-5.0%
1120	DIST. RESERVOIRS	-15.0%	-10.0%
1125	TRANS. AND DIST. MAINS	-10.0%	-5.0%
1130	SERVICES	-20.0%	-10.0%
1145	HYDRANTS	-15.0%	-10.0%
	WASTEWATER PLANT		
1345	FORCE MAINS	-10.0%	-5.0%
1350	GRAVITY MAINS	-10.0%	-5.0%
1353	MANHOLES	-10.0%	-5.0%
1360	SERVICES TO CUSTOMERS	-20.0%	-10.0%
1380	PUMPING	-10.0%	-5.0%
1385	RECLAIM WTP	-10.0%	-5.0%
1390	RECLAIM WTR	-10.0%	-5.0%
1395	LAGOON	-10.0%	-5.0%
1400	TREATMENT	-10.0%	-5.0%
1405	RECLAIM WTP	-10.0%	-5.0%

As shown in the table, I am still recommending negative net salvage rates for all of the adjusted accounts, despite the lack of evidence provided by the Company in support of any negative net salvage.

VII. CONCLUSION AND RECOMMENDATION

Q. SUMMARIZE THE KEY POINTS OF YOUR TESTIMONY.

A. For several of the accounts proposed in the water and wastewater depreciation studies, BGWC has failed to meet its burden to show that its proposed depreciation rates are not excessive, specifically regarding service life and net salvage. The service lives proposed by Mr. Spanos for several of the plant accounts in the depreciation studies are too short given the evidence supporting such service life proposals. Likewise, the net salvage rates proposed by Mr. Spanos are not supported by empirical evidence. Unreasonably short service lives and unreasonably low net salvage rates both contribute to the unreasonably high depreciation rates proposed by BGWC.

Q. WHAT IS YOUR RECOMMENDATION TO THE COMMISSION?

A. I recommend the Commission adopt the depreciation rates set forth in Exhibit DJG-4 and Exhibit DJG-6 for the Company's water and wastewater accounts respectively.

Q. DOES THIS CONCLUDE YOUR DEPRECIATION TESTIMONY?

A. Yes.

APPENDIX A:

THE DEPRECIATION SYSTEM

A depreciation accounting system may be thought of as a dynamic system in which estimates of life and salvage are inputs to the system, and the accumulated depreciation account is a measure of the state of the system at any given time.[36] The primary objective of the depreciation system is the timely recovery of capital. The process for calculating the annual accruals is determined by the factors required to define the system. A depreciation system should be defined by four primary factors: 1) a method of allocation; 2) a procedure for applying the method of allocation to a group of property; 3) a technique for applying the depreciation rate; and 4) a model for analyzing the characteristics of vintage groups comprising a continuous property group.[37] The figure below illustrates the basic concept of a depreciation system and includes some of the available parameters.[38]

There are hundreds of potential combinations of methods, procedures, techniques, and models, but in practice, analysts use only a few combinations. Ultimately, the system selected must result in the systematic and rational allocation of capital recovery for the utility. Each of the four primary factors defining the parameters of a depreciation system is discussed further below.

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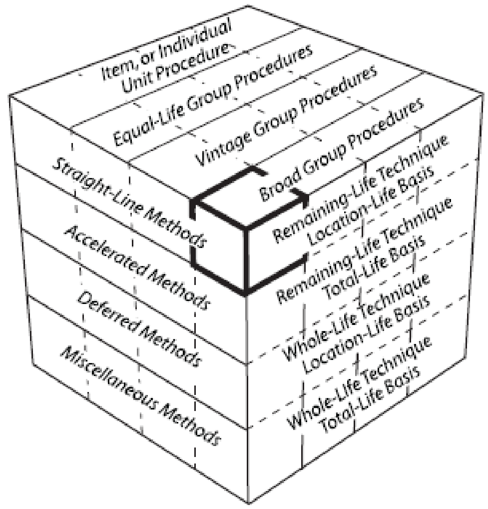
[36] Wolf *supra* n. 6, at 69-70.

[37] *Id.* at 70, 139-40.

[38] Edison Electric Institute, *Introduction to Depreciation* (inside cover) (EEI April 2013). Some definitions of the terms shown in this diagram are not consistent among depreciation practitioners and literature due to the fact that depreciation analysis is a relatively small and fragmented field. This diagram simply illustrates some of the available parameters of a depreciation system.

Figure 17:
The Depreciation System Cube



1. <u>Allocation Methods</u>

The "method" refers to the pattern of depreciation in relation to the accounting periods. The method most commonly used in the regulatory context is the "straight-line method" – a type of age-life method in which the depreciable cost of plant is charged in equal amounts to each accounting period over the service life of plant.[39] Because group depreciation rates and plant balances often change, the amount of the annual accrual rarely remains the same, even when the straight-line method is employed.[40] The basic formula for the straight-line method is as follows:[41]

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[39] NARUC *supra* n. 7, at 56.

[40] *Id*.

[41] *Id*.

Equation 1:
Straight-Line Accrual

$$Annual\ Accrual = \frac{Gross\ Plant - Net\ Salvage}{Service\ Life}$$

Gross plant is a known amount from the utility's records, while both net salvage and service life must be estimated to calculate the annual accrual. The straight-line method differs from accelerated methods of recovery, such as the "sum-of-the-years-digits" method and the "declining balance" method. Accelerated methods are primarily used for tax purposes and are rarely used in the regulatory context for determining annual accruals.[42] In practice, the annual accrual is expressed as a rate which is applied to the original cost of plant to determine the annual accrual in dollars. The formula for determining the straight-line rate is as follows:[43]

Equation 2:
Straight-Line Rate

$$Depreciation\ Rate\ \% = \frac{100 - Net\ Salvage\ \%}{Service\ Life}$$

2. Grouping Procedures

The "procedure" refers to the way the allocation method is applied through subdividing the total property into groups.[44] While single units may be analyzed for depreciation, a group plan of depreciation is particularly adaptable to utility property. Employing a grouping procedure allows for a composite application of depreciation rates to groups of similar property, rather than conducting calculations for each unit. Whereas an individual unit of property has a single life, a

[42] *Id*. at 57.

[43] *Id*. at 56.

[44] Wolf *supra* n. 6, at 74-75.

group of property displays a dispersion of lives and the life characteristics of the group must be described statistically.[45] When analyzing mass property categories, it is important that each group contains homogenous units of plant that are used in the same general manner throughout the plant and operated under the same general conditions.[46]

The "average life" and "equal life" grouping procedures are the two most common. In the average life procedure, a constant annual accrual rate based on the average life of all property in the group is applied to the surviving property. While property having shorter lives than the group average will not be fully depreciated, and likewise, property having longer lives than the group average will be over-depreciated, the ultimate result is that the group will be fully depreciated by the time of the final retirement.[47] Thus, the average life procedure treats each unit as though its life is equal to the average life of the group. In contrast, the equal life procedure treats each unit in the group as though its life was known.[48] Under the equal life procedure the property is divided into subgroups that each has a common life.[49]

3. Application Techniques

The third factor of a depreciation system is the "technique" for applying the depreciation rate. There are two commonly used techniques: "whole life" and "remaining life." The whole life technique applies the depreciation rate on the estimated average service life of a group, while the remaining life technique seeks to recover undepreciated costs over the remaining life of the plant.[50]

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[45] *Id*. at 74.

[46] NARUC *supra* n. 7, at 61-62.

[47] *See* Wolf *supr*a n. 6, at 74-75.

[48] *Id*. at 75.

[49] *Id*.

[50] NARUC *supra* n. 7, at 63-64.

In choosing the application technique, consideration should be given to the proper level of the accumulated depreciation account. Depreciation accrual rates are calculated using estimates of service life and salvage. Periodically these estimates must be revised due to changing conditions, which cause the accumulated depreciation account to be higher or lower than necessary. Unless some corrective action is taken, the annual accruals will not equal the original cost of the plant at the time of final retirement.[51] Analysts can calculate the level of imbalance in the accumulated depreciation account by determining the "calculated accumulated depreciation," (a.k.a. "theoretical reserve" and referred to in these appendices as "CAD"). The CAD is the calculated balance that would be in the accumulated depreciation account at a point in time using current depreciation parameters.[52] An imbalance exists when the actual accumulated depreciation account does not equal the CAD. The choice of application technique will affect how the imbalance is dealt with.

Use of the whole life technique requires that an adjustment be made to accumulated depreciation after calculation of the CAD. The adjustment can be made in a lump sum or over a period of time. With use of the remaining life technique, however, adjustments to accumulated depreciation are amortized over the remaining life of the property and are automatically included in the annual accrual.[53] This is one reason that the remaining life technique is popular among practitioners and regulators. The basic formula for the remaining life technique is as follows:[54]

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[51] Wolf *supra* n. 6, at 83.

[52] NARUC *supra* n. 7, at 325.

[53] NARUC *supra* n. 7, at 65 ("The desirability of using the remaining life technique is that any necessary adjustments of [accumulated depreciation] . . . are accrued automatically over the remaining life of the property. Once commenced, adjustments to the depreciation reserve, outside of those inherent in the remaining life rate would require regulatory approval.").

[54] *Id*. at 64.

Equation 3:
Remaining Life Accrual

$$Annual\ Accrual = \frac{Gross\ Plant - Accumulated\ Depreciation - Net\ Salvage}{Average\ Remaining\ Life}$$

The remaining life accrual formula is similar to the basic straight-line accrual formula above with two notable exceptions. First, the numerator has an additional factor in the remaining life formula: the accumulated depreciation. Second, the denominator is "average remaining life" instead of "average life." Essentially, the future accrual of plant (gross plant less accumulated depreciation) is allocated over the remaining life of plant. Thus, the adjustment to accumulated depreciation is "automatic" in the sense that it is built into the remaining life calculation.[55]

4. Analysis Model

The fourth parameter of a depreciation system, the "model," relates to the way of viewing the life and salvage characteristics of the vintage groups that have been combined to form a continuous property group for depreciation purposes.[56] A continuous property group is created when vintage groups are combined to form a common group. Over time, the characteristics of the property may change, but the continuous property group will continue. The two analysis models used among practitioners, the "broad group" and the "vintage group," are two ways of viewing the life and salvage characteristics of the vintage groups that have been combined to form a continuous property group.

The broad group model views the continuous property group as a collection of vintage groups that each have the same life and salvage characteristics. Thus, a single survivor curve and

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[55] Wolf *supra* n. 6, at 178.

[56] *See* Wolf *supra* n. 6, at 139 (I added the term "model" to distinguish this fourth depreciation system parameter from the other three parameters).

a single salvage schedule are chosen to describe all the vintages in the continuous property group. In contrast, the vintage group model views the continuous property group as a collection of vintage groups that may have different life and salvage characteristics. Typically, there is not a significant difference between vintage group and broad group results unless vintages within the applicable property group experienced dramatically different retirement levels than anticipated in the overall estimated life for the group. For this reason, many analysts utilize the broad group procedure because it is more efficient.

APPENDIX B:

IOWA CURVES

Early work in the analysis of the service life of industrial property was based on models that described the life characteristics of human populations.[57] This explains why the word "mortality" is often used in the context of depreciation analysis. In fact, a group of property installed during the same accounting period is analogous to a group of humans born during the same calendar year. Each period the group will incur a certain fraction of deaths / retirements until there are no survivors. Describing this pattern of mortality is part of actuarial analysis and is regularly used by insurance companies to determine life insurance premiums. The pattern of mortality may be described by several mathematical functions, particularly the survivor curve and frequency curve. Each curve may be derived from the other so that if one curve is known, the other may be obtained. A survivor curve is a graph of the percent of units remaining in service expressed as a function of age.[58] A frequency curve is a graph of the frequency of retirements as a function of age. Several types of survivor and frequency curves are illustrated in the figures below.

1. <u>Development</u>

The survivor curves used by analysts today were developed over several decades from extensive analysis of utility and industrial property. In 1931, Edwin Kurtz and Robley Winfrey used extensive data from a range of 65 industrial property groups to create survivor curves representing the life characteristics of each group of property.[59] They generalized the 65 curves

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[57] Wolf *supra* n. 6, at 276.

[58] *Id*. at 23.

[59] *Id*. at 34.

into 13 survivor curve types and published their results in *Bulletin 103: Life Characteristics of Physical Property*. The 13 type curves were designed to be used as valuable aids in forecasting probable future service lives of industrial property. Over the next few years, Winfrey continued gathering additional data, particularly from public utility property, and expanded the examined property groups from 65 to 176.[60] This resulted in 5 additional survivor curve types for a total of 18 curves. In 1935, Winfrey published *Bulletin 125: Statistical Analysis of Industrial Property Retirements*. According to Winfrey, "[t]he 18 type curves are expected to represent quite well all survivor curves commonly encountered in utility and industrial practices."[61] These curves are known as the "Iowa curves" and are used extensively in depreciation analysis in order to obtain the average service lives of property groups. (Use of Iowa curves in actuarial analysis is further discussed in Appendix C.)

In 1942, Winfrey published *Bulletin 155: Depreciation of Group Properties*. In Bulletin 155, Winfrey made some slight revisions to a few of the 18 curve types, and published the equations, tables of the percent surviving, and probable life of each curve at five-percent intervals.[62] Rather than using the original formulas, analysts typically rely on the published tables containing the percentages surviving. This is because absent knowledge of the integration technique applied to each age interval, it is not possible to recreate the exact original published table values. In the 1970s, John Russo collected data from over 2,000 property accounts reflecting observations during the period 1965 – 1975 as part of his Ph.D. dissertation at Iowa State. Russo

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[60] *Id*.

[61] Robley Winfrey, *Bulletin 125: Statistical Analyses of Industrial Property Retirements* 85, Vol. XXXIV, No. 23 (Iowa State College of Agriculture and Mechanic Arts 1935).

[62] Robley Winfrey, Bulletin 155: Depreciation of Group Properties 121-28, Vol XLI, No. 1 (The Iowa State College Bulletin 1942); see also Wolf supra n. 6, at 305-38 (publishing the percent surviving for each Iowa curve, including "O" type curve, at one percent intervals).

essentially repeated Winfrey's data collection, testing, and analysis methods used to develop the original Iowa curves, except that Russo studied industrial property in service several decades after Winfrey published the original Iowa curves. Russo drew three major conclusions from his research:[63]

1. No evidence was found to conclude that the Iowa curve set, as it stands, is not a valid system of standard curves;

2. No evidence was found to conclude that new curve shapes could be produced at this time that would add to the validity of the Iowa curve set; and

3. No evidence was found to suggest that the number of curves within the Iowa curve set should be reduced.

Prior to Russo's study, some had criticized the Iowa curves as being potentially obsolete because their development was rooted in the study of industrial property in existence during the early 1900s. Russo's research, however, negated this criticism by confirming that the Iowa curves represent a sufficiently wide range of life patterns, and that though technology will change over time, the underlying patterns of retirements remain constant and can be adequately described by the Iowa curves.[64]

Over the years, several more curve types have been added to Winfrey's 18 Iowa curves. In 1967, Harold Cowles added four origin-modal curves. In addition, a square curve is sometimes used to depict retirements which are all planned to occur at a given age. Finally, analysts commonly rely on several "half curves" derived from the original Iowa curves. Thus, the term "Iowa curves" could be said to describe up to 31 standardized survivor curves.

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[63] *See* Wolf *supra* n. 6, at 37.

[64] *Id*.

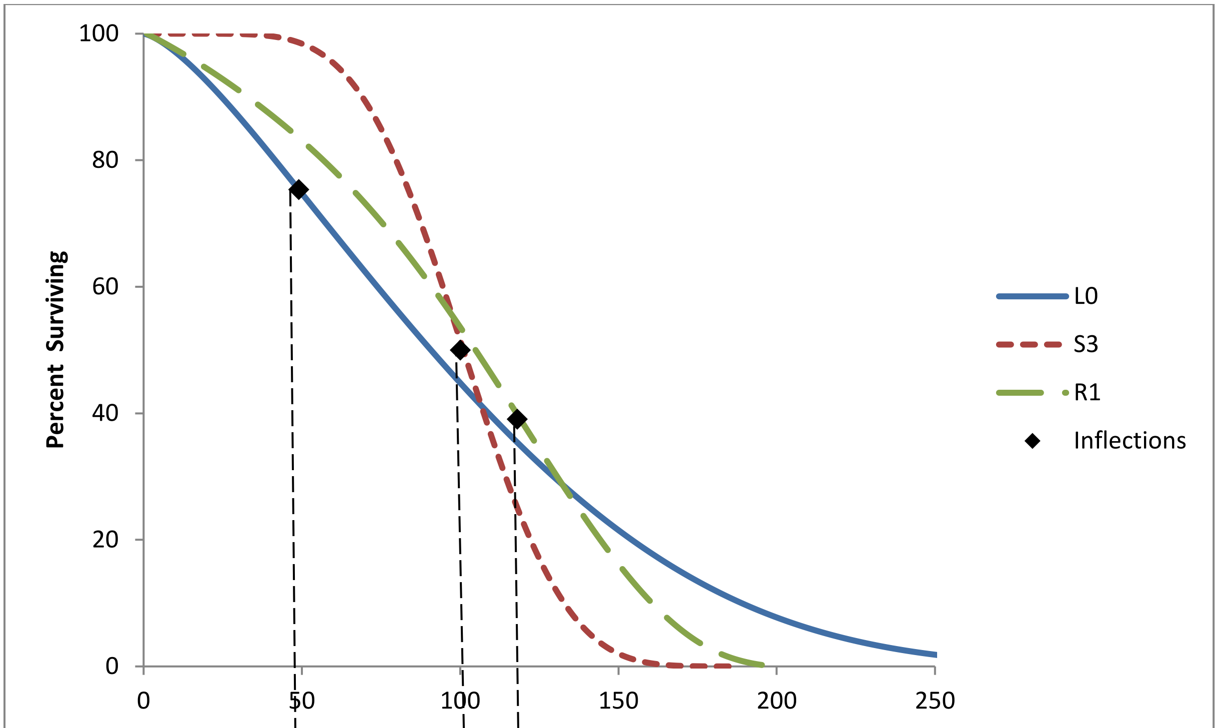
2. Classification

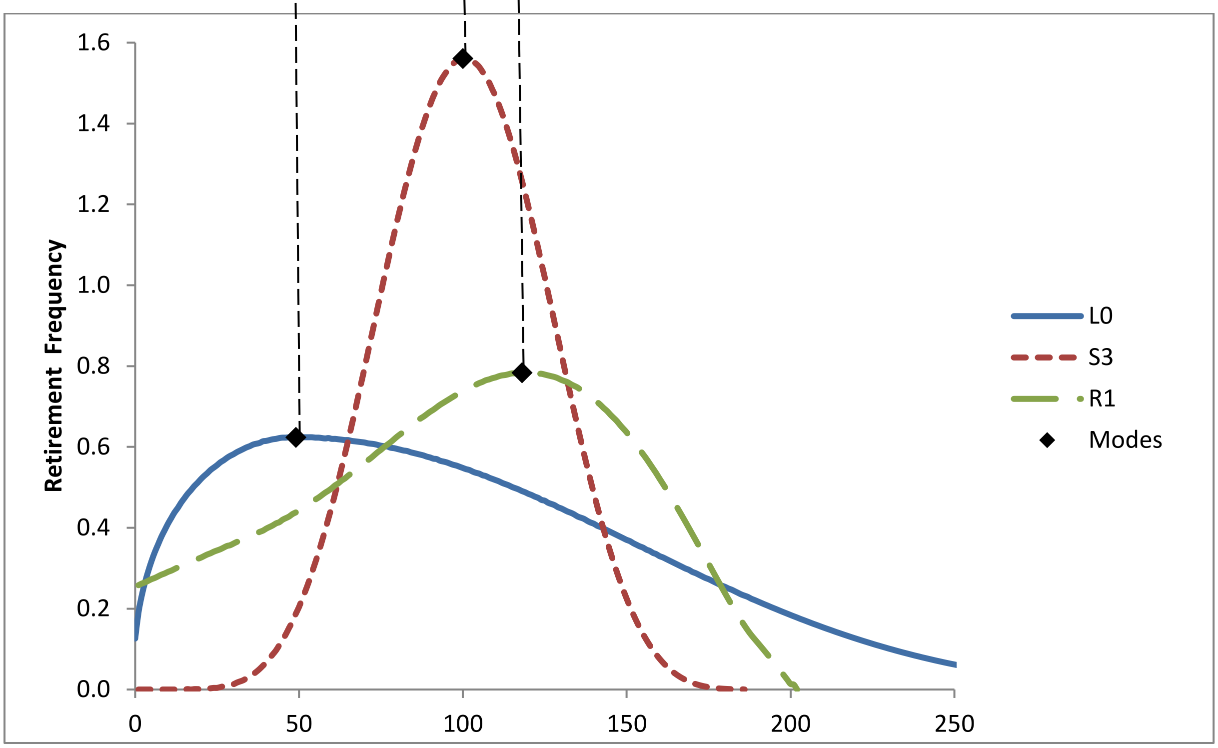
The Iowa curves are classified by three variables: modal location, average life, and variation of life. First, the mode is the percent life that results in the highest point of the frequency curve and the "inflection point" on the survivor curve. The modal age is the age at which the greatest rate of retirement occurs. As illustrated in the figure below, the modes appear at the steepest point of each survivor curve in the top graph, as well as the highest point of each corresponding frequency curve in the bottom graph.

The classification of the survivor curves was made according to whether the mode of the retirement frequency curves was to the left, to the right, or coincident with average service life. There are three modal "families" of curves: six left modal curves (L0, L1, L2, L3, L4, L5); five right modal curves (R1, R2, R3, R4, R5); and seven symmetrical curves (S0, S1, S2, S3, S4, S5, S6).[65] In the figure below, one curve from each family is shown: L0, S3 and R1, with average life at 100 on the x-axis. It is clear from the graphs that the modes for the L0 and R1 curves appear to the left and right of average life respectively, while the S3 mode is coincident with average life.

[65] In 1967, Harold A. Cowles added four origin-modal curves known as "O type" curves. There are also several "half" curves and a square curve, so the total amount of survivor curves commonly called "Iowa" curves is about 31 (see NARUC supra n. 7, at 68).

Figure 18:
Modal Age Illustration





The second Iowa curve classification variable is average life. The Iowa curves were designed using a single parameter of age expressed as a percent of average life instead of actual age. This was necessary for the curves to be of practical value. As Winfrey notes:

> Since the location of a particular survivor on a graph is affected by both its span in years and the shape of the curve, it is difficult to classify a group of curves unless one of these variables can be controlled. This is easily done by expressing the age in percent of average life."[66]

Because age is expressed in terms of percent of average life, any particular Iowa curve type can be modified to forecast property groups with various average lives.

The third variable, variation of life, is represented by the numbers next to each letter. A lower number (e.g., L1) indicates a relatively low mode, large variation, and large maximum life; a higher number (e.g., L5) indicates a relatively high mode, small variation, and small maximum life. All three classification variables – modal location, average life, and variation of life – are used to describe each Iowa curve. For example, a 13-L1 Iowa curve describes a group of property with a 13-year average life, with the greatest number of retirements occurring before (or to the left of) the average life, and a relatively low mode. The graphs below show these 18 survivor curves, organized by modal family.

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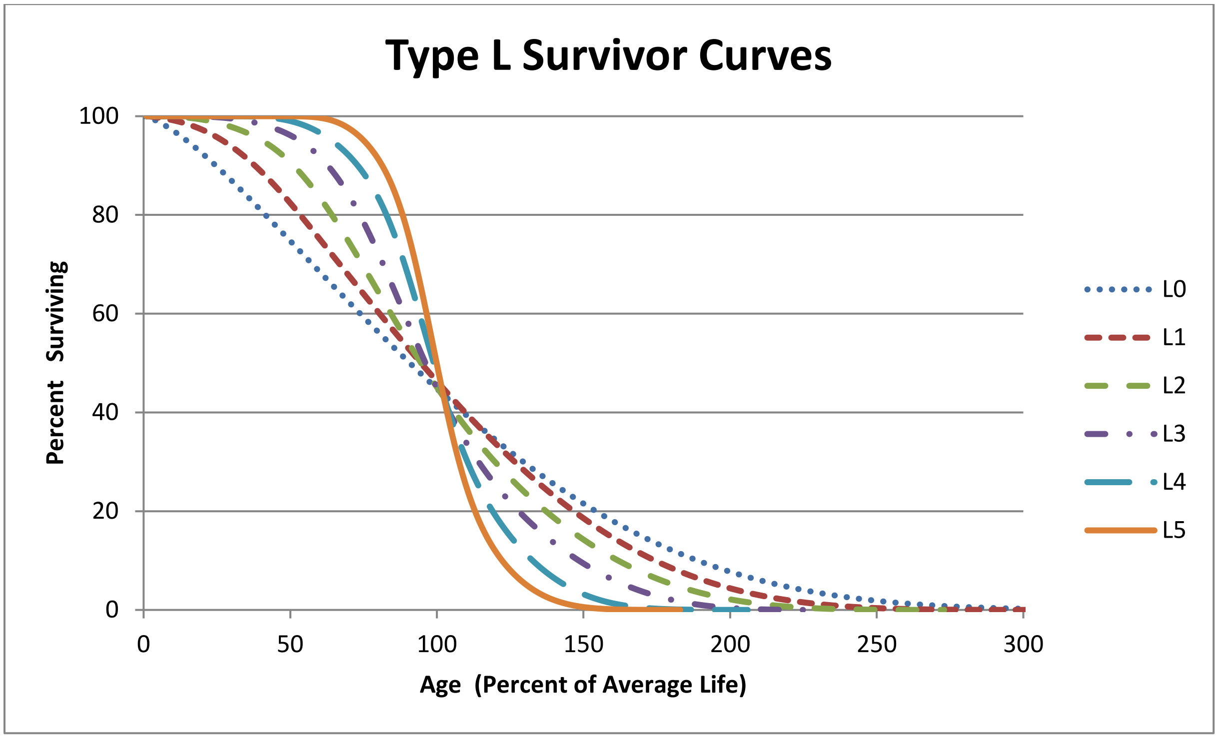
[66] Winfrey *supra* n. 75, at 60.

Figure 19:
Type L Survivor and Frequency Curves



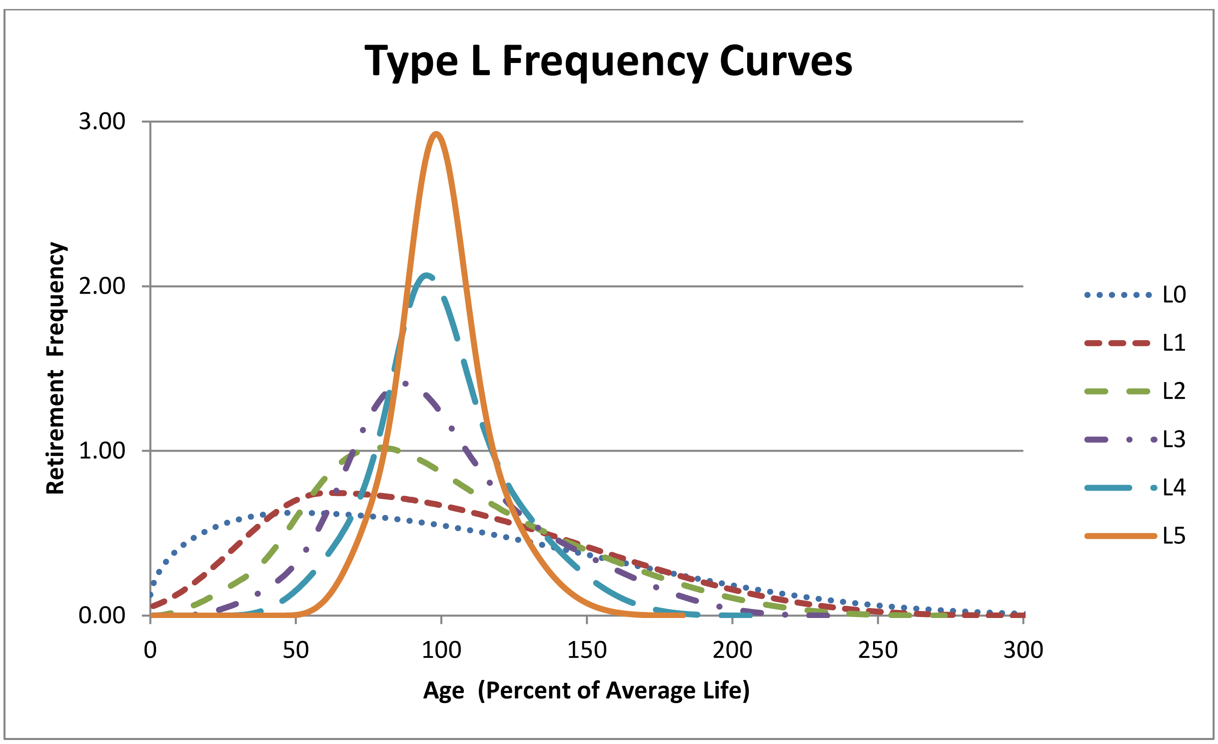
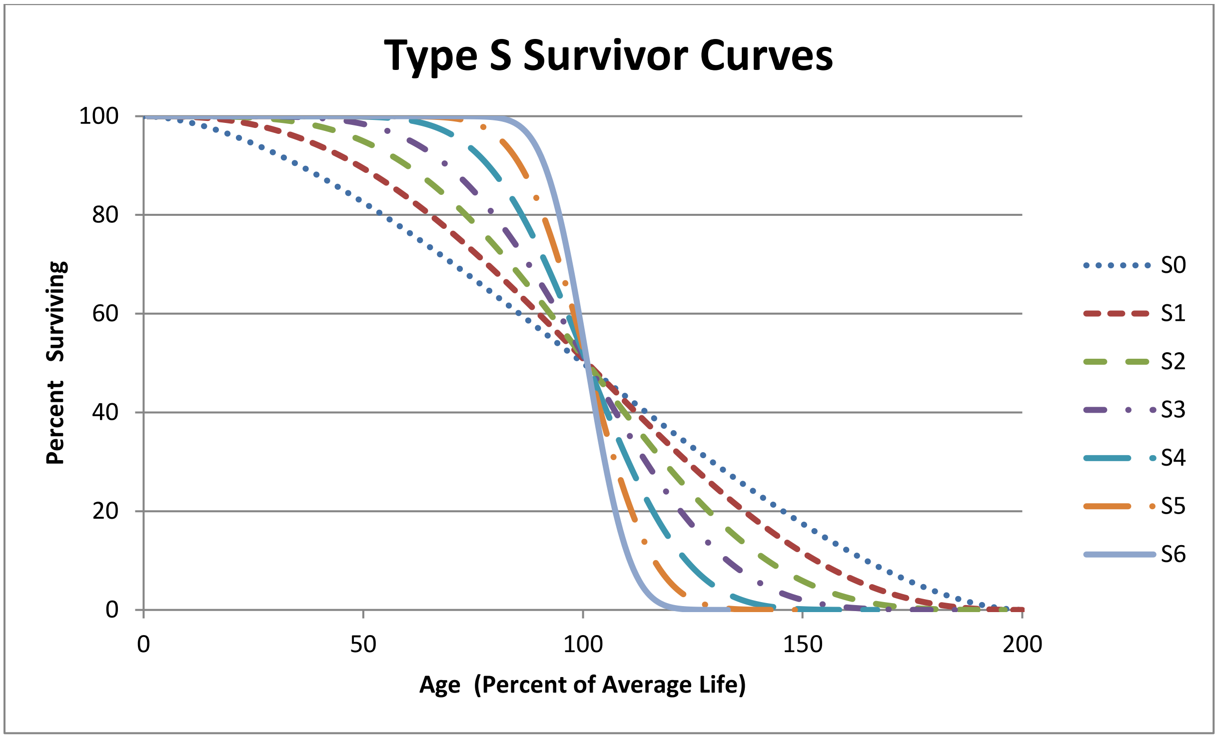


Figure 20:
Type S Survivor and Frequency Curves



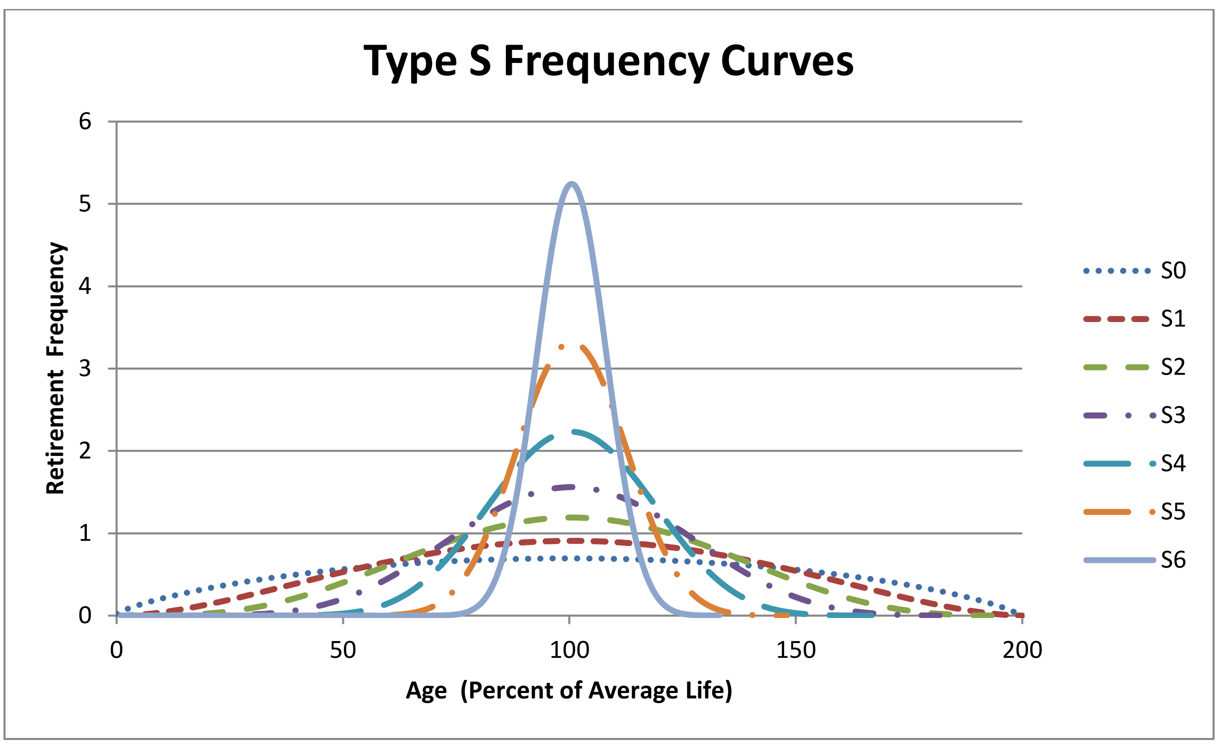
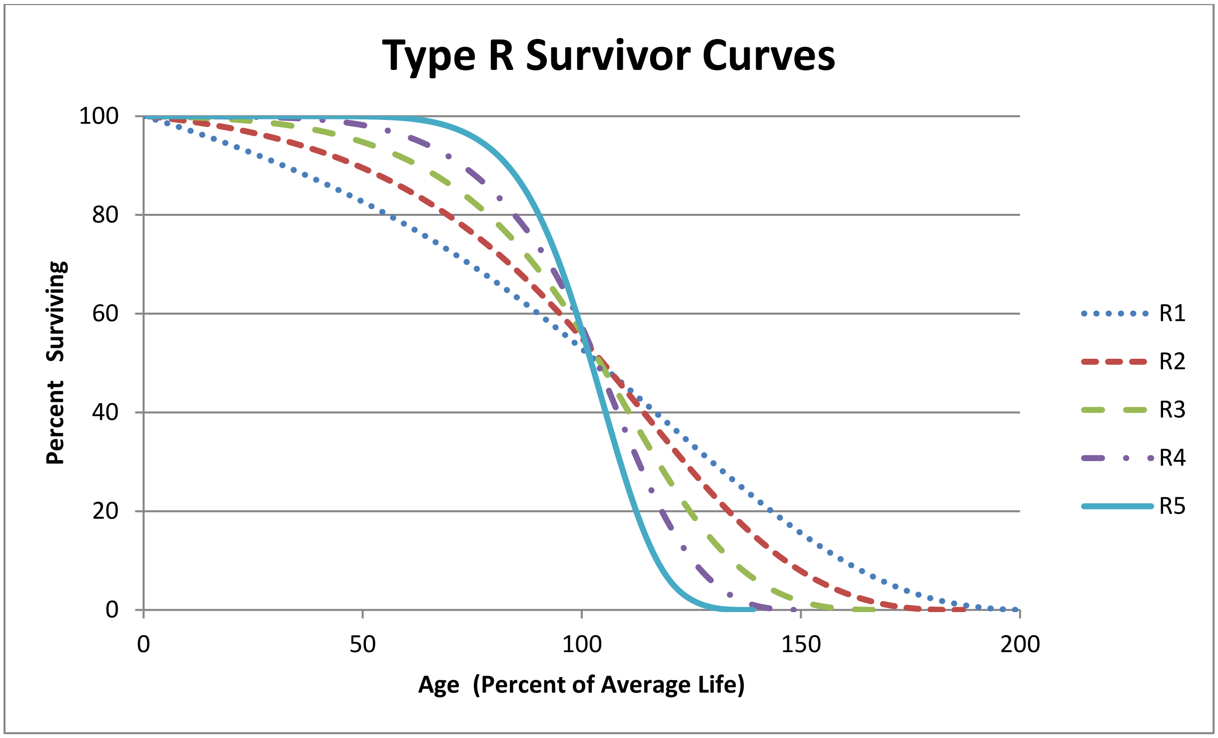
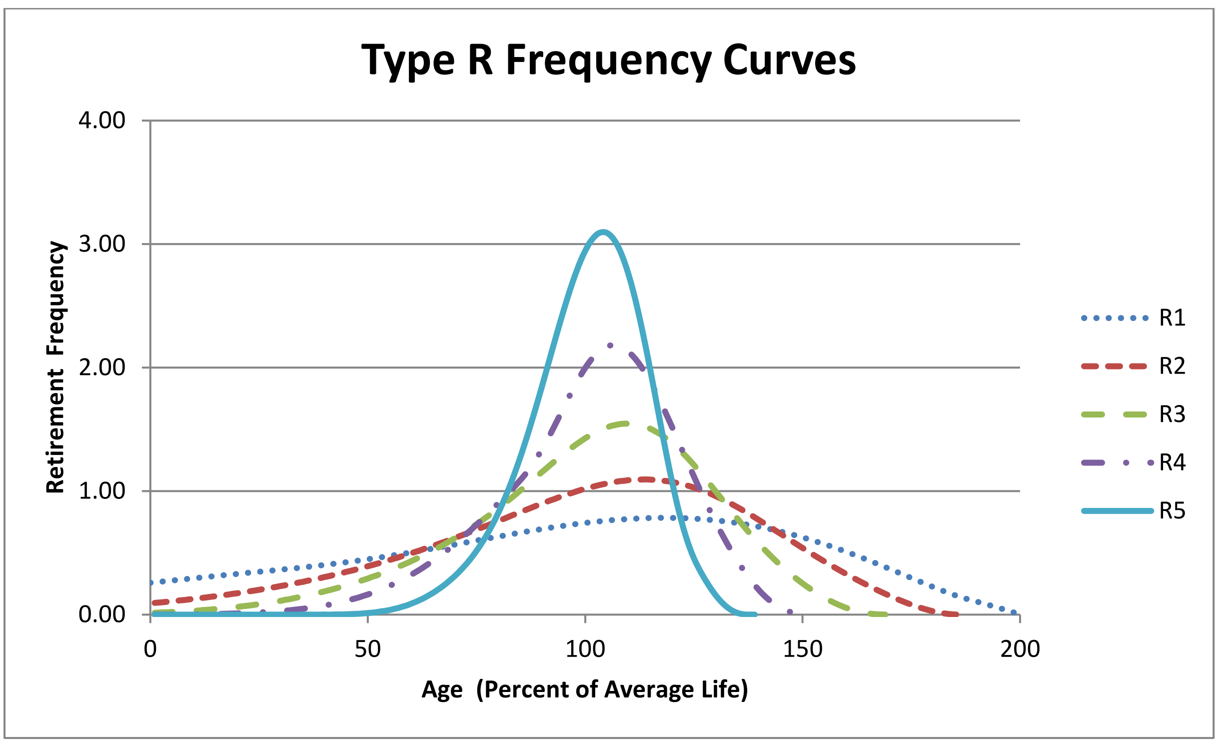


Figure 21:
Type R Survivor and Frequency Curves





As shown in the graphs above, the modes for the L family frequency curves occur to the left of average life (100% on the x-axis), while the S family modes occur at the average, and the R family modes occur after the average.

3. <u>Types of Lives</u>

Several other important statistical analyses and types of lives may be derived from an Iowa curve. These include: 1) average life; 2) realized life; 3) remaining life; and 4) probable life. The figure below illustrates these concepts. It shows the frequency curve, survivor curve, and probable life curve. Age M_x on the x-axis represents the modal age, while age AL_x represents the average age. Thus, this figure illustrates an "L type" Iowa curve since the mode occurs before the average.[67]

First, average life is the area under the survivor curve from age zero to maximum life. Because the survivor curve is measured in percent, the area under the curve must be divided by 100% to convert it from percent-years to years. The formula for average life is as follows:[68]

Equation 4:
Average Life

$$Average\ Life\ = \frac{Area\ Under\ Survivor\ Curve\ from\ Age\ 0\ to\ Max\ Life}{100\%}$$

Thus, average life may not be determined without a complete survivor curve. Many property groups being analyzed will not have experienced full retirement. This results in a "stub" survivor curve. Iowa curves are used to extend stub curves to maximum life in order for the average life calculation to be made (see Appendix C).

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[67] From age zero to age M_x on the survivor curve, it could be said that the percent surviving from this property group is decreasing at an increasing rate. Conversely, from point M_x to maximum on the survivor curve, the percent surviving is decreasing at a decreasing rate.

[68] *See* NARUC *supra* n. 7, at 71.

Realized life is similar to average life, except that realized life is the average years of service experienced to date from the vintage's original installations.[69] As shown in the figure below, realized life is the area under the survivor curve from zero to age RL_X. Likewise, unrealized life is the area under the survivor curve from age RL_X to maximum life. Thus, it could be said that average life equals realized life plus unrealized life.

Average remaining life represents the future years of service expected from the surviving property.[70] Remaining life is sometimes referred to as "average remaining life" and "life expectancy." To calculate average remaining life at age x, the area under the estimated future portion of the survivor curve is divided by the percent surviving at age x (denoted S_X). Thus, the average remaining life formula is:

Equation 5:
Average Remaining Life

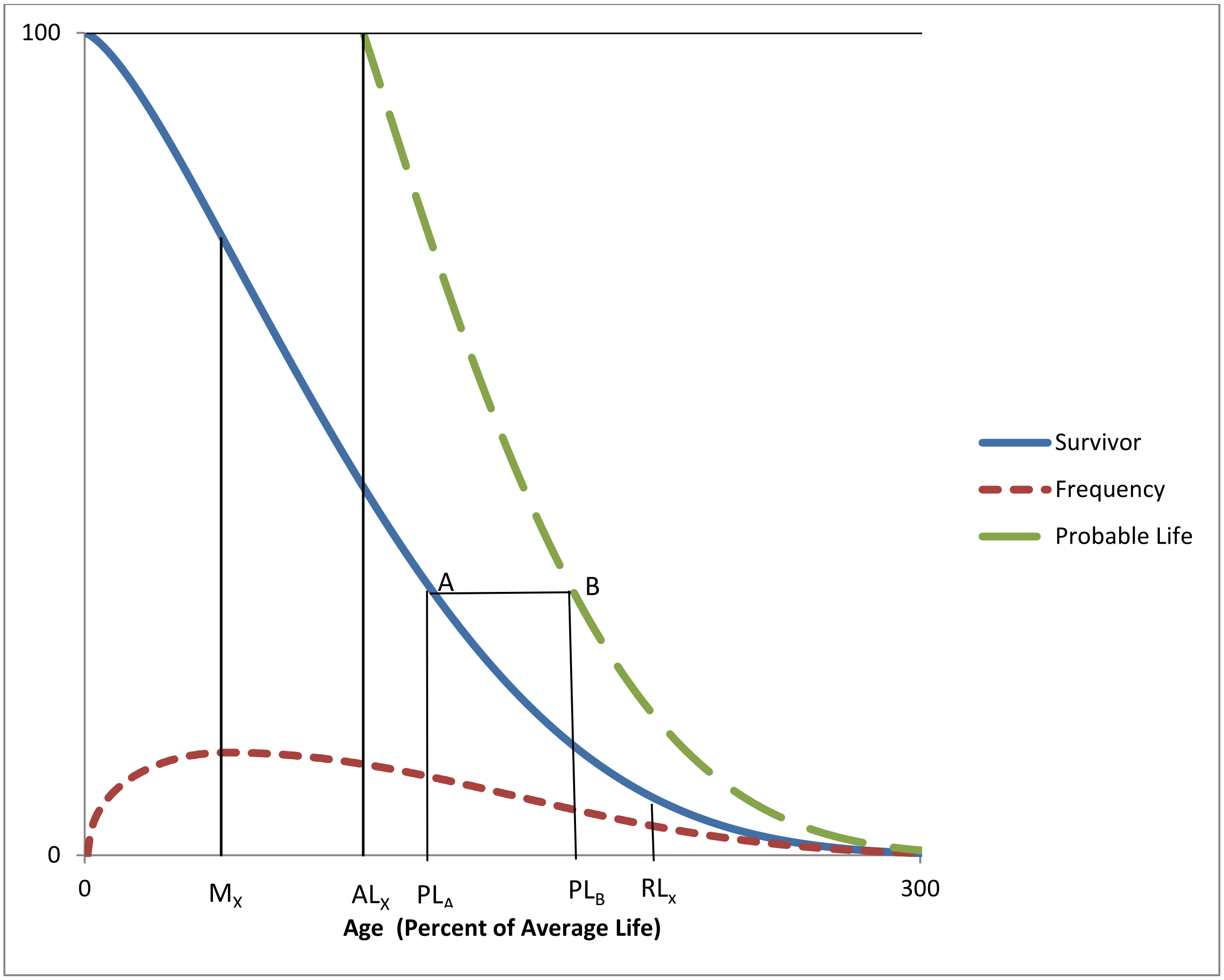
$$Average\ Remaining\ Life = \frac{Area\ Under\ Survivor\ Curve\ from\ Age\ x\ to\ Max\ Life}{S_X}$$

It is necessary to determine average remaining life to calculate the annual accrual under the remaining life technique.

[69] *Id*. at 73.

[70] *Id*. at 74.

Figure 22:
Iowa Curve Derivations



Finally, the probable life may also be determined from the Iowa curve. The probable life of a property group is the total life expectancy of the property surviving at any age and is equal to the remaining life plus the current age.[71] The probable life is also illustrated in this figure. The probable life at age PL_A is the age at point PL_B. Thus, to read the probable life at age PL_A, see the corresponding point on the survivor curve above at point "A," then horizontally to point "B" on

[71] Wolf *supra* n. 6, at 28.

the probable life curve, and back down to the age corresponding to point "B." It is no coincidence that the vertical line from AL_X connects at the top of the probable life curve. This is because at age zero, probable life equals average life.

APPENDIX C:

ACTUARIAL ANALYSIS

Actuarial science is a discipline that applies various statistical methods to assess risk probabilities and other related functions. Actuaries often study human mortality. The results from historical mortality data are used to predict how long similar groups of people who are alive today will live. Insurance companies rely on actuarial analysis in determining premiums for life insurance policies.

The study of human mortality is analogous to estimating service lives of industrial property groups. While some humans die solely from chance, most deaths are related to age; that is, death rates generally increase as age increases. Similarly, physical plant is also subject to forces of retirement. These forces include physical, functional, and contingent factors, as shown in the table below.[72]

Figure 23:
Forces of Retirement

Physical Factors	Functional Factors	Contingent Factors
Wear and tear Decay or deterioration Action of the elements	Inadequacy Obsolescence Changes in technology Regulations Managerial discretion	Casualties or disasters Extraordinary obsolescence

While actuaries study historical mortality data in order to predict how long a group of people will live, depreciation analysts must look at a utility's historical data in order to estimate the average lives of property groups. A utility's historical data is often contained in the Continuing Property Records ("CPR"). Generally, a CPR should contain 1) an inventory of property record

[72] NARUC *supra* n. 7, at 14-15.

units; 2) the association of costs with such units; and 3) the dates of installation and removal of plant. Since actuarial analysis includes the examination of historical data to forecast future retirements, the historical data used in the analysis should not contain events that are anomalous or unlikely to recur.[73] Historical data is used in the retirement rate actuarial method, which is discussed further below.

The Retirement Rate Method

There are several systematic actuarial methods that use historical data to calculate observed survivor curves for property groups. Of these methods, the retirement rate method is superior, and is widely employed by depreciation analysts.[74] The retirement rate method is ultimately used to develop an observed survivor curve, which can be fitted with an Iowa curve discussed in Appendix B to forecast average life. The observed survivor curve is calculated by using an observed life table ("OLT"). The figures below illustrate how the OLT is developed. First, historical property data are organized in a matrix format, with placement years on the left forming rows, and experience years on the top forming columns. The placement year (a.k.a. "vintage year" or "installation year") is the year of placement into service of a group of property. The experience year (a.k.a. "activity year") refers to the accounting data for a particular calendar year. The two matrices below use aged data – that is, data for which the dates of placements, retirements, transfers, and other transactions are known. Without aged data, the retirement rate actuarial method may not be employed. The first matrix is the exposure matrix, which shows the exposures

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[73] *Id*. at 112-13.

[74] Anson Marston, Robley Winfrey & Jean C. Hempstead, *Engineering Valuation and Depreciation* 154 (2nd ed., McGraw-Hill Book Company, Inc. 1953).

at the beginning of each year.[75] An exposure is simply the depreciable property subject to retirement during a period. The second matrix is the retirement matrix, which shows the annual retirements during each year. Each matrix covers placement years 2003–2015, and experience years 2008-2015. In the exposure matrix, the number in the 2012 experience column and the 2003 placement row is $192,000. This means at the beginning of 2012, there was $192,000 still exposed to retirement from the vintage group placed in 2003. Likewise, in the retirement matrix, $19,000 of the dollars invested in 2003 were retired during 2012.

Figure 24:
Exposure Matrix

	Experience Years Exposures at January 1 of Each Year (Dollars in 000's)									
Placement Years	2008	2009	2010	2011	2012	2013	2014	2015	Total at Start of Age Interval	Age Interval
2003	261	245	228	211	**192**	173	152	131	131	11.5 - 12.5
2004	267	252	236	220	202	**184**	165	145	297	10.5 - 11.5
2005	304	291	277	263	248	232	**216**	198	536	9.5 - 10.5
2006	345	334	322	310	298	284	270	**255**	**847**	8.5 - 9.5
2007	367	357	347	335	324	312	299	286	1,201	7.5 - 8.5
2008	375	366	357	347	336	325	314	302	1,581	6.5 - 7.5
2009		377	366	356	346	336	327	319	1,986	5.5 - 6.5
2010			381	369	358	347	336	327	2,404	4.5 - 5.5
2011				386	372	359	346	334	2,559	3.5 - 4.5
2012					395	380	366	352	2,722	2.5 - 3.5
2013						401	385	370	2,866	1.5 - 2.5
2014							410	393	2,998	0.5 - 1.5
2015								416	3,141	0.0 - 0.5
Total	1919	2222	2514	2796	3070	3333	3586	3827	23,268	

[75] Technically, the last numbers in each column are "gross additions" rather than exposures. Gross additions do not include adjustments and transfers applicable to plant placed in a previous year. Once retirements, adjustments, and transfers are factored in, the balance at the beginning of the next accounting period is called an "exposure" rather than an addition.

Figure 25:
Retirement Matrix

Placement Years	Experience Years Retirments During the Year (Dollars in 000's) 2008	2009	2010	2011	2012	2013	2014	2015	Total During Age Interval	Age Interval
2003	16	17	18	19	**19**	20	21	23	23	11.5 - 12.5
2004	15	16	17	17	18	**19**	20	21	43	10.5 - 11.5
2005	13	14	14	15	16	17	**17**	18	59	9.5 - 10.5
2006	11	12	12	13	13	14	15	**15**	**71**	8.5 - 9.5
2007	10	11	11	12	12	13	13	14	82	7.5 - 8.5
2008	9	9	10	10	11	11	12	13	91	6.5 - 7.5
2009		11	10	10	9	9	9	8	95	5.5 - 6.5
2010			12	11	11	10	10	9	100	4.5 - 5.5
2011				14	13	13	12	11	93	3.5 - 4.5
2012					15	14	14	13	91	2.5 - 3.5
2013						16	15	14	93	1.5 - 2.5
2014							17	16	100	0.5 - 1.5
2015								18	112	0.0 - 0.5
Total	74	89	104	121	139	157	175	194	1,052	

These matrices help visualize how exposure and retirement data are calculated for each age interval. An age interval is typically one year. A common convention is to assume that any unit installed during the year is installed in the middle of the calendar year (i.e., July 1st). This convention is called the "half-year convention" and effectively assumes that all units are installed uniformly during the year.[76] Adoption of the half-year convention leads to age intervals of 0-0.5 years, 0.5-1.5 years, etc., as shown in the matrices.

The purpose of the matrices is to calculate the totals for each age interval, which are shown in the second column from the right in each matrix. This column is calculated by adding each number from the corresponding age interval in the matrix. For example, in the exposure matrix, the total amount of exposures at the beginning of the 8.5-9.5 age interval is $847,000. This number was calculated by adding the numbers shown on the "stairs" to the left (192+184+216+255=847). The same calculation is applied to each number in the column. The amounts retired during the year

[76] Wolf *supra* n. 6, at 22.

in the retirements matrix affect the exposures at the beginning of each year in the exposures matrix. For example, the amount exposed to retirement in 2008 from the 2003 vintage is $261,000. The amount retired during 2008 from the 2003 vintage is $16,000. Thus, the amount exposed to retirement at the beginning of 2009 from the 2003 vintage is $245,000 ($261,000 - $16,000). The company's property records may contain other transactions which affect the property, including sales, transfers, and adjusting entries. Although these transactions are not shown in the matrices above, they would nonetheless affect the amount exposed to retirement at the beginning of each year.

The totaled amounts for each age interval in both matrices are used to form the exposure and retirement columns in the OLT, as shown in the chart below. This chart also shows the retirement ratio and the survivor ratio for each age interval. The retirement ratio for an age interval is the ratio of retirements during the interval to the property exposed to retirement at the beginning of the interval. The retirement ratio represents the probability that the property surviving at the beginning of an age interval will be retired during the interval. The survivor ratio is simply the complement to the retirement ratio (1 – retirement ratio). The survivor ratio represents the probability that the property surviving at the beginning of an age interval will survive to the next age interval.

Figure 26:
Observed Life Table

Age at Start of Interval	Exposures at Start of Age Interval	Retirements During Age Interval	Retirement Ratio	Survivor Ratio	Percent Surviving at Start of Age Interval
A	B	C	D = C / B	E = 1 - D	F
0.0	3,141	112	0.036	0.964	**100.00**
0.5	2,998	100	0.033	0.967	**96.43**
1.5	2,866	93	0.032	0.968	**93.21**
2.5	2,722	91	0.033	0.967	**90.19**
3.5	2,559	93	0.037	0.963	**87.19**
4.5	2,404	100	0.042	0.958	**84.01**
5.5	1,986	95	0.048	0.952	**80.50**
6.5	1,581	91	0.058	0.942	**76.67**
7.5	1,201	82	0.068	0.932	**72.26**
8.5	847	71	0.084	0.916	**67.31**
9.5	536	59	0.110	0.890	**61.63**
10.5	297	43	0.143	0.857	**54.87**
11.5	131	23	0.172	0.828	**47.01**
					38.91
Total	23,268	1,052			

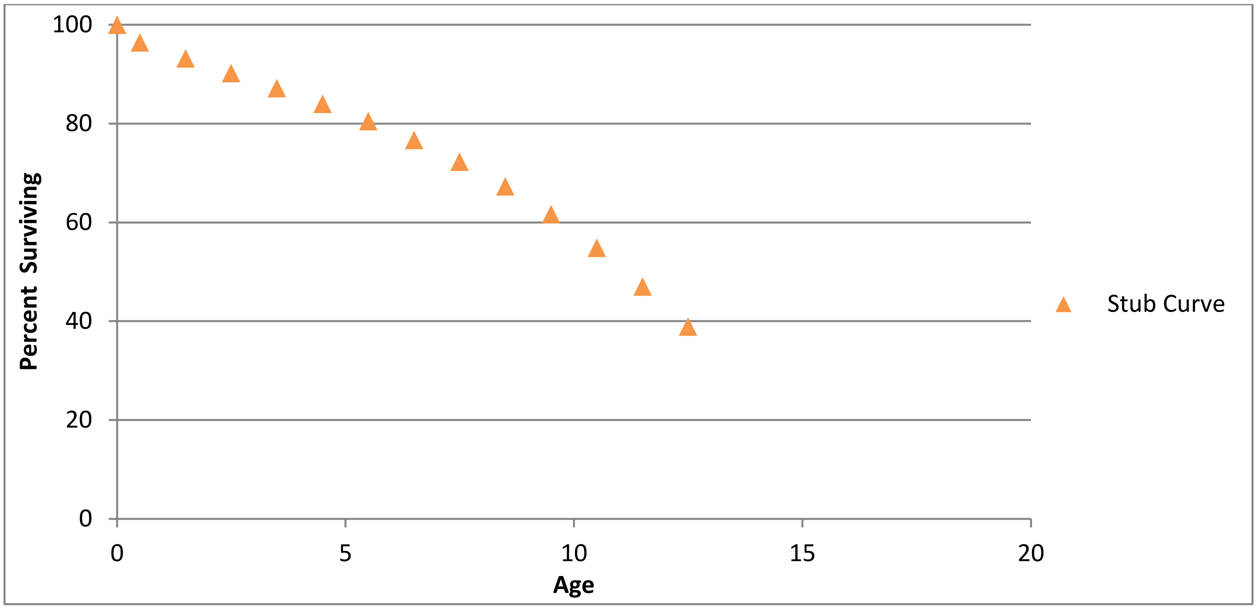
Column F on the right shows the percentages surviving at the beginning of each age interval. This column starts at 100% surviving. Each consecutive number below is calculated by multiplying the percent surviving from the previous age interval by the corresponding survivor ratio for that age interval. For example, the percent surviving at the start of age interval 1.5 is 93.21%, which was calculated by multiplying the percent surviving for age interval 0.5 (96.43%) by the survivor ratio for age interval 0.5 (0.967)[77].

The percentages surviving in Column F are the numbers that are used to form the original survivor curve. This particular curve starts at 100% surviving and ends at 38.91% surviving. An

[77] Multiplying 96.43 by 0.967 does not equal 93.21 exactly due to rounding.

observed survivor curve such as this that does not reach zero percent surviving is called a "stub" curve. The figure below illustrates the stub survivor curve derived from the OLT above.

Figure 27:
Original "Stub" Survivor Curve



The matrices used to develop the basic OLT and stub survivor curve provide a basic illustration of the retirement rate method in that only a few placement and experience years were used. In reality, analysts may have several decades of aged property data to analyze. In that case, it may be useful to use a technique called "banding" in order to identify trends in the data.

Banding

The forces of retirement and characteristics of industrial property are constantly changing. A depreciation analyst may examine the magnitude of these changes. Analysts often use a technique called "banding" to assist with this process. Banding refers to the merging of several years of data into a single data set for further analysis, and it is a common technique associated with the retirement rate method.[78] There are three primary benefits of using bands in depreciation analysis:

1. Increasing the sample size. In statistical analyses, the larger the sample size in relation to the body of total data, the greater the reliability of the result;

2. Smooth the observed data. Generally, the data obtained from a single activity or vintage year will not produce an observed life table that can be easily fit; and

3. Identify trends. By looking at successive bands, the analyst may identify broad trends in the data that may be useful in projecting the future life characteristics of the property.[79]

Two common types of banding methods are the "placement band" method and the "experience band" method." A placement band, as the name implies, isolates selected placement years for analysis. The figure below illustrates the same exposure matrix shown above, except that only the placement years 2005-2008 are considered in calculating the total exposures at the beginning of each age interval.

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[78] NARUC *supra* n. 7, at 113.

[79] *Id*.

**Figure 28:
Placement Bands**

Placement Years	Experience Years Exposures at January 1 of Each Year (Dollars in 000's) 2008	2009	2010	2011	2012	2013	2014	2015	Total at Start of Age Interval	Age Interval
2003	261	245	228	211	192	173	152	131		11.5 - 12.5
2004	267	252	236	220	202	184	165	145		10.5 - 11.5
2005	304	291	277	263	248	232	216	198	198	9.5 - 10.5
2006	345	334	322	310	298	284	270	255	471	8.5 - 9.5
2007	367	357	347	335	324	312	299	286	788	7.5 - 8.5
2008	375	366	357	347	336	325	314	302	1,133	6.5 - 7.5
2009		377	366	356	346	336	327	319	1,186	5.5 - 6.5
2010			381	369	358	347	336	327	1,237	4.5 - 5.5
2011				386	372	359	346	334	1,285	3.5 - 4.5
2012					395	380	366	352	1,331	2.5 - 3.5
2013						401	385	370	1,059	1.5 - 2.5
2014							410	393	733	0.5 - 1.5
2015								416	375	0.0 - 0.5
Total	1919	2222	2514	2796	3070	3333	3586	3827	9,796	

The shaded cells within the placement band equal the total exposures at the beginning of age interval 4.5–5.5 ($1,237). The same placement band would be used for the retirement matrix covering the same placement years of 2005 – 2008. This of course would result in a different OLT and original stub survivor curve than those that were calculated above without the restriction of a placement band.

Analysts often use placement bands for comparing the survivor characteristics of properties with different physical characteristics.[80] Placement bands allow analysts to isolate the effects of changes in technology and materials that occur in successive generations of plant. For example, if in 2005 an electric utility began placing transmission poles into service with a special chemical treatment that extended the service lives of those poles, an analyst could use placement bands to isolate and analyze the effect of that change in the property group's physical characteristics. While placement bands are very useful in depreciation analysis, they also possess an intrinsic dilemma.

80 Wolf *supra* n. 6, at 182.

A fundamental characteristic of placement bands is that they yield fairly complete survivor curves for older vintages. However, with newer vintages, which are arguably more valuable for forecasting, placement bands yield shorter survivor curves. Longer "stub" curves are considered more valuable for forecasting average life. Thus, an analyst must select a band width broad enough to provide confidence in the reliability of the resulting curve fit yet narrow enough so that an emerging trend may be observed.[81]

Analysts also use "experience bands." Experience bands show the composite retirement history for all vintages during a select set of activity years. The figure below shows the same data presented in the previous exposure matrices, except that the experience band from 2011 – 2013 is isolated, resulting in different interval totals.

Figure 29:
Experience Bands

	Experience Years Exposures at January 1 of Each Year (Dollars in 000's)									
Placement Years	2008	2009	2010	2011	2012	2013	2014	2015	Total at Start of Age Interval	Age Interval
2003	261	245	228	211	192	173	152	131		11.5 - 12.5
2004	267	252	236	220	202	184	165	145		10.5 - 11.5
2005	304	291	277	263	248	232	216	198	173	9.5 - 10.5
2006	345	334	322	310	298	284	270	255	376	8.5 - 9.5
2007	367	357	347	335	324	312	299	286	645	7.5 - 8.5
2008	375	366	357	347	336	325	314	302	752	6.5 - 7.5
2009		377	366	356	346	336	327	319	872	5.5 - 6.5
2010			381	369	358	347	336	327	959	4.5 - 5.5
2011				386	372	359	346	334	1,008	3.5 - 4.5
2012					395	380	366	352	1,039	2.5 - 3.5
2013						401	385	370	1,072	1.5 - 2.5
2014							410	393	1,121	0.5 - 1.5
2015								416	1,182	0.0 - 0.5
Total	1919	2222	2514	2796	3070	3333	3586	3827	9,199	

The shaded cells within the experience band equal the total exposures at the beginning of age interval 4.5–5.5 ($1,237). The same experience band would be used for the retirement matrix

[81] NARUC *supra* n. 7, at 114.

covering the same experience years of 2011 – 2013. This of course would result in a different OLT and original stub survivor than if the band had not been used. Analysts often use experience bands to isolate and analyze the effects of an operating environment over time.[82] Likewise, the use of experience bands allows analysis of the effects of an unusual environmental event. For example, if an unusually severe ice storm occurred in 2013, destruction from that storm would affect an electric utility's line transformers of all ages. That is, each of the line transformers from each placement year would be affected, including those recently installed in 2012, as well as those installed in 2003. Using experience bands, an analyst could isolate or even eliminate the 2013 experience year from the analysis. In contrast, a placement band would not effectively isolate the ice storm's effect on life characteristics. Rather, the placement band would show an unusually large rate of retirement during 2013, making it more difficult to accurately fit the data with a smooth Iowa curve. Experience bands tend to yield the most complete stub curves for recent bands because they have the greatest number of vintages included. Longer stub curves are better for forecasting. The experience bands, however, may also result in more erratic retirement dispersion making the curve fitting process more difficult.

Depreciation analysts must use professional judgment in determining the types of bands to use and the band widths. In practice, analysts may use various combinations of placement and experience bands in order to increase the data sample size, identify trends and changes in life characteristics, and isolate unusual events. Regardless of which bands are used, observed survivor curves in depreciation analysis rarely reach zero percent. This is because, as seen in the OLT above, relatively newer vintage groups have not yet been fully retired at the time the property is

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[82] *Id*.

studied. An analyst could confine the analysis to older, fully retired vintage groups to get complete survivor curves, but such analysis would ignore some of the property currently in service and would arguably not provide an accurate description of life characteristics for current plant in service. Because a complete curve is necessary to calculate the average life of the property group, however, curve fitting techniques using Iowa curves or other standardized curves may be employed in order to complete the stub curve.

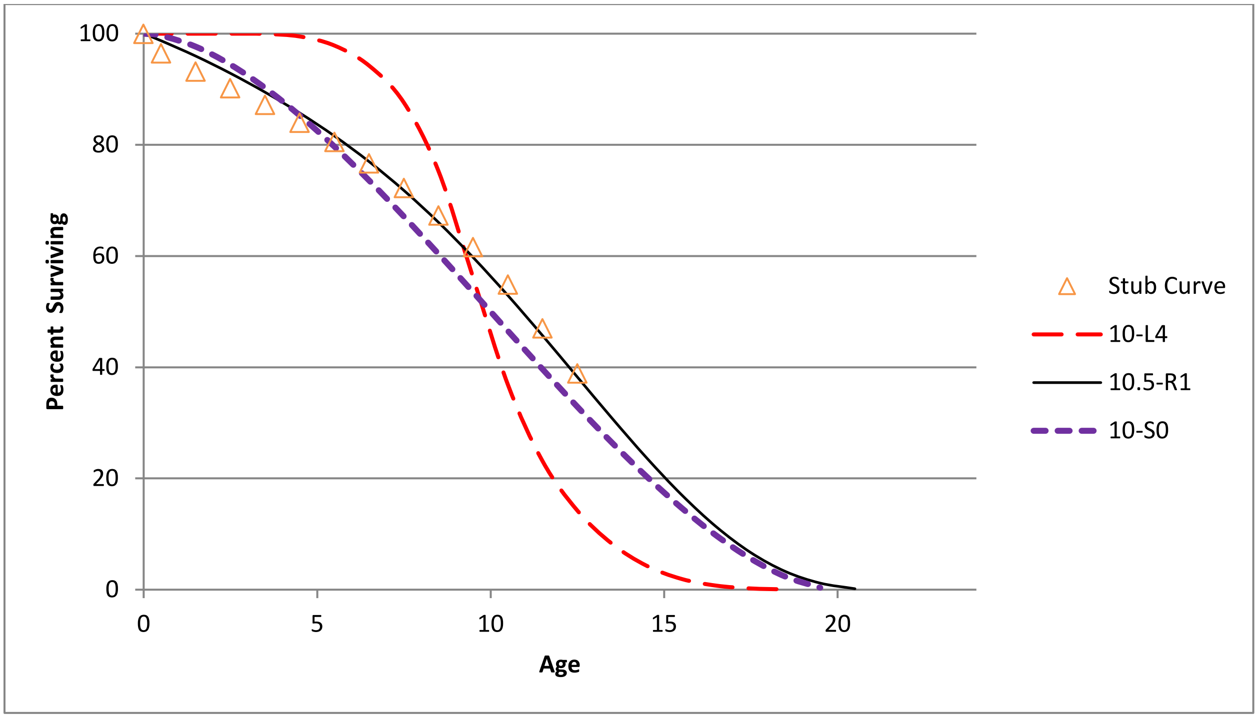
Curve Fitting

Depreciation analysts typically use the survivor curve rather than the frequency curve to fit the observed stub curves. The most commonly used generalized survivor curves in the curve fitting process are the Iowa curves discussed above. As Wolf notes, if "the Iowa curves are adopted as a model, an underlying assumption is that the process describing the retirement pattern is one of the 22 [or more] processes described by the Iowa curves."[83]

Curve fitting may be done through visual matching or mathematical matching. In visual curve fitting, the analyst visually examines the plotted data to make an initial judgment about the Iowa curves that may be a good fit. The figure below illustrates the stub survivor curve shown above. It also shows three different Iowa curves: the 10-L4, the 10.5-R1, and the 10-S0. Visually, it is clear that the 10.5-R1 curve is a better fit than the other two curves.

[83] Wolf *supra* n. 6, at 46 (22 curves includes Winfrey's 18 original curves plus Cowles's four "O" type curves).

Figure 30:
Visual Curve Fitting



In mathematical fitting, the least squares method is used to calculate the best fit. This mathematical method would be excessively time consuming if done by hand. With the use of modern computer software however, mathematical fitting is an efficient and useful process. The typical logic for a computer program, as well as the software employed for the analysis in this testimony is as follows:

> First (an Iowa curve) curve is arbitrarily selected. . . . If the observed curve is a stub curve, . . . calculate the area under the curve and up to the age at final data point. Call this area the realized life. Then systematically vary the average life of the theoretical survivor curve and calculate its realized life at the age corresponding to the study date. This trial and error procedure ends when you find an average life such that the realized life of the theoretical curve equals the realized life of the observed curve. Call this the average life.
>
> Once the average life is found, calculate the difference between each percent surviving point on the observed survivor curve and the corresponding point on the Iowa curve. Square each difference and sum them. The sum of squares is used as a measure of goodness of fit for that particular Iowa type curve. This procedure is

> repeated for the remaining 21 Iowa type curves. The "best fit" is declared to be the type of curve that minimizes the sum of differences squared.[84]

Mathematical fitting requires less judgment from the analyst and is thus less subjective. Blind reliance on mathematical fitting, however, may lead to poor estimates. Thus, analysts should employ both mathematical and visual curve fitting in reaching their final estimates. This way, analysts may utilize the objective nature of mathematical fitting while still employing professional judgment. As Wolf notes: "The results of mathematical curve fitting serve as a guide for the analyst and speed the visual fitting process. But the results of the mathematical fitting should be checked visually, and the final determination of the best fit be made by the analyst."[85]

In the graph above, visual fitting was sufficient to determine that the 10.5-R1 Iowa curve was a better fit than the 10-L4 and the 10-S0 curves. Using the sum of least squares method, mathematical fitting confirms the same result. In the chart below, the percentages surviving from the OLT that formed the original stub curve are shown in the left column, while the corresponding percentages surviving for each age interval are shown for the three Iowa curves. The right portion of the chart shows the differences between the points on each Iowa curve and the stub curve. These differences are summed at the bottom. Curve 10.5-R1 is the best fit because the sum of the squared differences for this curve is less than the same sum for the other two curves. Curve 10-L4 is the worst fit, which was also confirmed visually.

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[84] Wolf *supra* n. 6, at 47.

[85] *Id*. at 48.

Figure 31:
Mathematical Fitting

Age Interval	Stub Curve	Iowa Curves 10-L4	Iowa Curves 10-S0	Iowa Curves 10.5-R1	Squared Differences 10-L4	Squared Differences 10-S0	Squared Differences 10.5-R1
0.0	100.0	100.0	100.0	100.0	0.0	0.0	0.0
0.5	96.4	100.0	99.7	98.7	12.7	10.3	5.3
1.5	93.2	100.0	97.7	96.0	46.1	19.8	7.6
2.5	90.2	100.0	94.4	92.9	96.2	18.0	7.2
3.5	87.2	100.0	90.2	89.5	162.9	9.3	5.2
4.5	84.0	99.5	85.3	85.7	239.9	1.6	2.9
5.5	80.5	97.9	79.7	81.6	301.1	0.7	1.2
6.5	76.7	94.2	73.6	77.0	308.5	9.5	0.1
7.5	72.3	87.6	67.1	71.8	235.2	26.5	0.2
8.5	67.3	75.2	60.4	66.1	62.7	48.2	1.6
9.5	61.6	56.0	53.5	59.7	31.4	66.6	3.6
10.5	54.9	36.8	46.5	52.9	325.4	69.6	3.9
11.5	47.0	23.1	39.6	45.7	572.6	54.4	1.8
12.5	38.9	14.2	32.9	38.2	609.6	36.2	0.4
SUM					**3004.2**	**371.0**	**41.0**

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EDUCATION

University of Oklahoma — Norman, OK
Master of Business Administration — 2014
Areas of Concentration: Finance, Energy

University of Oklahoma College of Law — Norman, OK
Juris Doctor — 2007
Member, American Indian Law Review

University of Oklahoma — Norman, OK
Bachelor of Business Administration — 2003
Major: Finance

PROFESSIONAL DESIGNATIONS

Society of Depreciation Professionals
Certified Depreciation Professional (CDP)

Society of Utility and Regulatory Financial Analysts
Certified Rate of Return Analyst (CRRA)

The Mediation Institute
Certified Civil / Commercial & Employment Mediator

WORK EXPERIENCE

Resolve Utility Consulting PLLC — Oklahoma City, OK
Managing Member — 2016 – Present
Provide expert analysis and testimony specializing in depreciation and cost of capital issues for clients in utility regulatory proceedings.

Oklahoma Corporation Commission — Oklahoma City, OK
Public Utility Regulatory Analyst — 2012 – 2016
Assistant General Counsel — 2011 – 2012
Represented commission staff in utility regulatory proceedings and provided legal opinions to commissioners. Provided expert analysis and testimony in depreciation, cost of capital, incentive compensation, payroll and other issues.

Perebus Counsel, PLLC — Oklahoma City, OK
Managing Member — 2009 – 2011
Represented clients in the areas of family law, estate planning, debt negotiations, business organization, and utility regulation.

Moricoli & Schovanec, P.C. — Oklahoma City, OK
Associate Attorney — 2007 – 2009
Represented clients in the areas of contracts, oil and gas, business structures and estate administration.

TEACHING EXPERIENCE

University of Oklahoma — Norman, OK
Adjunct Instructor – "Conflict Resolution" — 2014 – Present
Adjunct Instructor – "Ethics in Leadership"

Rose State College — Midwest City, OK
Adjunct Instructor – "Legal Research" — 2013 – 2015
Adjunct Instructor – "Oil & Gas Law"

PUBLICATIONS

American Indian Law Review — Norman, OK
"Vine of the Dead: Reviving Equal Protection Rites for Religious Drug Use" — 2006
(31 Am. Indian L. Rev. 143)

VOLUNTEER EXPERIENCE

Calm Waters — Oklahoma City, OK
Board Member — 2015 – 2018
Participate in management of operations, attend meetings, review performance, compensation, and financial records. Assist in fundraising events.

Group Facilitator & Fundraiser — 2014 – 2018
Facilitate group meetings designed to help children and families cope with divorce and tragic events. Assist in fundraising events.

St. Jude Children's Research Hospital — Oklahoma City, OK
Oklahoma Fundraising Committee — 2008 – 2010
Raised money for charity by organizing local fundraising events.

PROFESSIONAL ASSOCIATIONS

Oklahoma Bar Association — 2007 – Present

Society of Depreciation Professionals — 2014 – Present
Board Member – President — 2017
Participate in management of operations, attend meetings, review performance, organize presentation agenda.

Society of Utility Regulatory Financial Analysts — 2014 – Present

SELECTED CONTINUING PROFESSIONAL EDUCATION

Society of Depreciation Professionals — Austin, TX
"Life and Net Salvage Analysis" — 2015
Extensive instruction on utility depreciation, including actuarial and simulation life analysis modes, gross salvage, cost of removal, life cycle analysis, and technology forecasting.

Society of Depreciation Professionals — New Orleans, LA
"Introduction to Depreciation" and "Extended Training" — 2014
Extensive instruction on utility depreciation, including average lives and net salvage.

Society of Utility and Regulatory Financial Analysts — Indianapolis, IN
46th Financial Forum. "The Regulatory Compact: Is it Still Relevant?" — 2014
Forum discussions on current issues.

New Mexico State University, Center for Public Utilities — Santa Fe, NM
Current Issues 2012, "The Santa Fe Conference" — 2012
Forum discussions on various current issues in utility regulation.

Michigan State University, Institute of Public Utilities — Clearwater, FL
"39th Eastern NARUC Utility Rate School" — 2011
One-week, hands-on training emphasizing the fundamentals of the utility ratemaking process.

New Mexico State University, Center for Public Utilities — Albuquerque, NM
"The Basics: Practical Regulatory Training for the Changing Electric Industries" — 2010
One-week, hands-on training designed to provide a solid foundation in core areas of utility ratemaking.

The Mediation Institute — Oklahoma City, OK
"Civil / Commercial & Employment Mediation Training" — 2009
Extensive instruction and mock mediations designed to build foundations in conducting mediations in civil matters.

Utility Regulatory Proceedings

Regulatory Agency	Utility Applicant	Docket Number	Issues Addressed	Parties Represented
New Mexico Public Regulation Commission	Southwestern Public Service Company	19-00170-UT	Cost of capital and authorized rate of return	The New Mexico Large Customer Group; Occidental Permian
Indiana Utility Regulatory Commission	Duke Energy Indiana	45253	Cost of capital, depreciation rates, net salvage	Indiana Office of Utility Consumer Counselor
Maryland Public Service Commission	Columbia Gas of Maryland	9609	Depreciation rates, service lives, net salvage	Maryland Office of People's Counsel
Washington Utilities & Transportation Commission	Avista Corporation	UE-190334	Cost of capital, awarded rate of return, capital structure	Washington Office of Attorney General
Indiana Utility Regulatory Commission	Indiana Michigan Power Company	45235	Cost of capital, depreciation rates, net salvage	Indiana Office of Utility Consumer Counselor
Public Utilities Commission of the State of California	Pacific Gas & Electric Company	18-12-009	Depreciation rates, service lives, net salvage	The Utility Reform Network
Oklahoma Corporation Commission	The Empire District Electric Company	PUD 201800133	Cost of capital, authorized ROE, depreciation rates	Oklahoma Industrial Energy Consumers and Oklahoma Energy Results
Arkansas Public Service Commission	Southwestern Electric Power Company	19-008-U	Cost of capital, depreciation rates, net salvage	Western Arkansas Large Energy Consumers
Public Utility Commission of Texas	CenterPoint Energy Houston Electric	PUC 49421	Depreciation rates, service lives, net salvage	Texas Coast Utilities Coalition
Massachusetts Department of Public Utilities	Massachusetts Electric Company and Nantucket Electric Company	D.P.U. 18-150	Depreciation rates, service lives, net salvage	Massachusetts Office of the Attorney General, Office of Ratepayer Advocacy
Oklahoma Corporation Commission	Oklahoma Gas & Electric Company	PUD 201800140	Cost of capital, authorized ROE, depreciation rates	Oklahoma Industrial Energy Consumers and Oklahoma Energy Results
Public Service Commission of the State of Montana	Montana-Dakota Utilities Company	D2018.9.60	Depreciation rates, service lives, net salvage	Montana Consumer Counsel and Denbury Onshore
Indiana Utility Regulatory Commission	Northern Indiana Public Service Company	45159	Depreciation rates, grouping procedure, demolition costs	Indiana Office of Utility Consumer Counselor
Public Service Commission of the State of Montana	NorthWestern Energy	D2018.2.12	Depreciation rates, service lives, net salvage	Montana Consumer Counsel
Oklahoma Corporation Commission	Public Service Company of Oklahoma	PUD 201800097	Depreciation rates, service lives, net salvage	Oklahoma Industrial Energy Consumers and Wal-Mart
Nevada Public Utilities Commission	Southwest Gas Corporation	18-05031	Depreciation rates, service lives, net salvage	Nevada Bureau of Consumer Protection
Public Utility Commission of Texas	Texas-New Mexico Power Company	PUC 48401	Depreciation rates, service lives, net salvage	Alliance of Texas-New Mexico Power Municipalities

Utility Regulatory Proceedings

Regulatory Agency	Utility Applicant	Docket Number	Issues Addressed	Parties Represented
Oklahoma Corporation Commission	Oklahoma Gas & Electric Company	PUD 201700496	Depreciation rates, service lives, net salvage	Oklahoma Industrial Energy Consumers and Oklahoma Energy Results
Maryland Public Service Commission	Washington Gas Light Company	9481	Depreciation rates, service lives, net salvage	Maryland Office of People's Counsel
Indiana Utility Regulatory Commission	Citizens Energy Group	45039	Depreciation rates, service lives, net salvage	Indiana Office of Utility Consumer Counselor
Public Utility Commission of Texas	Entergy Texas, Inc.	PUC 48371	Depreciation rates, decommissioning costs	Texas Municipal Group
Washington Utilities & Transportation Commission	Avista Corporation	UE-180167	Depreciation rates, service lives, net salvage	Washington Office of Attorney General
New Mexico Public Regulation Commission	Southwestern Public Service Company	17-00255-UT	Cost of capital and authorized rate of return	HollyFrontier Navajo Refining; Occidental Permian
Public Utility Commission of Texas	Southwestern Public Service Company	PUC 47527	Depreciation rates, plant service lives	Alliance of Xcel Municipalities
Public Service Commission of the State of Montana	Montana-Dakota Utilities Company	D2017.9.79	Depreciation rates, service lives, net salvage	Montana Consumer Counsel
Florida Public Service Commission	Florida City Gas	20170179-GU	Cost of capital, depreciation rates	Florida Office of Public Counsel
Washington Utilities & Transportation Commission	Avista Corporation	UE-170485	Cost of capital and authorized rate of return	Washington Office of Attorney General
Wyoming Public Service Commission	Powder River Energy Corporation	10014-182-CA-17	Credit analysis, cost of capital	Private customer
Oklahoma Corporation Commission	Public Service Co. of Oklahoma	PUD 201700151	Depreciation, terminal salvage, risk analysis	Oklahoma Industrial Energy Consumers
Public Utility Commission of Texas	Oncor Electric Delivery Company	PUC 46957	Depreciation rates, simulated analysis	Alliance of Oncor Cities
Nevada Public Utilities Commission	Nevada Power Company	17-06004	Depreciation rates, service lives, net salvage	Nevada Bureau of Consumer Protection
Public Utility Commission of Texas	El Paso Electric Company	PUC 46831	Depreciation rates, interim retirements	City of El Paso
Idaho Public Utilities Commission	Idaho Power Company	IPC-E-16-24	Accelerated depreciation of North Valmy plant	Micron Technology, Inc.
Idaho Public Utilities Commission	Idaho Power Company	IPC-E-16-23	Depreciation rates, service lives, net salvage	Micron Technology, Inc.

Utility Regulatory Proceedings

Regulatory Agency	Utility Applicant	Docket Number	Issues Addressed	Parties Represented
Public Utility Commission of Texas	Southwestern Electric Power Company	PUC 46449	Depreciation rates, decommissioning costs	Cities Advocating Reasonable Deregulation
Massachusetts Department of Public Utilities	Eversource Energy	D.P.U. 17-05	Cost of capital, capital structure, and rate of return	Sunrun Inc.; Energy Freedom Coalition of America
Railroad Commission of Texas	Atmos Pipeline - Texas	GUD 10580	Depreciation rates, grouping procedure	City of Dallas
Public Utility Commission of Texas	Sharyland Utility Company	PUC 45414	Depreciation rates, simulated analysis	City of Mission
Oklahoma Corporation Commission	Empire District Electric Company	PUD 201600468	Cost of capital, depreciation rates	Oklahoma Industrial Energy Consumers
Railroad Commission of Texas	CenterPoint Energy Texas Gas	GUD 10567	Depreciation rates, simulated plant analysis	Texas Coast Utilities Coalition
Arkansas Public Service Commission	Oklahoma Gas & Electric Company	160-159-GU	Cost of capital, depreciation rates, terminal salvage	Arkansas River Valley Energy Consumers; Wal-Mart
Florida Public Service Commission	Peoples Gas	160-159-GU	Depreciation rates, service lives, net salvage	Florida Office of Public Counsel
Arizona Corporation Commission	Arizona Public Service Company	E-01345A-16-0036	Cost of capital, depreciation rates, terminal salvage	Energy Freedom Coalition of America
Nevada Public Utilities Commission	Sierra Pacific Power Company	16-06008	Depreciation rates, net salvage, theoretical reserve	Northern Nevada Utility Customers
Oklahoma Corporation Commission	Oklahoma Gas & Electric Co.	PUD 201500273	Cost of capital, depreciation rates, terminal salvage	Public Utility Division
Oklahoma Corporation Commission	Public Service Co. of Oklahoma	PUD 201500208	Cost of capital, depreciation rates, terminal salvage	Public Utility Division
Oklahoma Corporation Commission	Oklahoma Natural Gas Company	PUD 201500213	Cost of capital, depreciation rates, net salvage	Public Utility Division

Summary Depreciation Accrual Adjustment

	[1]	[2]	[3]	[4]
Plant Function	Plant Balance 12/31/2018	BGWC Proposed Accrual	ORS Proposed Accrual	**ORS Adjustment**
Water Plant	$ 44,265,998	$ 1,798,816	$ 1,436,138	$ (362,678)
Wastewater Plant	51,148,886	1,700,188	1,309,987	(390,201)
Total	$ 95,414,884	$ 3,499,004	$ 2,746,126	**$ (752,878)**

[1], [2] From depreciation study

[3] From Exhibits DJG-3 (water) and DJG-5 (wastewater)

[4] = [3] - [2]

Depreciation Parameter Comparison

		BGWC Proposed					ORS Proposed				
Account		Net	Iowa Curve		Depr	Annual	Net	Iowa Curve		Depr	Annual
No.	Description	Salvage	Type	AL	Rate	Accrual	Salvage	Type	AL	Rate	Accrual
	WATER PLANT										
1050	SOURCE OF SUPPLY	-5.0%	R3	50	2.76%	98,006	-5.0%	R2.5	55	2.24%	79,477
1055	WATER TREATMENT	-5.0%	R3	50	2.61%	34,468	-5.0%	R2.5	55	2.12%	28,037
1060	T&D STRUC. & IMPROV.	-5.0%	R3	50	2.19%	671	-5.0%	R2.5	55	1.95%	598
1065	GENERAL	-5.0%	R3	50	2.26%	6,303	-5.0%	R2.5	55	1.97%	5,510
1080	WELLS AND SPRINGS	-5.0%	R1.5	45	3.85%	110,830	-5.0%	R0.5	55	2.30%	66,107
1100	SOURCE OF SUPPLY	-10.0%	R0.5	30	4.53%	51,694	-5.0%	R0.5	30	4.31%	49,146
1105	WATER TREATMENT	-10.0%	R0.5	30	5.00%	101,923	-5.0%	R0.5	30	4.73%	96,524
1110	T&D PUMING EQUIP.	-10.0%	R0.5	30	4.76%	44,287	-5.0%	R0.5	30	4.53%	42,194
1115	WATER TREATMENT EQUIP.	-10.0%	R1.5	30	6.77%	123,921	-5.0%	R0.5	42	2.85%	52,234
1120	DIST. RESERVOIRS	-15.0%	S0.5	35	4.40%	316,417	-10.0%	S0	40	3.17%	227,805
1125	TRANS. AND DIST. MAINS	-10.0%	R2	70	1.85%	218,560	-5.0%	R1	95	1.10%	129,573
1130	SERVICES	-20.0%	L2	26	7.00%	375,698	-10.0%	L2	26	6.40%	343,219
1145	HYDRANTS	-15.0%	R1.5	55	2.47%	9,692	-10.0%	R1.5	55	2.35%	9,217
	WASTEWATER PLANT										
1290	COLLECTION	-5.0%	R1.5	50	3.68%	3,173	-5.0%	L1	55	2.57%	2,217
1295	PUMPING	-5.0%	R1.5	50	2.85%	53,797	-5.0%	L1	55	2.30%	43,469
1300	TREATMENT	-5.0%	R1.5	50	2.34%	114,767	-5.0%	L1	55	2.03%	99,279
1305	RECLAIM WTP	-5.0%	R1.5	50	2.24%	281	-5.0%	L1	55	1.98%	248
1310	RECLAIM WTR	-5.0%	R1.5	50	3.41%	904	-5.0%	L1	55	2.32%	616
1315	GENERAL	-5.0%	R1.5	50	2.15%	41,475	-5.0%	L1	55	1.94%	37,521
1345	FORCE MAINS	-10.0%	S0	65	1.98%	76,151	-5.0%	S0	65	1.88%	72,107
1350	GRAVITY MAINS	-10.0%	S1.5	70	1.78%	204,766	-5.0%	S1.5	95	1.10%	126,875
1353	MANHOLES	-10.0%	R3	65	3.37%	48,235	-5.0%	R3	65	3.21%	45,911
1360	SERVICES TO CUSTOMERS	-20.0%	S0	45	3.86%	136,283	-10.0%	L0	53	2.36%	83,507
1380	PUMPING	-10.0%	L0.5	30	4.77%	313,049	-5.0%	L0.5	30	4.54%	298,128
1385	RECLAIM WTP	-10.0%	L0.5	30	5.79%	12,881	-5.0%	L0.5	30	5.53%	12,294
1390	RECLAIM WTR	-10.0%	L0.5	30	5.49%	6,884	-5.0%	L0.5	30	5.24%	6,574
1395	LAGOON	-10.0%	R0.5	35	3.63%	76,300	-5.0%	O1	40	2.81%	58,986
1400	TREATMENT	-10.0%	R0.5	35	4.73%	547,943	-5.0%	O1	40	3.10%	358,978
1405	RECLAIM WTP	-10.0%	R0.5	35	3.31%	51	-5.0%	O1	40	2.59%	40

Detailed Rate Comparison
Water Plant

		[1]	[2]		[3]		[4]	
			BGWC Proposed		ORS Proposed		Difference	
Account No.	Description	Plant 12/31/2018	Rate	Annual Accrual	Rate	Annual Accrual	Rate	Annual Accrual
	DEPRECIABLE WATER PLANT							
	Structures and Improvements							
1050	SOURCE OF SUPPLY	3,552,791	2.76%	98,006	2.24%	79,477	-0.52%	-18,529
1055	WATER TREATMENT	1,321,329	2.61%	34,468	2.12%	28,037	-0.49%	-6,431
1060	TRANSMISSION AND DISTRIBUTION	30,701	2.19%	671	1.95%	598	-0.24%	-73
1065	GENERAL	279,443	2.26%	6,303	1.97%	5,510	-0.29%	-793
	Total Structures and Improvements	5,184,265	2.69%	139,448	2.19%	113,622	-0.50%	-25,826
1080	WELLS AND SPRINGS	2,879,699	3.85%	110,830	2.30%	66,107	-1.55%	-44,723
1090	SUPPLY MAINS	761,990	1.91%	14,536	1.91%	14,548	0.00%	12
	Electric Pumping Equipment							
1100	SOURCE OF SUPPLY	1,139,958	4.53%	51,694	4.31%	49,146	-0.22%	-2,548
1105	WATER TREATMENT	2,039,347	5.00%	101,923	4.73%	96,524	-0.27%	-5,399
1110	TRANSMISSION AND DISTRIBUTION	930,462	4.76%	44,287	4.53%	42,194	-0.23%	-2,093
	Total Electric Pumping Equipment	4,109,767	4.82%	197,904	4.57%	187,864	-0.24%	-10,040
1115	WATER TREATMENT EQUIPMENT	1,831,244	6.77%	123,921	2.85%	52,234	-3.92%	-71,687
1120	DISTRIBUTION RESERVOIRS AND STANDPIPES	7,196,956	4.40%	316,417	3.17%	227,805	-1.23%	-88,612
1125	TRANSMISSION AND DISTRIBUTION MAINS	11,805,906	1.85%	218,560	1.10%	129,573	-0.75%	-88,987
1130	SERVICES	5,364,914	7.00%	375,698	6.40%	343,219	-0.60%	-32,479
1135	METERS	846,808	6.07%	51,396	6.05%	51,226	-0.02%	-170
1140	METER INSTALLATIONS	513,693	5.13%	26,335	5.12%	26,326	-0.01%	-9
1145	HYDRANTS	392,467	2.47%	9,692	2.35%	9,217	-0.12%	-475
1150	BACKFLOW PREVENTION DEVICES	27,307	5.06%	1,381	5.05%	1,380	-0.01%	-1
	Other Plant and Miscellaneous Equipment							
1155	INTANGIBLE	2,894	4.56%	132	4.57%	132	0.01%	0
1160	SOURCE OF SUPPLY	2,211	2.67%	59	2.66%	59	-0.01%	0
1165	WATER TREATMENT	1,890	3.28%	62	3.28%	62	0.00%	0
1170	TRANSMISSION AND DISTRIBUTION	1,457	4.19%	61	4.20%	61	0.01%	0
	Total Other Plant and Miscellaneous Equipment	8,452	3.71%	314	3.72%	314	0.00%	0

Detailed Rate Comparison
Water Plant

		[1]	[2]		[3]		[4]	
			BGWC Proposed		ORS Proposed		Difference	
Account No.	Description	Plant 12/31/2018	Rate	Annual Accrual	Rate	Annual Accrual	Rate	Annual Accrual
1175	STRUCTURES AND IMPROVEMENTS - OFFICE	107,248	2.24%	2,401	2.24%	2,401	0.00%	0
1180	OFFICE FURNITURE AND EQUIPMENT	376,451	13.03%	49,059	12.92%	48,648	-0.11%	-411
1190	TOOLS, SHOP AND GARAGE EQUIPMENT	581,498	10.11%	58,770	10.06%	58,518	-0.05%	-252
1195	LABORATORY EQUIPMENT	128,547	10.72%	13,781	10.75%	13,817	0.03%	36
1200	POWER OPERATED EQUIPMENT	2,261	8.93%	202	8.94%	202	0.01%	0
1205	COMMUNICATION EQUIPMENT	172,558	23.35%	40,286	23.80%	41,070	0.45%	784
1210	MISCELLANEOUS EQUIPMENT	15,820	6.14%	972	6.16%	975	0.02%	3
1220	OTHER TANGIBLE PLANT	18,922	7.56%	1,431	7.58%	1,435	0.02%	4
	Total Depreciable Water Plant	42,326,773	4.14%	1,753,334	3.29%	1,390,501	-0.86%	-362,833
	DEPRECIABLE COMMON PLANT							
1555	TRANSPORTATION EQUIPMENT	1,570,996	2.90%	45,482	2.90%	45,637	0.00%	155
1580	MAINFRAME COMPUTERS	9,317	0.00%	0	0.00%	0	0.00%	0
1585	MINI COMPUTERS	347,694	0.00%	0	0.00%	0	0.00%	0
1590	COMPUTER SYSTEM	3,000	0.00%	0	0.00%	0	0.00%	0
1595	MICRO SYSTEM	8,217	0.00%	0	0.00%	0	0.00%	0
	Total Depreciable Common Plant	1,939,225	2.35%	45,482	2.35%	45,637	0.01%	155
	TOTAL DEPRECIABLE PLANT	**$ 44,265,998**	**4.06%**	**$ 1,798,816**	**3.24%**	**$ 1,436,138**	**-0.82%**	**$ (362,678)**

[1], [2] From depreciation study
[3] Rates and accruals developed in Exhibit DJG-5
[4] = [3] - [2]

Depreciation Rate Development
Water Plant

		[1]	[2]		[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]
			Iowa Curve							Service Life		Net Salvage		Total	
Account No.	Description	Plant 12/31/2018	Type	AL	Net Salvage	Depreciable Base	Book Reserve	Future Accruals	Remaining Life	Accrual	Rate	Accrual	Rate	Accrual	Rate
	DEPRECIABLE WATER PLANT														
	Structures and Improvements														
1050	SOURCE OF SUPPLY	3,552,791	R2.5	55	-5.0%	3,730,431	495,698	3,234,733	40.70	75,113	2.11%	4,365	0.12%	79,477	**2.24%**
1055	WATER TREATMENT	1,321,329	R2.5	55	-5.0%	1,387,396	173,670	1,213,726	43.29	26,511	2.01%	1,526	0.12%	28,037	**2.12%**
1060	TRANSMISSION AND DISTRIBUTION	30,701	R2.5	55	-5.0%	32,236	3,019	29,217	48.89	566	1.84%	31	0.10%	598	**1.95%**
1065	GENERAL	279,443	R2.5	55	-5.0%	293,415	44,328	249,087	45.21	5,201	1.86%	309	0.11%	5,510	**1.97%**
	Total Structures and Improvements	5,184,265			-5.0%	5,443,478	716,715	4,726,763	41.60	107,391	2.07%	6,231	0.12%	113,622	**2.19%**
1080	WELLS AND SPRINGS	2,879,699	R0.5	55	-5.0%	3,023,684	359,558	2,664,126	40.30	62,535	2.17%	3,573	0.12%	66,107	**2.30%**
1090	SUPPLY MAINS	761,990	R3	60	-10.0%	838,189	62,777	775,412	53.30	13,118	1.72%	1,430	0.19%	14,548	**1.91%**
	Electric Pumping Equipment														
1100	SOURCE OF SUPPLY	1,139,958	R0.5	30	-5.0%	1,196,956	61,682	1,135,274	23.10	46,679	4.09%	2,467	0.22%	49,146	**4.31%**
1105	WATER TREATMENT	2,039,347	R0.5	30	-5.0%	2,141,314	297,706	1,843,608	19.10	91,185	4.47%	5,339	0.26%	96,524	**4.73%**
1110	TRANSMISSION AND DISTRIBUTION	930,462	R0.5	30	-5.0%	976,985	19,188	957,797	22.70	40,144	4.31%	2,049	0.22%	42,194	**4.53%**
	Total Electric Pumping Equipment	4,109,767			-5.0%	4,315,255	378,576	3,936,679	20.95	178,008	4.33%	9,856	0.24%	187,864	**4.57%**
1115	WATER TREATMENT EQUIPMENT	1,831,244	R0.5	42	-5.0%	1,922,806	245,054	1,677,752	32.12	49,383	2.70%	2,851	0.16%	52,234	**2.85%**
1120	DISTRIBUTION RESERVOIRS AND STANDPIPES	7,196,956	S0	40	-10.0%	7,916,652	207,741	7,708,911	33.84	206,537	2.87%	21,268	0.30%	227,805	**3.17%**
1125	TRANSMISSION AND DISTRIBUTION MAINS	11,805,906	R1	95	-5.0%	12,396,201	2,194,917	10,201,284	78.73	122,075	1.03%	7,498	0.06%	129,573	**1.10%**
1130	SERVICES	5,364,914	L2	26	-10.0%	5,901,405	203,966	5,697,439	16.60	310,900	5.80%	32,319	0.60%	343,219	**6.40%**
1135	METERS	846,808	L3	25	0.0%	846,808	288,450	558,358	10.90	51,226	6.05%	0	0.00%	51,226	**6.05%**
1140	METER INSTALLATIONS	513,693	R2.5	30	0.0%	513,693	55,627	458,066	17.40	26,326	5.12%	0	0.00%	26,326	**5.12%**
1145	HYDRANTS	392,467	R1.5	55	-10.0%	431,713	58,433	373,280	40.50	8,248	2.10%	969	0.25%	9,217	**2.35%**
1150	BACKFLOW PREVENTION DEVICES	27,307	S0.5	25	0.0%	27,307	2,599	24,708	17.90	1,380	5.05%	0	0.00%	1,380	**5.05%**
	Other Plant and Miscellaneous Equipment														
1155	INTANGIBLE	2,894	R3	30	0.0%	2,894	1,651	1,243	9.40	132	4.57%	0	0.00%	132	**4.57%**
1160	SOURCE OF SUPPLY	2,211	R3	30	0.0%	2,211	750	1,461	24.80	59	2.66%	0	0.00%	59	**2.66%**
1165	WATER TREATMENT	1,890	R3	30	0.0%	1,890	488	1,402	22.60	62	3.28%	0	0.00%	62	**3.28%**
1170	TRANSMISSION AND DISTRIBUTION	1,457	R3	30	0.0%	1,457	222	1,235	20.20	61	4.20%	0	0.00%	61	**4.20%**
	Total Other Plant and Miscellaneous Equipment	8,452			0.0%	8,452	3,111	5,341	16.99	314	3.72%	0	0.00%	314	**3.72%**
1175	STRUCTURES AND IMPROVEMENTS - OFFICE	107,248	R3	50	-5.0%	112,610	13,430	99,180	41.30	2,272	2.12%	130	0.12%	2,401	**2.24%**
1180	OFFICE FURNITURE AND EQUIPMENT	376,451	SQ	20	0.0%	376,451	138,075	238,376	4.90	48,648	12.92%	0	0.00%	48,648	**12.92%**
1190	TOOLS, SHOP AND GARAGE EQUIPMENT	581,498	SQ	25	0.0%	581,498	312,314	269,184	4.60	58,518	10.06%	0	0.00%	58,518	**10.06%**
1195	LABORATORY EQUIPMENT	128,547	SQ	20	0.0%	128,547	78,805	49,742	3.60	13,817	10.75%	0	0.00%	13,817	**10.75%**
1200	POWER OPERATED EQUIPMENT	2,261	L2.5	15	10.0%	2,035	155	1,880	9.30	226	10.02%	-24	-1.08%	202	**8.94%**
1205	COMMUNICATION EQUIPMENT	172,558	SQ	15	0.0%	172,558	90,418	82,140	2.00	41,070	23.80%	0	0.00%	41,070	**23.80%**
1210	MISCELLANEOUS EQUIPMENT	15,820	SQ	20	0.0%	15,820	3,833	11,987	12.30	975	6.16%	0	0.00%	975	**6.16%**
1220	OTHER TANGIBLE PLANT	18,922	SQ	20	0.0%	18,922	5,288	13,634	9.50	1,435	7.58%	0	0.00%	1,435	**7.58%**
	Total Depreciable Water Plant	42,326,773			-6.3%	44,994,086	5,419,842	39,574,244	28.46	1,304,403	3.08%	86,098	0.20%	1,390,501	**3.29%**

Depreciation Rate Development
Water Plant

		[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]
			Iowa Curve						Service Life		Net Salvage		Total	
Account No.	Description	Plant 12/31/2018	Type AL	Net Salvage	Depreciable Base	Book Reserve	Future Accruals	Remaining Life	Accrual	Rate	Accrual	Rate	Accrual	Rate
	DEPRECIABLE COMMON PLANT													
1555	TRANSPORTATION EQUIPMENT	1,570,996	L2 - 12	0.0%	1,570,996	1,091,812	479,184	10.50	45,637	2.90%	0	0.00%	45,637	**2.90%**
1580	MAINFRAME COMPUTERS	9,317	SQ - 7	0.0%	9,317	9,317	0							
1585	MINI COMPUTERS	347,694	SQ - 7	0.0%	347,694	347,694	0							
1590	COMPUTER SYSTEM	3,000	SQ - 5	0.0%	3,000	3,000	0							
1595	MICRO SYSTEM	8,217	SQ - 5	0.0%	8,217	8,217	0							
	Total Depreciable Common Plant	1,939,225		0.0%	1,939,225	1,460,040	479,185	10.50	45,637	2.35%	0	0.00%	45,637	**2.35%**
	TOTAL DEPRECIABLE PLANT	**$ 44,265,998**		**-6.0%**	**$ 46,933,311**	**$ 6,879,882**	**$ 40,053,429**	**27.89**	**$ 1,350,040**	**3.05%**	**$ 86,098**	**0.19%**	**$ 1,436,138**	**3.24%**

[1] From depreciation study
[2] Average life and Iowa curve shape developed through actuarial analysis and professional judgment; no interim retirement curves for production units
[3] Mass net salvage rates developed through statistical analysis and professional judgment
[4] = [1]*(1-[3])
[5] From depreciation study
[6] = [4] - [5]
[7] Composite remaining life based on Iowa cuve in [2]; see DJG remaining life exhibit for detailed calculations
[8] = ([1] - [5]) / [7]
[9] = [8] / [1]
[10] = [12] - [8]
[11] = [13] - [9]
[12] = [6] / [7]
[13] = [12] / [1]

Detailed Rate Comparison
Wastewater Plant

		[1]	[2]		[3]		[4]	
			BGWC Proposed		ORS Proposed		Difference	
Account No.	Description	Plant 12/31/2018	Rate	Annual Accrual	Rate	Annual Accrual	Rate	Annual Accrual
	DEPRECIABLE WASTEWATER PLANT							
	Structures and Improvements							
1290	COLLECTION	86,284	3.68%	3,173	2.57%	2,217	-1.11%	-956
1295	PUMPING	1,890,189	2.85%	53,797	2.30%	43,469	-0.55%	-10,328
1300	TREATMENT	4,899,260	2.34%	114,767	2.03%	99,279	-0.31%	-15,488
1305	RECLAIM WTP	12,538	2.24%	281	1.98%	248	-0.26%	-33
1310	RECLAIM WTR	26,540	3.41%	904	2.32%	616	-1.09%	-288
1315	GENERAL	1,930,248	2.15%	41,475	1.94%	37,521	-0.21%	-3,954
	Total Structures and Improvements	8,845,060	2.42%	214,397	2.07%	183,350	-0.35%	-31,047
	Power Generating Equipment							
1320	COLLECTION	7,473	4.17%	312	4.17%	312	0.00%	0
1325	PUMPING	47,763	4.08%	1,949	4.07%	1,946	-0.01%	-3
1330	TREATMENT	33,612	4.17%	1,401	4.17%	1,400	0.00%	-1
	Total Power Generating Equipment	88,848	4.12%	3,662	4.12%	3,658	0.00%	-4
1345	FORCE MAINS	3,844,715	1.98%	76,151	1.88%	72,107	-0.10%	-4,044
1350	GRAVITY MAINS	11,530,909	1.78%	204,766	1.10%	126,875	-0.68%	-77,891
1353	MANHOLES	1,431,242	3.37%	48,235	3.21%	45,911	-0.16%	-2,324
1355	SPECIAL COLLECTION STRUCTURES	53,757	2.16%	1,159	2.16%	1,160	0.00%	1
1360	SERVICES TO CUSTOMERS	3,531,559	3.86%	136,283	2.36%	83,507	-1.50%	-52,776
1365	FLOW MEASURING DEVICES	59,648	5.50%	3,283	5.50%	3,282	0.00%	-1
1370	FLOW MEASURING INSTALLATIONS	2,044	5.14%	105	5.14%	105	0.00%	0
1375	RECEIVING WELLS	602	2.99%	18	2.99%	18	0.00%	0
	Pumping Equipment							
1380	PUMPING	6,561,910	4.77%	313,049	4.54%	298,128	-0.23%	-14,921
1385	RECLAIM WTP	222,372	5.79%	12,881	5.53%	12,294	-0.26%	-587
1390	RECLAIM WTR	125,403	5.49%	6,884	5.24%	6,574	-0.25%	-310
	Total Pumping Equipment	6,909,685	4.82%	332,814	4.59%	316,995	-0.23%	-15,819
	Treatment and Disposal Equipment							
1395	LAGOON	2,102,721	3.63%	76,300	2.81%	58,986	-0.82%	-17,314
1400	TREATMENT	11,587,595	4.73%	547,943	3.10%	358,978	-1.63%	-188,965
1405	RECLAIM WTP	1,541	3.31%	51	2.59%	40	-0.72%	-11
	Total Treatment and Disposal Equipment	13,691,857	4.56%	624,294	3.05%	418,003	-1.51%	-206,291

Detailed Rate Comparison
Wastewater Plant

		[1]	[2]		[3]		[4]	
			BGWC Proposed		ORS Proposed		Difference	
Account No.	Description	Plant 12/31/2018	Rate	Annual Accrual	Rate	Annual Accrual	Rate	Annual Accrual
	Plant Sewers							
1410	TREATMENT	348,335	5.50%	19,173	5.49%	19,132	-0.01%	-41
1415	RECLAIM WTP	3,877	5.88%	228	5.87%	227	-0.01%	-1
	Total Plant Sewers	352,212	5.51%	19,401	5.50%	19,360	-0.01%	-41
1420	OUTFALL LINES	293,535	2.17%	6,382	2.17%	6,376	0.00%	-6
	Other Plant							
1425	TANGIBLE	2,424	7.76%	188	7.73%	187	-0.03%	-1
1430	COLLECTION	10,833	6.01%	651	5.99%	649	-0.02%	-2
1435	PUMPING	46,912	7.58%	3,558	7.61%	3,568	0.03%	10
1440	TREATMENT	21,098	7.63%	1,609	7.61%	1,605	-0.02%	-4
1445	RECLAIM WTR	1,720	7.79%	134	7.79%	134	0.00%	0
	Total Other Plant	82,987	7.40%	6,140	7.40%	6,143	0.00%	3
1455	OFFICE STRUCTURES AND IMPROVEMENTS	82,688	2.25%	1,857	2.24%	1,855	-0.01%	-2
1460	OFFICE FURNITURE AND EQUIPMENT	8,186	6.62%	542	6.60%	541	-0.02%	-1
1465	STORES EQUIPMENT	723	6.22%	45	6.24%	45	0.02%	0
1470	TOOLS, SHOP AND MISCELLANEOUS EQUIPMENT	190,659	5.69%	10,842	5.70%	10,859	0.01%	17
1475	LABORATORY EQUIPMENT	59,166	6.18%	3,657	6.19%	3,661	0.01%	4
1480	POWER OPERATED EQUIPMENT	13,988	5.42%	758	5.41%	757	-0.01%	-1
1485	COMMUNICATION EQUIPMENT	4,199	15.24%	640	15.35%	645	0.11%	5
1490	MISCELLANEOUS EQUIPMENT	70,617	6.74%	4,757	6.76%	4,774	0.02%	17
	TOTAL DEPRECIABLE PLANT	**$ 51,148,886**	**3.32%**	**$ 1,700,188**	**2.56%**	**$ 1,309,987**	**-0.76%**	**$ (390,201)**

[1], [2] From depreciation study
[3] Rates and accruals developed in Exhibit DJG-7
[4] = [3] - [2]

Depreciation Rate Development
Wastewater Plant

		[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]
									Service Life		Net Salvage		Total	
Account No.	Description	Plant 12/31/2018	Iowa Curve Type AL	Net Salvage	Depreciable Base	Book Reserve	Future Accruals	Remaining Life	Accrual	Rate	Accrual	Rate	Accrual	Rate
	DEPRECIABLE WASTEWATER PLANT													
	Structures and Improvements													
1290	COLLECTION	86,284	L1 - 55	-5.0%	90,598	7,822	82,776	37.34	2,101	2.44%	116	0.13%	2,217	**2.57%**
1295	PUMPING	1,890,189	L1 - 55	-5.0%	1,984,699	243,781	1,740,918	40.05	41,109	2.17%	2,360	0.12%	43,469	**2.30%**
1300	TREATMENT	4,899,260	L1 - 55	-5.0%	5,144,223	490,026	4,654,197	46.88	94,054	1.92%	5,225	0.11%	99,279	**2.03%**
1305	RECLAIM WTP	12,538	L1 - 55	-5.0%	13,165	33	13,132	52.87	237	1.89%	12	0.09%	248	**1.98%**
1310	RECLAIM WTR	26,540	L1 - 55	-5.0%	27,867	7,067	20,800	33.75	577	2.17%	39	0.15%	616	**2.32%**
1315	GENERAL	1,930,248	L1 - 55	-5.0%	2,026,761	195,351	1,831,410	48.81	35,544	1.84%	1,977	0.10%	37,521	**1.94%**
	Total Structures and Improvements	8,845,060		-5.0%	9,287,313	944,080	8,343,233	45.50	173,621	1.96%	9,729	0.11%	183,350	**2.07%**
	Power Generating Equipment													
1320	COLLECTION	7,473	S2.5 - 30	0.0%	7,473	1,050	6,423	20.60	312	4.17%	0	0.00%	312	**4.17%**
1325	PUMPING	47,763	S2.5 - 30	0.0%	47,763	5,731	42,032	21.60	1,946	4.07%	0	0.00%	1,946	**4.07%**
1330	TREATMENT	33,612	S2.5 - 30	0.0%	33,612	4,767	28,844	20.60	1,400	4.17%	0	0.00%	1,400	**4.17%**
	Total Power Generating Equipment	88,848		0.0%	88,848	11,549	77,299	21.13	3,658	4.12%	0	0.00%	3,658	**4.12%**
1345	FORCE MAINS	3,844,715	S0 - 65	-5.0%	4,036,950	633,487	3,403,464	47.20	68,034	1.77%	4,073	0.11%	72,107	**1.88%**
1350	GRAVITY MAINS	11,530,909	S1.5 - 95	-5.0%	12,107,454	2,605,779	9,501,675	74.89	119,177	1.03%	7,699	0.07%	126,875	**1.10%**
1353	MANHOLES	1,431,242	R3 - 65	-5.0%	1,502,804	74,961	1,427,843	31.10	43,610	3.05%	2,301	0.16%	45,911	**3.21%**
1355	SPECIAL COLLECTION STRUCTURES	53,757	R3 - 50	-5.0%	56,445	3,665	52,780	45.50	1,101	2.05%	59	0.11%	1,160	**2.16%**
1360	SERVICES TO CUSTOMERS	3,531,559	L0 - 53	-10.0%	3,884,715	185,372	3,699,343	44.30	75,535	2.14%	7,972	0.23%	83,507	**2.36%**
1365	FLOW MEASURING DEVICES	59,648	S1 - 25	0.0%	59,648	908	58,740	17.90	3,282	5.50%	0	0.00%	3,282	**5.50%**
1370	FLOW MEASURING INSTALLATIONS	2,044	S1 - 25	0.0%	2,044	310	1,734	16.50	105	5.14%	0	0.00%	105	**5.14%**
1375	RECEIVING WELLS	602	S2.5 - 40	-5.0%	632	96	536	29.80	17	2.82%	1	0.17%	18	**2.99%**
	Pumping Equipment													
1380	PUMPING	6,561,910	L0.5 - 30	-5.0%	6,890,006	122,509	6,767,496	22.70	283,674	4.32%	14,454	0.22%	298,128	**4.54%**
1385	RECLAIM WTP	222,372	L0.5 - 30	-5.0%	233,490	2,363	231,127	18.80	11,703	5.26%	591	0.27%	12,294	**5.53%**
1390	RECLAIM WTR	125,403	L0.5 - 30	-5.0%	131,674	3,486	128,187	19.50	6,252	4.99%	322	0.26%	6,574	**5.24%**
	Total Pumping Equipment	6,909,685		-5.0%	7,255,170	128,359	7,126,811	22.48	301,629	4.37%	15,367	0.22%	316,995	**4.59%**
	Treatment and Disposal Equipment													
1395	LAGOON	2,102,721	O1 - 40	-5.0%	2,207,857	38,960	2,168,898	36.77	56,126	2.67%	2,859	0.14%	58,986	**2.81%**
1400	TREATMENT	11,587,595	O1 - 40	-5.0%	12,166,975	611,477	11,555,498	32.19	340,979	2.94%	17,999	0.16%	358,978	**3.10%**
1405	RECLAIM WTP	1,541	O1 - 40	-5.0%	1,618	210	1,408	35.25	38	2.45%	2	0.14%	40	**2.59%**
	Total Treatment and Disposal Equipment	13,691,857		-5.0%	14,376,450	650,647	13,725,803	32.84	397,143	2.90%	20,860	0.15%	418,003	**3.05%**
	Plant Sewers													
1410	TREATMENT	348,335	R3 - 25	-5.0%	365,752	13,716	352,035	18.40	18,186	5.22%	947	0.27%	19,132	**5.49%**
1415	RECLAIM WTP	3,877	R3 - 25	-5.0%	4,071	592	3,479	15.30	215	5.54%	13	0.33%	227	**5.87%**
	Total Plant Sewers	352,212		-5.0%	369,822	14,308	355,514	18.36	18,401	5.22%	959	0.27%	19,360	**5.50%**
1420	OUTFALL LINES	293,535	R3 - 60	-5.0%	308,212	27,659	280,553	44.00	6,043	2.06%	334	0.11%	6,376	**2.17%**
	Other Plant													
1425	TANGIBLE	2,424	S1.5 - 20	0.0%	2,424	399	2,024	10.80	187	7.73%	0	0.00%	187	**7.73%**
1430	COLLECTION	10,833	S1.5 - 20	0.0%	10,833	575	10,259	15.80	649	5.99%	0	0.00%	649	**5.99%**
1435	PUMPING	46,912	S1.5 - 20	0.0%	46,912	5,877	41,035	11.50	3,568	7.61%	0	0.00%	3,568	**7.61%**
1440	TREATMENT	21,098	S1.5 - 20	0.0%	21,098	2,004	19,094	11.90	1,605	7.61%	0	0.00%	1,605	**7.61%**
1445	RECLAIM WTR	1,720	S1.5 - 20	0.0%	1,720	273	1,447	10.80	134	7.79%	0	0.00%	134	**7.79%**
	Total Other Plant	82,987		0.0%	82,987	9,128	73,858	12.02	6,143	7.40%	0	0.00%	6,143	**7.40%**
1455	OFFICE STRUCTURES AND IMPROVEMENTS	82,688	R3 - 50	-5.0%	86,822	1,480	85,343	46.00	1,765	2.14%	90	0.11%	1,855	**2.24%**
1460	OFFICE FURNITURE AND EQUIPMENT	8,186	SQ - 20	0.0%	8,186	672	7,514	13.90	541	6.60%	0	0.00%	541	**6.60%**
1465	STORES EQUIPMENT	723	SQ - 25	0.0%	723	73	650	14.40	45	6.24%	0	0.00%	45	**6.24%**

Depreciation Rate Development
Wastewater Plant

		[1]	[2]		[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]
Account		Plant	Iowa Curve		Net	Depreciable	Book	Future	Remaining	Service Life		Net Salvage		Total	
No.	Description	12/31/2018	Type	AL	Salvage	Base	Reserve	Accruals	Life	Accrual	Rate	Accrual	Rate	Accrual	Rate
1470	TOOLS, SHOP AND MISCELLANEOUS EQUIPMENT	190,659	SQ	25	0.0%	190,659	20,173	170,486	15.70	10,859	5.70%	0	0.00%	10,859	**5.70%**
1475	LABORATORY EQUIPMENT	59,166	SQ	20	0.0%	59,166	584	58,583	16.00	3,661	6.19%	0	0.00%	3,661	**6.19%**
1480	POWER OPERATED EQUIPMENT	13,988	L3	22	10.0%	12,590	257	12,333	16.30	842	6.02%	-86	-0.61%	757	**5.41%**
1485	COMMUNICATION EQUIPMENT	4,199	SQ	15	0.0%	4,199	1,943	2,256	3.50	645	15.35%	0	0.00%	645	**15.35%**
1490	MISCELLANEOUS EQUIPMENT	70,617	SQ	20	0.0%	70,617	6,174	64,444	13.50	4,774	6.76%	0	0.00%	4,774	**6.76%**
	TOTAL DEPRECIABLE PLANT	**$ 51,148,886**			**-5.3%**	**$ 53,852,456**	**$ 5,321,660**	**$ 48,530,796**	**37.05**	**$ 1,240,630**	**2.43%**	**$ 69,357**	**0.14%**	**$ 1,309,987**	**2.56%**

[1] From depreciation study
[2] Average life and Iowa curve shape developed through actuarial analysis and professional judgment; no interim retirement curves for production units
[3] Mass net salvage rates developed through statistical analysis and professional judgment
[4] = [1]*(1-[3])
[5] From depreciation study
[6] = [4] - [5]
[7] Composite remaining life based on Iowa cuve in [2]; see DJG remaining life exhibit for detailed calculations
[8] = ([1] - [5]) / [7]
[9] = [8] / [1]
[10] = [12] - [8]
[11] = [13] - [9]
[12] = [6] / [7]
[13] = [12] / [1]

Accounts 1050 - 1065 Curve Fitting

[1] Age (Years)	[2] Exposures (Dollars)	[3] Observed Life Table (OLT)	[4] BGWC R3-50	[5] ORS R2.5-55	[6] BGWC SSD	[7] ORS SSD
0.0	2,694,538	100.00%	100.00%	100.00%	0.0000	0.0000
0.5	2,878,806	100.00%	99.98%	99.95%	0.0000	0.0000
1.5	2,756,872	100.00%	99.95%	99.84%	0.0000	0.0000
2.5	2,577,708	99.94%	99.91%	99.73%	0.0000	0.0000
3.5	3,015,368	99.85%	99.86%	99.61%	0.0000	0.0000
4.5	3,719,391	99.82%	99.80%	99.47%	0.0000	0.0000
5.5	3,455,673	99.82%	99.74%	99.33%	0.0000	0.0000
6.5	3,477,991	99.81%	99.66%	99.18%	0.0000	0.0000
7.5	3,437,329	99.81%	99.57%	99.01%	0.0000	0.0001
8.5	3,146,805	99.73%	99.47%	98.84%	0.0000	0.0001
9.5	2,313,157	99.72%	99.36%	98.65%	0.0000	0.0001
10.5	1,815,235	99.56%	99.23%	98.44%	0.0000	0.0001
11.5	1,663,030	99.30%	99.09%	98.22%	0.0000	0.0001
12.5	1,388,772	98.90%	98.92%	97.99%	0.0000	0.0001
13.5	1,384,807	98.81%	98.73%	97.74%	0.0000	0.0001
14.5	1,382,979	98.60%	98.53%	97.47%	0.0000	0.0001
15.5	861,654	98.37%	98.29%	97.18%	0.0000	0.0001
16.5	258,529	98.27%	98.04%	96.87%	0.0000	0.0002
17.5	257,230	96.53%	97.75%	96.54%	0.0001	0.0000
18.5	213,305	95.65%	97.43%	96.19%	0.0003	0.0000
19.5	197,179	94.40%	97.08%	95.81%	0.0007	0.0002
20.5	195,629	93.66%	96.70%	95.41%	0.0009	0.0003
21.5	419,260	91.60%	96.28%	94.99%	0.0022	0.0011
22.5	417,960	91.31%	95.81%	94.53%	0.0020	0.0010
23.5	417,364	91.18%	95.31%	94.05%	0.0017	0.0008
24.5	448,358	91.15%	94.76%	93.53%	0.0013	0.0006
25.5	446,481	90.76%	94.16%	92.99%	0.0012	0.0005
26.5	656,091	90.17%	93.51%	92.41%	0.0011	0.0005
27.5	699,365	89.87%	92.81%	91.80%	0.0009	0.0004
28.5	595,625	89.87%	92.05%	91.14%	0.0005	0.0002
29.5	611,042	89.77%	91.23%	90.46%	0.0002	0.0000
30.5	612,013	87.73%	90.35%	89.73%	0.0007	0.0004
31.5	723,954	87.51%	89.40%	88.96%	0.0004	0.0002
32.5	724,703	87.46%	88.38%	88.15%	0.0001	0.0000
33.5	496,603	87.23%	87.28%	87.29%	0.0000	0.0000
34.5	496,124	87.12%	86.11%	86.38%	0.0001	0.0001
35.5	496,124	87.12%	84.85%	85.43%	0.0005	0.0003
36.5	505,432	86.83%	83.51%	84.42%	0.0011	0.0006
37.5	473,980	81.42%	82.07%	83.36%	0.0000	0.0004
38.5	250,916	76.01%	80.53%	82.25%	0.0020	0.0039
39.5	203,140	75.05%	78.89%	81.08%	0.0015	0.0036
40.5	143,000	74.80%	77.14%	79.85%	0.0005	0.0025
41.5	127,962	74.71%	75.28%	78.56%	0.0000	0.0015
42.5	113,097	74.71%	73.30%	77.20%	0.0002	0.0006
43.5	126	74.71%	71.21%	75.78%	0.0012	0.0001
44.5	4,478	74.71%	68.99%	74.29%	0.0033	0.0000
45.5	4,478	74.71%	66.66%	72.73%	0.0065	0.0004
46.5	4,478	74.71%	64.20%	71.09%	0.0110	0.0013

Accounts 1050 - 1065 Curve Fitting

[1] Age (Years)	[2] Exposures (Dollars)	[3] Observed Life Table (OLT)	[4] BGWC R3-50	[5] ORS R2.5-55	[6] BGWC SSD	[7] ORS SSD
47.5	4,478	74.71%	61.63%	69.39%	0.0171	0.0028
48.5	4,478	74.71%	58.95%	67.62%	0.0248	0.0050
49.5	4,478	74.71%	56.17%	65.77%	0.0344	0.0080
50.5	4,478	74.71%	53.29%	63.85%	0.0459	0.0118
51.5	217	3.61%	50.34%	61.86%	0.2183	0.3393
52.5			47.32%	59.80%		
Sum of Squared Differences				[8]	0.3829	0.3898
Up to 1% of Beginning Exposures				[9]	0.1646	0.0505

[1] Age in years using half-year convention

[2] Dollars exposed to retirement at the beginning of each age interval

[3] Observed life table based on the Company's property records. These numbers form the original survivor curve.

[4] The Company's selected Iowa curve to be fitted to the OLT.

[5] My selected Iowa curve to be fitted to the OLT.

[6] = ([4] - [3])^2. This is the squared difference between each point on the Company's curve and the observed survivor curve.

[7] = ([5] - [3])^2. This is the squared difference between each point on my curve and the observed survivor curve.

[8] = Sum of squared differences. The smallest SSD represents the best mathematical fit.

Account 1080 Curve Fitting

[1]	[2]	[3]	[4]	[5]	[6]	[7]
Age (Years)	Exposures (Dollars)	Observed Life Table (OLT)	BGWC R1-45	ORS R0.5-55	BGWC SSD	ORS SSD
0.0	823,429	100.00%	100.00%	100.00%	0.0000	0.0000
0.5	1,190,118	100.00%	99.71%	99.66%	0.0000	0.0000
1.5	1,159,024	100.00%	99.13%	98.96%	0.0001	0.0001
2.5	1,133,857	100.00%	98.52%	98.26%	0.0002	0.0003
3.5	1,128,728	97.84%	97.90%	97.56%	0.0000	0.0000
4.5	1,132,157	97.84%	97.26%	96.85%	0.0000	0.0001
5.5	1,083,142	97.84%	96.60%	96.13%	0.0002	0.0003
6.5	1,069,308	97.81%	95.92%	95.40%	0.0004	0.0006
7.5	1,060,581	97.81%	95.22%	94.67%	0.0007	0.0010
8.5	1,038,042	96.60%	94.51%	93.94%	0.0004	0.0007
9.5	903,643	96.60%	93.78%	93.20%	0.0008	0.0012
10.5	744,138	96.50%	93.04%	92.45%	0.0012	0.0016
11.5	712,054	96.50%	92.27%	91.70%	0.0018	0.0023
12.5	282,652	95.04%	91.49%	90.94%	0.0013	0.0017
13.5	212,314	80.76%	90.69%	90.17%	0.0099	0.0089
14.5	286,136	80.76%	89.88%	89.40%	0.0083	0.0075
15.5	241,957	78.71%	89.05%	88.63%	0.0107	0.0098
16.5	240,957	78.38%	88.20%	87.85%	0.0096	0.0090
17.5	263,103	78.38%	87.33%	87.06%	0.0080	0.0075
18.5	194,470	78.38%	86.44%	86.27%	0.0065	0.0062
19.5	256,473	78.38%	85.53%	85.47%	0.0051	0.0050
20.5	243,007	74.27%	84.60%	84.66%	0.0107	0.0108
21.5	414,250	74.27%	83.64%	83.85%	0.0088	0.0092
22.5	436,396	74.27%	82.67%	83.03%	0.0070	0.0077
23.5	487,184	74.27%	81.66%	82.21%	0.0055	0.0063
24.5	598,497	74.27%	80.63%	81.38%	0.0040	0.0050
25.5	754,685	74.27%	79.57%	80.54%	0.0028	0.0039
26.5	901,295	74.27%	78.49%	79.69%	0.0018	0.0029
27.5	1,032,392	74.27%	77.38%	78.83%	0.0010	0.0021
28.5	1,083,317	69.03%	76.23%	77.97%	0.0052	0.0080
29.5	1,083,317	69.03%	75.06%	77.10%	0.0036	0.0065
30.5	1,105,464	69.03%	73.85%	76.21%	0.0023	0.0052
31.5	1,105,508	69.03%	72.62%	75.32%	0.0013	0.0040
32.5	1,105,508	69.03%	71.35%	74.42%	0.0005	0.0029
33.5	855,410	68.26%	70.04%	73.51%	0.0003	0.0028
34.5	840,646	68.26%	68.71%	72.59%	0.0000	0.0019
35.5	778,643	68.26%	67.35%	71.66%	0.0001	0.0012
36.5	854,667	68.26%	65.95%	70.72%	0.0005	0.0006
37.5	694,541	67.94%	64.52%	69.77%	0.0012	0.0003
38.5	497,205	61.64%	63.06%	68.81%	0.0002	0.0051
39.5	365,833	61.60%	61.57%	67.84%	0.0000	0.0039
40.5	242,119	61.60%	60.06%	66.85%	0.0002	0.0028
41.5	227,355	61.60%	58.51%	65.86%	0.0010	0.0018
42.5	219,973	61.60%	56.94%	64.85%	0.0022	0.0011
43.5	245,005	61.60%	55.34%	63.84%	0.0039	0.0005
44.5	212,591	53.45%	53.71%	62.81%	0.0000	0.0088
45.5	205,209	53.45%	52.07%	61.78%	0.0002	0.0069
46.5	197,826	53.45%	50.40%	60.73%	0.0009	0.0053

Account 1080 Curve Fitting

[1]	[2]	[3]	[4]	[5]	[6]	[7]
Age (Years)	**Exposures (Dollars)**	**Observed Life Table (OLT)**	**BGWC R1-45**	**ORS R0.5-55**	**BGWC SSD**	**ORS SSD**
47.5	197,826	53.45%	48.72%	59.67%	0.0022	0.0039
48.5	74,112	53.45%	47.02%	58.60%	0.0041	0.0027
49.5	74,112	53.45%	45.31%	57.53%	0.0066	0.0017
50.5	59,348	53.45%	43.58%	56.44%	0.0097	0.0009
51.5	59,348	53.45%	41.85%	55.35%	0.0135	0.0004
52.5	59,348	53.45%	40.11%	54.24%	0.0178	0.0001
53.5	51,966	53.45%	38.37%	53.13%	0.0227	0.0000
54.5	37,201	53.45%	36.63%	52.01%	0.0283	0.0002
55.5		53.45%	34.89%	50.88%		
Sum of Squared Differences				[8]	0.2354	0.1909
Up to 1% of Beginning Exposures				[9]	0.2354	0.1909

[1] Age in years using half-year convention

[2] Dollars exposed to retirement at the beginning of each age interval

[3] Observed life table based on the Company's property records. These numbers form the original survivor curve.

[4] The Company's selected Iowa curve to be fitted to the OLT.

[5] My selected Iowa curve to be fitted to the OLT.

[6] = ([4] - [3])^2. This is the squared difference between each point on the Company's curve and the observed survivor curve.

[7] = ([5] - [3])^2. This is the squared difference between each point on my curve and the observed survivor curve.

[8] = Sum of squared differences. The smallest SSD represents the best mathematical fit.

Account 1115 Curve Fitting

[1]	[2]	[3]	[4]	[5]	[6]	[7]
Age (Years)	**Exposures (Dollars)**	**Observed Life Table (OLT)**	**BGWC R1.5-30**	**ORS R0.5-42**	**BGWC SSD**	**ORS SSD**
0.0	985,356	100.00%	100.00%	100.00%	0.0000	0.0000
0.5	1,000,369	100.00%	99.70%	99.55%	0.0000	0.0000
1.5	949,866	99.60%	99.08%	98.64%	0.0000	0.0001
2.5	1,203,062	98.26%	98.42%	97.72%	0.0000	0.0000
3.5	1,119,420	96.88%	97.72%	96.79%	0.0001	0.0000
4.5	1,059,748	95.96%	96.97%	95.84%	0.0001	0.0000
5.5	965,269	95.29%	96.18%	94.89%	0.0001	0.0000
6.5	1,128,672	93.95%	95.33%	93.93%	0.0002	0.0000
7.5	1,032,397	93.35%	94.44%	92.96%	0.0001	0.0000
8.5	983,428	92.79%	93.50%	91.98%	0.0001	0.0001
9.5	782,171	92.26%	92.51%	90.98%	0.0000	0.0002
10.5	601,985	91.65%	91.45%	89.98%	0.0000	0.0003
11.5	561,891	90.37%	90.34%	88.97%	0.0000	0.0002
12.5	517,004	89.25%	89.16%	87.95%	0.0000	0.0002
13.5	514,607	88.76%	87.91%	86.92%	0.0001	0.0003
14.5	220,534	87.74%	86.59%	85.88%	0.0001	0.0003
15.5	212,779	84.66%	85.18%	84.83%	0.0000	0.0000
16.5	217,781	83.34%	83.70%	83.76%	0.0000	0.0000
17.5	219,824	82.65%	82.12%	82.69%	0.0000	0.0000
18.5	19,953	79.06%	80.44%	81.60%	0.0002	0.0006
19.5	19,953	79.06%	78.67%	80.51%	0.0000	0.0002
20.5	17,486	69.28%	76.79%	79.39%	0.0056	0.0102
21.5	133,357	63.71%	74.81%	78.27%	0.0123	0.0212
22.5	131,814	62.88%	72.71%	77.13%	0.0097	0.0203
23.5	126,821	60.50%	70.50%	75.97%	0.0100	0.0239
24.5	126,272	59.60%	68.18%	74.80%	0.0074	0.0231
25.5	119,782	56.46%	65.74%	73.61%	0.0086	0.0294
26.5	119,583	56.22%	63.19%	72.40%	0.0049	0.0262
27.5	119,583	56.22%	60.53%	71.18%	0.0019	0.0224
28.5	268,730	55.51%	57.77%	69.94%	0.0005	0.0208
29.5	267,548	55.26%	54.92%	68.68%	0.0000	0.0180
30.5	267,199	55.19%	51.98%	67.40%	0.0010	0.0149
31.5	400,438	55.19%	48.97%	66.11%	0.0039	0.0119
32.5	399,243	55.03%	45.90%	64.79%	0.0083	0.0095
33.5	284,202	55.00%	42.80%	63.46%	0.0149	0.0072
34.5	284,080	54.98%	39.67%	62.11%	0.0234	0.0051
35.5	284,080	54.98%	36.56%	60.74%	0.0339	0.0033
36.5	284,080	54.98%	33.47%	59.36%	0.0463	0.0019
37.5	284,080	54.98%	30.43%	57.95%	0.0603	0.0009
38.5	283,514	54.87%	27.47%	56.53%	0.0751	0.0003
39.5	283,075	54.79%	24.61%	55.10%	0.0911	0.0000
40.5	132,549	54.73%	21.87%	53.65%	0.1080	0.0001
41.5	132,549	54.73%	19.27%	52.18%	0.1257	0.0006
42.5	132,549	54.73%	16.82%	50.71%	0.1437	0.0016
43.5		54.73%	14.54%	49.22%		
Sum of Squared Differences				[8]	0.7976	0.2756

Account 1115 Curve Fitting

[1] Age (Years)	[2] Exposures (Dollars)	[3] Observed Life Table (OLT)	[4] BGWC R1.5-30	[5] ORS R0.5-42	[6] BGWC SSD	[7] ORS SSD
Up to 1% of Beginning Exposures				[9]	0.7976	0.2756

[1] Age in years using half-year convention

[2] Dollars exposed to retirement at the beginning of each age interval

[3] Observed life table based on the Company's property records. These numbers form the original survivor curve.

[4] The Company's selected Iowa curve to be fitted to the OLT.

[5] My selected Iowa curve to be fitted to the OLT.

[6] = ([4] - [3])^2. This is the squared difference between each point on the Company's curve and the observed survivor curve.

[7] = ([5] - [3])^2. This is the squared difference between each point on my curve and the observed survivor curve.

[8] = Sum of squared differences. The smallest SSD represents the best mathematical fit.

Account 1120 Curve Fitting

[1] Age (Years)	[2] Exposures (Dollars)	[3] Observed Life Table (OLT)	[4] BGWC S0.5-35	[5] ORS S0-40	[6] BGWC SSD	[7] ORS SSD
0.0	5,807,741	100.00%	100.00%	100.00%	0.0000	0.0000
0.5	5,684,478	99.96%	99.98%	99.97%	0.0000	0.0000
1.5	4,861,263	99.66%	99.86%	99.79%	0.0000	0.0000
2.5	3,923,441	99.33%	99.64%	99.49%	0.0000	0.0000
3.5	1,422,074	99.22%	99.34%	99.08%	0.0000	0.0000
4.5	1,199,198	98.59%	98.95%	98.58%	0.0000	0.0000
5.5	968,584	98.44%	98.46%	97.99%	0.0000	0.0000
6.5	982,336	97.21%	97.89%	97.33%	0.0000	0.0000
7.5	916,446	96.79%	97.23%	96.59%	0.0000	0.0000
8.5	826,370	96.40%	96.47%	95.78%	0.0000	0.0000
9.5	574,962	96.14%	95.63%	94.91%	0.0000	0.0002
10.5	540,899	95.30%	94.70%	93.97%	0.0000	0.0002
11.5	497,345	94.26%	93.67%	92.97%	0.0000	0.0002
12.5	479,350	93.19%	92.56%	91.93%	0.0000	0.0002
13.5	131,497	92.53%	91.36%	90.82%	0.0001	0.0003
14.5	130,224	91.00%	90.08%	89.67%	0.0001	0.0002
15.5	128,084	89.50%	88.71%	88.47%	0.0001	0.0001
16.5	127,325	82.11%	87.26%	87.23%	0.0027	0.0026
17.5	341,238	81.13%	85.73%	85.94%	0.0021	0.0023
18.5	270,962	81.11%	84.13%	84.61%	0.0009	0.0012
19.5	256,717	76.61%	82.45%	83.25%	0.0034	0.0044
20.5	262,317	74.81%	80.70%	81.85%	0.0035	0.0050
21.5	629,258	72.44%	78.89%	80.41%	0.0042	0.0064
22.5	675,500	72.38%	77.01%	78.94%	0.0021	0.0043
23.5	708,220	71.14%	75.07%	77.45%	0.0015	0.0040
24.5	752,818	70.97%	73.08%	75.92%	0.0004	0.0025
25.5	784,848	69.57%	71.04%	74.37%	0.0002	0.0023
26.5	1,251,313	69.51%	68.95%	72.79%	0.0000	0.0011
27.5	1,268,179	69.38%	66.82%	71.20%	0.0007	0.0003
28.5	1,417,560	69.25%	64.65%	69.58%	0.0021	0.0000
29.5	1,204,035	68.50%	62.46%	67.94%	0.0037	0.0000
30.5	1,186,768	67.51%	60.23%	66.28%	0.0053	0.0002
31.5	1,129,486	64.25%	57.98%	64.61%	0.0039	0.0000
32.5	1,089,786	61.99%	55.71%	62.92%	0.0039	0.0001
33.5	711,284	59.44%	53.43%	61.23%	0.0036	0.0003
34.5	652,416	54.52%	51.15%	59.52%	0.0011	0.0025
35.5	428,355	35.80%	48.86%	57.80%	0.0170	0.0484
36.5	444,075	33.57%	46.57%	56.07%	0.0169	0.0506
37.5	395,099	29.87%	44.29%	54.34%	0.0208	0.0599
38.5	191,822	28.99%	42.02%	52.61%	0.0170	0.0558
39.5	190,293	28.73%	39.77%	50.87%	0.0122	0.0490
40.5	49,049	28.69%	37.54%	49.13%	0.0078	0.0418
41.5	62,712	28.69%	35.35%	47.40%	0.0044	0.0350
42.5	118,628	28.69%	33.18%	45.66%	0.0020	0.0288
43.5	144,824	28.22%	31.05%	43.93%	0.0008	0.0247
44.5	144,824	28.22%	28.96%	42.21%	0.0001	0.0196
45.5	116,418	22.68%	26.92%	40.49%	0.0018	0.0317
46.5	115,952	22.59%	24.93%	38.78%	0.0005	0.0262

Account 1120 Curve Fitting

[1]	[2]	[3]	[4]	[5]	[6]	[7]
Age (Years)	**Exposures (Dollars)**	**Observed Life Table (OLT)**	**BGWC S0.5-35**	**ORS S0-40**	**BGWC SSD**	**ORS SSD**
47.5	112,042	21.83%	22.99%	37.08%	0.0001	0.0233
48.5	55,987	19.17%	21.11%	35.40%	0.0004	0.0263
49.5	42,463	14.54%	19.30%	33.73%	0.0023	0.0368
50.5	42,463	14.54%	17.55%	32.07%	0.0009	0.0307
51.5	42,463	14.54%	15.87%	30.43%	0.0002	0.0253
52.5	42,393	14.54%	14.27%	28.81%	0.0000	0.0204
53.5	42,393	14.54%	12.74%	27.21%	0.0003	0.0161
54.5		14.54%	11.29%	25.64%		
Sum of Squared Differences				[8]	0.1515	0.6911
Relevant Portion of OLT Curve				[9]	0.0460	0.0407

[1] Age in years using half-year convention

[2] Dollars exposed to retirement at the beginning of each age interval

[3] Observed life table based on the Company's property records. These numbers form the original survivor curve.

[4] The Company's selected Iowa curve to be fitted to the OLT.

[5] My selected Iowa curve to be fitted to the OLT.

[6] = ([4] - [3])^2. This is the squared difference between each point on the Company's curve and the observed survivor curve.

[7] = ([5] - [3])^2. This is the squared difference between each point on my curve and the observed survivor curve.

[8] = Sum of squared differences. The smallest SSD represents the best mathematical fit.

Account 1125 Curve Fitting

[1] Age (Years)	[2] Exposures (Dollars)	[3] Observed Life Table (OLT)	[4] BGWC R2-70	[5] ORS R1-95	[6] BGWC SSD	[7] ORS SSD
0.0	4,211,715	100.00%	100.00%	100.00%	0.0000	0.0000
0.5	4,616,938	99.94%	99.93%	99.86%	0.0000	0.0000
1.5	5,242,792	99.86%	99.79%	99.59%	0.0000	0.0000
2.5	4,849,898	99.82%	99.65%	99.31%	0.0000	0.0000
3.5	4,507,707	99.82%	99.49%	99.03%	0.0000	0.0001
4.5	3,913,261	99.76%	99.33%	98.75%	0.0000	0.0001
5.5	3,341,177	99.71%	99.16%	98.46%	0.0000	0.0002
6.5	3,529,079	99.50%	98.98%	98.16%	0.0000	0.0002
7.5	3,231,611	99.43%	98.80%	97.86%	0.0000	0.0002
8.5	2,785,907	99.30%	98.61%	97.56%	0.0000	0.0003
9.5	2,365,170	99.27%	98.40%	97.26%	0.0001	0.0004
10.5	1,884,927	99.16%	98.19%	96.95%	0.0001	0.0005
11.5	2,376,492	98.49%	97.97%	96.63%	0.0000	0.0003
12.5	2,081,118	98.10%	97.74%	96.31%	0.0000	0.0003
13.5	1,115,968	97.58%	97.50%	95.99%	0.0000	0.0003
14.5	1,111,539	96.84%	97.25%	95.67%	0.0000	0.0001
15.5	1,223,207	95.31%	96.98%	95.34%	0.0003	0.0000
16.5	1,583,582	94.63%	96.71%	95.00%	0.0004	0.0000
17.5	1,669,130	94.41%	96.42%	94.66%	0.0004	0.0000
18.5	1,548,471	93.63%	96.13%	94.32%	0.0006	0.0000
19.5	1,695,816	93.38%	95.82%	93.98%	0.0006	0.0000
20.5	1,690,164	92.82%	95.49%	93.63%	0.0007	0.0001
21.5	2,338,822	91.81%	95.16%	93.27%	0.0011	0.0002
22.5	2,762,972	91.25%	94.81%	92.92%	0.0013	0.0003
23.5	2,094,928	90.72%	94.45%	92.56%	0.0014	0.0003
24.5	2,174,672	90.45%	94.07%	92.19%	0.0013	0.0003
25.5	2,535,600	90.11%	93.68%	91.82%	0.0013	0.0003
26.5	3,593,680	89.64%	93.27%	91.45%	0.0013	0.0003
27.5	3,701,844	89.08%	92.85%	91.07%	0.0014	0.0004
28.5	3,902,742	88.81%	92.41%	90.69%	0.0013	0.0004
29.5	3,934,363	88.60%	91.95%	90.31%	0.0011	0.0003
30.5	3,771,697	88.53%	91.48%	89.92%	0.0009	0.0002
31.5	3,940,416	88.27%	90.99%	89.53%	0.0007	0.0002
32.5	3,912,886	87.63%	90.48%	89.13%	0.0008	0.0002
33.5	3,245,689	86.72%	89.95%	88.73%	0.0010	0.0004
34.5	3,038,957	86.14%	89.41%	88.33%	0.0011	0.0005
35.5	3,014,338	85.43%	88.84%	87.92%	0.0012	0.0006
36.5	3,182,173	85.05%	88.25%	87.51%	0.0010	0.0006
37.5	2,799,375	84.20%	87.65%	87.10%	0.0012	0.0008
38.5	1,745,224	83.75%	87.02%	86.67%	0.0011	0.0009
39.5	1,499,656	83.58%	86.37%	86.25%	0.0008	0.0007
40.5	991,489	83.53%	85.70%	85.82%	0.0005	0.0005
41.5	961,613	83.40%	85.00%	85.38%	0.0003	0.0004
42.5	898,795	83.35%	84.28%	84.94%	0.0001	0.0003
43.5	676,233	83.32%	83.54%	84.50%	0.0000	0.0001
44.5	676,766	83.18%	82.77%	84.05%	0.0000	0.0001
45.5	676,346	83.13%	81.98%	83.59%	0.0001	0.0000
46.5	468,496	83.10%	81.17%	83.13%	0.0004	0.0000

Account 1125 Curve Fitting

[1] Age (Years)	[2] Exposures (Dollars)	[3] Observed Life Table (OLT)	[4] BGWC R2-70	[5] ORS R1-95	[6] BGWC SSD	[7] ORS SSD
47.5	467,417	82.91%	80.32%	82.67%	0.0007	0.0000
48.5	225,000	82.85%	79.45%	82.19%	0.0012	0.0000
49.5	224,080	82.51%	78.56%	81.72%	0.0016	0.0001
50.5	223,132	82.16%	77.64%	81.23%	0.0020	0.0001
51.5	223,054	82.13%	76.68%	80.74%	0.0030	0.0002
52.5	222,384	81.88%	75.71%	80.25%	0.0038	0.0003
53.5	159,735	81.87%	74.70%	79.74%	0.0051	0.0005
54.5	128,466	81.87%	73.66%	79.24%	0.0067	0.0007
55.5	42,828	81.83%	72.60%	78.72%	0.0085	0.0010
56.5	42,828	81.83%	71.51%	78.20%	0.0107	0.0013
57.5	42,828	81.83%	70.38%	77.67%	0.0131	0.0017
58.5	43	81.83%	69.23%	77.14%	0.0159	0.0022
59.5	43	81.83%	68.05%	76.60%	0.0190	0.0027
60.5	43	81.83%	66.84%	76.05%	0.0225	0.0033
61.5	43	81.83%	65.61%	75.49%	0.0263	0.0040
62.5	43	81.83%	64.34%	74.93%	0.0306	0.0048
63.5	43	81.83%	63.05%	74.36%	0.0353	0.0056
64.5	43	81.83%	61.73%	73.79%	0.0404	0.0065
65.5	43	81.83%	60.38%	73.21%	0.0460	0.0074
66.5			59.01%	72.62%		
Sum of Squared Differences				[8]	0.3183	0.0548
Up to 1% of Beginning Exposures				[9]	0.0824	0.0183

[1] Age in years using half-year convention

[2] Dollars exposed to retirement at the beginning of each age interval

[3] Observed life table based on the Company's property records. These numbers form the original survivor curve.

[4] The Company's selected Iowa curve to be fitted to the OLT.

[5] My selected Iowa curve to be fitted to the OLT.

[6] = ([4] - [3])^2. This is the squared difference between each point on the Company's curve and the observed survivor curve.

[7] = ([5] - [3])^2. This is the squared difference between each point on my curve and the observed survivor curve.

[8] = Sum of squared differences. The smallest SSD represents the best mathematical fit.

Accounts 1290 - 1315 Curve Fitting

[1] Age (Years)	[2] Exposures (Dollars)	[3] Observed Life Table (OLT)	[4] BGWC R1.5-50	[5] ORS L1-55	[6] BGWC SSD	[7] ORS SSD
0.0	6,650,780	100.00%	100.00%	100.00%	0.0000	0.0000
0.5	6,584,932	100.00%	99.82%	99.95%	0.0000	0.0000
1.5	6,516,175	100.00%	99.46%	99.82%	0.0000	0.0000
2.5	5,921,543	100.00%	99.08%	99.68%	0.0001	0.0000
3.5	5,620,320	99.82%	98.69%	99.50%	0.0001	0.0000
4.5	3,202,807	99.80%	98.28%	99.29%	0.0002	0.0000
5.5	3,194,108	99.10%	97.86%	99.05%	0.0002	0.0000
6.5	3,033,136	99.07%	97.42%	98.77%	0.0003	0.0000
7.5	2,631,943	97.99%	96.97%	98.46%	0.0001	0.0000
8.5	2,437,821	97.49%	96.50%	98.09%	0.0001	0.0000
9.5	2,098,336	97.30%	96.01%	97.69%	0.0002	0.0000
10.5	1,344,463	96.37%	95.51%	97.23%	0.0001	0.0001
11.5	752,611	96.22%	94.98%	96.73%	0.0002	0.0000
12.5	746,456	95.79%	94.44%	96.18%	0.0002	0.0000
13.5	735,101	94.84%	93.89%	95.57%	0.0001	0.0001
14.5	796,643	94.66%	93.31%	94.91%	0.0002	0.0000
15.5	951,842	91.85%	92.71%	94.19%	0.0001	0.0005
16.5	1,003,883	91.31%	92.09%	93.43%	0.0001	0.0004
17.5	1,057,988	91.31%	91.45%	92.60%	0.0000	0.0002
18.5	997,414	91.21%	90.79%	91.72%	0.0000	0.0000
19.5	962,243	89.33%	90.11%	90.79%	0.0001	0.0002
20.5	1,084,140	87.42%	89.40%	89.81%	0.0004	0.0006
21.5	1,112,884	86.43%	88.67%	88.78%	0.0005	0.0006
22.5	1,239,723	86.35%	87.91%	87.71%	0.0002	0.0002
23.5	1,272,374	86.27%	87.13%	86.58%	0.0001	0.0000
24.5	1,331,034	85.81%	86.31%	85.42%	0.0000	0.0000
25.5	1,365,493	83.82%	85.47%	84.22%	0.0003	0.0000
26.5	1,281,769	82.56%	84.60%	82.98%	0.0004	0.0000
27.5	1,531,652	82.22%	83.70%	81.72%	0.0002	0.0000
28.5	1,323,499	80.01%	82.76%	80.42%	0.0008	0.0000
29.5	1,240,233	78.51%	81.79%	79.11%	0.0011	0.0000
30.5	1,901,853	77.06%	80.79%	77.78%	0.0014	0.0001
31.5	1,837,358	76.84%	79.75%	76.43%	0.0008	0.0000
32.5	1,780,665	75.70%	78.67%	75.08%	0.0009	0.0000
33.5	1,664,724	75.57%	77.56%	73.72%	0.0004	0.0003
34.5	1,595,275	75.57%	76.40%	72.37%	0.0001	0.0010
35.5	1,755,726	72.31%	75.21%	71.02%	0.0008	0.0002
36.5	1,597,362	70.50%	73.98%	69.66%	0.0012	0.0001
37.5	1,567,877	70.40%	72.71%	68.32%	0.0005	0.0004
38.5	1,458,717	70.40%	71.40%	66.97%	0.0001	0.0012
39.5	1,422,728	70.29%	70.05%	65.62%	0.0000	0.0022
40.5	1,022,371	68.07%	68.65%	64.28%	0.0000	0.0014
41.5	1,001,185	67.63%	67.22%	62.95%	0.0000	0.0022
42.5	1,001,185	67.63%	65.74%	61.62%	0.0004	0.0036
43.5	388,939	67.32%	64.23%	60.29%	0.0010	0.0049
44.5	135,636	23.48%	62.67%	58.98%	0.1536	0.1260
45.5	135,144	23.39%	61.08%	57.66%	0.1420	0.1175
46.5	109,664	22.70%	59.44%	56.36%	0.1350	0.1133

Accounts 1290 - 1315 Curve Fitting

[1] Age (Years)	[2] Exposures (Dollars)	[3] Observed Life Table (OLT)	[4] BGWC R1.5-50	[5] ORS L1-55	[6] BGWC SSD	[7] ORS SSD
47.5	109,664	22.70%	57.77%	55.06%	0.1230	0.1047
48.5	39,461	22.70%	56.07%	53.78%	0.1114	0.0966
49.5	39,461	22.70%	54.34%	52.50%	0.1001	0.0888
50.5			52.57%	51.23%		
Sum of Squared Differences				[8]	0.7789	0.6677
Up to 1% of Beginning Exposures				[9]	0.5674	0.4824

[1] Age in years using half-year convention

[2] Dollars exposed to retirement at the beginning of each age interval

[3] Observed life table based on the Company's property records. These numbers form the original survivor curve.

[4] The Company's selected Iowa curve to be fitted to the OLT.

[5] My selected Iowa curve to be fitted to the OLT.

[6] = ([4] - [3])^2. This is the squared difference between each point on the Company's curve and the observed survivor curve.

[7] = ([5] - [3])^2. This is the squared difference between each point on my curve and the observed survivor curve.

[8] = Sum of squared differences. The smallest SSD represents the best mathematical fit.

Account 1360 Curve Fitting

[1] Age (Years)	[2] Exposures (Dollars)	[3] Observed Life Table (OLT)	[4] BGWC S1.5-70	[5] ORS S1.5-95	[6] BGWC SSD	[7] ORS SSD
0.0	5,811,595	100.00%	100.00%	100.00%	0.0000	0.0000
0.5	5,187,811	100.00%	100.00%	100.00%	0.0000	0.0000
1.5	4,728,116	100.00%	100.00%	100.00%	0.0000	0.0000
2.5	4,600,194	100.00%	100.00%	100.00%	0.0000	0.0000
3.5	2,793,391	100.00%	99.99%	99.99%	0.0000	0.0000
4.5	2,840,799	100.00%	99.98%	99.99%	0.0000	0.0000
5.5	2,700,758	99.91%	99.96%	99.98%	0.0000	0.0000
6.5	2,787,439	99.88%	99.93%	99.97%	0.0000	0.0000
7.5	2,818,887	99.80%	99.90%	99.96%	0.0000	0.0000
8.5	2,661,996	99.79%	99.86%	99.94%	0.0000	0.0000
9.5	1,977,025	99.69%	99.81%	99.92%	0.0000	0.0000
10.5	1,506,621	99.67%	99.74%	99.89%	0.0000	0.0000
11.5	1,475,022	99.67%	99.67%	99.86%	0.0000	0.0000
12.5	1,435,010	99.59%	99.58%	99.82%	0.0000	0.0000
13.5	1,466,283	99.59%	99.47%	99.78%	0.0000	0.0000
14.5	1,547,109	99.59%	99.35%	99.73%	0.0000	0.0000
15.5	1,628,383	99.59%	99.22%	99.67%	0.0000	0.0000
16.5	1,614,940	99.51%	99.06%	99.61%	0.0000	0.0000
17.5	1,572,694	99.40%	98.89%	99.54%	0.0000	0.0000
18.5	1,479,436	99.40%	98.70%	99.46%	0.0000	0.0000
19.5	1,518,247	99.34%	98.48%	99.37%	0.0001	0.0000
20.5	2,250,633	98.96%	98.24%	99.27%	0.0001	0.0000
21.5	2,217,581	98.91%	97.98%	99.17%	0.0001	0.0000
22.5	2,925,493	98.90%	97.70%	99.05%	0.0001	0.0000
23.5	2,692,716	98.86%	97.39%	98.92%	0.0002	0.0000
24.5	2,608,037	98.68%	97.06%	98.78%	0.0003	0.0000
25.5	3,343,734	98.57%	96.69%	98.64%	0.0004	0.0000
26.5	3,325,776	98.52%	96.30%	98.48%	0.0005	0.0000
27.5	3,527,840	98.52%	95.88%	98.30%	0.0007	0.0000
28.5	3,521,690	98.45%	95.43%	98.12%	0.0009	0.0000
29.5	3,565,230	98.39%	94.95%	97.92%	0.0012	0.0000
30.5	4,761,693	97.25%	94.44%	97.71%	0.0008	0.0000
31.5	4,647,776	97.02%	93.90%	97.48%	0.0010	0.0000
32.5	4,463,074	97.00%	93.32%	97.24%	0.0014	0.0000
33.5	3,892,281	96.84%	92.71%	96.99%	0.0017	0.0000
34.5	3,148,767	80.66%	92.07%	96.72%	0.0130	0.0258
35.5	3,390,040	80.36%	91.39%	96.44%	0.0122	0.0259
36.5	3,323,487	79.93%	90.68%	96.14%	0.0116	0.0263
37.5	3,977,353	79.86%	89.93%	95.82%	0.0101	0.0255
38.5	3,637,366	79.84%	89.15%	95.49%	0.0087	0.0245
39.5	3,582,326	79.82%	88.34%	95.14%	0.0073	0.0235
40.5	3,306,101	79.80%	87.49%	94.78%	0.0059	0.0224
41.5	3,770,846	79.78%	86.60%	94.40%	0.0047	0.0214
42.5	3,657,971	79.74%	85.69%	94.00%	0.0035	0.0203
43.5	2,486,858	79.71%	84.74%	93.58%	0.0025	0.0192
44.5	2,476,391	79.37%	83.75%	93.15%	0.0019	0.0190
45.5	2,533,099	79.32%	82.73%	92.69%	0.0012	0.0179
46.5	2,386,594	79.32%	81.68%	92.22%	0.0006	0.0166

Account 1360 Curve Fitting

[1]	[2]	[3]	[4]	[5]	[6]	[7]
Age (Years)	**Exposures (Dollars)**	**Observed Life Table (OLT)**	**BGWC S1.5-70**	**ORS S1.5-95**	**BGWC SSD**	**ORS SSD**
47.5	2,384,286	79.25%	80.60%	91.73%	0.0002	0.0156
48.5	1,441,539	79.21%	79.48%	91.23%	0.0000	0.0144
49.5	1,441,383	79.21%	78.33%	90.70%	0.0001	0.0132
50.5	744,638	79.16%	77.16%	90.15%	0.0004	0.0121
51.5	744,563	79.15%	75.95%	89.59%	0.0010	0.0109
52.5	744,563	79.15%	74.72%	89.01%	0.0020	0.0097
53.5	741,114	79.15%	73.46%	88.40%	0.0032	0.0086
54.5	216,724	79.15%	72.18%	87.78%	0.0049	0.0075
55.5	216,724	79.15%	70.87%	87.14%	0.0069	0.0064
56.5	72,243	79.15%	69.53%	86.49%	0.0093	0.0054
57.5	72,243	79.15%	68.18%	85.81%	0.0120	0.0044
58.5			66.80%	85.12%		
Sum of Squared Differences				[8]	0.1324	0.3965
Up to 1% of Beginning Exposures				[9]	0.0094	0.0001

[1] Age in years using half-year convention

[2] Dollars exposed to retirement at the beginning of each age interval

[3] Observed life table based on the Company's property records. These numbers form the original survivor curve.

[4] The Company's selected Iowa curve to be fitted to the OLT.

[5] My selected Iowa curve to be fitted to the OLT.

[6] = ([4] - [3])^2. This is the squared difference between each point on the Company's curve and the observed survivor curve.

[7] = ([5] - [3])^2. This is the squared difference between each point on my curve and the observed survivor curve.

[8] = Sum of squared differences. The smallest SSD represents the best mathematical fit.

Account 1360 Curve Fitting

[1] Age (Years)	[2] Exposures (Dollars)	[3] Observed Life Table (OLT)	[4] BGWC S0-45	[5] ORS L0-53	[6] BGWC SSD	[7] ORS SSD
0.0	2,390,443	100.00%	100.00%	100.00%	0.0000	0.0000
0.5	2,220,289	99.77%	99.98%	99.88%	0.0000	0.0000
1.5	2,089,740	99.67%	99.83%	99.49%	0.0000	0.0000
2.5	1,947,741	99.41%	99.58%	98.97%	0.0000	0.0000
3.5	1,743,353	99.12%	99.25%	98.37%	0.0000	0.0001
4.5	1,533,332	98.89%	98.84%	97.69%	0.0000	0.0001
5.5	1,306,159	98.64%	98.36%	96.95%	0.0000	0.0003
6.5	737,143	98.54%	97.82%	96.15%	0.0001	0.0006
7.5	500,310	97.96%	97.21%	95.31%	0.0001	0.0007
8.5	360,444	96.80%	96.55%	94.43%	0.0000	0.0006
9.5	241,346	96.24%	95.83%	93.50%	0.0000	0.0007
10.5	222,636	96.00%	95.06%	92.55%	0.0001	0.0012
11.5	242,453	94.45%	94.24%	91.56%	0.0000	0.0008
12.5	257,663	93.38%	93.37%	90.55%	0.0000	0.0008
13.5	238,189	92.71%	92.46%	89.52%	0.0000	0.0010
14.5	246,639	91.01%	91.50%	88.46%	0.0000	0.0007
15.5	262,676	89.67%	90.51%	87.38%	0.0001	0.0005
16.5	262,865	89.34%	89.47%	86.28%	0.0000	0.0009
17.5	269,586	87.56%	88.40%	85.17%	0.0001	0.0006
18.5	252,940	86.43%	87.30%	84.05%	0.0001	0.0006
19.5	406,768	82.69%	86.16%	82.91%	0.0012	0.0000
20.5	525,668	79.59%	84.99%	81.76%	0.0029	0.0005
21.5	508,871	78.47%	83.78%	80.60%	0.0028	0.0005
22.5	516,454	77.36%	82.55%	79.44%	0.0027	0.0004
23.5	523,125	76.72%	81.29%	78.27%	0.0021	0.0002
24.5	526,597	75.62%	80.01%	77.09%	0.0019	0.0002
25.5	546,384	73.92%	78.70%	75.92%	0.0023	0.0004
26.5	559,432	72.97%	77.36%	74.74%	0.0019	0.0003
27.5	594,261	71.84%	76.01%	73.56%	0.0017	0.0003
28.5	600,806	70.92%	74.63%	72.38%	0.0014	0.0002
29.5	633,073	70.23%	73.23%	71.21%	0.0009	0.0001
30.5	764,044	69.70%	71.82%	70.03%	0.0004	0.0000
31.5	743,157	69.06%	70.39%	68.86%	0.0002	0.0000
32.5	549,539	67.28%	68.94%	67.69%	0.0003	0.0000
33.5	429,642	64.56%	67.48%	66.52%	0.0009	0.0004
34.5	403,474	62.32%	66.00%	65.35%	0.0014	0.0009
35.5	559,954	58.90%	64.52%	64.19%	0.0032	0.0028
36.5	515,559	56.50%	63.02%	63.03%	0.0042	0.0043
37.5	603,738	52.57%	61.51%	61.88%	0.0080	0.0087
38.5	582,546	52.01%	59.99%	60.73%	0.0064	0.0076
39.5	558,064	51.78%	58.47%	59.59%	0.0045	0.0061
40.5	525,713	51.75%	56.94%	58.45%	0.0027	0.0045
41.5	627,652	51.69%	55.40%	57.32%	0.0014	0.0032
42.5	602,742	51.58%	53.86%	56.19%	0.0005	0.0021
43.5	489,254	51.52%	52.32%	55.07%	0.0001	0.0013
44.5	484,547	51.02%	50.78%	53.95%	0.0000	0.0009
45.5	495,126	50.92%	49.23%	52.85%	0.0003	0.0004
46.5	471,174	50.86%	47.69%	51.75%	0.0010	0.0001

Account 1360 Curve Fitting

[1] Age (Years)	[2] Exposures (Dollars)	[3] Observed Life Table (OLT)	[4] BGWC S0-45	[5] ORS L0-53	[6] BGWC SSD	[7] ORS SSD
47.5	467,827	50.50%	46.14%	50.66%	0.0019	0.0000
48.5	287,677	50.44%	44.60%	49.58%	0.0034	0.0001
49.5	287,677	50.44%	43.07%	48.50%	0.0054	0.0004
50.5	148,230	50.38%	41.54%	47.44%	0.0078	0.0009
51.5	147,996	50.30%	40.01%	46.38%	0.0106	0.0015
52.5	147,996	50.30%	38.50%	45.33%	0.0139	0.0025
53.5	147,855	50.30%	36.99%	44.30%	0.0177	0.0036
54.5	42,783	50.30%	35.49%	43.27%	0.0219	0.0049
55.5	42,783	50.30%	34.00%	42.25%	0.0266	0.0065
56.5	14,464	50.30%	32.53%	41.25%	0.0316	0.0082
57.5	14,464	50.30%	31.07%	40.25%	0.0370	0.0101
58.5			29.62%	39.27%		
Sum of Squared Differences				[8]	0.2355	0.0951
Up to 1% of Beginning Exposures				[9]	0.1670	0.0768

[1] Age in years using half-year convention

[2] Dollars exposed to retirement at the beginning of each age interval

[3] Observed life table based on the Company's property records. These numbers form the original survivor curve.

[4] The Company's selected Iowa curve to be fitted to the OLT.

[5] My selected Iowa curve to be fitted to the OLT.

[6] = ([4] - [3])^2. This is the squared difference between each point on the Company's curve and the observed survivor curve.

[7] = ([5] - [3])^2. This is the squared difference between each point on my curve and the observed survivor curve.

[8] = Sum of squared differences. The smallest SSD represents the best mathematical fit.

Accounts 1395 - 1405 Curve Fitting

[1] Age (Years)	[2] Exposures (Dollars)	[3] Observed Life Table (OLT)	[4] BGWC R0.5-35	[5] ORS O1-40	[6] BGWC SSD	[7] ORS SSD
0.0	9,995,117	100.00%	100.00%	100.00%	0.0000	0.0000
0.5	9,123,080	99.86%	99.46%	99.38%	0.0000	0.0000
1.5	7,574,902	99.27%	98.36%	98.13%	0.0001	0.0001
2.5	5,921,141	97.98%	97.25%	96.88%	0.0001	0.0001
3.5	5,556,637	96.49%	96.13%	95.63%	0.0000	0.0001
4.5	5,962,458	95.69%	94.99%	94.38%	0.0000	0.0002
5.5	5,843,672	95.06%	93.83%	93.13%	0.0002	0.0004
6.5	5,189,236	91.24%	92.66%	91.88%	0.0002	0.0000
7.5	4,894,931	90.06%	91.48%	90.63%	0.0002	0.0000
8.5	4,627,178	89.01%	90.28%	89.38%	0.0002	0.0000
9.5	3,837,294	88.32%	89.07%	88.13%	0.0001	0.0000
10.5	3,814,266	87.54%	87.85%	86.88%	0.0000	0.0000
11.5	3,220,142	86.98%	86.61%	85.63%	0.0000	0.0002
12.5	2,103,725	85.47%	85.35%	84.38%	0.0000	0.0001
13.5	1,223,611	78.92%	84.08%	83.13%	0.0027	0.0018
14.5	1,203,590	77.28%	82.80%	81.88%	0.0030	0.0021
15.5	1,432,648	76.10%	81.49%	80.63%	0.0029	0.0020
16.5	1,574,908	74.02%	80.17%	79.38%	0.0038	0.0029
17.5	1,202,703	72.11%	78.83%	78.13%	0.0045	0.0036
18.5	959,007	69.43%	77.47%	76.88%	0.0065	0.0055
19.5	1,370,464	69.10%	76.09%	75.63%	0.0049	0.0043
20.5	1,524,120	68.10%	74.68%	74.38%	0.0043	0.0039
21.5	1,492,000	66.96%	73.25%	73.13%	0.0040	0.0038
22.5	1,473,326	66.06%	71.80%	71.88%	0.0033	0.0034
23.5	1,304,751	64.03%	70.31%	70.63%	0.0039	0.0043
24.5	1,346,336	63.46%	68.81%	69.38%	0.0029	0.0035
25.5	1,563,369	62.87%	67.28%	68.13%	0.0019	0.0028
26.5	1,552,367	62.30%	65.72%	66.88%	0.0012	0.0021
27.5	1,592,552	61.67%	64.13%	65.63%	0.0006	0.0016
28.5	1,352,216	59.92%	62.52%	64.38%	0.0007	0.0020
29.5	1,211,853	59.28%	60.88%	63.13%	0.0003	0.0015
30.5	3,192,515	59.03%	59.22%	61.88%	0.0000	0.0008
31.5	3,173,811	58.42%	57.53%	60.63%	0.0001	0.0005
32.5	2,539,952	57.28%	55.82%	59.38%	0.0002	0.0004
33.5	3,395,075	57.07%	54.08%	58.13%	0.0009	0.0001
34.5	3,385,648	56.94%	52.33%	56.88%	0.0021	0.0000
35.5	3,366,643	56.43%	50.56%	55.63%	0.0034	0.0001
36.5	3,353,133	56.20%	48.77%	54.38%	0.0055	0.0003
37.5	3,341,100	55.63%	46.97%	53.13%	0.0075	0.0006
38.5	2,942,226	55.33%	45.16%	51.88%	0.0104	0.0012
39.5	2,923,707	55.10%	43.33%	50.63%	0.0139	0.0020
40.5	2,911,348	55.05%	41.50%	49.38%	0.0184	0.0032
41.5	2,901,511	55.04%	39.67%	48.13%	0.0236	0.0048
42.5	2,840,863	54.15%	37.83%	46.88%	0.0266	0.0053
43.5	890,836	54.15%	36.00%	45.63%	0.0329	0.0073
44.5	876,608	54.02%	34.18%	44.38%	0.0394	0.0093
45.5	863,411	53.85%	32.37%	43.13%	0.0462	0.0115
46.5	92,657	53.85%	30.57%	41.88%	0.0542	0.0143

Accounts 1395 - 1405 Curve Fitting

[1]	[2]	[3]	[4]	[5]	[6]	[7]
Age (Years)	**Exposures (Dollars)**	**Observed Life Table (OLT)**	**BGWC R0.5-35**	**ORS O1-40**	**BGWC SSD**	**ORS SSD**
47.5	90,632	52.68%	28.79%	40.63%	0.0571	0.0145
48.5	80,018	51.65%	27.03%	39.38%	0.0606	0.0151
49.5	80,018	51.65%	25.29%	38.13%	0.0695	0.0183
50.5	366	51.65%	23.59%	36.88%	0.0788	0.0218
51.5	90	12.66%	21.91%	35.63%	0.0086	0.0527
52.5	90	12.66%	20.28%	34.38%	0.0058	0.0472
53.5			18.68%	33.13%		
Sum of Squared Differences				[8]	0.6179	0.2838
Up to 1% of Beginning Exposures				[9]	0.2833	0.0998

[1] Age in years using half-year convention

[2] Dollars exposed to retirement at the beginning of each age interval

[3] Observed life table based on the Company's property records. These numbers form the original survivor curve.

[4] The Company's selected Iowa curve to be fitted to the OLT.

[5] My selected Iowa curve to be fitted to the OLT.

[6] = ([4] - [3])^2. This is the squared difference between each point on the Company's curve and the observed survivor curve.

[7] = ([5] - [3])^2. This is the squared difference between each point on my curve and the observed survivor curve.

[8] = Sum of squared differences. The smallest SSD represents the best mathematical fit.

BGWC

Water Division

106.60 Structures and Improvements

Observed Life Table

Retirement Expr. 2005 TO 2018
Placement Years 1962 TO 2018

Age Interval	$ Surviving At Beginning of Age Interval	$ Retired During The Age Interval	Retirement Ratio	% Surviving At Beginning of Age Interval
0.0 - 0.5	$2,952,834.81	$0.00	0.00000	100.00
0.5 - 1.5	$2,872,893.40	$0.00	0.00000	100.00
1.5 - 2.5	$3,263,645.73	$1,519.73	0.00047	100.00
2.5 - 3.5	$3,870,119.24	$2,559.50	0.00066	99.95
3.5 - 4.5	$3,797,667.60	$867.54	0.00023	99.89
4.5 - 5.5	$3,764,074.15	$0.00	0.00000	99.86
5.5 - 6.5	$3,522,823.39	$327.27	0.00009	99.86
6.5 - 7.5	$3,499,556.63	$0.00	0.00000	99.86
7.5 - 8.5	$3,444,437.28	$2,584.99	0.00075	99.86
8.5 - 9.5	$3,152,867.39	$286.25	0.00009	99.78
9.5 - 10.5	$2,315,820.12	$3,896.97	0.00168	99.77
10.5 - 11.5	$1,817,551.48	$4,603.60	0.00253	99.60
11.5 - 12.5	$1,663,030.25	$6,687.58	0.00402	99.35
12.5 - 13.5	$1,389,809.93	$1,379.84	0.00099	98.95
13.5 - 14.5	$1,386,068.96	$2,865.85	0.00207	98.85
14.5 - 15.5	$1,566,829.71	$3,248.42	0.00207	98.65
15.5 - 16.5	$1,048,537.98	$905.55	0.00086	98.44
16.5 - 17.5	$264,801.38	$4,555.93	0.01721	98.36
17.5 - 18.5	$261,782.29	$2,343.58	0.00895	96.67
18.5 - 19.5	$214,841.39	$2,796.76	0.01302	95.80
19.5 - 20.5	$425,117.65	$1,550.35	0.00365	94.55
20.5 - 21.5	$423,567.30	$4,306.86	0.01017	94.21
21.5 - 22.5	$419,260.44	$1,300.31	0.00310	93.25
22.5 - 23.5	$449,122.90	$596.11	0.00133	92.96
23.5 - 24.5	$448,526.79	$168.83	0.00038	92.84
24.5 - 25.5	$660,891.03	$1,877.29	0.00284	92.80
25.5 - 26.5	$704,466.70	$2,922.28	0.00415	92.54
26.5 - 27.5	$779,620.31	$2,178.95	0.00279	92.16
27.5 - 28.5	$793,528.63	$0.00	0.00000	91.90
28.5 - 29.5	$626,577.75	$670.08	0.00107	91.90
29.5 - 30.5	$739,385.76	$13,894.95	0.01879	91.80
30.5 - 31.5	$726,620.50	$1,536.84	0.00212	90.08
31.5 - 32.5	$725,083.66	$380.86	0.00053	89.89
32.5 - 33.5	$724,874.69	$1,906.30	0.00263	89.84
33.5 - 34.5	$496,775.30	$651.60	0.00131	89.60
34.5 - 35.5	$536,715.30	$0.00	0.00000	89.48
35.5 - 36.5	$536,715.30	$1,658.88	0.00309	89.48

BGWC
Water Division
106.60 Structures and Improvements
Observed Life Table
Retirement Expr. 2005 TO 2018
Placement Years 1962 TO 2018

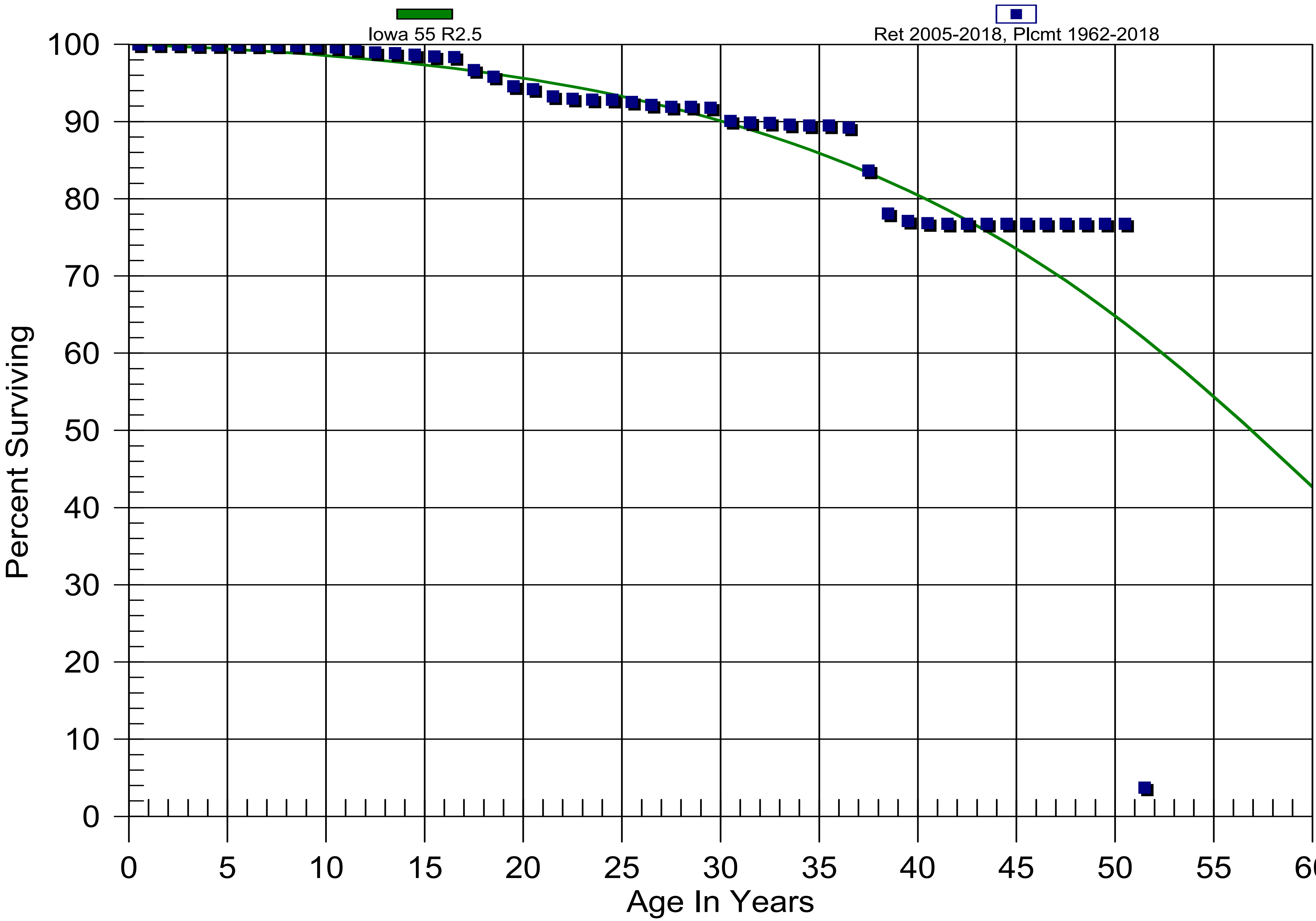
Age Interval	*$ Surviving At Beginning of Age Interval*	*$ Retired During The Age Interval*	*Retirement Ratio*	*% Surviving At Beginning of Age Interval*
36.5 - 37.5	$505,432.10	$31,452.06	0.06223	89.21
37.5 - 38.5	$473,980.04	$31,483.94	0.06642	83.66
38.5 - 39.5	$250,916.19	$3,178.67	0.01267	78.10
39.5 - 40.5	$203,140.20	$677.12	0.00333	77.11
40.5 - 41.5	$143,000.00	$171.89	0.00120	76.85
41.5 - 42.5	$128,088.28	$0.00	0.00000	76.76
42.5 - 43.5	$117,574.16	$0.00	0.00000	76.76
43.5 - 44.5	$4,477.61	$0.00	0.00000	76.76
44.5 - 45.5	$4,477.61	$0.00	0.00000	76.76
45.5 - 46.5	$4,477.61	$0.00	0.00000	76.76
46.5 - 47.5	$4,477.61	$0.00	0.00000	76.76
47.5 - 48.5	$4,477.61	$0.00	0.00000	76.76
48.5 - 49.5	$4,477.61	$0.00	0.00000	76.76
49.5 - 50.5	$4,477.61	$0.00	0.00000	76.76
50.5 - 51.5	$4,477.61	$4,261.00	0.95162	76.76

BGWC

Water Division

106.60 Structures and Improvements

Original And Smooth Survivor Curves



BGWC

Water Division

108.00 Wells and Springs

Observed Life Table

Retirement Expr. 2005 TO 2018
Placement Years 1963 TO 2018

Age Interval	$ Surviving At Beginning of Age Interval	$ Retired During The Age Interval	Retirement Ratio	% Surviving At Beginning of Age Interval
0.0 - 0.5	$1,278,013.84	$0.00	0.00000	100.00
0.5 - 1.5	$1,227,173.76	$0.00	0.00000	100.00
1.5 - 2.5	$1,194,804.70	$0.00	0.00000	100.00
2.5 - 3.5	$1,173,968.63	$24,491.58	0.02086	100.00
3.5 - 4.5	$1,136,482.13	$0.00	0.00000	97.91
4.5 - 5.5	$1,217,055.77	$0.00	0.00000	97.91
5.5 - 6.5	$1,168,041.34	$277.45	0.00024	97.91
6.5 - 7.5	$1,083,773.89	$0.00	0.00000	97.89
7.5 - 8.5	$1,148,868.49	$13,119.02	0.01142	97.89
8.5 - 9.5	$1,111,863.89	$0.00	0.00000	96.77
9.5 - 10.5	$942,069.28	$997.29	0.00106	96.77
10.5 - 11.5	$782,563.97	$0.00	0.00000	96.67
11.5 - 12.5	$712,054.20	$10,743.30	0.01509	96.67
12.5 - 13.5	$356,473.41	$42,480.33	0.11917	95.21
13.5 - 14.5	$286,135.60	$0.00	0.00000	83.87
14.5 - 15.5	$286,135.60	$7,268.09	0.02540	83.87
15.5 - 16.5	$264,103.15	$1,000.00	0.00379	81.74
16.5 - 17.5	$263,103.15	$0.00	0.00000	81.43
17.5 - 18.5	$325,105.43	$0.00	0.00000	81.43
18.5 - 19.5	$256,472.57	$0.00	0.00000	81.43
19.5 - 20.5	$501,536.83	$13,465.49	0.02685	81.43
20.5 - 21.5	$510,217.87	$0.00	0.00000	79.24
21.5 - 22.5	$498,398.38	$0.00	0.00000	79.24
22.5 - 23.5	$609,712.01	$0.00	0.00000	79.24
23.5 - 24.5	$754,684.94	$0.00	0.00000	79.24
24.5 - 25.5	$975,117.14	$0.00	0.00000	79.24
25.5 - 26.5	$1,106,213.39	$0.00	0.00000	79.24
26.5 - 27.5	$1,156,105.70	$0.00	0.00000	79.24
27.5 - 28.5	$1,178,252.23	$72,788.65	0.06178	79.24
28.5 - 29.5	$1,127,610.11	$0.00	0.00000	74.34
29.5 - 30.5	$1,167,510.00	$0.00	0.00000	74.34
30.5 - 31.5	$1,167,510.00	$0.00	0.00000	74.34
31.5 - 32.5	$1,112,889.90	$0.00	0.00000	74.34
32.5 - 33.5	$1,120,272.08	$12,415.52	0.01108	74.34
33.5 - 34.5	$862,792.30	$0.00	0.00000	73.52
34.5 - 35.5	$1,027,982.48	$0.00	0.00000	73.52
35.5 - 36.5	$965,980.20	$0.00	0.00000	73.52

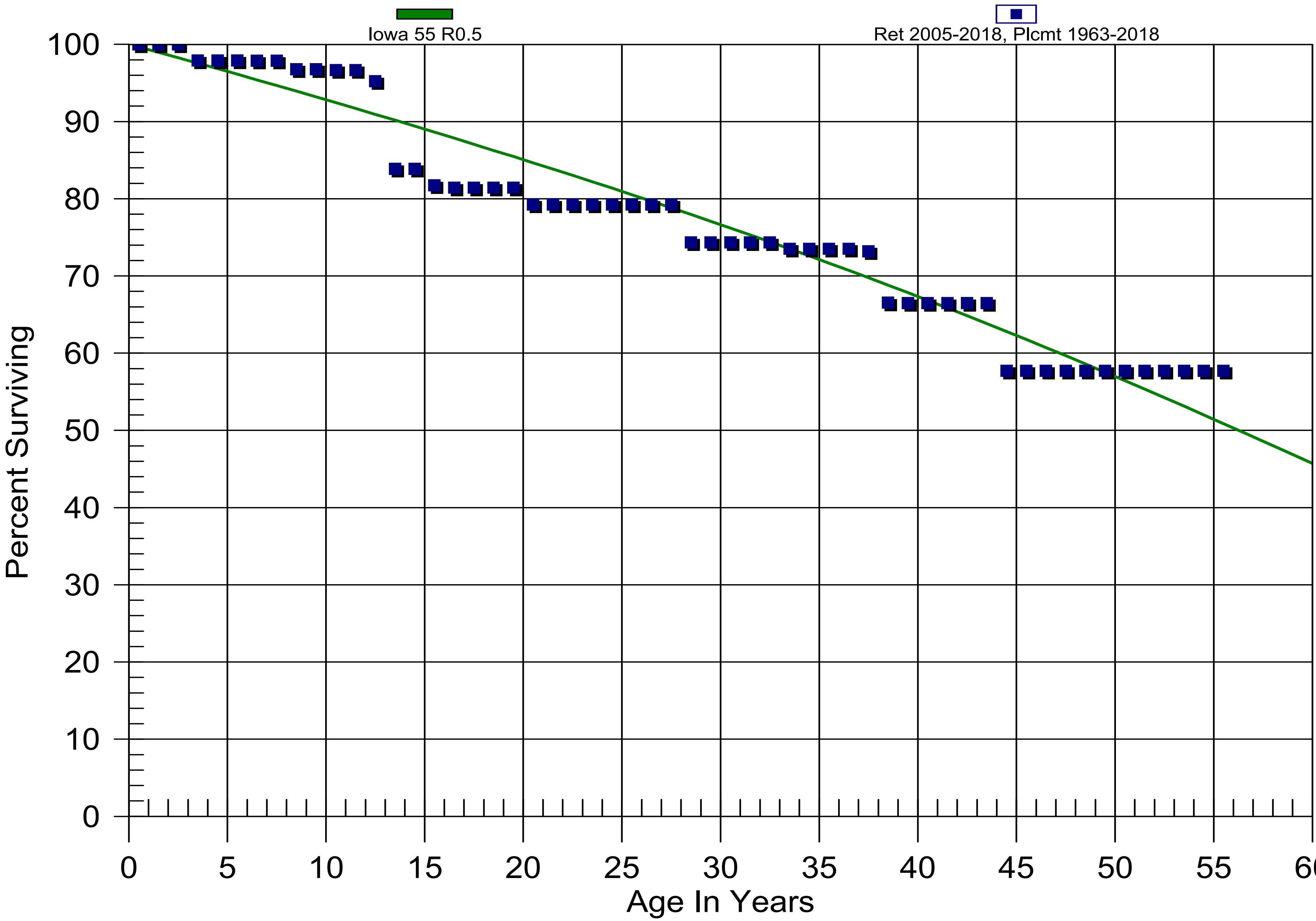
BGWC
Water Division
108.00 Wells and Springs

Observed Life Table
Retirement Expr. 2005 TO 2018
Placement Years 1963 TO 2018

Age Interval	$ Surviving At Beginning of Age Interval	$ Retired During The Age Interval	Retirement Ratio	% Surviving At Beginning of Age Interval
36.5 - 37.5	$869,430.92	$3,937.78	0.00453	73.52
37.5 - 38.5	$709,305.48	$64,457.33	0.09087	73.19
38.5 - 39.5	$497,204.60	$274.87	0.00055	66.54
39.5 - 40.5	$373,215.66	$0.00	0.00000	66.50
40.5 - 41.5	$264,265.93	$0.00	0.00000	66.50
41.5 - 42.5	$311,734.92	$0.00	0.00000	66.50
42.5 - 43.5	$289,588.39	$0.00	0.00000	66.50
43.5 - 44.5	$245,004.84	$32,414.15	0.13230	66.50
44.5 - 45.5	$212,590.69	$0.00	0.00000	57.70
45.5 - 46.5	$205,208.51	$0.00	0.00000	57.70
46.5 - 47.5	$197,826.33	$0.00	0.00000	57.70
47.5 - 48.5	$197,826.33	$0.00	0.00000	57.70
48.5 - 49.5	$74,112.25	$0.00	0.00000	57.70
49.5 - 50.5	$74,112.25	$0.00	0.00000	57.70
50.5 - 51.5	$59,347.90	$0.00	0.00000	57.70
51.5 - 52.5	$59,347.90	$0.00	0.00000	57.70
52.5 - 53.5	$59,347.90	$0.00	0.00000	57.70
53.5 - 54.5	$51,965.72	$0.00	0.00000	57.70
54.5 - 55.5	$37,201.37	$0.00	0.00000	57.70

BGWC

Water Division
108.00 Wells and Springs
Original And Smooth Survivor Curves



BGWC

Water Division

111.50 Water Treatment Equipment

Observed Life Table

Retirement Expr. 2005 TO 2018
Placement Years 1975 TO 2018

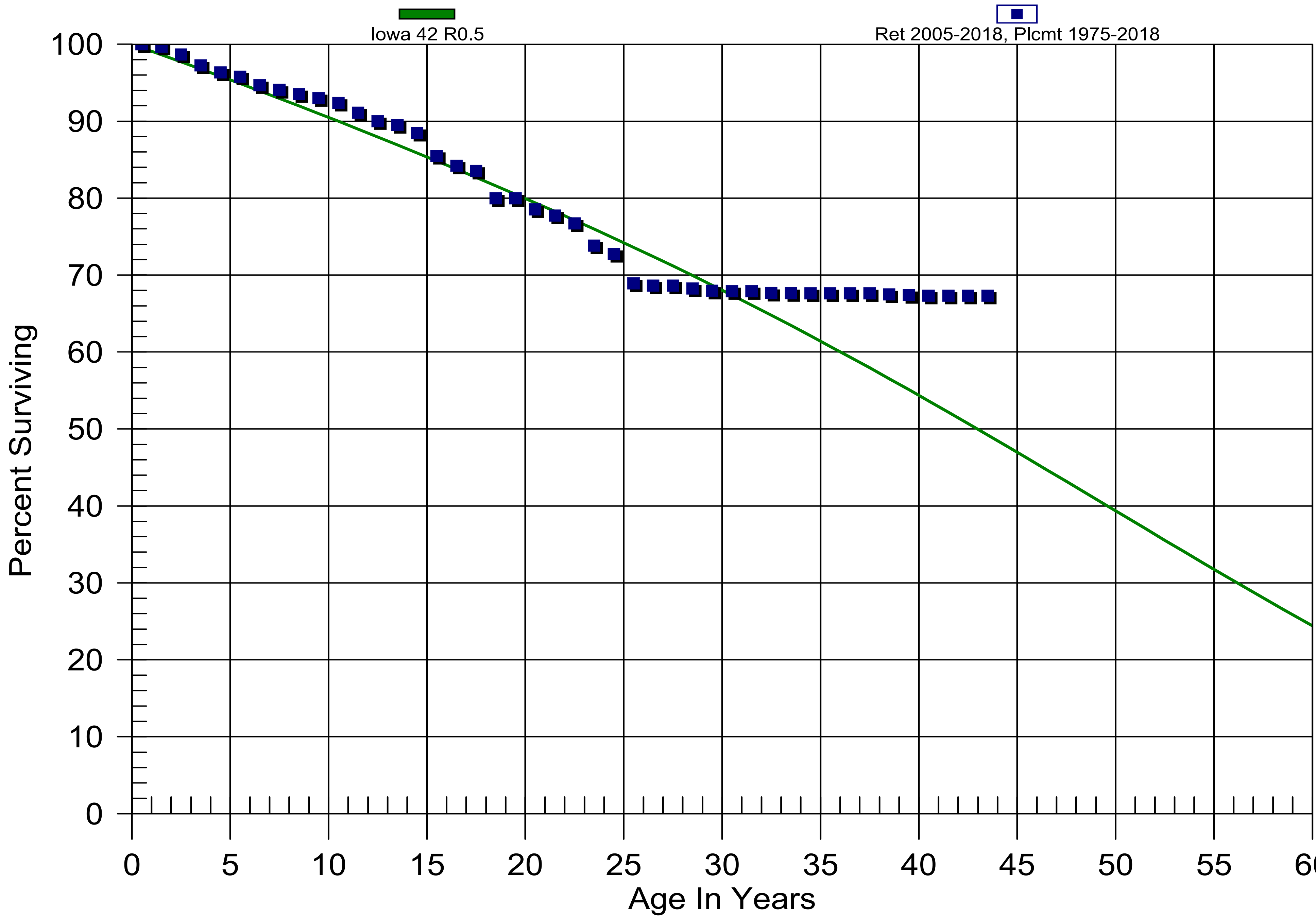
Age Interval	*$ Surviving At Beginning of Age Interval*	*$ Retired During The Age Interval*	*Retirement Ratio*	*% Surviving At Beginning of Age Interval*
0.0 - 0.5	$1,009,964.96	$0.00	0.00000	100.00
0.5 - 1.5	$1,291,994.46	$4,040.15	0.00313	100.00
1.5 - 2.5	$1,232,927.20	$12,711.38	0.01031	99.69
2.5 - 3.5	$1,189,055.61	$16,966.63	0.01427	98.66
3.5 - 4.5	$1,122,691.83	$10,621.94	0.00946	97.25
4.5 - 5.5	$1,277,580.89	$7,326.72	0.00573	96.33
5.5 - 6.5	$1,180,683.62	$13,671.33	0.01158	95.78
6.5 - 7.5	$1,134,813.22	$7,206.06	0.00635	94.67
7.5 - 8.5	$1,036,424.30	$6,087.60	0.00587	94.07
8.5 - 9.5	$985,008.77	$5,634.09	0.00572	93.52
9.5 - 10.5	$792,860.28	$5,241.70	0.00661	92.98
10.5 - 11.5	$613,242.93	$8,364.28	0.01364	92.37
11.5 - 12.5	$563,197.25	$6,954.32	0.01235	91.11
12.5 - 13.5	$519,781.55	$2,882.15	0.00554	89.98
13.5 - 14.5	$516,899.40	$5,885.98	0.01139	89.48
14.5 - 15.5	$228,845.17	$7,754.94	0.03389	88.46
15.5 - 16.5	$224,921.94	$3,309.44	0.01471	85.47
16.5 - 17.5	$225,710.02	$1,788.01	0.00792	84.21
17.5 - 18.5	$223,922.01	$9,563.70	0.04271	83.54
18.5 - 19.5	$19,952.58	$0.00	0.00000	79.97
19.5 - 20.5	$137,229.97	$2,466.64	0.01797	79.97
20.5 - 21.5	$134,961.28	$1,405.97	0.01042	78.54
21.5 - 22.5	$133,555.31	$1,741.11	0.01304	77.72
22.5 - 23.5	$133,160.18	$4,993.11	0.03750	76.70
23.5 - 24.5	$128,331.65	$1,894.59	0.01476	73.83
24.5 - 25.5	$126,742.01	$6,654.86	0.05251	72.74
25.5 - 26.5	$120,087.15	$504.45	0.00420	68.92
26.5 - 27.5	$270,241.36	$0.00	0.00000	68.63
27.5 - 28.5	$270,241.36	$1,511.14	0.00559	68.63
28.5 - 29.5	$268,730.22	$1,181.97	0.00440	68.25
29.5 - 30.5	$400,786.56	$348.78	0.00087	67.95
30.5 - 31.5	$400,437.78	$0.00	0.00000	67.89
31.5 - 32.5	$400,437.78	$1,195.15	0.00298	67.89
32.5 - 33.5	$399,242.63	$164.58	0.00041	67.68
33.5 - 34.5	$284,201.92	$121.96	0.00043	67.66
34.5 - 35.5	$284,079.96	$0.00	0.00000	67.63
35.5 - 36.5	$284,079.96	$0.00	0.00000	67.63

BGWC
Water Division
111.50 Water Treatment Equipment
Observed Life Table
Retirement Expr. 2005 TO 2018
Placement Years 1975 TO 2018

Age Interval	$ Surviving At Beginning of Age Interval	$ Retired During The Age Interval	Retirement Ratio	% Surviving At Beginning of Age Interval
36.5 - 37.5	$284,079.96	$0.00	0.00000	67.63
37.5 - 38.5	$284,079.96	$566.37	0.00199	67.63
38.5 - 39.5	$283,513.59	$438.27	0.00155	67.49
39.5 - 40.5	$283,075.32	$303.34	0.00107	67.39
40.5 - 41.5	$132,549.37	$0.00	0.00000	67.32
41.5 - 42.5	$132,549.37	$0.00	0.00000	67.32
42.5 - 43.5	$132,549.37	$0.00	0.00000	67.32

BGWC

Water Division
111.50 Water Treatment Equipment
Original And Smooth Survivor Curves



BGWC
Water Division
112.00 Distribution Reservoirs and Standpipes
Observed Life Table
Retirement Expr. 2005 TO 2018
Placement Years 1963 TO 2018

Age Interval	$ Surviving At Beginning of Age Interval	$ Retired During The Age Interval	Retirement Ratio	% Surviving At Beginning of Age Interval
0.0 - 0.5	$6,235,105.13	$2,186.58	0.00035	100.00
0.5 - 1.5	$6,065,237.97	$17,451.70	0.00288	99.96
1.5 - 2.5	$4,890,864.43	$15,915.36	0.00325	99.68
2.5 - 3.5	$3,935,273.47	$4,329.47	0.00110	99.35
3.5 - 4.5	$1,442,821.11	$8,971.57	0.00622	99.24
4.5 - 5.5	$1,294,932.94	$1,925.29	0.00149	98.63
5.5 - 6.5	$1,064,339.82	$12,076.98	0.01135	98.48
6.5 - 7.5	$989,487.90	$4,203.76	0.00425	97.36
7.5 - 8.5	$928,259.76	$3,750.52	0.00404	96.95
8.5 - 9.5	$833,765.05	$2,201.37	0.00264	96.56
9.5 - 10.5	$581,414.48	$4,995.59	0.00859	96.30
10.5 - 11.5	$556,750.26	$5,900.52	0.01060	95.47
11.5 - 12.5	$508,108.88	$5,690.88	0.01120	94.46
12.5 - 13.5	$481,458.97	$3,373.57	0.00701	93.40
13.5 - 14.5	$132,403.60	$2,179.82	0.01646	92.75
14.5 - 15.5	$158,814.23	$2,139.34	0.01347	91.22
15.5 - 16.5	$372,112.94	$10,577.52	0.02843	89.99
16.5 - 17.5	$343,201.89	$1,524.86	0.00444	87.44
17.5 - 18.5	$342,480.71	$60.83	0.00018	87.05
18.5 - 19.5	$283,389.13	$15,048.59	0.05310	87.03
19.5 - 20.5	$643,601.98	$6,023.25	0.00936	82.41
20.5 - 21.5	$684,325.73	$8,320.33	0.01216	81.64
21.5 - 22.5	$720,240.15	$505.36	0.00070	80.65
22.5 - 23.5	$766,090.56	$11,514.81	0.01503	80.59
23.5 - 24.5	$801,416.53	$1,758.21	0.00219	79.38
24.5 - 25.5	$1,266,857.21	$14,810.67	0.01169	79.20
25.5 - 26.5	$1,271,259.10	$733.05	0.00058	78.28
26.5 - 27.5	$1,422,205.51	$2,346.90	0.00165	78.23
27.5 - 28.5	$1,430,035.70	$2,299.06	0.00161	78.10
28.5 - 29.5	$1,427,833.28	$15,445.31	0.01082	77.98
29.5 - 30.5	$1,204,131.61	$17,363.49	0.01442	77.14
30.5 - 31.5	$1,186,768.12	$57,281.95	0.04827	76.02
31.5 - 32.5	$1,130,280.14	$39,700.18	0.03512	72.35
32.5 - 33.5	$1,090,579.96	$44,795.91	0.04108	69.81
33.5 - 34.5	$711,283.98	$58,867.75	0.08276	66.94
34.5 - 35.5	$694,808.97	$224,061.73	0.32248	61.40
35.5 - 36.5	$470,747.24	$26,672.15	0.05666	41.60

BGWC

Water Division

112.00 Distribution Reservoirs and Standpipes

Observed Life Table

Retirement Expr. 2005 TO 2018
Placement Years 1963 TO 2018

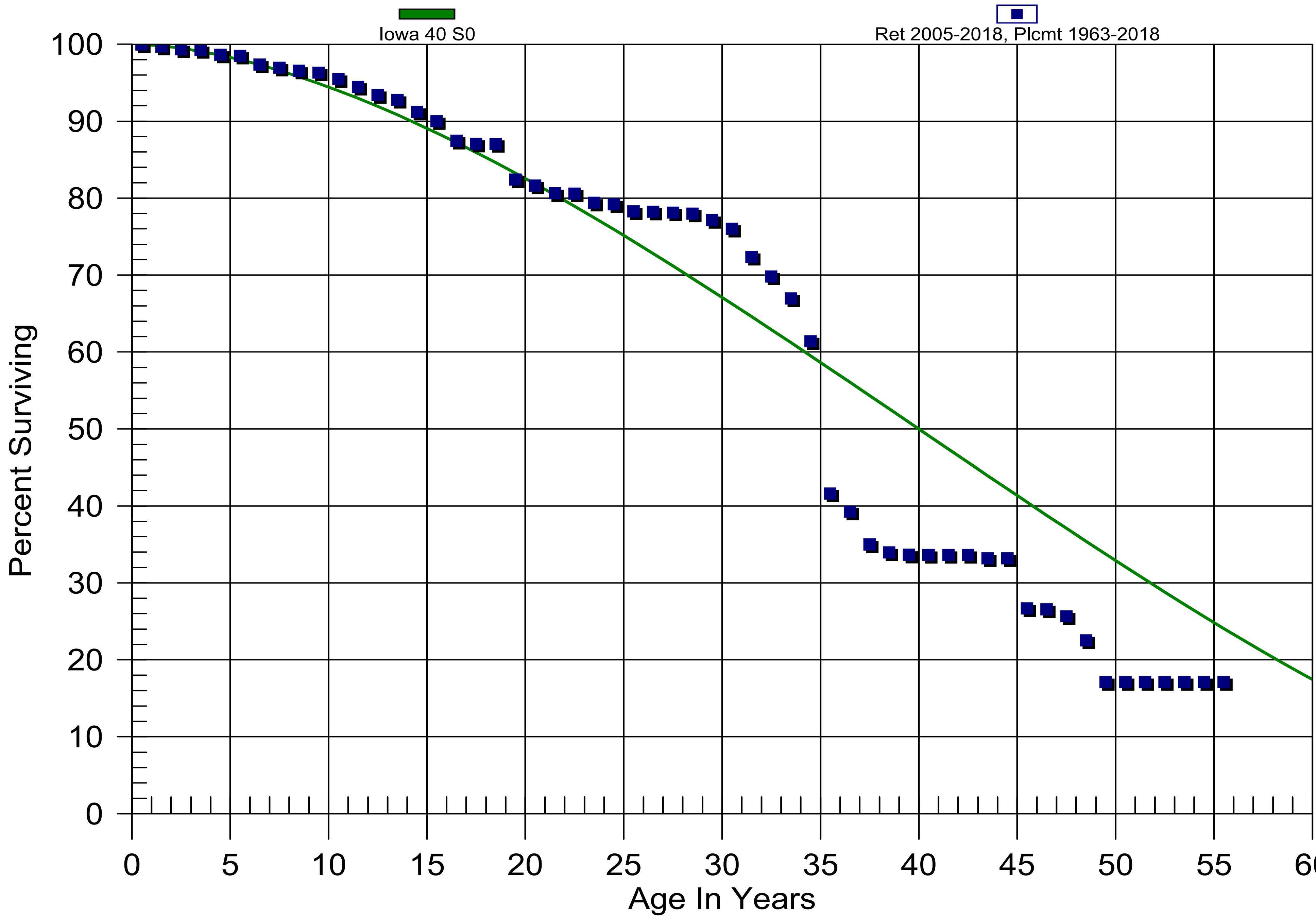
Age Interval	$ Surviving At Beginning of Age Interval	$ Retired During The Age Interval	Retirement Ratio	% Surviving At Beginning of Age Interval
36.5 - 37.5	$450,186.21	$48,976.26	0.10879	39.25
37.5 - 38.5	$401,444.92	$11,554.69	0.02878	34.98
38.5 - 39.5	$192,367.51	$1,764.13	0.00917	33.97
39.5 - 40.5	$204,265.99	$245.36	0.00120	33.66
40.5 - 41.5	$118,628.24	$0.00	0.00000	33.62
41.5 - 42.5	$146,784.97	$0.00	0.00000	33.62
42.5 - 43.5	$146,784.97	$1,961.05	0.01336	33.62
43.5 - 44.5	$144,823.92	$0.00	0.00000	33.17
44.5 - 45.5	$144,823.92	$28,406.06	0.19614	33.17
45.5 - 46.5	$116,417.86	$466.35	0.00401	26.66
46.5 - 47.5	$115,951.51	$3,909.30	0.03371	26.56
47.5 - 48.5	$112,042.21	$13,662.61	0.12194	25.66
48.5 - 49.5	$55,986.86	$13,524.00	0.24156	22.53
49.5 - 50.5	$42,462.86	$0.00	0.00000	17.09
50.5 - 51.5	$42,462.86	$0.00	0.00000	17.09
51.5 - 52.5	$42,462.86	$0.00	0.00000	17.09
52.5 - 53.5	$42,392.74	$0.00	0.00000	17.09
53.5 - 54.5	$42,392.74	$0.00	0.00000	17.09
54.5 - 55.5	$0.00	$0.00	0.00000	17.09

BGWC

Water Division

112.00 Distribution Reservoirs and Standpipes

Original And Smooth Survivor Curves



BGWC
Water Division
112.50 Transmission and Distribution Mains
Observed Life Table
Retirement Expr. 2005 TO 2018
Placement Years 1952 TO 2018

Age Interval	*$ Surviving At Beginning of Age Interval*	*$ Retired During The Age Interval*	*Retirement Ratio*	*% Surviving At Beginning of Age Interval*
0.0 - 0.5	$5,291,737.46	$2,434.13	0.00046	100.00
0.5 - 1.5	$5,224,832.93	$3,908.92	0.00075	99.95
1.5 - 2.5	$4,900,554.53	$1,924.58	0.00039	99.88
2.5 - 3.5	$4,819,315.96	$0.00	0.00000	99.84
3.5 - 4.5	$4,292,084.48	$2,725.11	0.00063	99.84
4.5 - 5.5	$4,316,290.98	$2,087.73	0.00048	99.78
5.5 - 6.5	$3,752,404.09	$6,851.12	0.00183	99.73
6.5 - 7.5	$3,549,317.95	$2,541.69	0.00072	99.55
7.5 - 8.5	$3,253,508.99	$4,416.58	0.00136	99.47
8.5 - 9.5	$2,799,142.49	$669.48	0.00024	99.34
9.5 - 10.5	$3,029,514.97	$2,569.89	0.00085	99.32
10.5 - 11.5	$2,550,744.32	$12,752.33	0.00500	99.23
11.5 - 12.5	$2,380,314.40	$9,406.54	0.00395	98.74
12.5 - 13.5	$2,085,939.04	$11,094.28	0.00532	98.35
13.5 - 14.5	$1,249,227.85	$8,410.60	0.00673	97.82
14.5 - 15.5	$1,609,945.64	$17,609.95	0.01094	97.16
15.5 - 16.5	$1,681,560.27	$8,753.55	0.00521	96.10
16.5 - 17.5	$1,951,010.25	$3,676.59	0.00188	95.60
17.5 - 18.5	$2,098,713.13	$13,791.85	0.00657	95.42
18.5 - 19.5	$1,704,529.52	$4,034.38	0.00237	94.79
19.5 - 20.5	$2,367,424.16	$10,331.64	0.00436	94.57
20.5 - 21.5	$2,795,543.23	$18,270.08	0.00654	94.16
21.5 - 22.5	$2,780,690.53	$14,301.32	0.00514	93.54
22.5 - 23.5	$2,852,444.58	$16,065.77	0.00563	93.06
23.5 - 24.5	$2,550,112.17	$6,312.21	0.00248	92.54
24.5 - 25.5	$3,614,855.25	$8,199.87	0.00227	92.31
25.5 - 26.5	$3,866,005.28	$12,975.23	0.00336	92.10
26.5 - 27.5	$4,407,293.17	$22,828.67	0.00518	91.79
27.5 - 28.5	$4,359,658.61	$11,080.19	0.00254	91.31
28.5 - 29.5	$4,103,171.05	$9,308.32	0.00227	91.08
29.5 - 30.5	$4,359,425.49	$2,830.04	0.00065	90.87
30.5 - 31.5	$4,100,752.71	$11,271.91	0.00275	90.82
31.5 - 32.5	$3,942,089.62	$28,401.17	0.00720	90.57
32.5 - 33.5	$4,164,872.28	$40,801.82	0.00980	89.91
33.5 - 34.5	$3,497,145.41	$21,698.51	0.00620	89.03
34.5 - 35.5	$3,283,037.41	$24,891.04	0.00758	88.48
35.5 - 36.5	$3,258,146.37	$13,351.56	0.00410	87.81

BGWC

Water Division

112.50 Transmission and Distribution Mains

Observed Life Table

Retirement Expr. 2005 TO 2018
Placement Years 1952 TO 2018

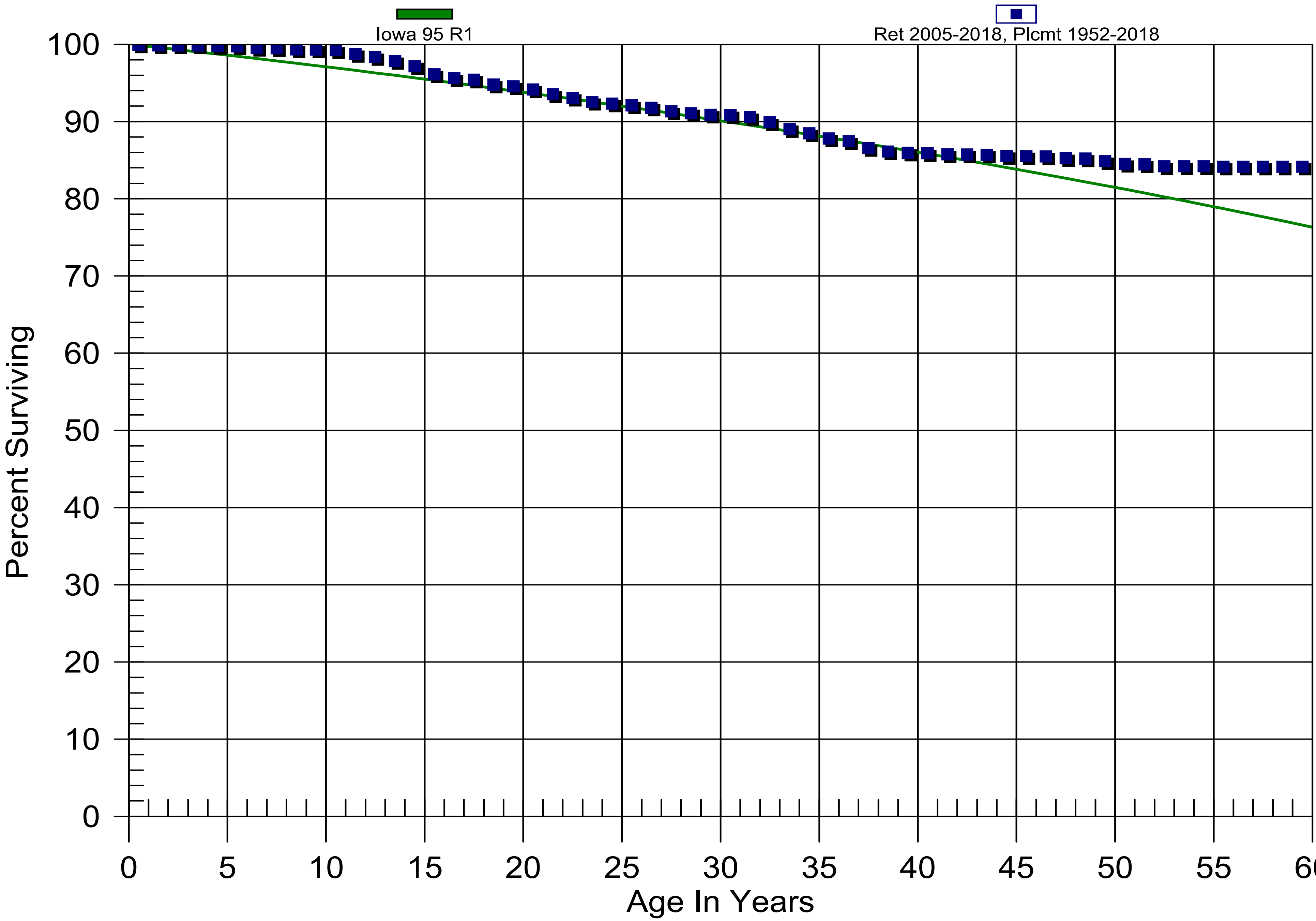
Age Interval	*$ Surviving At Beginning of Age Interval*	*$ Retired During The Age Interval*	*Retirement Ratio*	*% Surviving At Beginning of Age Interval*
36.5 - 37.5	$3,182,172.87	$32,150.76	0.01010	87.45
37.5 - 38.5	$2,799,486.10	$14,662.80	0.00524	86.57
38.5 - 39.5	$1,745,394.67	$3,552.99	0.00204	86.11
39.5 - 40.5	$1,565,274.46	$1,025.00	0.00065	85.94
40.5 - 41.5	$1,088,766.60	$1,502.13	0.00138	85.88
41.5 - 42.5	$1,078,902.87	$603.18	0.00056	85.76
42.5 - 43.5	$986,033.48	$272.11	0.00028	85.71
43.5 - 44.5	$677,900.14	$1,133.72	0.00167	85.69
44.5 - 45.5	$719,657.31	$420.59	0.00058	85.55
45.5 - 46.5	$719,236.72	$252.55	0.00035	85.50
46.5 - 47.5	$468,563.22	$1,079.67	0.00230	85.47
47.5 - 48.5	$467,483.55	$357.72	0.00077	85.27
48.5 - 49.5	$224,999.63	$919.22	0.00409	85.21
49.5 - 50.5	$224,080.41	$948.43	0.00423	84.86
50.5 - 51.5	$223,131.98	$78.25	0.00035	84.50
51.5 - 52.5	$223,053.73	$670.00	0.00300	84.47
52.5 - 53.5	$222,426.28	$26.98	0.00012	84.21
53.5 - 54.5	$159,777.36	$0.00	0.00000	84.20
54.5 - 55.5	$128,466.38	$66.85	0.00052	84.20
55.5 - 56.5	$42,828.21	$0.00	0.00000	84.16
56.5 - 57.5	$42,828.21	$0.00	0.00000	84.16
57.5 - 58.5	$42,828.21	$0.00	0.00000	84.16
58.5 - 59.5	$42.55	$0.00	0.00000	84.16
59.5 - 60.5	$42.55	$0.00	0.00000	84.16
60.5 - 61.5	$42.55	$0.00	0.00000	84.16
61.5 - 62.5	$42.55	$0.00	0.00000	84.16
62.5 - 63.5	$42.55	$0.00	0.00000	84.16
63.5 - 64.5	$42.55	$0.00	0.00000	84.16
64.5 - 65.5	$42.55	$0.00	0.00000	84.16

BGWC

Water Division

112.50 Transmission and Distribution Mains

Original And Smooth Survivor Curves



BGWC

Wastewater Division

131.60 Structures and Improvements

Observed Life Table

Retirement Expr. 2005 TO 2018
Placement Years 1968 TO 2018

Age Interval	$ Surviving At Beginning of Age Interval	$ Retired During The Age Interval	Retirement Ratio	% Surviving At Beginning of Age Interval
0.0 - 0.5	$6,809,770.73	$0.00	0.00000	100.00
0.5 - 1.5	$6,642,418.78	$0.00	0.00000	100.00
1.5 - 2.5	$6,454,531.74	$0.00	0.00000	100.00
2.5 - 3.5	$5,933,120.51	$10,574.32	0.00178	100.00
3.5 - 4.5	$5,634,073.39	$1,476.82	0.00026	99.82
4.5 - 5.5	$3,346,492.05	$22,192.05	0.00663	99.80
5.5 - 6.5	$3,240,173.07	$1,119.51	0.00035	99.13
6.5 - 7.5	$3,064,297.68	$33,026.75	0.01078	99.10
7.5 - 8.5	$2,665,301.12	$13,536.52	0.00508	98.03
8.5 - 9.5	$2,469,231.08	$4,768.88	0.00193	97.53
9.5 - 10.5	$2,298,339.04	$20,062.89	0.00873	97.35
10.5 - 11.5	$1,358,325.59	$2,036.40	0.00150	96.50
11.5 - 12.5	$818,897.57	$3,383.31	0.00413	96.35
12.5 - 13.5	$856,392.39	$7,394.82	0.00863	95.95
13.5 - 14.5	$845,036.90	$1,349.95	0.00160	95.12
14.5 - 15.5	$990,315.85	$23,667.32	0.02390	94.97
15.5 - 16.5	$1,015,311.26	$5,577.28	0.00549	92.70
16.5 - 17.5	$1,066,703.33	$0.00	0.00000	92.19
17.5 - 18.5	$1,123,740.49	$1,151.55	0.00102	92.19
18.5 - 19.5	$1,029,113.56	$20,609.30	0.02003	92.10
19.5 - 20.5	$1,132,332.07	$20,564.89	0.01816	90.25
20.5 - 21.5	$1,156,593.39	$12,327.75	0.01066	88.62
21.5 - 22.5	$1,269,935.14	$939.32	0.00074	87.67
22.5 - 23.5	$1,426,195.02	$1,185.62	0.00083	87.61
23.5 - 24.5	$1,350,899.62	$6,768.11	0.00501	87.53
24.5 - 25.5	$1,461,645.65	$30,881.71	0.02113	87.09
25.5 - 26.5	$1,404,232.46	$20,547.30	0.01463	85.25
26.5 - 27.5	$1,296,378.11	$5,247.04	0.00405	84.01
27.5 - 28.5	$1,203,424.76	$41,169.54	0.03421	83.67
28.5 - 29.5	$979,566.50	$24,882.51	0.02540	80.80
29.5 - 30.5	$1,201,343.04	$22,814.44	0.01899	78.75
30.5 - 31.5	$1,122,794.52	$5,417.09	0.00482	77.26
31.5 - 32.5	$1,058,300.06	$27,290.71	0.02579	76.88
32.5 - 33.5	$1,023,103.01	$3,177.61	0.00311	74.90
33.5 - 34.5	$872,838.55	$0.00	0.00000	74.67
34.5 - 35.5	$1,140,079.30	$68,777.96	0.06033	74.67
35.5 - 36.5	$963,840.08	$43,871.36	0.04552	70.16

BGWC

Wastewater Division

131.60 Structures and Improvements

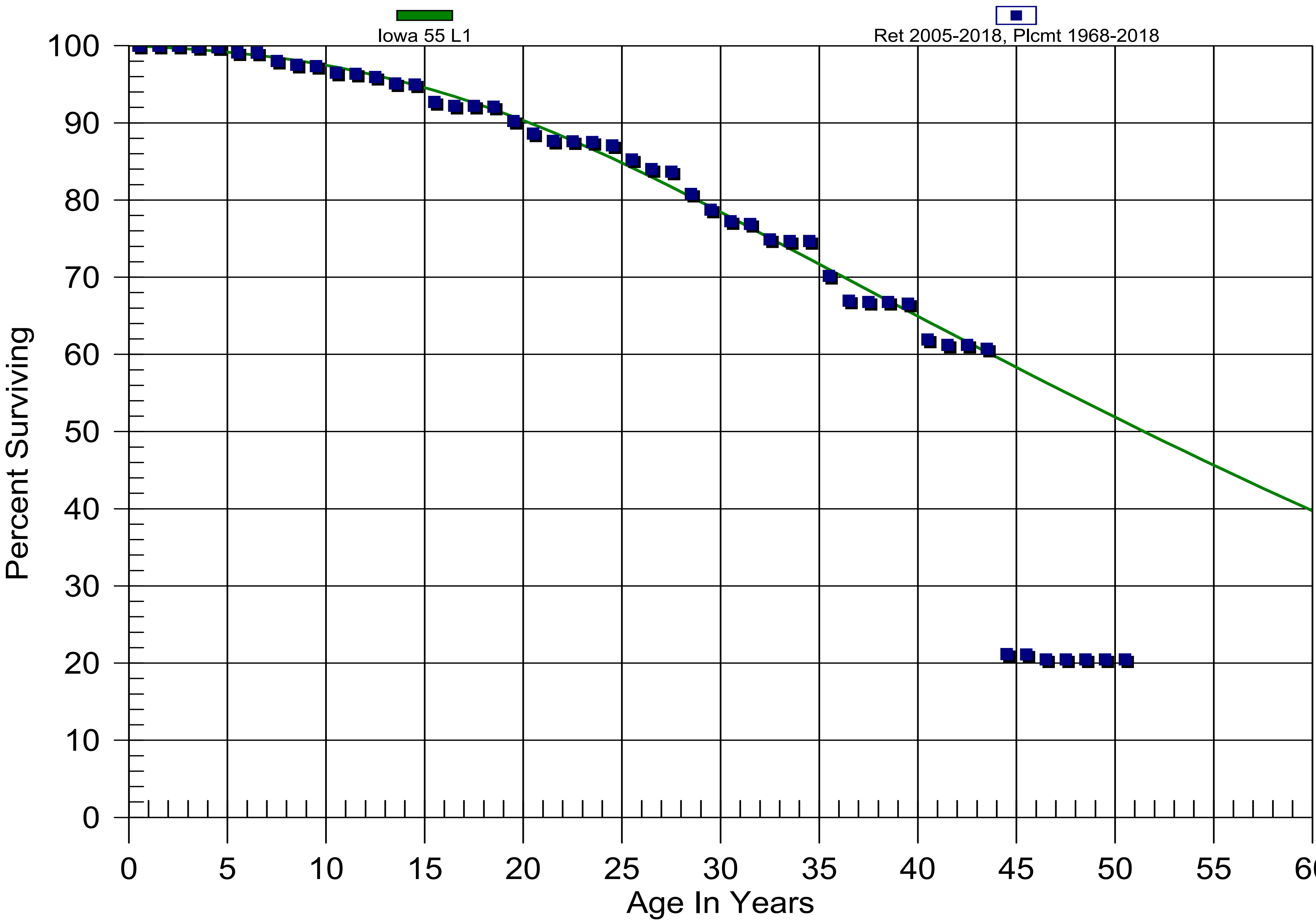
Observed Life Table

Retirement Expr. 2005 TO 2018
Placement Years 1968 TO 2018

Age Interval	$ Surviving At Beginning of Age Interval	$ Retired During The Age Interval	Retirement Ratio	% Surviving At Beginning of Age Interval
36.5 - 37.5	$852,591.34	$2,309.33	0.00271	66.97
37.5 - 38.5	$775,991.53	$100.83	0.00013	66.79
38.5 - 39.5	$679,659.18	$2,262.48	0.00333	66.78
39.5 - 40.5	$643,669.46	$44,908.53	0.06977	66.56
40.5 - 41.5	$587,244.81	$6,639.68	0.01131	61.91
41.5 - 42.5	$566,059.27	$0.00	0.00000	61.21
42.5 - 43.5	$566,059.27	$4,518.51	0.00798	61.21
43.5 - 44.5	$388,938.75	$253,302.85	0.65127	60.73
44.5 - 45.5	$135,635.90	$491.85	0.00363	21.18
45.5 - 46.5	$135,144.05	$3,983.36	0.02947	21.10
46.5 - 47.5	$109,664.28	$0.00	0.00000	20.48
47.5 - 48.5	$109,664.28	$0.00	0.00000	20.48
48.5 - 49.5	$39,461.35	$0.00	0.00000	20.48
49.5 - 50.5	$39,461.35	$0.00	0.00000	20.48

BGWC

Wastewater Division
131.60 Structures and Improvements
Original And Smooth Survivor Curves



BGWC

Wastewater Division

135.00 Gravity Mains

Observed Life Table

Retirement Expr. 2005 TO 2018
Placement Years 1960 TO 2018

Age Interval	*$ Surviving At Beginning of Age Interval*	*$ Retired During The Age Interval*	*Retirement Ratio*	*% Surviving At Beginning of Age Interval*
0.0 - 0.5	$5,861,300.16	$0.00	0.00000	100.00
0.5 - 1.5	$5,190,551.20	$0.00	0.00000	100.00
1.5 - 2.5	$4,731,885.12	$0.00	0.00000	100.00
2.5 - 3.5	$4,700,881.12	$0.00	0.00000	100.00
3.5 - 4.5	$2,920,300.28	$0.00	0.00000	100.00
4.5 - 5.5	$3,043,364.65	$2,518.49	0.00083	100.00
5.5 - 6.5	$2,862,910.80	$723.87	0.00025	99.92
6.5 - 7.5	$2,946,143.03	$2,261.10	0.00077	99.89
7.5 - 8.5	$2,981,039.87	$363.90	0.00012	99.82
8.5 - 9.5	$2,661,995.77	$2,679.38	0.00101	99.80
9.5 - 10.5	$2,257,252.87	$499.40	0.00022	99.70
10.5 - 11.5	$1,628,663.57	$0.00	0.00000	99.68
11.5 - 12.5	$1,569,412.62	$1,082.65	0.00069	99.68
12.5 - 13.5	$1,515,835.56	$0.00	0.00000	99.61
13.5 - 14.5	$1,547,108.55	$0.00	0.00000	99.61
14.5 - 15.5	$1,628,383.35	$0.00	0.00000	99.61
15.5 - 16.5	$1,700,701.47	$1,325.06	0.00078	99.61
16.5 - 17.5	$1,695,765.26	$1,778.29	0.00105	99.53
17.5 - 18.5	$1,680,649.16	$0.00	0.00000	99.43
18.5 - 19.5	$1,504,806.90	$904.97	0.00060	99.43
19.5 - 20.5	$1,415,791.64	$5,829.67	0.00412	99.37
20.5 - 21.5	$1,352,320.06	$1,090.64	0.00081	98.96
21.5 - 22.5	$1,478,238.84	$342.06	0.00023	98.88
22.5 - 23.5	$1,526,478.52	$1,130.68	0.00074	98.86
23.5 - 24.5	$1,285,532.29	$4,729.70	0.00368	98.78
24.5 - 25.5	$1,988,686.65	$2,908.20	0.00146	98.42
25.5 - 26.5	$1,959,890.36	$1,990.73	0.00102	98.28
26.5 - 27.5	$2,161,068.99	$0.00	0.00000	98.18
27.5 - 28.5	$2,152,561.69	$2,226.38	0.00103	98.18
28.5 - 29.5	$2,191,048.53	$2,428.28	0.00111	98.08
29.5 - 30.5	$2,203,645.33	$41,308.66	0.01875	97.97
30.5 - 31.5	$2,081,511.25	$10,874.78	0.00522	96.13
31.5 - 32.5	$1,982,058.41	$1,223.52	0.00062	95.63
32.5 - 33.5	$2,103,163.22	$7,152.00	0.00340	95.57
33.5 - 34.5	$2,028,493.46	$650,423.31	0.32064	95.24
34.5 - 35.5	$2,275,459.79	$11,663.67	0.00513	64.71
35.5 - 36.5	$1,980,579.35	$18,261.29	0.00922	64.37

BGWC
Wastewater Division
135.00 Gravity Mains

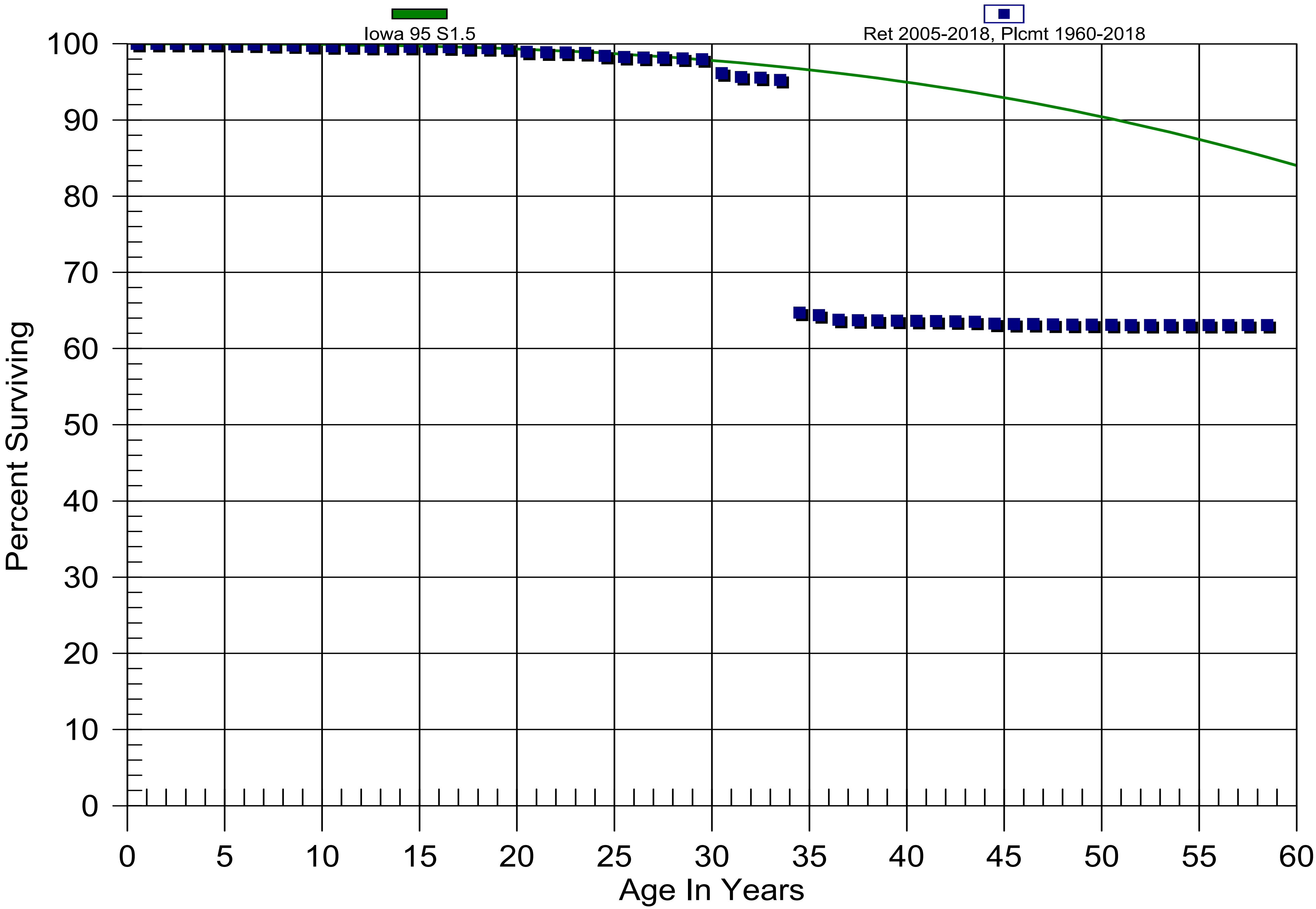
Observed Life Table

Retirement Expr. 2005 TO 2018
Placement Years 1960 TO 2018

Age Interval	*$ Surviving At Beginning of Age Interval*	*$ Retired During The Age Interval*	*Retirement Ratio*	*% Surviving At Beginning of Age Interval*
36.5 - 37.5	$2,609,969.87	$2,879.14	0.00110	63.78
37.5 - 38.5	$2,567,891.59	$1,134.62	0.00044	63.71
38.5 - 39.5	$2,406,112.69	$928.28	0.00039	63.68
39.5 - 40.5	$2,355,326.74	$722.38	0.00031	63.66
40.5 - 41.5	$2,600,207.20	$854.53	0.00033	63.64
41.5 - 42.5	$2,539,592.94	$1,685.57	0.00066	63.62
42.5 - 43.5	$2,571,354.58	$1,557.30	0.00061	63.57
43.5 - 44.5	$2,486,858.01	$10,467.37	0.00421	63.54
44.5 - 45.5	$2,548,708.76	$1,577.35	0.00062	63.27
45.5 - 46.5	$2,533,099.14	$0.00	0.00000	63.23
46.5 - 47.5	$2,386,594.05	$2,307.69	0.00097	63.23
47.5 - 48.5	$2,384,286.36	$945.69	0.00040	63.17
48.5 - 49.5	$1,441,538.93	$155.58	0.00011	63.14
49.5 - 50.5	$1,441,383.35	$800.58	0.00056	63.14
50.5 - 51.5	$744,638.35	$75.22	0.00010	63.10
51.5 - 52.5	$744,563.13	$0.00	0.00000	63.09
52.5 - 53.5	$744,563.13	$0.00	0.00000	63.09
53.5 - 54.5	$741,113.89	$0.00	0.00000	63.09
54.5 - 55.5	$216,723.56	$0.00	0.00000	63.09
55.5 - 56.5	$216,723.56	$0.00	0.00000	63.09
56.5 - 57.5	$72,242.90	$0.00	0.00000	63.09
57.5 - 58.5	$72,242.90	$0.00	0.00000	63.09

BGWC

Wastewater Division
135.00 Gravity Mains
Original And Smooth Survivor Curves



BGWC
Wastewater Division
136.00 Services to Customers

Observed Life Table
Retirement Expr. 2005 TO 2018
Placement Years 1960 TO 2018

Age Interval	$ Surviving At Beginning of Age Interval	$ Retired During The Age Interval	Retirement Ratio	% Surviving At Beginning of Age Interval
0.0 - 0.5	$2,433,129.85	$5,423.73	0.00223	100.00
0.5 - 1.5	$2,252,574.72	$2,267.01	0.00101	99.78
1.5 - 2.5	$2,118,882.13	$5,465.98	0.00258	99.68
2.5 - 3.5	$1,988,458.52	$5,629.02	0.00283	99.42
3.5 - 4.5	$1,772,590.06	$4,087.34	0.00231	99.14
4.5 - 5.5	$1,570,186.10	$3,818.43	0.00243	98.91
5.5 - 6.5	$1,338,488.79	$1,329.70	0.00099	98.67
6.5 - 7.5	$768,161.63	$4,347.45	0.00566	98.57
7.5 - 8.5	$532,640.01	$5,921.16	0.01112	98.01
8.5 - 9.5	$362,996.48	$2,106.42	0.00580	96.92
9.5 - 10.5	$264,732.21	$584.12	0.00221	96.36
10.5 - 11.5	$246,061.31	$3,608.16	0.01466	96.15
11.5 - 12.5	$260,400.08	$2,736.97	0.01051	94.74
12.5 - 13.5	$273,828.19	$1,856.76	0.00678	93.74
13.5 - 14.5	$254,354.08	$4,368.88	0.01718	93.11
14.5 - 15.5	$267,036.90	$3,631.08	0.01360	91.51
15.5 - 16.5	$277,140.02	$977.46	0.00353	90.26
16.5 - 17.5	$277,328.61	$5,235.02	0.01888	89.95
17.5 - 18.5	$286,210.52	$3,455.78	0.01207	88.25
18.5 - 19.5	$293,942.09	$10,965.72	0.03731	87.18
19.5 - 20.5	$413,971.53	$15,256.08	0.03685	83.93
20.5 - 21.5	$398,615.03	$7,346.92	0.01843	80.84
21.5 - 22.5	$381,839.07	$7,211.21	0.01889	79.35
22.5 - 23.5	$402,323.77	$4,290.14	0.01066	77.85
23.5 - 24.5	$409,545.56	$7,464.00	0.01823	77.02
24.5 - 25.5	$429,658.81	$11,843.61	0.02757	75.61
25.5 - 26.5	$432,510.73	$7,051.53	0.01630	73.53
26.5 - 27.5	$471,963.02	$8,670.95	0.01837	72.33
27.5 - 28.5	$464,678.00	$7,631.71	0.01642	71.00
28.5 - 29.5	$500,150.25	$5,792.10	0.01158	69.84
29.5 - 30.5	$633,146.78	$4,795.49	0.00757	69.03
30.5 - 31.5	$619,997.09	$7,036.21	0.01135	68.50
31.5 - 32.5	$602,003.40	$19,124.56	0.03177	67.73
32.5 - 33.5	$574,304.60	$22,188.58	0.03864	65.58
33.5 - 34.5	$426,710.89	$14,927.57	0.03498	63.04
34.5 - 35.5	$590,325.87	$22,160.89	0.03754	60.84
35.5 - 36.5	$557,023.02	$22,794.80	0.04092	58.55

BGWC

Wastewater Division

136.00 Services to Customers

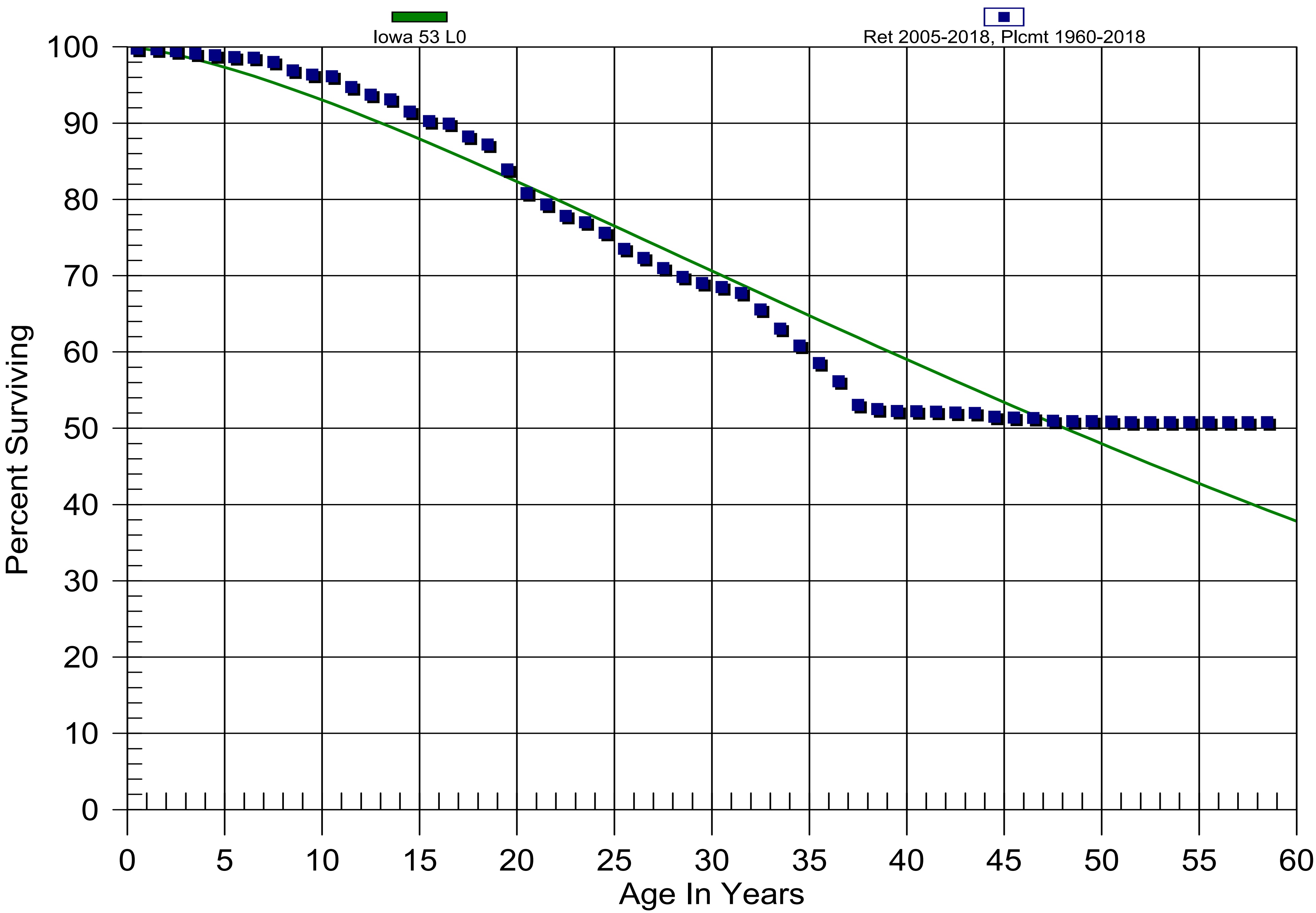
Observed Life Table

Retirement Expr. 2005 TO 2018
Placement Years 1960 TO 2018

Age Interval	$ Surviving At Beginning of Age Interval	$ Retired During The Age Interval	Retirement Ratio	% Surviving At Beginning of Age Interval
36.5 - 37.5	$651,817.14	$35,842.15	0.05499	56.16
37.5 - 38.5	$600,807.60	$6,441.04	0.01072	53.07
38.5 - 39.5	$582,546.39	$2,641.63	0.00453	52.50
39.5 - 40.5	$558,915.12	$321.09	0.00057	52.26
40.5 - 41.5	$630,785.12	$586.11	0.00093	52.23
41.5 - 42.5	$627,652.24	$1,285.45	0.00205	52.18
42.5 - 43.5	$631,668.76	$784.06	0.00124	52.08
43.5 - 44.5	$489,254.31	$4,707.36	0.00962	52.01
44.5 - 45.5	$499,010.47	$991.77	0.00199	51.51
45.5 - 46.5	$495,125.98	$550.72	0.00111	51.41
46.5 - 47.5	$471,174.08	$3,347.53	0.00710	51.35
47.5 - 48.5	$467,826.55	$508.28	0.00109	50.99
48.5 - 49.5	$287,676.60	$0.00	0.00000	50.93
49.5 - 50.5	$287,676.60	$372.58	0.00130	50.93
50.5 - 51.5	$148,230.42	$234.70	0.00158	50.87
51.5 - 52.5	$147,995.72	$0.00	0.00000	50.78
52.5 - 53.5	$147,995.72	$0.00	0.00000	50.78
53.5 - 54.5	$147,855.31	$0.00	0.00000	50.78
54.5 - 55.5	$42,783.49	$0.00	0.00000	50.78
55.5 - 56.5	$42,783.49	$0.00	0.00000	50.78
56.5 - 57.5	$14,463.52	$0.00	0.00000	50.78
57.5 - 58.5	$14,463.52	$0.00	0.00000	50.78

BGWC

Wastewater Division
136.00 Services to Customers
Original And Smooth Survivor Curves



BGWC

Wastewater Division

140.60 Treatment and Disposal Equipment

Observed Life Table

Retirement Expr. 2005 TO 2018
Placement Years 1960 TO 2018

Age Interval	$ Surviving At Beginning of Age Interval	$ Retired During The Age Interval	Retirement Ratio	% Surviving At Beginning of Age Interval
0.0 - 0.5	$10,687,609.81	$13,677.29	0.00128	100.00
0.5 - 1.5	$8,990,510.31	$54,222.49	0.00603	99.87
1.5 - 2.5	$7,454,564.30	$98,763.70	0.01325	99.27
2.5 - 3.5	$5,815,692.86	$89,856.53	0.01545	97.95
3.5 - 4.5	$6,160,247.54	$45,901.59	0.00745	96.44
4.5 - 5.5	$5,896,475.39	$39,483.99	0.00670	95.72
5.5 - 6.5	$5,623,521.62	$234,696.57	0.04173	95.08
6.5 - 7.5	$4,821,834.09	$67,268.00	0.01395	91.11
7.5 - 8.5	$4,540,603.60	$56,770.95	0.01250	89.84
8.5 - 9.5	$4,242,658.67	$35,954.30	0.00847	88.72
9.5 - 10.5	$3,471,548.54	$33,931.43	0.00977	87.97
10.5 - 11.5	$3,311,638.18	$24,220.58	0.00731	87.11
11.5 - 12.5	$2,718,502.72	$55,975.54	0.02059	86.47
12.5 - 13.5	$1,789,969.44	$161,192.86	0.09005	84.69
13.5 - 14.5	$906,373.78	$25,537.51	0.02818	77.06
14.5 - 15.5	$1,140,409.62	$18,382.16	0.01612	74.89
15.5 - 16.5	$1,228,765.89	$39,075.54	0.03180	73.68
16.5 - 17.5	$1,245,252.26	$40,635.70	0.03263	71.34
17.5 - 18.5	$806,991.79	$44,667.75	0.05535	69.01
18.5 - 19.5	$697,007.43	$4,554.87	0.00653	65.19
19.5 - 20.5	$760,752.41	$19,842.08	0.02608	64.77
20.5 - 21.5	$746,565.33	$25,488.53	0.03414	63.08
21.5 - 22.5	$720,394.60	$20,120.25	0.02793	60.92
22.5 - 23.5	$707,328.50	$45,297.65	0.06404	59.22
23.5 - 24.5	$711,788.08	$11,686.34	0.01642	55.43
24.5 - 25.5	$934,510.24	$12,439.35	0.01331	54.52
25.5 - 26.5	$920,536.67	$14,241.14	0.01547	53.79
26.5 - 27.5	$957,425.99	$15,666.48	0.01636	52.96
27.5 - 28.5	$951,785.74	$45,262.45	0.04756	52.10
28.5 - 29.5	$710,468.49	$14,248.87	0.02006	49.62
29.5 - 30.5	$2,090,587.25	$5,228.53	0.00250	48.62
30.5 - 31.5	$2,082,040.38	$32,667.46	0.01569	48.50
31.5 - 32.5	$2,063,336.31	$61,983.54	0.03004	47.74
32.5 - 33.5	$2,767,863.12	$9,369.00	0.00338	46.31
33.5 - 34.5	$2,685,623.80	$8,105.66	0.00302	46.15
34.5 - 35.5	$2,690,312.57	$30,146.96	0.01121	46.01
35.5 - 36.5	$2,659,437.56	$13,412.82	0.00504	45.49

BGWC

Wastewater Division

140.60 Treatment and Disposal Equipment

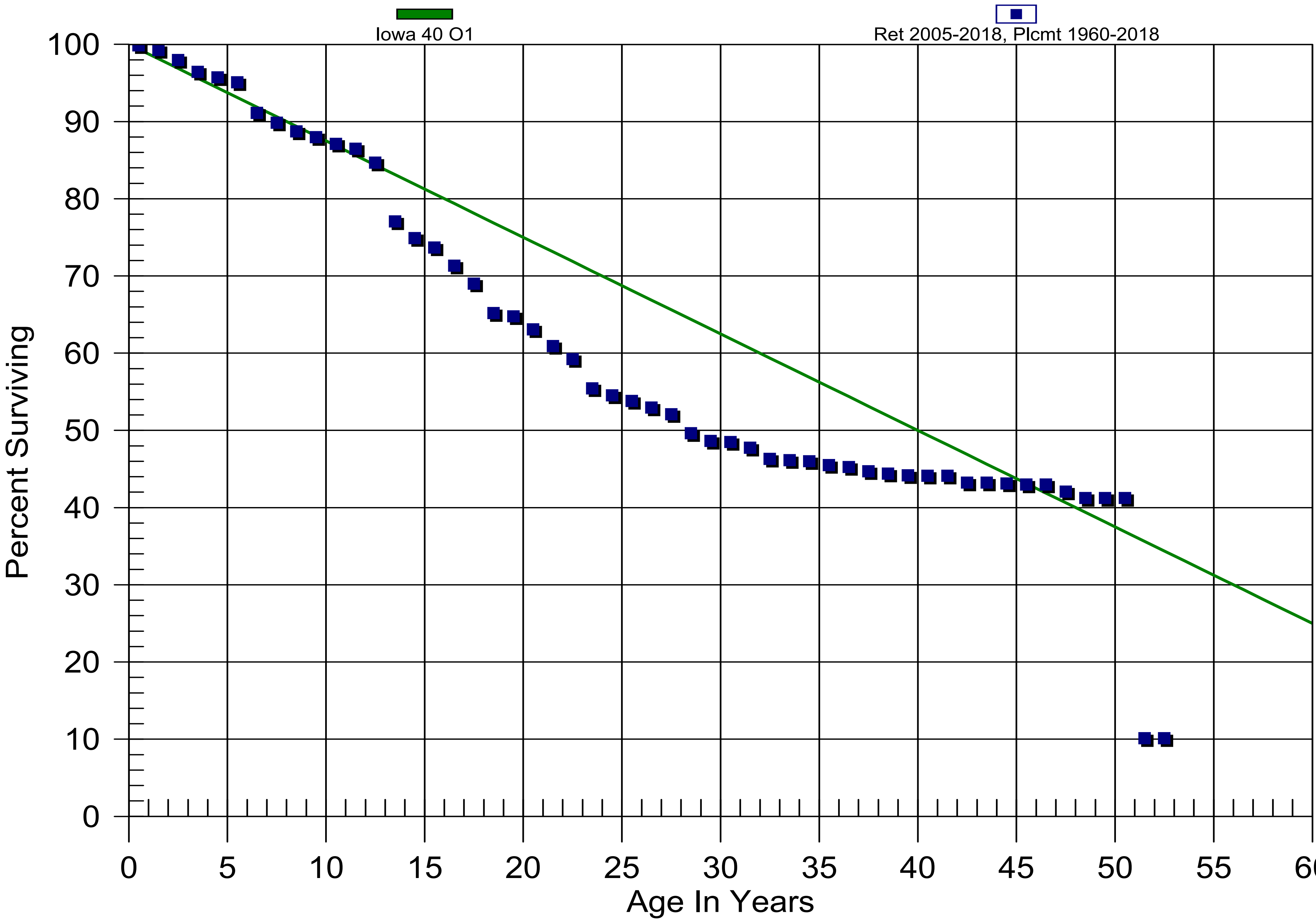
Observed Life Table

Retirement Expr. 2005 TO 2018
Placement Years 1960 TO 2018

Age Interval	$ Surviving At Beginning of Age Interval	$ Retired During The Age Interval	Retirement Ratio	% Surviving At Beginning of Age Interval
36.5 - 37.5	$2,726,280.96	$34,321.44	0.01259	45.27
37.5 - 38.5	$2,633,894.52	$17,663.73	0.00671	44.70
38.5 - 39.5	$2,401,628.35	$12,482.91	0.00520	44.40
39.5 - 40.5	$2,383,287.85	$2,530.26	0.00106	44.16
40.5 - 41.5	$2,370,749.92	$701.71	0.00030	44.12
41.5 - 42.5	$2,360,913.22	$46,632.01	0.01975	44.10
42.5 - 43.5	$2,300,264.90	$0.00	0.00000	43.23
43.5 - 44.5	$890,836.12	$2,208.63	0.00248	43.23
44.5 - 45.5	$876,884.60	$2,687.11	0.00306	43.13
45.5 - 46.5	$863,411.37	$0.00	0.00000	42.99
46.5 - 47.5	$92,657.38	$2,025.88	0.02186	42.99
47.5 - 48.5	$90,631.50	$1,761.41	0.01943	42.05
48.5 - 49.5	$80,018.09	$0.00	0.00000	41.24
49.5 - 50.5	$80,018.09	$0.00	0.00000	41.24
50.5 - 51.5	$365.75	$276.11	0.75491	41.24
51.5 - 52.5	$89.64	$0.00	0.00000	10.11

BGWC

Wastewater Division
140.60 Treatment and Disposal Equipment
Original And Smooth Survivor Curves



BGWC
Water Division
105.00 Source of Supply

Original Cost Of Utility Plant In Service
And Development Of Composite Remaining Life as of December 31, 2018
Based Upon Broad Group/Remaining Life Procedure and Technique

Average Service Life: 55 **Survivor Curve:** R2.5

Year (1)	Original Cost (2)	Avg. Service Life (3)	Avg. Annual Accrual (4)	Avg. Remaining Life (5)	Future Annual Accruals (6)
1975	98,230.77	55.00	1,786.01	19.43	34,694.61
1980	191,579.91	55.00	3,483.26	22.71	79,097.01
1985	196,461.54	55.00	3,572.02	26.26	93,797.88
1990	181,816.66	55.00	3,305.75	30.05	99,325.57
2002	785,846.16	55.00	14,288.08	39.96	570,936.29
2003	491,153.86	55.00	8,930.05	40.83	364,619.92
2006	150,797.18	55.00	2,741.76	43.48	119,213.75
2007	108,756.57	55.00	1,977.39	44.38	87,748.34
2008	184,826.71	55.00	3,360.48	45.28	152,149.94
2009	613,120.37	55.00	11,147.62	46.18	514,816.02
2010	37,884.45	55.00	688.81	47.09	32,437.26
2011	21,998.23	55.00	399.97	48.01	19,200.91
2012	16,721.83	55.00	304.03	48.93	14,875.10
2013	191,653.08	55.00	3,484.59	49.85	173,707.02
2014	26,153.24	55.00	475.51	50.78	24,145.60
2015	39,676.74	55.00	721.39	51.71	37,303.30
2016	53,459.04	55.00	971.98	52.65	51,169.98
2017	97,478.51	55.00	1,772.33	53.58	94,969.74
2018	65,176.62	55.00	1,185.03	54.53	64,616.53
Total	3,552,791.47	55.00	64,596.08	40.70	2,628,824.77

Composite Average Remaining Life ... 40.70 Years

BGWC

Water Division

105.50 Water Treatment

Original Cost Of Utility Plant In Service

And Development Of Composite Remaining Life as of December 31, 2018

Based Upon Broad Group/Remaining Life Procedure and Technique

Average Service Life: 55 *Survivor Curve:* R2.5

Year (1)	Original Cost (2)	Avg. Service Life (3)	Avg. Annual Accrual (4)	Avg. Remaining Life (5)	Future Annual Accruals (6)
1975	14,865.78	55.00	270.29	19.43	5,250.52
1976	14,865.78	55.00	270.29	20.06	5,421.65
1977	14,865.78	55.00	270.29	20.70	5,596.02
1978	59,463.08	55.00	1,081.14	21.36	23,092.13
1979	44,597.32	55.00	810.86	22.03	17,861.54
1982	21,034.03	55.00	382.44	24.10	9,216.19
1985	29,731.55	55.00	540.57	26.26	14,194.92
1999	14,865.78	55.00	270.29	37.38	10,104.20
2000	44,597.32	55.00	810.86	38.23	31,002.57
2003	27,146.56	55.00	493.57	40.83	20,152.90
2005	2,584.99	55.00	47.00	42.59	2,001.76
2006	116,773.82	55.00	2,123.16	43.48	92,316.35
2007	41,161.06	55.00	748.38	44.38	33,210.08
2008	51,793.62	55.00	941.70	45.28	42,636.67
2009	225,621.92	55.00	4,102.21	46.18	189,446.94
2010	251,446.90	55.00	4,571.75	47.09	215,292.81
2011	32,051.37	55.00	582.75	48.01	27,975.68
2012	7,610.05	55.00	138.36	48.93	6,769.61
2013	67,473.75	55.00	1,226.79	49.85	61,155.62
2014	57,782.81	55.00	1,050.59	50.78	53,347.15
2015	22,200.94	55.00	403.65	51.71	20,872.89
2016	111,070.57	55.00	2,019.46	52.65	106,314.65
2017	34,418.29	55.00	625.79	53.58	33,532.48
2018	13,305.98	55.00	241.93	54.53	13,191.64

BGWC

Water Division

105.50 Water Treatment

Original Cost Of Utility Plant In Service

And Development Of Composite Remaining Life as of December 31, 2018

Based Upon Broad Group/Remaining Life Procedure and Technique

***Average Service Life:* 55** ***Survivor Curve:* R2.5**

Year (1)	*Original Cost* (2)	*Avg. Service Life* (3)	*Avg. Annual Accrual* (4)	*Avg. Remaining Life* (5)	*Future Annual Accruals* (6)
Total	1,321,329.05	55.00	24,024.12	43.29	1,039,956.97

Composite Average Remaining Life ... 43.29 Years

BGWC

Water Division

106.00 Transmission and Distribution

Original Cost Of Utility Plant In Service

And Development Of Composite Remaining Life as of December 31, 2018

Based Upon Broad Group/Remaining Life Procedure and Technique

***Average Service Life:* 55** ***Survivor Curve:* R2.5**

Year (1)	Original Cost (2)	Avg. Service Life (3)	Avg. Annual Accrual (4)	Avg. Remaining Life (5)	Future Annual Accruals (6)
2008	9,552.25	55.00	173.68	45.28	7,863.44
2011	6,786.01	55.00	123.38	48.01	5,923.09
2015	14,363.10	55.00	261.15	51.71	13,503.91
Total	30,701.36	55.00	558.21	48.89	27,290.44

Composite Average Remaining Life ... 48.89 Years

BGWC
Water Division
106.50 General

Original Cost Of Utility Plant In Service
And Development Of Composite Remaining Life as of December 31, 2018
Based Upon Broad Group/Remaining Life Procedure and Technique

Average Service Life: 55 **Survivor Curve:** R2.5

Year (1)	Original Cost (2)	Avg. Service Life (3)	Avg. Annual Accrual (4)	Avg. Remaining Life (5)	Future Annual Accruals (6)
1982	8,590.29	55.00	156.19	24.10	3,763.89
2008	248,199.09	55.00	4,512.70	45.28	204,318.29
2009	335.35	55.00	6.10	46.18	281.58
2013	2,296.87	55.00	41.76	49.85	2,081.80
2014	395.71	55.00	7.19	50.78	365.33
2015	432.64	55.00	7.87	51.71	406.76
2016	15,424.11	55.00	280.44	52.65	14,763.67
2018	3,768.70	55.00	68.52	54.53	3,736.31
Total	279,442.76	55.00	5,080.77	45.21	229,717.63

Composite Average Remaining Life ... 45.21 Years

BGWC

Water Division

108.00 Wells and Springs

Original Cost Of Utility Plant In Service

And Development Of Composite Remaining Life as of December 31, 2018

Based Upon Broad Group/Remaining Life Procedure and Technique

Average Service Life: 55 *Survivor Curve:* R0.5

Year (1)	Original Cost (2)	Avg. Service Life (3)	Avg. Annual Accrual (4)	Avg. Remaining Life (5)	Future Annual Accruals (6)
1963	37,201.37	55.00	676.37	23.51	15,900.80
1964	14,764.35	55.00	268.44	23.99	6,439.41
1965	7,382.18	55.00	134.22	24.47	3,284.64
1968	14,764.35	55.00	268.44	25.95	6,965.59
1970	123,714.08	55.00	2,249.30	26.95	60,628.61
1972	7,382.18	55.00	134.22	27.98	3,754.93
1973	7,382.18	55.00	134.22	28.49	3,824.41
1975	44,583.55	55.00	810.59	29.54	23,946.02
1976	22,146.53	55.00	402.66	30.07	12,108.30
1977	22,146.53	55.00	402.66	30.60	12,323.19
1978	123,714.08	55.00	2,249.30	31.14	70,047.15
1979	131,096.25	55.00	2,383.52	31.68	75,517.87
1980	147,643.55	55.00	2,684.37	32.23	86,513.75
1981	156,187.66	55.00	2,839.72	32.78	93,079.11
1982	111,313.63	55.00	2,023.84	33.33	67,454.82
1983	62,002.28	55.00	1,127.29	33.89	38,198.59
1984	22,146.53	55.00	402.66	34.44	13,869.41
1985	245,064.26	55.00	4,455.62	35.01	155,980.48
1987	62,002.28	55.00	1,127.29	36.14	40,742.76
1989	22,146.53	55.00	402.66	37.29	15,014.12
1992	73,821.77	55.00	1,342.19	39.03	52,380.86
1995	11,214.73	55.00	203.90	40.78	8,315.95
1997	73,821.77	55.00	1,342.19	41.97	56,326.17
2000	68,632.86	55.00	1,247.84	43.75	54,591.77
2003	36,910.89	55.00	671.09	45.54	30,563.92
2005	27,857.48	55.00	506.49	46.75	23,675.86
2006	418,659.26	55.00	7,611.83	47.35	360,404.51

BGWC

Water Division

108.00 Wells and Springs

Original Cost Of Utility Plant In Service

And Development Of Composite Remaining Life as of December 31, 2018

Based Upon Broad Group/Remaining Life Procedure and Technique

Average Service Life: 55 *Survivor Curve:* R0.5

Year (1)	Original Cost (2)	Avg. Service Life (3)	Avg. Annual Accrual (4)	Avg. Remaining Life (5)	Future Annual Accruals (6)
2007	70,509.77	55.00	1,281.97	47.95	61,473.12
2008	158,508.02	55.00	2,881.90	48.56	139,938.13
2009	208,220.93	55.00	3,785.76	49.16	186,123.90
2010	23,885.58	55.00	434.27	49.77	21,614.85
2011	8,727.17	55.00	158.67	50.38	7,994.16
2012	98,455.49	55.00	1,790.06	50.99	91,279.88
2013	49,014.43	55.00	891.15	51.61	45,988.03
2014	3,838.99	55.00	69.80	52.22	3,644.81
2015	17,548.07	55.00	319.05	52.83	16,856.84
2016	25,167.50	55.00	457.58	53.45	24,458.28
2017	69,279.95	55.00	1,259.61	54.07	68,107.09
2018	50,840.08	55.00	924.35	54.69	50,552.82
Total	2,879,699.09	55.00	52,357.07	40.30	2,109,884.92

Composite Average Remaining Life ... 40.30 Years

BGWC

Water Division

111.50 Water Treatment Equipment

Original Cost Of Utility Plant In Service

And Development Of Composite Remaining Life as of December 31, 2018

Based Upon Broad Group/Remaining Life Procedure and Technique

Average Service Life: 42 *Survivor Curve:* R0.5

Year (1)	Original Cost (2)	Avg. Service Life (3)	Avg. Annual Accrual (4)	Avg. Remaining Life (5)	Future Annual Accruals (6)
1975	132,549.37	42.00	3,155.84	17.42	54,983.62
1978	150,222.61	42.00	3,576.62	18.86	67,461.18
1985	114,876.13	42.00	2,735.06	22.41	61,295.58
2000	194,405.73	42.00	4,628.57	30.82	142,647.80
2004	290,479.85	42.00	6,915.97	33.19	229,517.18
2006	38,753.90	42.00	922.68	34.38	31,723.07
2007	42,166.31	42.00	1,003.93	34.98	35,118.48
2008	175,196.87	42.00	4,171.23	35.58	148,420.64
2009	196,951.00	42.00	4,689.17	36.18	169,675.03
2010	45,581.03	42.00	1,085.23	36.79	39,924.53
2011	92,510.46	42.00	2,202.56	37.39	82,364.68
2012	34,898.69	42.00	830.90	38.00	31,576.46
2013	93,012.28	42.00	2,214.51	38.61	85,507.86
2014	54,479.46	42.00	1,297.09	39.22	50,877.04
2015	64,339.92	42.00	1,531.86	39.84	61,025.71
2016	32,132.44	42.00	765.03	40.45	30,948.13
2017	62,677.42	42.00	1,492.27	41.07	61,288.68
2018	16,010.60	42.00	381.19	41.69	15,892.20
Total	1,831,244.07	42.00	43,599.71	32.12	1,400,247.87

Composite Average Remaining Life ... ***32.12 Years***

BGWC

Water Division

112.00 Distribution Reservoirs and Standpipes

Original Cost Of Utility Plant In Service

And Development Of Composite Remaining Life as of December 31, 2018

Based Upon Broad Group/Remaining Life Procedure and Technique

Average Service Life: 40 *Survivor Curve:* S0

Year (1)	Original Cost (2)	Avg. Service Life (3)	Avg. Annual Accrual (4)	Avg. Remaining Life (5)	Future Annual Accruals (6)
1964	42,392.74	40.00	1,059.82	9.75	10,334.69
1966	70.12	40.00	1.75	10.57	18.52
1970	42,392.74	40.00	1,059.82	12.23	12,956.92
1978	141,309.13	40.00	3,532.73	15.68	55,402.59
1980	197,832.78	40.00	4,945.82	16.58	82,004.94
1985	334,500.07	40.00	8,362.50	18.90	158,019.90
1989	208,256.36	40.00	5,206.41	20.83	108,464.45
2000	70,654.56	40.00	1,766.36	26.68	47,124.47
2002	18,772.77	40.00	469.32	27.85	13,070.34
2005	345,681.80	40.00	8,642.04	29.69	256,564.22
2006	21,865.35	40.00	546.63	30.33	16,577.52
2007	43,943.27	40.00	1,098.58	30.98	34,031.61
2008	29,229.83	40.00	730.75	31.65	23,124.74
2009	256,439.26	40.00	6,410.98	32.33	207,251.49
2010	90,906.89	40.00	2,272.67	33.03	75,063.67
2011	64,256.65	40.00	1,606.42	33.75	54,211.93
2012	67,355.98	40.00	1,683.90	34.49	58,074.20
2013	231,238.65	40.00	5,780.96	35.25	203,774.54
2014	236,397.72	40.00	5,909.94	36.04	212,980.83
2015	2,498,767.10	40.00	62,469.13	36.85	2,302,091.21
2016	925,133.76	40.00	23,128.33	37.70	871,937.94
2017	1,158,651.59	40.00	28,966.27	38.58	1,117,579.17
2018	170,907.28	40.00	4,272.68	39.51	168,827.65
Total	7,196,956.40	40.00	179,923.78	33.84	6,089,487.54

Composite Average Remaining Life ... 33.84 Years

BGWC
Water Division
112.50 Transmission and Distribution Mains
Original Cost Of Utility Plant In Service
And Development Of Composite Remaining Life as of December 31, 2018
Based Upon Broad Group/Remaining Life Procedure and Technique

Average Service Life: 95 *Survivor Curve:* R1

Year (1)	Original Cost (2)	Avg. Service Life (3)	Avg. Annual Accrual (4)	Avg. Remaining Life (5)	Future Annual Accruals (6)
1960	42,785.66	95.00	450.37	55.04	24,789.62
1963	85,571.32	95.00	900.74	56.91	51,258.98
1964	31,310.98	95.00	329.58	57.54	18,962.60
1965	62,621.94	95.00	659.17	58.17	38,340.51
1970	242,126.20	95.00	2,548.65	61.36	156,380.24
1972	250,487.80	95.00	2,636.67	62.65	165,197.45
1975	307,861.23	95.00	3,240.59	64.62	209,394.34
1976	93,932.92	95.00	988.75	65.27	64,540.57
1977	93,932.92	95.00	988.75	65.94	65,194.10
1978	507,201.77	95.00	5,338.87	66.60	355,563.40
1979	242,126.20	95.00	2,548.65	67.26	171,432.94
1980	1,039,488.34	95.00	10,941.79	67.93	743,291.02
1981	350,646.89	95.00	3,690.96	68.60	253,207.76
1982	62,621.94	95.00	659.17	69.27	45,662.73
1984	436,218.22	95.00	4,591.69	70.62	324,270.70
1985	627,197.16	95.00	6,601.96	71.30	470,704.61
1987	148,193.26	95.00	1,559.90	72.66	113,335.79
1988	256,713.97	95.00	2,702.21	73.34	198,171.99
1989	62,621.94	95.00	659.17	74.02	48,791.61
1990	342,285.30	95.00	3,602.94	74.70	269,156.55
1991	128,356.99	95.00	1,351.10	75.39	101,860.69
1995	655,395.04	95.00	6,898.78	78.15	539,146.45
2000	385,070.96	95.00	4,053.31	81.64	330,918.17
2005	954,894.67	95.00	10,051.35	85.18	856,159.80
2006	288,950.91	95.00	3,041.54	85.89	261,243.95
2007	158,516.43	95.00	1,668.57	86.61	144,510.68
2008	479,184.61	95.00	5,043.96	87.33	440,466.64

BGWC
Water Division
112.50 Transmission and Distribution Mains

Original Cost Of Utility Plant In Service
And Development Of Composite Remaining Life as of December 31, 2018
Based Upon Broad Group/Remaining Life Procedure and Technique

Average Service Life: 95 *Survivor Curve:* R1

Year (1)	Original Cost (2)	Avg. Service Life (3)	Avg. Annual Accrual (4)	Avg. Remaining Life (5)	Future Annual Accruals (6)
2009	431,791.74	95.00	4,545.10	88.05	400,175.46
2010	451,460.97	95.00	4,752.14	88.77	421,836.40
2011	304,991.58	95.00	3,210.38	89.49	287,303.96
2012	206,408.22	95.00	2,172.68	90.22	196,016.76
2013	571,864.42	95.00	6,019.52	90.95	547,462.86
2014	371,595.14	95.00	3,911.46	91.68	358,599.87
2015	343,919.45	95.00	3,620.14	92.41	334,548.37
2016	393,081.67	95.00	4,137.63	93.15	385,417.00
2017	327,893.76	95.00	3,451.45	93.89	324,049.44
2018	66,583.22	95.00	700.86	94.63	66,321.97
Total	11,805,905.74	95.00	124,270.55	78.73	9,783,685.98

Composite Average Remaining Life ... 78.73 Years

BGWC

Wastewater Division

129.00 Collection

Original Cost Of Utility Plant In Service

And Development Of Composite Remaining Life as of December 31, 2018

Based Upon Broad Group/Remaining Life Procedure and Technique

Average Service Life: 55 **Survivor Curve:** L1

Year (1)	Original Cost (2)	Avg. Service Life (3)	Avg. Annual Accrual (4)	Avg. Remaining Life (5)	Future Annual Accruals (6)
1975	47,680.43	55.00	866.86	29.59	25,647.46
2008	22,183.22	55.00	403.31	45.88	18,504.90
2009	12,479.18	55.00	226.88	46.67	10,587.99
2012	601.57	55.00	10.94	49.14	537.41
2014	143.30	55.00	2.61	50.88	132.55
2017	136.36	55.00	2.48	53.60	132.87
2018	3,060.00	55.00	55.63	54.53	3,033.77
Total	86,284.06	55.00	1,568.70	37.34	58,576.96

Composite Average Remaining Life ... 37.34 Years

BGWC

Wastewater Division

129.50 Pumping

Original Cost Of Utility Plant In Service

And Development Of Composite Remaining Life as of December 31, 2018

Based Upon Broad Group/Remaining Life Procedure and Technique

Average Service Life: 55 **Survivor Curve: L1**

Year (1)	Original Cost (2)	Avg. Service Life (3)	Avg. Annual Accrual (4)	Avg. Remaining Life (5)	Future Annual Accruals (6)
1968	24,197.00	55.00	439.92	27.21	11,968.96
1970	36,580.10	55.00	665.05	27.87	18,535.41
1972	1,830.82	55.00	33.29	28.55	950.22
1975	11,227.26	55.00	204.12	29.59	6,039.18
1977	8,263.80	55.00	150.24	30.30	4,551.79
1978	3,800.41	55.00	69.09	30.66	2,118.22
1979	21,163.12	55.00	384.76	31.02	11,935.56
1980	39,782.82	55.00	723.28	31.39	22,702.45
1981	43,895.56	55.00	798.05	31.76	25,345.64
1982	50,032.25	55.00	909.62	32.13	29,230.05
1983	45,910.95	55.00	834.69	32.51	27,138.52
1984	45,158.60	55.00	821.01	32.90	27,007.85
1985	83,053.24	55.00	1,509.96	33.28	50,254.92
1986	18,236.76	55.00	331.56	33.67	11,164.40
1987	31,968.60	55.00	581.21	34.07	19,800.86
1988	31,279.02	55.00	568.67	34.47	19,602.64
1989	33,171.22	55.00	603.08	34.88	21,035.98
1990	105,385.76	55.00	1,915.98	35.30	67,639.85
1991	59,437.03	55.00	1,080.61	35.74	38,617.23
1992	58,296.70	55.00	1,059.87	36.18	38,350.22
1993	46,498.10	55.00	845.37	36.65	30,978.91
1995	73,915.98	55.00	1,343.84	37.62	50,549.95
1996	17,056.29	55.00	310.09	38.13	11,823.62
1997	17,131.71	55.00	311.47	38.66	12,041.52
1998	18,246.79	55.00	331.74	39.21	13,008.13
1999	27,415.36	55.00	498.43	39.78	19,829.10
2000	74,918.28	55.00	1,362.06	40.37	54,989.73

BGWC

Wastewater Division

129.50 Pumping

Original Cost Of Utility Plant In Service

And Development Of Composite Remaining Life as of December 31, 2018

Based Upon Broad Group/Remaining Life Procedure and Technique

Average Service Life: 55 *Survivor Curve:* L1

Year (1)	Original Cost (2)	Avg. Service Life (3)	Avg. Annual Accrual (4)	Avg. Remaining Life (5)	Future Annual Accruals (6)
2003	8,524.97	55.00	154.99	42.28	6,552.66
2004	20,362.13	55.00	370.20	42.96	15,902.25
2005	515.55	55.00	9.37	43.65	409.16
2006	60,412.66	55.00	1,098.34	44.37	48,738.95
2007	111,835.48	55.00	2,033.24	45.12	91,737.16
2008	416,550.19	55.00	7,573.16	45.88	347,479.72
2009	105,580.78	55.00	1,919.53	46.67	89,580.27
2010	34,840.44	55.00	633.42	47.47	30,070.11
2011	4,169.46	55.00	75.80	48.29	3,660.85
2012	5,589.60	55.00	101.62	49.14	4,993.48
2013	12,558.25	55.00	228.32	50.00	11,415.52
2014	1,225.92	55.00	22.29	50.88	1,133.93
2015	7,692.46	55.00	139.85	51.77	7,240.16
2016	43,400.90	55.00	789.06	52.68	41,563.72
2017	16,792.34	55.00	305.30	53.60	16,363.10
2018	12,284.76	55.00	223.35	54.53	12,179.46
Total	1,890,189.42	55.00	34,364.91	40.05	1,376,231.42

Composite Average Remaining Life ... 40.05 Years

BGWC

Wastewater Division

130.00 Treatment

Original Cost Of Utility Plant In Service

And Development Of Composite Remaining Life as of December 31, 2018

Based Upon Broad Group/Remaining Life Procedure and Technique

Average Service Life: 55 *Survivor Curve:* L1

Year (1)	Original Cost (2)	Avg. Service Life (3)	Avg. Annual Accrual (4)	Avg. Remaining Life (5)	Future Annual Accruals (6)
1968	15,264.35	55.00	277.52	27.21	7,550.46
1970	33,622.83	55.00	611.29	27.87	17,036.93
1972	9,772.23	55.00	177.67	28.55	5,071.93
1975	81,671.34	55.00	1,484.84	29.59	43,931.29
1977	6,282.06	55.00	114.21	30.30	3,460.23
1978	6,339.00	55.00	115.25	30.66	3,533.14
1979	12,564.12	55.00	228.42	31.02	7,085.90
1980	52,293.11	55.00	950.72	31.39	29,841.57
1981	30,394.92	55.00	552.60	31.76	17,550.26
1982	63,962.30	55.00	1,162.88	32.13	37,368.33
1983	61,550.31	55.00	1,119.03	32.51	36,383.13
1984	24,290.79	55.00	441.62	32.90	14,527.51
1985	62,748.56	55.00	1,140.81	33.28	37,968.70
1986	11,165.99	55.00	203.01	33.67	6,835.73
1987	27,108.77	55.00	492.86	34.07	16,790.75
1988	24,455.06	55.00	444.61	34.47	15,326.05
1989	24,925.21	55.00	453.16	34.88	15,806.66
1990	77,258.57	55.00	1,404.61	35.30	49,586.95
1991	43,974.43	55.00	799.48	35.74	28,570.92
1992	43,619.67	55.00	793.03	36.18	28,695.00
1993	18,583.95	55.00	337.87	36.65	12,381.38
1994	12,217.80	55.00	222.13	37.12	8,245.57
1995	78,499.01	55.00	1,427.16	37.62	53,684.21
1996	12,216.62	55.00	222.11	38.13	8,468.70
1997	12,564.12	55.00	228.42	38.66	8,831.06
1998	9,380.68	55.00	170.55	39.21	6,687.49
1999	18,846.18	55.00	342.64	39.78	13,631.15

BGWC

Wastewater Division

130.00 Treatment

Original Cost Of Utility Plant In Service

And Development Of Composite Remaining Life as of December 31, 2018

Based Upon Broad Group/Remaining Life Procedure and Technique

Average Service Life: *55* ***Survivor Curve:*** *L1*

Year (1)	*Original Cost* (2)	*Avg. Service Life* (3)	*Avg. Annual Accrual* (4)	*Avg. Remaining Life* (5)	*Future Annual Accruals* (6)
2000	50,256.49	55.00	913.70	40.37	36,888.07
2001	8,715.12	55.00	158.45	40.99	6,494.13
2002	5,531.51	55.00	100.57	41.62	4,185.72
2003	6,282.06	55.00	114.21	42.28	4,828.66
2004	26,681.51	55.00	485.09	42.96	20,837.51
2005	113,077.10	55.00	2,055.82	43.65	89,741.56
2007	491,842.37	55.00	8,942.02	45.12	403,451.78
2008	562.71	55.00	10.23	45.88	469.40
2009	75,532.42	55.00	1,373.23	46.67	64,085.67
2010	145,728.23	55.00	2,649.44	47.47	125,775.22
2011	305,976.34	55.00	5,562.86	48.29	268,652.09
2012	137,334.36	55.00	2,496.83	49.14	122,687.90
2013	63,360.64	55.00	1,151.94	50.00	57,595.20
2014	1,609,762.85	55.00	29,266.57	50.88	1,488,969.67
2015	194,023.72	55.00	3,527.48	51.77	182,615.55
2016	523,478.28	55.00	9,517.19	52.68	501,319.14
2017	66,721.57	55.00	1,213.04	53.60	65,016.05
2018	198,820.57	55.00	3,614.69	54.53	197,116.36
Total	4,899,259.83	55.00	89,071.84	46.88	4,175,580.70

Composite Average Remaining Life ... ***46.88 Years***

BGWC

Wastewater Division

130.50 Reclaim WTP

Original Cost Of Utility Plant In Service

And Development Of Composite Remaining Life as of December 31, 2018

Based Upon Broad Group/Remaining Life Procedure and Technique

Average Service Life: 55 *Survivor Curve:* L1

Year (1)	Original Cost (2)	Avg. Service Life (3)	Avg. Annual Accrual (4)	Avg. Remaining Life (5)	Future Annual Accruals (6)
1982	498.28	55.00	9.06	32.13	291.11
2008	1,125.00	55.00	20.45	45.88	938.46
2018	10,915.00	55.00	198.44	54.53	10,821.44
Total	12,538.28	55.00	227.95	52.87	12,051.01

Composite Average Remaining Life ... 52.87 Years

BGWC

Wastewater Division

131.00 Reclaim WTR

Original Cost Of Utility Plant In Service

And Development Of Composite Remaining Life as of December 31, 2018

Based Upon Broad Group/Remaining Life Procedure and Technique

Average Service Life: *55* *Survivor Curve:* *L1*

Year (1)	Original Cost (2)	Avg. Service Life (3)	Avg. Annual Accrual (4)	Avg. Remaining Life (5)	Future Annual Accruals (6)
1975	19,930.73	55.00	362.35	29.59	10,720.81
1985	1,084.13	55.00	19.71	33.28	656.00
2006	994.61	55.00	18.08	44.37	802.42
2008	1,308.86	55.00	23.80	45.88	1,091.83
2009	52.19	55.00	0.95	46.67	44.28
2011	1,170.18	55.00	21.27	48.29	1,027.44
2014	67.96	55.00	1.24	50.88	62.86
2016	87.40	55.00	1.59	52.68	83.70
2017	1,844.15	55.00	33.53	53.60	1,797.01
Total	26,540.21	55.00	482.52	33.75	16,286.34

Composite Average Remaining Life ... *33.75 Years*

BGWC

Wastewater Division

131.50 General

Original Cost Of Utility Plant In Service

And Development Of Composite Remaining Life as of December 31, 2018

Based Upon Broad Group/Remaining Life Procedure and Technique

Average Service Life: 55 *Survivor Curve:* L1

Year (1)	Original Cost (2)	Avg. Service Life (3)	Avg. Annual Accrual (4)	Avg. Remaining Life (5)	Future Annual Accruals (6)
1972	9,893.36	55.00	179.87	28.55	5,134.80
1975	12,092.25	55.00	219.85	29.59	6,504.46
1978	1,376.71	55.00	25.03	30.66	767.33
1980	4,155.59	55.00	75.55	31.39	2,371.43
1985	200.92	55.00	3.65	33.28	121.58
1989	286.33	55.00	5.21	34.88	181.58
1990	44.39	55.00	0.81	35.30	28.49
1993	188.91	55.00	3.43	36.65	125.86
1994	879.73	55.00	15.99	37.12	593.71
1995	220.56	55.00	4.01	37.62	150.84
1997	1,686.20	55.00	30.66	38.66	1,185.19
2002	319.75	55.00	5.81	41.62	241.96
2005	304.09	55.00	5.53	43.65	241.34
2006	7,650.67	55.00	139.09	44.37	6,172.31
2008	492,083.01	55.00	8,946.40	45.88	410,488.03
2009	172,481.17	55.00	3,135.82	46.67	146,342.08
2010	33,375.16	55.00	606.78	47.47	28,805.46
2011	88,011.60	55.00	1,600.11	48.29	77,275.58
2012	63,442.76	55.00	1,153.43	49.14	56,676.70
2013	55,075.36	55.00	1,001.31	50.00	50,063.83
2014	814,041.54	55.00	14,799.82	50.88	752,957.59
2015	42,094.02	55.00	765.30	51.77	39,618.98
2016	43,024.90	55.00	782.22	52.68	41,203.63
2017	64,328.17	55.00	1,169.53	53.60	62,683.83
2018	22,991.06	55.00	417.99	54.53	22,793.99

BGWC

Wastewater Division

131.50 General

Original Cost Of Utility Plant In Service

And Development Of Composite Remaining Life as of December 31, 2018

Based Upon Broad Group/Remaining Life Procedure and Technique

Average Service Life: 55 *Survivor Curve:* L1

Year (1)	Original Cost (2)	Avg. Service Life (3)	Avg. Annual Accrual (4)	Avg. Remaining Life (5)	Future Annual Accruals (6)
Total	1,930,248.21	55.00	35,093.21	48.81	1,712,730.59

Composite Average Remaining Life ... 48.81 Years

BGWC

Wastewater Division

135.00 Gravity Mains

Original Cost Of Utility Plant In Service

And Development Of Composite Remaining Life as of December 31, 2018

Based Upon Broad Group/Remaining Life Procedure and Technique

Average Service Life: 95 *Survivor Curve:* S1.5

Year (1)	Original Cost (2)	Avg. Service Life (3)	Avg. Annual Accrual (4)	Avg. Remaining Life (5)	Future Annual Accruals (6)
1960	72,242.90	95.00	760.45	45.54	34,629.02
1962	144,480.66	95.00	1,520.85	46.80	71,181.19
1964	524,390.33	95.00	5,519.90	48.10	265,493.18
1965	3,449.24	95.00	36.31	48.76	1,770.24
1968	695,944.42	95.00	7,325.73	50.78	372,015.12
1970	941,801.74	95.00	9,913.70	52.17	517,231.28
1972	146,505.09	95.00	1,542.16	53.60	82,656.49
1973	14,032.27	95.00	147.71	54.32	8,023.90
1975	82,939.27	95.00	873.04	55.80	48,713.55
1976	111,189.03	95.00	1,170.41	56.55	66,183.40
1977	59,759.73	95.00	629.05	57.31	36,047.94
1978	279,756.25	95.00	2,944.80	58.07	171,010.44
1979	54,111.32	95.00	569.59	58.85	33,518.75
1980	160,644.28	95.00	1,690.99	59.63	100,834.03
1981	39,199.14	95.00	412.62	60.43	24,933.32
1982	48,292.61	95.00	508.34	61.23	31,124.13
1983	283,216.77	95.00	2,981.23	62.03	184,940.19
1984	59,690.22	95.00	628.32	62.85	39,490.60
1985	67,517.76	95.00	710.71	63.68	45,255.20
1986	24,176.76	95.00	254.49	64.51	16,416.84
1987	103,041.68	95.00	1,084.65	65.35	70,880.28
1988	80,825.42	95.00	850.79	66.20	56,319.78
1989	70,986.15	95.00	747.22	67.05	50,103.24
1990	76,241.14	95.00	802.54	67.92	54,505.30
1991	80,825.42	95.00	850.79	68.79	58,523.66
1992	79,719.59	95.00	839.15	69.67	58,460.05
1993	89,640.86	95.00	943.59	70.55	66,571.19

BGWC

Wastewater Division

135.00 Gravity Mains

Original Cost Of Utility Plant In Service

And Development Of Composite Remaining Life as of December 31, 2018

Based Upon Broad Group/Remaining Life Procedure and Technique

Average Service Life: *95* *Survivor Curve:* *S1.5*

Year (1)	*Original Cost* (2)	*Avg. Service Life* (3)	*Avg. Annual Accrual* (4)	*Avg. Remaining Life* (5)	*Future Annual Accruals* (6)
1994	120,361.49	95.00	1,266.96	71.44	90,516.70
1995	280,228.26	95.00	2,949.77	72.34	213,396.84
1997	161,650.83	95.00	1,701.59	74.16	126,195.11
1998	153,930.88	95.00	1,620.33	75.08	121,658.45
1999	159,420.80	95.00	1,678.11	76.01	127,551.12
2000	201,213.51	95.00	2,118.04	76.94	162,969.85
2001	121,293.24	95.00	1,276.77	77.88	99,437.31
2002	84,436.57	95.00	888.81	78.83	70,060.66
2005	49,552.43	95.00	521.60	81.69	42,609.19
2006	133,319.83	95.00	1,403.37	82.65	115,992.41
2007	153,641.37	95.00	1,617.28	83.62	135,239.61
2008	750,132.08	95.00	7,896.13	84.59	667,971.96
2009	682,291.78	95.00	7,182.02	85.57	614,580.10
2010	318,177.86	95.00	3,349.24	86.55	289,886.81
2011	124,492.89	95.00	1,310.45	87.54	114,713.56
2012	74,245.14	95.00	781.53	88.53	69,184.82
2013	339,586.19	95.00	3,574.59	89.52	319,981.87
2014	75,464.54	95.00	794.36	90.51	71,896.87
2015	1,892,686.08	95.00	19,923.01	91.50	1,823,038.59
2016	129,207.25	95.00	1,360.08	92.50	125,808.96
2017	459,950.71	95.00	4,841.59	93.50	452,688.72
2018	671,004.72	95.00	7,063.21	94.50	667,471.61
Total	11,530,908.50	95.00	121,377.99	74.89	9,089,683.42

Composite Average Remaining Life ... 74.89 Years

BGWC

Wastewater Division

136.00 Services to Customers

Original Cost Of Utility Plant In Service

And Development Of Composite Remaining Life as of December 31, 2018

Based Upon Broad Group/Remaining Life Procedure and Technique

Average Service Life: 53 *Survivor Curve:* L0

Year (1)	Original Cost (2)	Avg. Service Life (3)	Avg. Annual Accrual (4)	Avg. Remaining Life (5)	Future Annual Accruals (6)
1960	14,463.52	53.00	272.91	28.85	7,873.94
1962	28,319.97	53.00	534.36	29.42	15,721.49
1964	105,071.82	53.00	1,982.55	30.00	59,475.40
1965	140.41	53.00	2.65	30.29	80.25
1968	139,073.60	53.00	2,624.11	31.19	81,840.72
1970	179,641.67	53.00	3,389.57	31.80	107,787.17
1972	23,401.18	53.00	441.55	32.42	14,315.61
1973	2,892.72	53.00	54.58	32.74	1,786.83
1975	141,630.39	53.00	2,672.35	33.38	89,194.48
1976	23,625.28	53.00	445.77	33.70	15,023.10
1977	2,546.77	53.00	48.05	34.03	1,635.21
1978	32,880.73	53.00	620.41	34.36	21,316.88
1979	21,840.37	53.00	412.10	34.69	14,297.04
1980	11,820.17	53.00	223.03	35.03	7,812.79
1981	15,167.39	53.00	286.19	35.37	10,122.53
1982	21,599.97	53.00	407.56	35.71	14,555.50
1983	11,141.96	53.00	210.23	36.06	7,581.08
1984	11,239.49	53.00	212.07	36.41	7,721.68
1985	125,405.13	53.00	2,366.21	36.76	86,991.23
1986	33,339.97	53.00	629.08	37.12	23,351.81
1987	13,850.20	53.00	261.33	37.48	9,795.05
1988	8,354.20	53.00	157.63	37.85	5,965.58
1989	5,331.69	53.00	100.60	38.21	3,844.21
1990	286.91	53.00	5.41	38.58	208.87
1991	13,077.69	53.00	246.76	38.96	9,613.12
1992	10,073.97	53.00	190.08	39.34	7,477.05
1993	15,478.05	53.00	292.05	39.72	11,599.59

BGWC

Wastewater Division

136.00 Services to Customers

Original Cost Of Utility Plant In Service

And Development Of Composite Remaining Life as of December 31, 2018

Based Upon Broad Group/Remaining Life Procedure and Technique

Average Service Life: 53 *Survivor Curve:* L0

Year (1)	Original Cost (2)	Avg. Service Life (3)	Avg. Annual Accrual (4)	Avg. Remaining Life (5)	Future Annual Accruals (6)
1994	19,531.77	53.00	368.54	40.10	14,779.84
1995	18,955.80	53.00	357.67	40.50	14,483.80
1996	2,220.53	53.00	41.90	40.89	1,713.27
1997	26,443.63	53.00	498.95	41.29	20,603.15
1998	17,093.71	53.00	322.53	41.70	13,450.04
1999	20,255.08	53.00	382.18	42.12	16,096.30
2000	29,814.88	53.00	562.56	42.54	23,931.23
2001	2,507.98	53.00	47.32	42.97	2,033.46
2002	13,297.57	53.00	250.91	43.41	10,891.95
2003	729.42	53.00	13.76	43.86	603.65
2004	3,346.07	53.00	63.14	44.32	2,798.10
2005	33,782.43	53.00	637.42	44.79	28,549.64
2008	41,512.14	53.00	783.27	46.27	36,243.41
2009	119,543.68	53.00	2,255.61	46.79	105,550.43
2010	166,274.56	53.00	3,137.35	47.33	148,502.11
2011	263,504.34	53.00	4,971.94	47.89	238,107.36
2012	600,016.17	53.00	11,321.41	48.47	548,711.83
2013	260,209.05	53.00	4,909.76	49.07	240,898.94
2014	212,229.13	53.00	4,004.45	49.69	198,977.89
2015	213,752.50	53.00	4,033.19	50.34	203,024.97
2016	139,402.92	53.00	2,630.33	51.03	134,219.42
2017	134,295.12	53.00	2,533.95	51.76	131,161.55
2018	181,145.35	53.00	3,417.94	52.56	179,644.66
Total	3,531,559.05	53.00	66,635.27	44.30	2,951,965.18

Composite Average Remaining Life ... 44.30 Years

BGWC

Wastewater Division

139.50 Lagoon

Original Cost Of Utility Plant In Service

And Development Of Composite Remaining Life as of December 31, 2018

Based Upon Broad Group/Remaining Life Procedure and Technique

Average Service Life: 40 *Survivor Curve:* O1

Year (1)	Original Cost (2)	Avg. Service Life (3)	Avg. Annual Accrual (4)	Avg. Remaining Life (5)	Future Annual Accruals (6)
1977	824.95	40.00	20.62	19.25	397.06
1978	4,326.77	40.00	108.17	19.75	2,136.60
1980	16,605.52	40.00	415.12	20.75	8,615.03
1981	49,995.41	40.00	1,249.84	21.25	26,562.70
1985	9,372.11	40.00	234.29	23.25	5,447.96
1988	12,592.33	40.00	314.80	24.75	7,792.00
1989	49,895.87	40.00	1,247.35	25.25	31,498.63
1990	23,236.12	40.00	580.88	25.75	14,959.08
1993	769.33	40.00	19.23	27.25	524.13
1995	3,743.69	40.00	93.59	28.25	2,644.09
1997	6,281.57	40.00	157.03	29.25	4,593.55
1998	1,037.83	40.00	25.94	29.75	771.91
1999	91,194.53	40.00	2,279.77	30.25	68,967.88
2000	43,832.79	40.00	1,095.78	30.75	33,697.37
2001	6,739.91	40.00	168.49	31.25	5,265.69
2002	16,225.10	40.00	405.61	31.75	12,878.97
2003	13,938.16	40.00	348.44	32.25	11,237.88
2004	3,644.21	40.00	91.10	32.75	2,983.75
2005	35,627.57	40.00	890.65	33.25	29,615.94
2006	26,965.08	40.00	674.10	33.75	22,752.15
2007	14,388.45	40.00	359.70	34.25	12,320.29
2008	7,086.57	40.00	177.16	34.75	6,156.54
2009	5,317.57	40.00	132.93	35.25	4,686.16
2010	30,131.76	40.00	753.26	35.75	26,930.53
2011	16,882.54	40.00	422.05	36.25	15,299.93
2012	156,841.87	40.00	3,920.89	36.75	144,099.51
2013	175,930.45	40.00	4,398.09	37.25	163,836.24

BGWC
Wastewater Division
139.50 Lagoon

Original Cost Of Utility Plant In Service
And Development Of Composite Remaining Life as of December 31, 2018
Based Upon Broad Group/Remaining Life Procedure and Technique

Average Service Life: 40 **Survivor Curve:** O1

Year (1)	Original Cost (2)	Avg. Service Life (3)	Avg. Annual Accrual (4)	Avg. Remaining Life (5)	Future Annual Accruals (6)
2014	30,015.09	40.00	750.35	37.75	28,326.88
2015	47,112.95	40.00	1,177.78	38.25	45,051.93
2016	38,420.05	40.00	960.46	38.75	37,219.52
2017	65,894.15	40.00	1,647.29	39.25	64,658.74
2018	1,097,850.82	40.00	27,445.20	39.75	1,090,989.91
Total	2,102,721.12	40.00	52,565.98	36.77	1,932,918.52

Composite Average Remaining Life ... 36.77 Years

BGWC

Wastewater Division

140.00 Treatment

Original Cost Of Utility Plant In Service

And Development Of Composite Remaining Life as of December 31, 2018

Based Upon Broad Group/Remaining Life Procedure and Technique

Average Service Life: 40 *Survivor Curve:* O1

Year (1)	Original Cost (2)	Avg. Service Life (3)	Avg. Annual Accrual (4)	Avg. Remaining Life (5)	Future Annual Accruals (6)
1968	79,652.34	40.00	1,991.23	14.75	29,379.10
1970	8,852.00	40.00	221.29	15.75	3,486.22
1972	770,753.99	40.00	19,268.10	16.75	322,812.54
1973	10,786.12	40.00	269.64	17.25	4,652.31
1974	12,019.00	40.00	300.46	17.75	5,334.28
1975	1,409,428.78	40.00	35,234.35	18.25	643,147.42
1976	14,016.31	40.00	350.39	18.75	6,571.06
1977	8,310.04	40.00	207.74	19.25	3,999.73
1978	5,680.90	40.00	142.02	19.75	2,805.28
1979	6,036.36	40.00	150.90	20.25	3,056.25
1980	197,996.92	40.00	4,949.73	20.75	102,721.81
1981	8,069.59	40.00	201.73	21.25	4,287.40
1982	97.83	40.00	2.45	21.75	53.20
1983	728.05	40.00	18.20	22.25	405.01
1984	1,321.58	40.00	33.04	22.75	751.71
1985	63,498.21	40.00	1,587.39	23.25	36,911.17
1986	4,243.64	40.00	106.09	23.75	2,519.84
1987	152.62	40.00	3.82	24.25	92.53
1988	4,842.02	40.00	121.05	24.75	2,996.19
1989	16,218.51	40.00	405.45	25.25	10,238.54
1990	186,934.69	40.00	4,673.19	25.75	120,345.85
1991	5,070.39	40.00	126.75	26.25	3,327.62
1992	9,791.66	40.00	244.78	26.75	6,548.49
1993	13,795.98	40.00	344.89	27.25	9,398.94
1994	9,629.49	40.00	240.73	27.75	6,680.74
1995	9,399.46	40.00	234.98	28.25	6,638.63
1996	3.86	40.00	0.10	28.75	2.77

BGWC

Wastewater Division

140.00 Treatment

Original Cost Of Utility Plant In Service

And Development Of Composite Remaining Life as of December 31, 2018

Based Upon Broad Group/Remaining Life Procedure and Technique

Average Service Life: **40** *Survivor Curve:* **O1**

Year (1)	Original Cost (2)	Avg. Service Life (3)	Avg. Annual Accrual (4)	Avg. Remaining Life (5)	Future Annual Accruals (6)
1997	7,408.17	40.00	185.20	29.25	5,417.41
1998	365.18	40.00	9.13	29.75	271.61
1999	15,407.14	40.00	385.16	30.25	11,651.99
2000	27,787.51	40.00	694.66	30.75	21,362.23
2001	397,161.67	40.00	9,928.65	31.25	310,290.30
2002	545.45	40.00	13.64	31.75	432.96
2003	3,312.99	40.00	82.82	32.25	2,671.15
2004	1,474.32	40.00	36.86	32.75	1,207.12
2005	697,409.75	40.00	17,434.56	33.25	579,732.04
2006	859,708.67	40.00	21,491.88	33.75	725,390.73
2007	569,631.56	40.00	14,240.23	34.25	487,754.01
2008	133,008.37	40.00	3,325.08	34.75	115,552.50
2009	762,103.09	40.00	19,051.83	35.25	671,610.90
2010	214,517.44	40.00	5,362.73	35.75	191,726.85
2011	230,747.07	40.00	5,768.45	36.25	209,116.32
2012	430,741.88	40.00	10,768.13	36.75	395,746.95
2013	216,047.06	40.00	5,400.97	37.25	201,195.06
2014	292,339.71	40.00	7,308.21	37.75	275,896.96
2015	264,238.50	40.00	6,605.71	38.25	252,679.01
2016	1,550,098.30	40.00	38,750.95	38.75	1,501,661.71
2017	1,449,350.35	40.00	36,232.35	39.25	1,422,177.32
2018	606,860.58	40.00	15,170.92	39.75	603,068.07
Total	11,587,595.10	40.00	289,678.59	32.19	9,325,777.84

Composite Average Remaining Life ... 32.19 Years

BGWC
Wastewater Division
140.50 Reclaim WTP

Original Cost Of Utility Plant In Service
And Development Of Composite Remaining Life as of December 31, 2018
Based Upon Broad Group/Remaining Life Procedure and Technique

Average Service Life: 40 *Survivor Curve:* O1

Year (1)	Original Cost (2)	Avg. Service Life (3)	Avg. Annual Accrual (4)	Avg. Remaining Life (5)	Future Annual Accruals (6)
2009	1,541.09	40.00	38.53	35.25	1,358.10
Total	1,541.09	40.00	38.53	35.25	1,358.10

Composite Average Remaining Life ... 35.25 *Years*