Water Meter Useful Life Analysis

Office Management and Budget

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ARIZONA

Introduction

Using data analytic tools to:

- Calculate the average time to failure for water meters
- Calculate the probability of failure for a specified time
- Calculate the remaining life assuming reliability for a certain time.
- Determine the intersection between loss of revenue (due to unreliability) and depreciation of asset
- Conclude optimal time for water meter replacement

Methodology & Definitions

Methodology:

- Descriptive Statistical Analysis
- Weibull Statistical Analysis
- Straight Line Depreciation
- Break Even Analysis

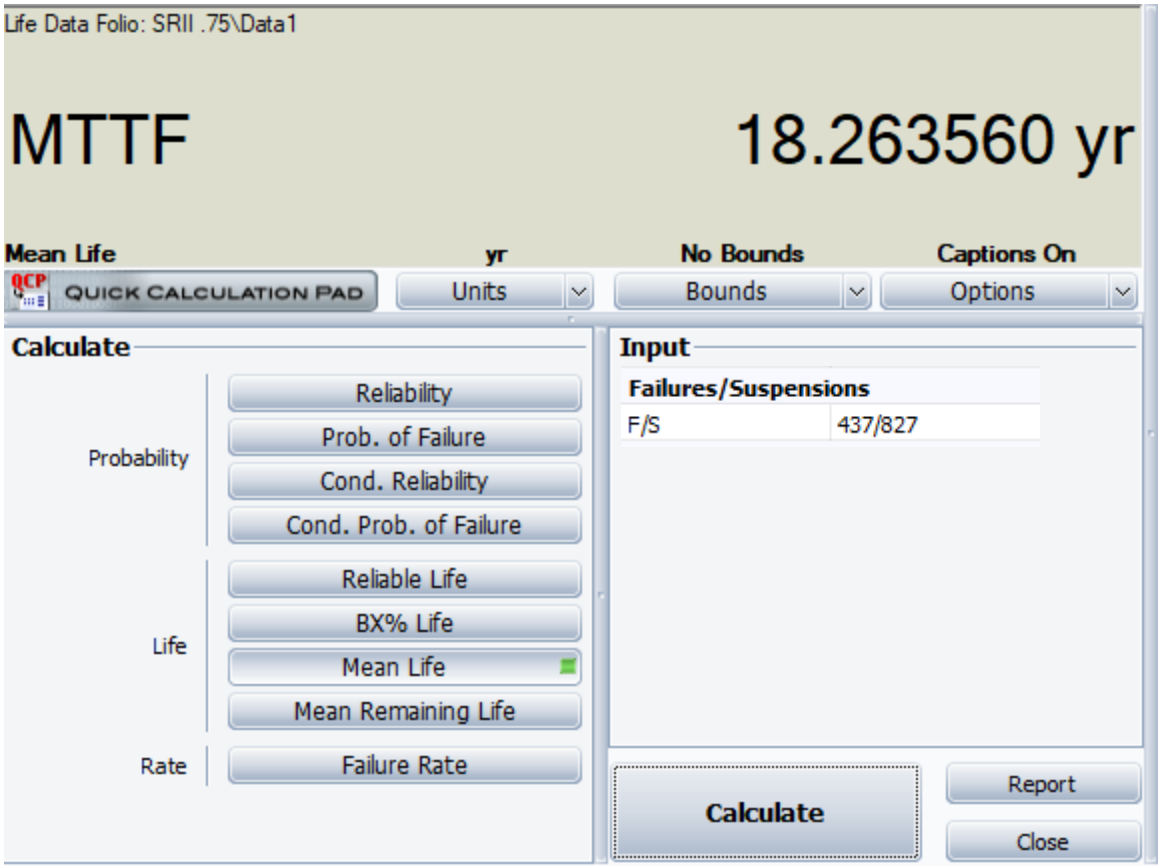
Definitions:

Accuracy: Ability for a meter to exact readings at different rates of water flow.

Reliability: Probability an item (e.g. system or sub system) will perform its function with no failure for a stated mission time.

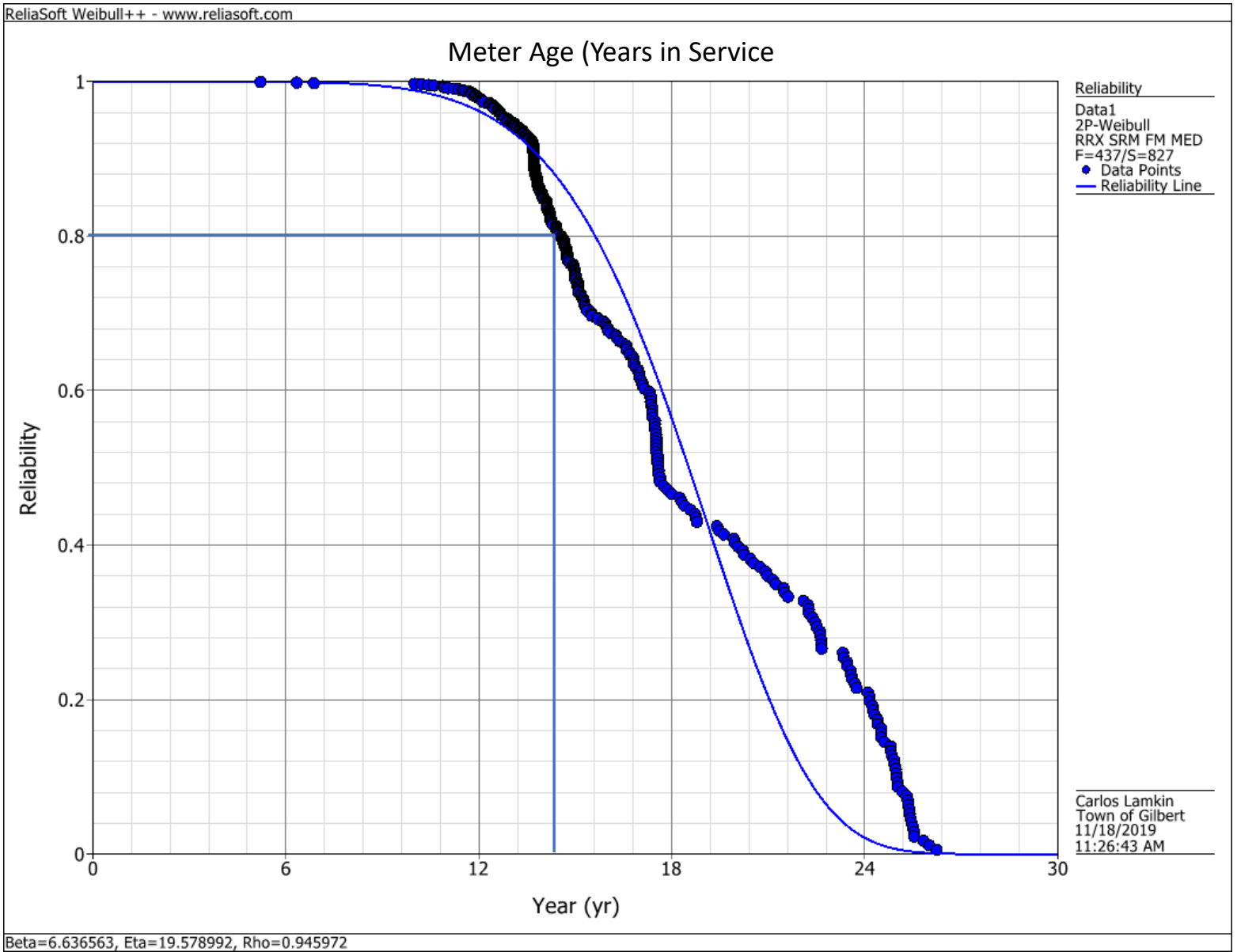
Accuracy of meter test determines failure threshold and reliability of the water meter system.

Mean Time To Failure



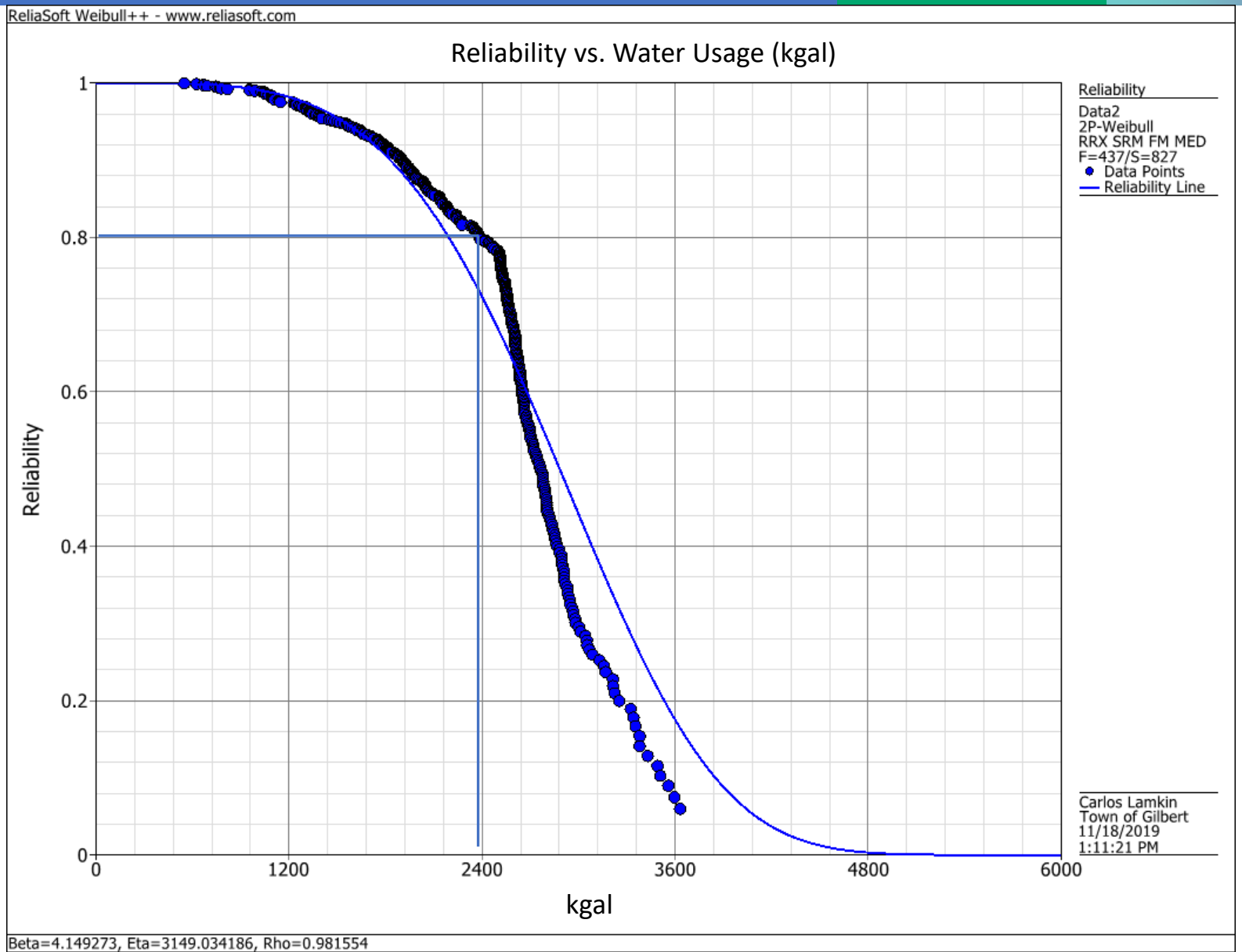
Reliability Vs. Time

Years .75 SRII Weibull Statistical Analysis



Reliability vs. Time

Kilogallons .75 SRII Weibull Statistical Analysis



Straight Line Depreciation

Meter Costs

.75”	128
1”	184

Annual Depreciation Charge

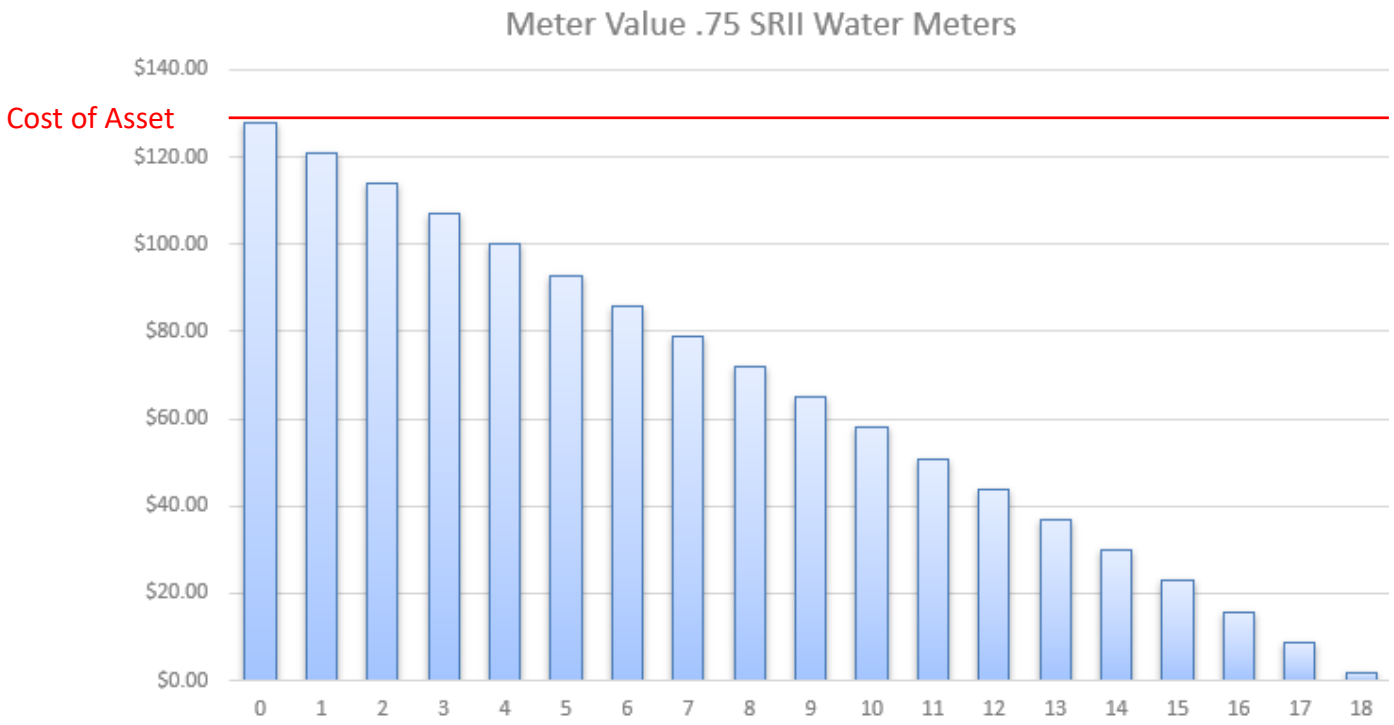
ADE=C-R/N

C = Cost of the asset

R = Salvage Value of asset (0)

N = Useful life in years (MTTF)

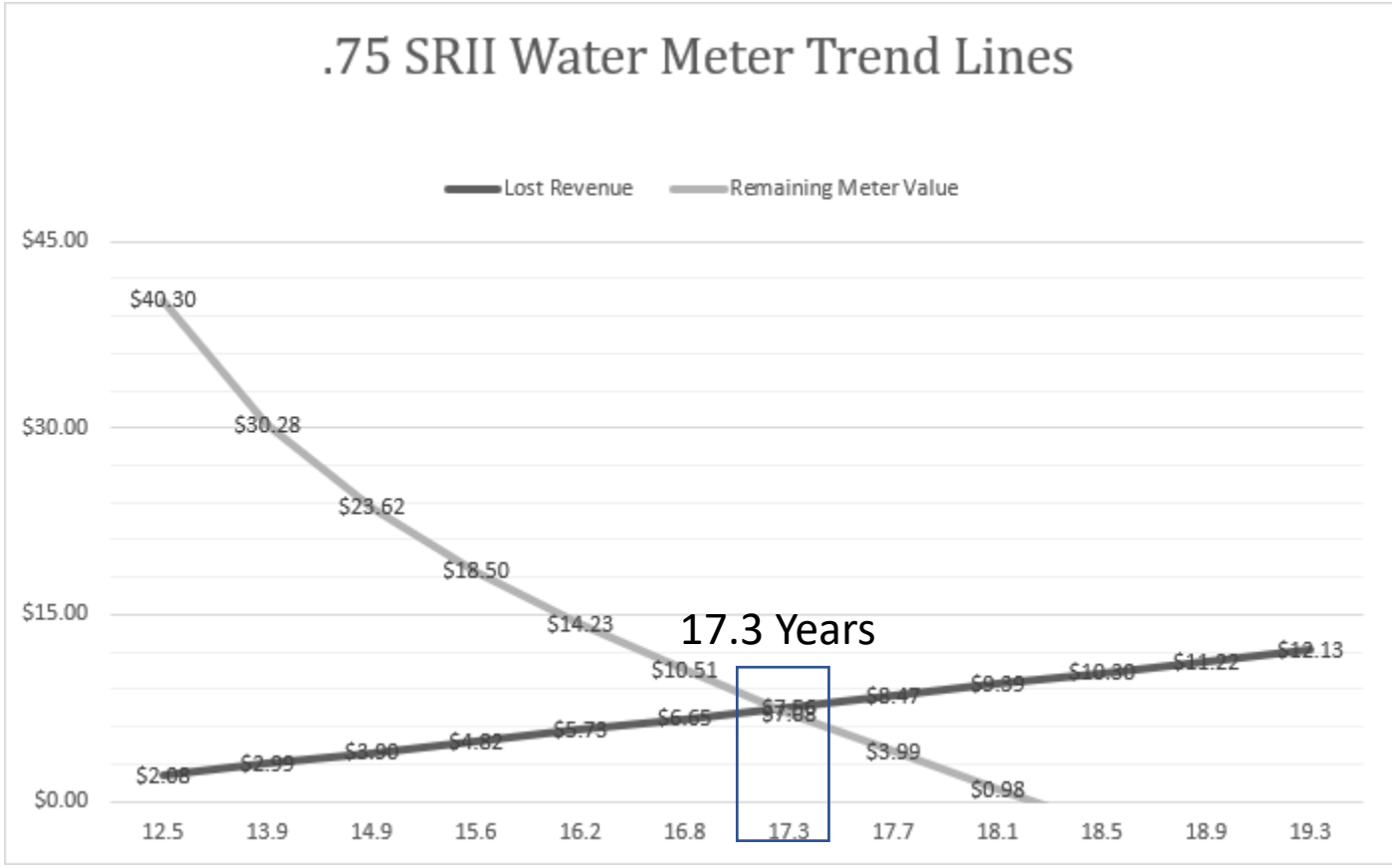
Measuring loss revenue: combines meter reliability with average accuracy readings for both passed and failed meters to measure **slippage** in revenue that results from declining accuracy and reliability.



Meter Value vs. Lost Water

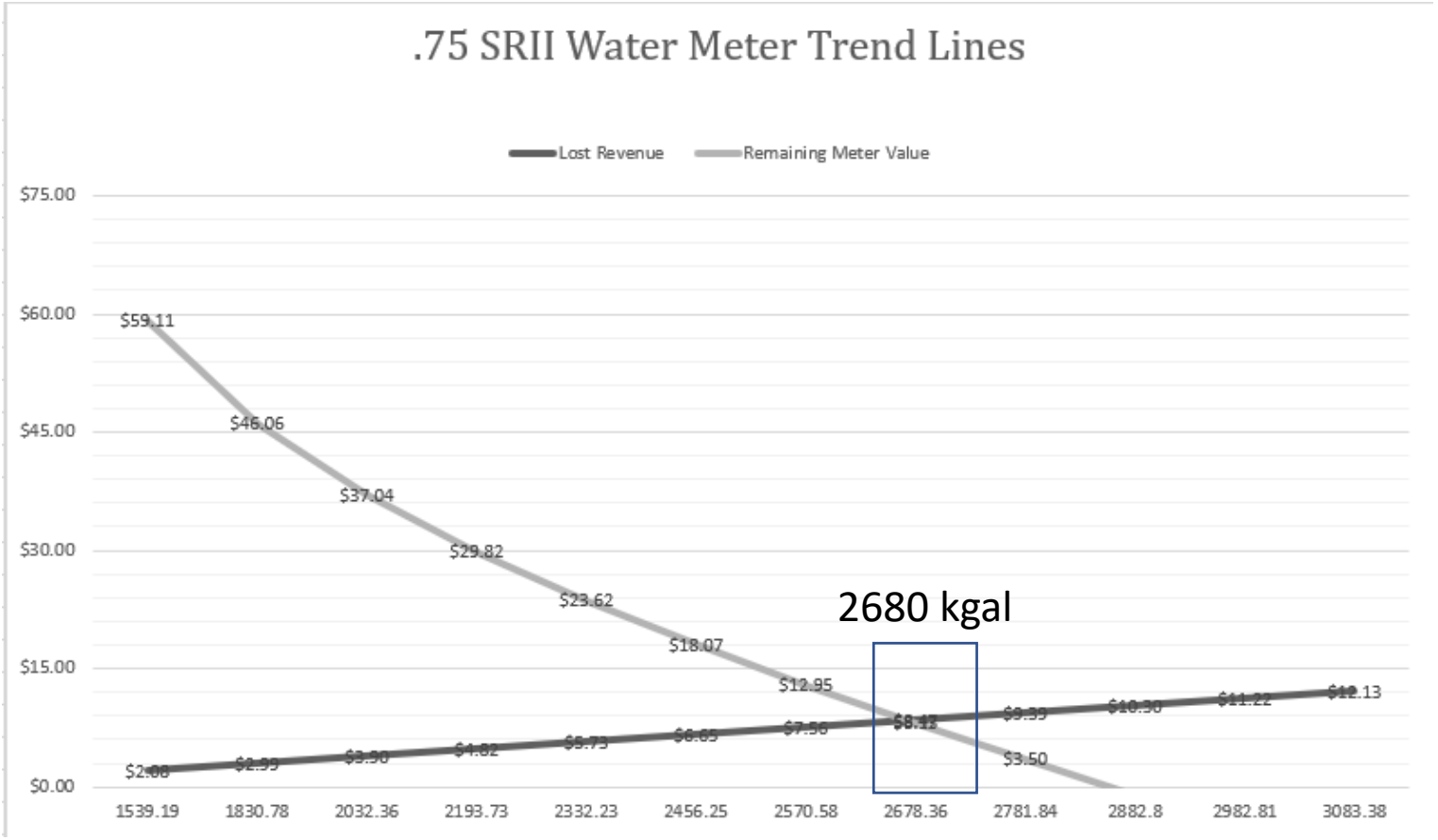
Σ μ

Average KG per Year	151.44	**Meter Reliability**	100%	95%	90%	85%	80%	75%	70%	65%	60%	55%
Water Rate	$1.28	**Revenue**	$193.84	$191.77	$190.85	$189.94	$189.02	$188.11	$187.20	$186.28	$185.37	$184.45
Revenue Assuming Full Reliability	$193.84	**Lost Revenue**	$0.00	$2.08	$2.99	$3.90	$4.82	$5.73	$6.65	$7.56	$8.47	$9.39
Straight Line Depreciation (MTTF 20 yr.)		**Age in Years**	0.0	12.5	13.9	14.9	15.6	16.2	16.8	17.3	17.7	18.1
Annual Depreciation Charge is $7.01 Where ADE=C-R/N And C= Cost of the asset, R= Salvage value of asset and N= Useful economic life of asset in years (MTTF)		**Remaining Meter Value**	x	$40.30	$30.28	$23.62	$18.50	$14.23	$10.51	$7.08	$3.99	$0.98
Remaining Months to Full Depreciation of Asset		**Breakeven Analysis Months**	x	19.4	10.1	6.0	3.8	2.5	1.6	0.9	0.5	0.1



Results All Meters

Average KG per Year	151.44	**Meter Reliability**	100%	95%	90%	85%	80%	75%	70%	65%	60%	55%	50%
Water Rate	$1.28	**Revenue**	$193.84	$191.77	$190.85	$189.94	$189.02	$188.11	$187.20	$186.28	$185.37	$184.45	$183.54
Revenue Assuming Full Reliability	$193.84	**Lost Revenue**	$0.00	$2.08	$2.99	$3.90	$4.82	$5.73	$6.65	$7.56	$8.47	$9.39	$10.30
Straight Line Depreciation (MTTF 20 yr.)		**Number of KG**	0.0	1539.19	1830.78	2032.36	2193.73	2332.23	2456.25	2570.58	2678.36	2781.84	2882.8
Annual Depreciation Charge is .044 Where ADE=C-R/N And C= Cost of the asset, R= Salvage value of asset and N= Useful economic life of asset in years (MTTF)		**Remaining Meter Value**	x	$59.11	$46.06	$37.04	$29.82	$23.62	$18.07	$12.95	$8.13	$3.50	-$1.02
Remaining Months to Full Depreciation of Asset		**Breakeven Analysis Months**	x	28.5	15.4	9.5	6.2	4.1	2.7	1.7	1.0	0.4	-0.1



Conclusions

Meter		MTTF (Years)	MTTF (KGAL)	ADE YEARS	ADE KGAL	AVG KGAL/YR	Intercept Years	Intercept KGAL
SRII	0.75	18.26	2860.27	7.01	0.045	151.44	17.30	2678.36
	1	17.08	55169.27	10.77	0.002	7087.02	15.6	3674.51
PMM	0.75	8.25	2911.92	7.01	0.044	385.10	6.7	2442.73
	1	6.77	4504.50	10.77	0.028	690.61	5.4	3590.09

The intercept is the point where the depreciation of the asset is equal to the lost revenue.

By measuring asset depreciation and revenue slippage due to system degradation we can obtain an optimal point for asset replacement. The following conclusions can be made.

- Across the whole system, optimal asset replacement can save on fixed costs.
- Changing the meter too early increases meter replacement costs.
- Changing the meter too late increases lost revenue from water sales.

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