TO: BOARD OF DIRECTORS

FROM: BRUCE BUEL BB

DATE: AUGUST 22, 2008

AGENDA ITEM
C-4
AUGUST 27, 2008

TOWN & BLACKLAKE WATER & SEWER REPLACEMENT STUDY

ITEM

Presentation of Draft Town and Blacklake Water and Sewer Replacement Study by Malcolm McEwen of Boyle Engineering [NO ACTION REQUESTED].

BACKGROUND

Attached is a copy of the text of the Replacement Study from Boyle (Appendices available for review at NCSD Office).

RECOMMENDATION

Staff recommends that your Honorable Board receive the presentations and ask questions as appropriate. It is staff's expectation that the Board will consider adopting the Report at a subsequent meeting.

ATTACHMENTS

- Town and Blacklake Water and Sewer Replacement Study

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Nipomo Community Services District

2007 Water and Sewer Replacement Study

Nipomo Community Services District

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Contents

0.0 Executive Summary

Background

The District recognizes the need to collect funds for the replacement of its water and wastewater infrastructure. The replacement fund was established in 1996 via Board adoption of the annual budget.

This study produces a schedule of projected facility replacement needs and their projected future costs, document the condition of District water and wastewater facilities, as reported by District staff, develops strategies and recommendations relative to establishment of replacement funding and timing to assist the District in the process of gaining acceptance by the community and the District Board.

Scope and Methodology

The general methodology is to inventory the existing infrastructure systems, develop unit costs for replacement, estimate the present annual accumulation rate needed to fully fund the future projected replacement costs, and determine impacts on rates or other funding methods to accumulate funds to pay for future replacements.

Existing Systems

Year 2007 replacement costs for system assets were estimated to be:

Water – Town System:	$82,000,000
Wastewater – Town System:	$37,000,000
Water – Blacklake System:	$9,600,000
Wastewater – Blacklake System:	$9,900,000

Replacement Cost Schedule Development and Results

Inventory information is combined with the replacement costs and life expectancies to determine the estimated present replacement cost, the projected future replacement cost, the required annual savings rate to replace each asset, the required present value of accrued annual savings, and the remaining service life as a fraction of total system service life.

The amounts expressed are in terms of present worth dollars, as of December, 2007. The assumed interest rate for savings is 4.5%. The assumed inflation rate is 3.0%.

Three different funding alternatives were quantified:

- Model 1: 20 Year Savings Program. Predicted "single year" costs are "spread" so that 90% of the replacements occurring within ±5 years of the end of service life. These spread costs are funded by setting up a savings program that begins to save for each year's anticipated costs 20 year in advance, saving a constant amount each year.

- Model 2: Service Life Savings Program. Single year costs are funded by saving over each asset's service life. The savings rate for a particular asset remains constant until the asset is replaced. When the asset is replaced the savings rate increases to account for the anticipated future replacement cost increase due to inflation.

- Model 3: Pay-as-you-go Set-Aside Program. Single year costs are "spread" as in Model 1. Each year "set-aside" sufficient funds to cover that year's predicted costs. The resulting set-aside rates will vary from year to year. Because this model is not a "savings" program, no accrued savings are required.

Key results are shown below:

Table 4-2: Budgeted and Modeled Replacement Funding

Fund	Budgeted Replacement Funding			2007 Savings or Set-Aside		
	2005/06	2006/07	2007/08	20-Year Savings (Model 1)	Service Life Savings (Model 2)	Pay-as-you-Go Set-Asides (Model 3)
#800 – Town Water	$93,678	$88,000	$392,000	$750,000	$950,000	$114,000
#810 – Town Sewer	200,738	256,000	351,000	190,000	540,000	140,000
#820 – Blacklake Water	-	-	-	44,000	171,000	12,000
#830 – Blacklake Sewer	34,000	23,000	40,000	55,000	159,000	43,000
Combined	328,416	367,000	783,000	1,039,000	1,820,000	$309,000

Table 4-4: Actual and Modeled Replacement Fund Balances, 7/1/2007

Fund	Balance 7/1/07	Accrued Savings Required		
		20-Year Savings (Model 1)	Service Life Savings (Model 2)	Pay-as-you-Go Set-Asides (Model 3)
#800 – Town Water	$1,954,212	$6,700,000	$26,000,000	$0
#810 – Town Sewer	2,755,915	2,300,000	8,500,000	0
#820 – Blacklake Water	349,170	470,000	2,300,000	0
#830 – Blacklake Sewer	(26,123)	660,000	1,800,000	0
Combined Total	$5,033,174	10,130,000	38,600,000	$0

Figure 4-4: Comparison of Savings Rates (2007-2047)

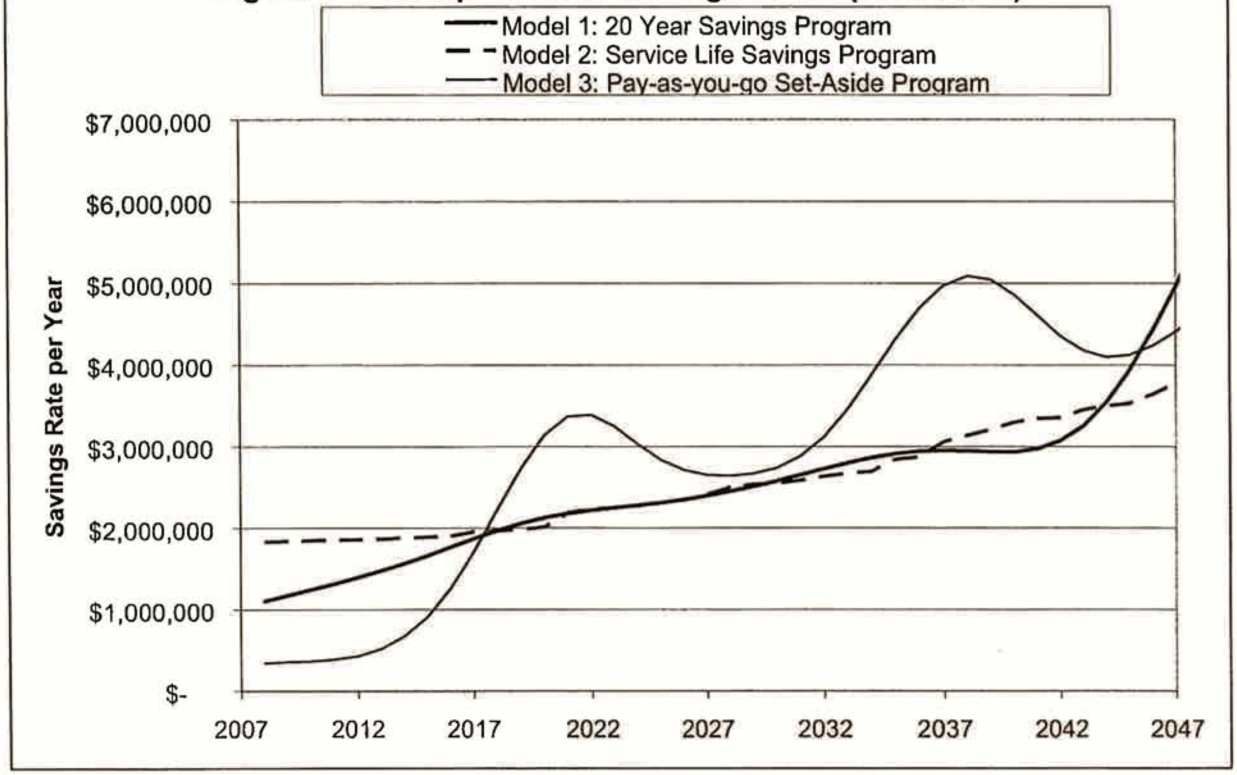
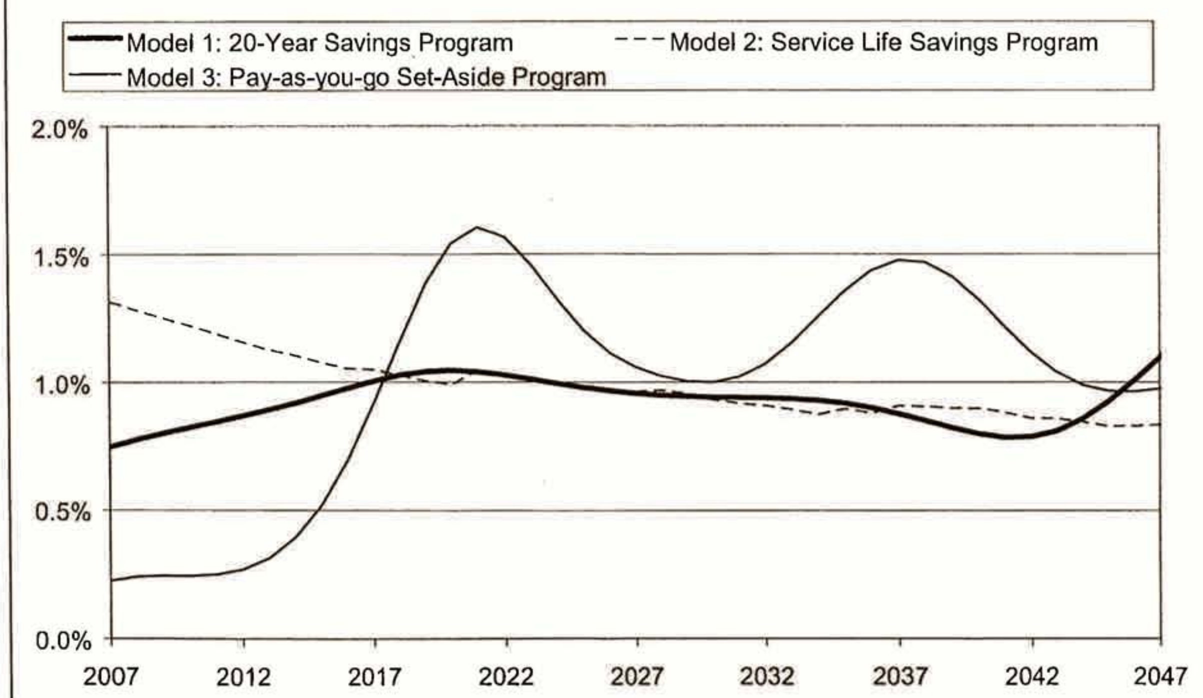


Figure 4-6: Annual Savings (or Costs) as Percent of Total System Replacement Cost



Summary Recommendations

Replacement costs are expected to rise significantly within the next 15 to 20 years. The District can reduce the "shock" of these future cost increases by continuing their asset replacement savings program.

Therefore, the Pay-as-you-go Set-Aside Program (Model 3) is not recommended.

The most equitable savings approach, the Service-Life Savings Program (Model 2), may be impractical to implement at this time because there are insufficient reserves.

Therefore, Boyle recommends that the District adopt the 20-year Savings Program described by Model 1. To implement this approach, the District will need to adopt the annual savings rates noted, and should also adjust these savings rates upward or downward to bring the reserved fund balance in line with the required balance. The funding approaches detailed below will accomplish this realignment within 10 years.

Table 6-6: Recommended Adjusted 20-year Savings Program for All Divisions

Division	Town Water	Town Wastewater	Blacklake Water	Blacklake Wastewater
Customers	3,428	3,055	589	558
Year	**Per-Customer Recommended Bi-Monthly Savings Rate**			
2007	$68	$8	$22	$44
2008	70	8	24	45
2009	73	9	25	45
2010	76	9	27	46
2011	78	10	29	47
2012	80	10	32	47
2013	83	11	35	48
2014	86	12	39	50
2015	89	13	44	51
2016	92	14	49	53
2017	94	15	56	54

1.0 Introduction

1.1 *Background*

The Nipomo Community Services District (District) provides water and wastewater (sewer) service to a population of 12,296 persons and is located along Highway 101 in the southern portion of San Luis Obispo County, California. The District is situated approximately halfway between the cities of San Francisco and Los Angeles. The Community Services District was authorized by San Luis Obispo County and formed in 1965. Five directors serve on the District's governing board (Board).

The District provides services for two areas: Town and Blacklake. The Town Systems serve the main area of Nipomo and the Blacklake Systems serve the Blacklake development.

The Town area is characterized as a growing residential community. The Blacklake area is characterized as a predominately developed adult community oriented around the 27-hole Blacklake Golf Course.

The District recognizes the need to collect funds for the replacement of its water and wastewater infrastructure. Each component has an expected life and by planning for the replacement and building reserves for the replacement, the District will avoid or at least significantly reduce the impact of varying funding needs on a year-to-year basis and avoid significant fluctuations in water and wastewater rates to accommodate those funding needs.

The replacement fund was established in 1996 via Board adoption of the annual budget. Funding is allocated annually, based on what the budget can support and Board discretion during the budgeting process. Replacement funding amounts allocated in the 2005/06, 2006/07, and 2007/08 budgets are presented below.

Budgeted Replacement Funding

Fund	2005/06	2006/07	2007/08
#800 – Town Water	$93,678	$88,000	$392,000
#810 – Town Sewer	200,738	256,000	351,000
#820 – Blacklake Water	0	0	0
#830 – Blacklake Sewer	34,000	23,000	40,000

As of July 1, 2007 the above described accounts had funded reserves as shown below:

	Town System	Blacklake System
Water	$1,954,212	$349,170
Wastewater	$2,755,915	($26,123)

The revenue by sources for the District are budgeted as follows:

Table 1-1
2007/2008 Budgeted Operating Revenue

System	Operating Revenue
Water-Town	$2,393,000
Wastewater-Town	$829,000
Water-Blacklake	$378,000
Wastewater-Blacklake	$245,000

What this study does and does not do is listed below:

What Study Does	What Study Does Not Do
▪ Produces a schedule of projected facility replacement needs and their projected future costs.	▪ Determine a specific replacement year for each component
▪ Document the condition of District water and wastewater facilities, as reported by District staff.	▪ Assess the condition of individual facilities
▪ Develop strategies and recommendations relative to establishment of replacement funding and timing.	
▪ Assist the District in the process of gaining acceptance by the community and the District Board.	

1.2 Scope/General Methodology

1.2.1 Definitions of "Replacement"

For purposes of this study the generic term replacement refers to:

a. The reconstruction of existing facilities for which it is no longer cost effective to keep in service. That time or date can vary considerably. For a pump, it may be when the efficiency drops below a pre-determined acceptable level. For a pipeline, it may be when the costs of repair and reliability are excessive. All of us face the same questions with personal automobiles, for example.

b. Major refurbishment of facilities without full replacement. An example would be sliplining an existing pipeline rather than full replacement, thus extending the life to approximately that of a full replacement project. Reasons for doing so may include economics or reduced inconvenience to the public due to less traffic disruption. For purposes of this study, the costs assume replacement rather than refurbishment because the possibility of refurbishment needs evaluation on a case by case basis. However, this assumption is appropriate for budgeting purposes because the refurbishment costs usually are not significantly different than replacement.

c. Normal major refurbishment such as repainting steel reservoirs. These can have significant costs and while they could be considered as normal maintenance, it is convenient to include them in the replacement study.

Sometimes the term "replacement" becomes further blurred when after years of service, a facility is replaced and enlarged to accommodate growth or changed requirements. In such cases, the total cost may be split between the replacement fund and other capital budgets. In fact, state law requires a nexus between project costs and the costs of serving new development. Stated another way, developers should not have to fund pure replacement projects.

1.2.2 Scope of Work

The Scope of this study includes the following:

- Analyze the useful and remaining life of system components.
- Breakdown the costs for rehabilitation and replacement of components in the water and wastewater systems. This includes developing a schedule for replacement.
- Prepare alternative plans to achieve funding goals.
- Prepare recommendations for the District pertaining to the rehabilitation and replacement of the District's systems. Also include recommendations relative to gaining acceptance by the community and the District Board.

1.2.3 General Methodology

The general methodology is to:

A. Inventory the existing infrastructure systems, including the age of facilities and other information regarding the condition of the facilities, as reported by District staff. Sources of data included the Geographic Information System (GIS) database of District water and sewer facilities, readily available replacement records, and interviews with District staff.

B. Develop unit costs for replacement.

C. Estimate the present annual accumulation rate needed to fully fund the future projected replacement costs.

D. Determine impacts on rates or other funding methods to accumulate funds to pay for future replacements.

1.3 Acknowledgments

Boyle Engineering Corporation wishes to acknowledge the assistance of the following persons at the Nipomo Community Services District:

- Bruce Buel — General Manager
- Lisa Bognuda — Assistant Administrator
- Peter Sevcik, PE — District Engineer
- Tina Greitens — Utility Superintendent
- Dan Migliazzo — Utility Field Supervisor
- Butch Simmons — Inspector

2.0 Existing Systems

2.1 Water – Town Systems

The Town System (water) serves 3,428 customers over an area of approximately 4 sq. miles. The water system has one pressure zone. The pressure zone contains:

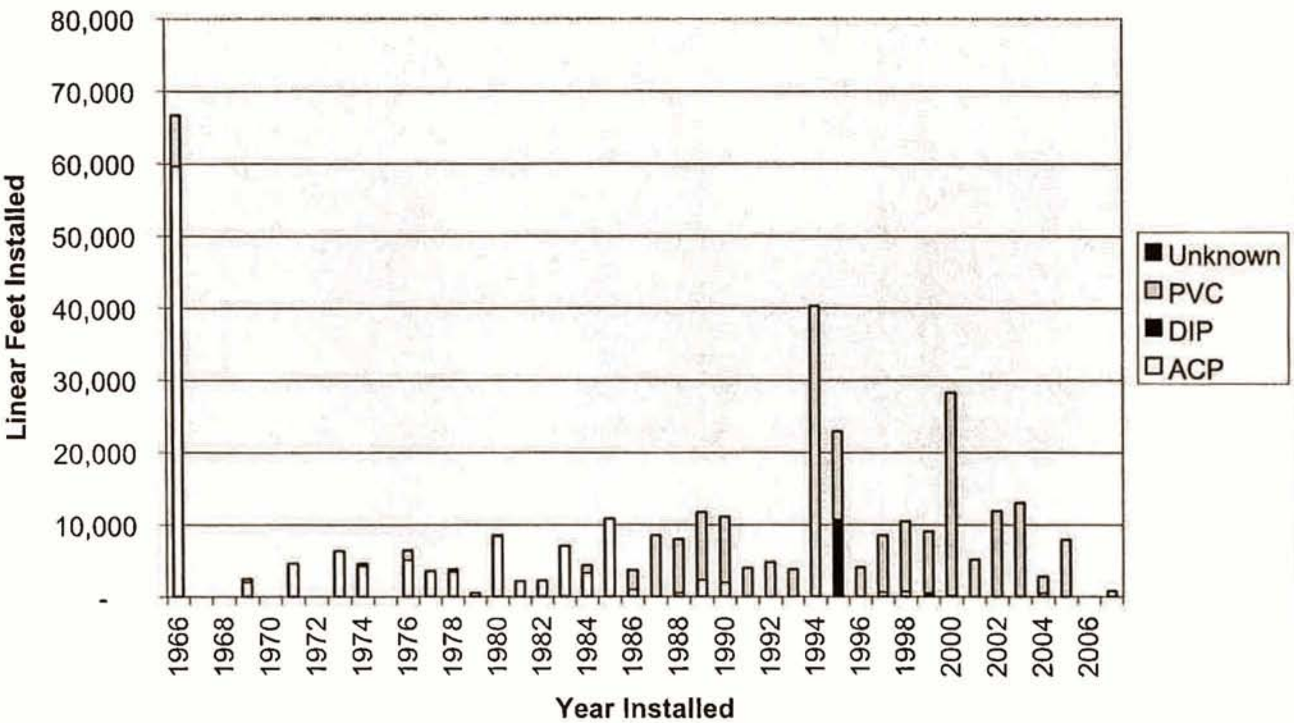
- Two storage facilities, Quad Tanks and Standpipe, which total 4 million gallons (MG) of storage.
- Seven active wells, which include disinfection by injecting liquid sodium hypochlorite solution into the well discharge. The seven wells are as follows:
  - Eureka Well
  - Via Concha Well
  - Bevington Well
  - Olympic Well
  - Sundale Well
  - Knollwood Well
  - Church Well
- The wells range in depth from 240 feet to 730 feet. Water is pumped from these wells using electrically powered submersible motors, electrically powered vertical turbine motors and a natural gas engine.
- A distribution system comprised of 6-, 8-, 10-, 12-, and 16-inch diameter pipes, which total approximately 415,079 feet, according to the District's Geographic Information System (GIS) database.

In general, the Town Water System components have been installed between 1966 and the current time. The operations personnel report the following:

- Good overall condition
- Pumps and motors may need replacement
- Electrical panels may need updating or replacement
- Tanks may need to be re-inspected, repaired, and re-coated

The distribution system was first installed using mostly asbestos-cement pipe. During later expansions the predominant material has shifted to PVC, as shown below.

Figure 2-1: Town Water Pipe Assets by Material and Installation Year



2.2 *Water – Blacklake System*

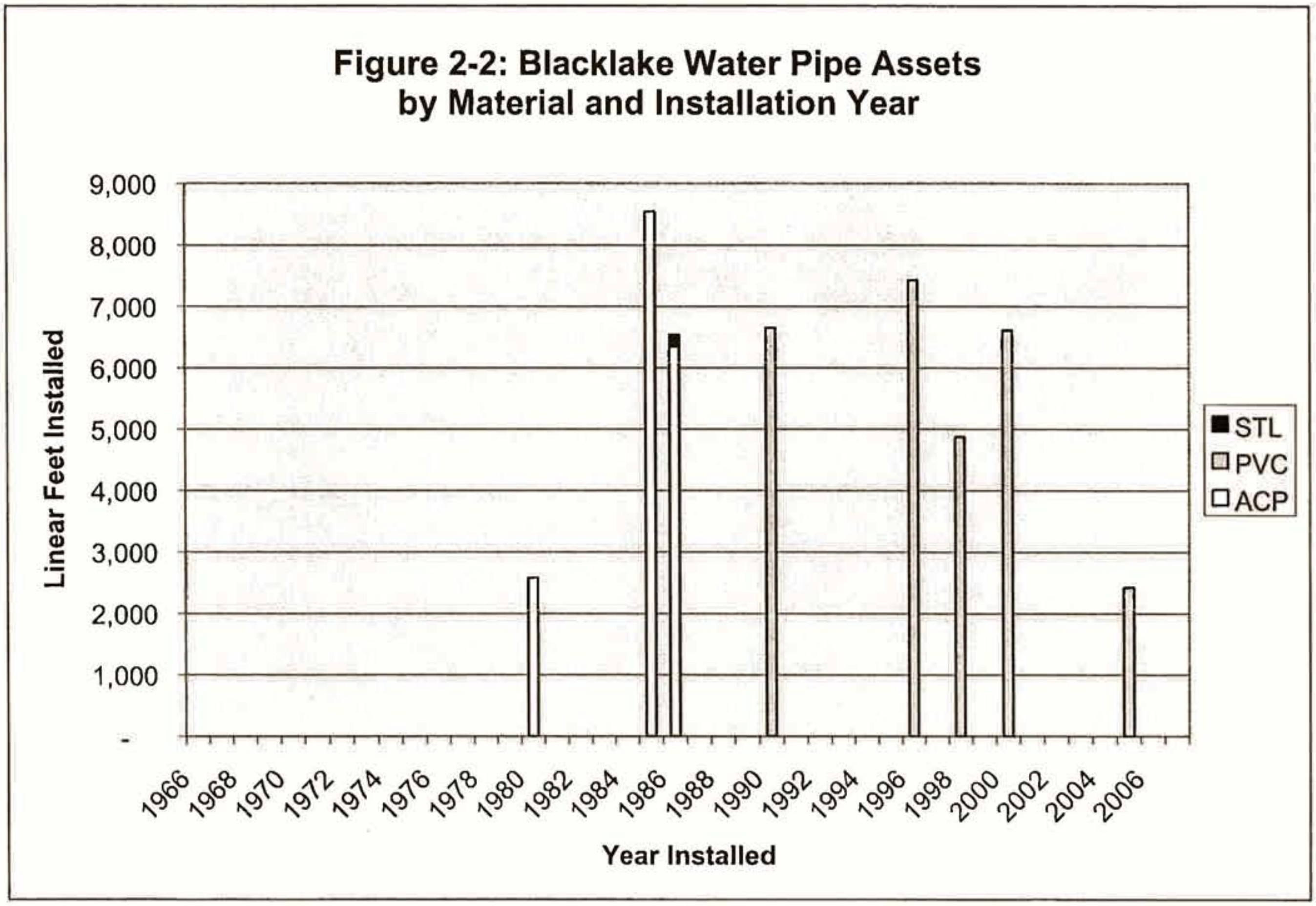
The Blacklake System (water) serves 589 customers over an area of approximately 0.7 sq. miles. The water system has one pressure zone and contains:

- One storage facility, Blacklake Tank, with a capacity of 0.4 MG.
- A transfer pump.
- Two active wells:
  - Blacklake #3
  - Blacklake #4
- A distribution system comprised of 4-, 6- and 8-inch diameter pipes, which total approximately 47,723 feet, according to the District's GIS.

In general, the Blacklake System components have been installed between 1985 and the current time. The operations personnel report the following:

- All systems are functioning well.
- The tank needs to be recoated.
- The existing booster station is past the end of its useful service life.

The distribution system was first installed using asbestos-cement pipe. Since 1990 PVC has been used, as shown below.



2.3 *Wastewater (Sewer) – Town System*

The Town Wastewater System (Sewer) serves 3,055 customers. The wastewater system contains the following:

- Wastewater treatment is provided at the District's wastewater treatment plant, located adjacent to Highway 101 at Southland and South Frontage Road. The plant currently is rated at 0.9 MGD. The plant was expanded in 1999. At that time all components were refurbished or replaced, except for ponds 1 and 2. The wastewater treatment facility utilizes a series of aerated lagoons to achieve the mandated discharge requirements. The wastewater enters the facility at the headworks were it is macerated prior to being pumped to the aerated lagoons for treatment, after which the treated effluent is discharged to the infiltration basins.

- The gravity wastewater pipelines consist of 6-inch to 12-inch diameter pipelines and total approximately 147,141 feet. The wastewater force mains consist of 4-, 6-, and 8-inch diameter pipelines and total 8,602 feet. The lines were installed between 1971 and the current time. Prior to 1985 the sewer system consisted of collection systems connected to community septic tanks.

- The wastewater transmission system includes eleven District-owned lift stations ranging from 110 to 600 gpm. The lift stations are as follows:

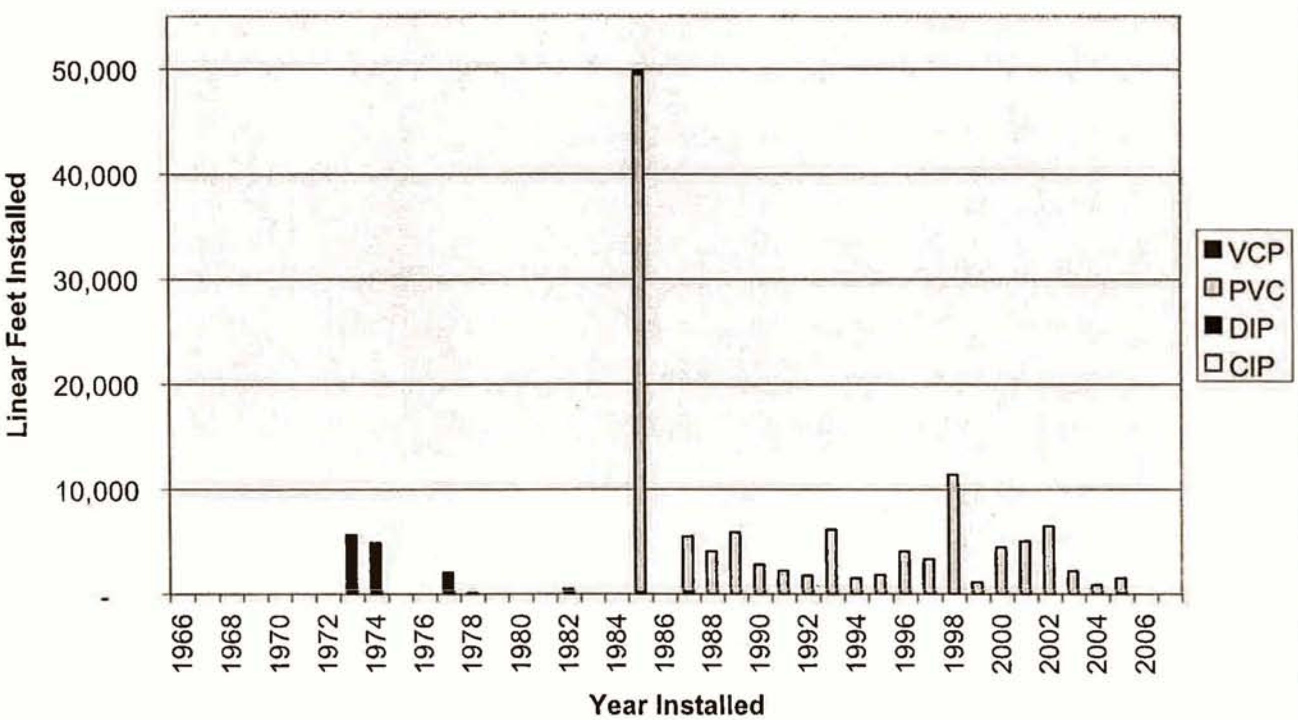
  - Influent (Treatment Plant)
  - Honey Grove
  - Nipomo Palms
  - La Mirada
  - Tejas (aka Hazel Lane)
  - Braken/Primrose
  - Gardenia
  - Juniper
  - N. Oak Glen
  - Tefft
  - Maria Vista

- – Two additional lift stations that are not owned or operated by the District deliver domestic wastewater to the collection system. These lift stations are noted here, but are not counted as district assets.

  - Galaxy Park
  - Self Help

The collection system was first installed using vitrified clay pipe. Since the system expansion in 1985 PVC has been used almost exclusively, as shown below.

Figure 2-3: Town Sewer Pipe Assets by Material and Installation Year



2.4 Wastewater (Sewer) – Blacklake System

The Blacklake Wastewater System (Sewer) serves 558 customers. The wastewater system contains the following:

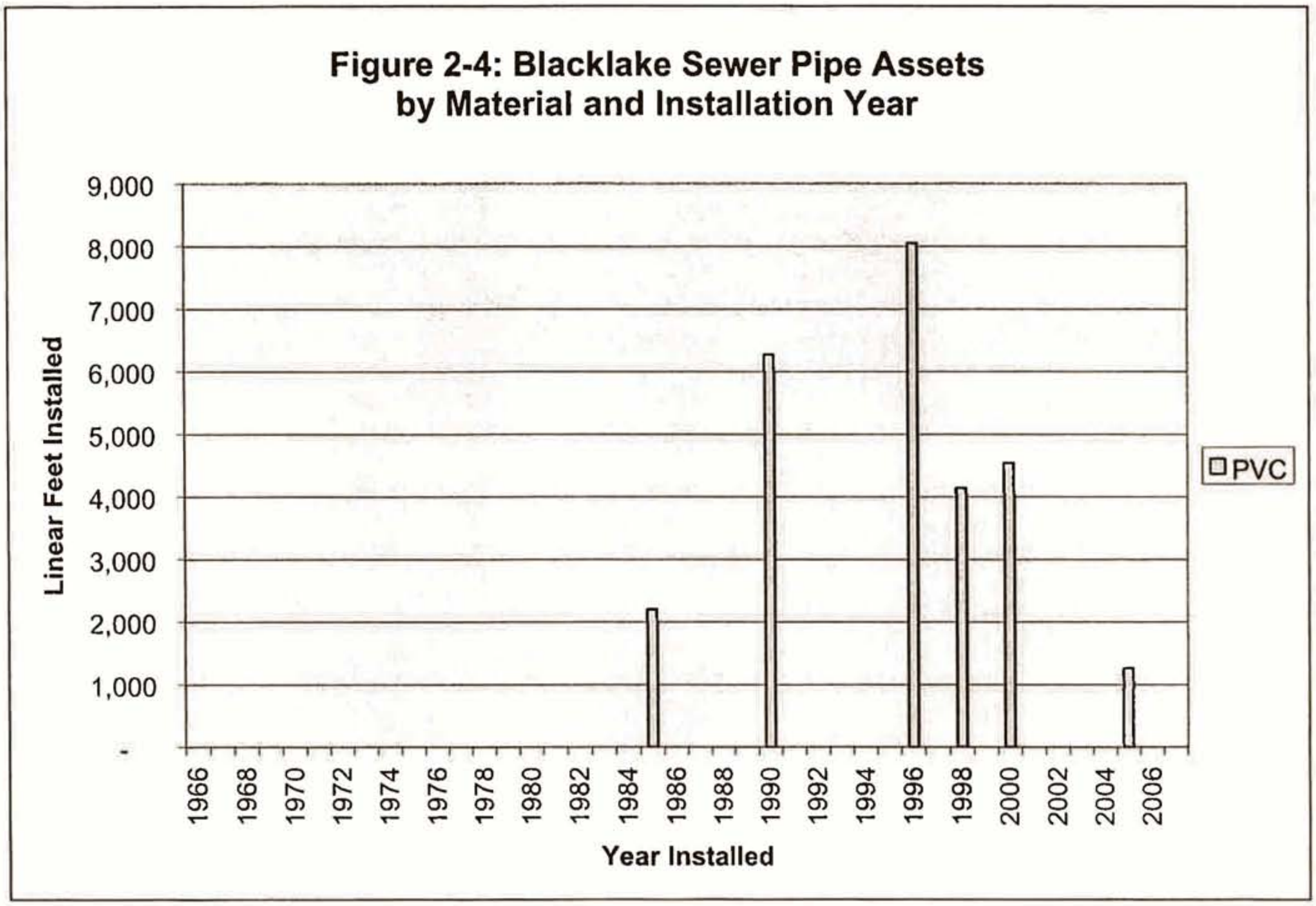
- Wastewater treatment is provided at the Blacklake Wastewater Treatment Plant. This treatment facility was constructed in 1986 and expanded in 1998 to its current capacity of 0.2 MGD. The wastewater enters the facility through a bar screen prior to entering the duplex comminutors. Once through the bar screen and comminutors the wastewater flows to the aerated lagoons for treatment. The treated effluent is then chlorinated before being discharged to the golf course irrigation storage pond.

- The gravity wastewater pipelines consist of 6-inch and 8-inch diameter pipelines and total approximately 36,475 feet. The wastewater force mains consist of 4-and 6-inch diameter pipelines and total 2,706 feet. These lines were installed between 1985 and the current time.

  The Blacklake System includes three lift stations as shown below:

- Woodgreen
- The Oaks
- Misty Glen

The collection system was installed using PVC, as shown below.



2.5 *Asset Summaries*

Summary inventories of the Town Water System, the Blacklake Water System, the Town Wastewater System and the Blacklake Wastewater System are provided in the following tables. More complete inventories are shown in the Appendices.

These inventories were developed using GIS and accounting data from the District. They are intended for the establishment of replacement funds and not intended as a complete listing for District depreciation purposes.

Table 2-1
Summary of Water System Assets

Facilities	Location Name	Town	Blacklake
Wells			
	Eureka (800 gpm)	x	
	Via Concha (700 gpm)	x	
	Bevington #2 (400 gpm)	x	
	Olympic #2 (145 gpm)	x	
	Church #2 (160 gpm)	x	
	Sundale (1,000 gpm)	x	
	Knollwood	x	
	Dana #1	(pending)	
	Dana #2	(pending)	
	Blacklake #3 (325 gpm)		x
	Blacklake #4 (400 gpm)		x
Reservoirs			
	Quad Tank #1 (0.5 MG)	x	
	Quad Tank #2 (0.5 MG)	x	
	Quad Tank #3 (1.0 MG)	x	
	Quad Tank #4 (1.0 MG)	x	
	Standpipe (1.0 MG)	x	
	Blacklake (0.4 MG)		x
Pipelines			
	2" AC	636	
	2" PVC	44	79
	4" AC	5,004	
	4" PVC	103	1,000
	6" AC	79,985	2,536
	6" PVC	43,909	4,098
	6" Steel		62
	8" AC	33,213	14,893
	8" PVC	123,603	24,932
	8" Steel		122
	10" AC	49,110	
	10" Ductile Iron	386	
	10" PVC	27,302	
	12" AC	503	
	12" Ductile Iron	555	
	12" PVC	23,040	
	14" AC	4,952	
	16" Ductile Iron	10,649	
	16" PVC	12,292	
	Unknown Material and Diameter	793	
	Total Length Per System, LF	**415,079**	**47,723**
	Total Length, LF		**462,802**
Fire Hydrants		585	73
SCADA System		x	x

Table 2-2
Summary of Wastewater System Assets

Facilities	Location Name	Town	Blacklake
Lift Stations			
	Influent (Southland Facility)	x	
	Honey Grove	x	
	Nipomo Palms	x	
	La Mirada	x	
	Tejas	x	
	Braken/Primrose	x	
	Gardenia	x	
	Juniper	x	
	The Oaks		x
	Woodgreen		x
	Misty Glen		x
	N. Oak Glen	x	
	Maria Vista	x	
	Tefft	x	
Treatment Plants			
	Southland WWTF	x	
	Blacklake WWTF		x
Pipelines			
	4" PVC (polyvinyl chloride)	27	
	6" CIP (cast iron)	39	
	6" VCP (vitrified clay)	5,501	
	6" PVC	2,317	4,734
	8" CIP	60	
	8" DIP (ductile iron)	434	
	8" VCP	7,771	
	8" PVC	107,756	30,577
	10" PVC	5,555	
	12" PVC	10,903	1,163
	15" PVC	33	
	Total Length Per System, LF	151,845	36,475
	Total Length, LF		188,320
Force Mains			
	4" PVC	7,318	1,906
	4" DIP	20	
	4" VCP	55	
	6" PVC	983	800
	6" DIP	42	
	8" PVC	81	
	8" DIP	103	
	Total Length Per System, LF	8,602	2,706
	Total Length, LF		16,803

3.0 System Unit Costs and Service Life Expectancy

3.1 General

In presenting unit cost opinions and service life expectancy, it must be remembered that these are somewhat generic and intended to establish reasonable replacement funding levels. There is no representation that these values will coincide with the values for a particular facility. Further, with respect to "service life" there are many facilities whose life has been longer than the numbers shown. However, their reliability or cost effectiveness may have been compromised. The replacement funds are intended to preclude that situation to a reasonable extent.

Tables 3-1 and 3-2 present the unit replacement cost opinions and service life expectancy for the various components of the Town and Blacklake water and wastewater systems.

3.2 Unit Replacement Cost

3.2.1 General

The unit replacement costs presented are based on: (1) recent experience by the District on repair/replacement projects (2) Boyle observations on similar projects or new projects with adjustment factors to better represent the increased work effort when a replacement project occurs. Those factors include, for example, the cost of reconnection of services and the cost of working in existing streets.

The cost represents our opinion of probable construction costs; they include an allowance for engineering design and construction services, where applicable. They are a "tool" to be used in addressing the broad issues; they do not represent a detailed analysis of any one facility or any one specific cost.

3.2.2 Water System

Table 3-1 presents the unit replacement costs for the water systems.

Comments are:

- 'Replacement' for pipelines could be full pipeline replacement including trenching and laying a new pipeline. It also could mean sliplining, pipe-bursting, or other trenchless technology, particularly where there are infrequent water services and few inline valves. The presence of services or valves can alter the preferred methodology. Also, water pipelines (i.e. AC or PVC) typically reach the end of their life due to exterior rather than interior problems.

- Unit costs for pipelines include additional work to reconnect existing services and to replace hydrants.
- Minimum size for water mains is 8". Existing mains that are smaller will be replaced with this minimum size.

3.2.3 Wastewater System

Comments are:

- 'Replacement' for pipelines could either be complete replacement or sliplining or other trenchless technology. The latter is gaining popularity due to the reduction of street/traffic impact; however, it is not applicable when the capacity of the existing line is marginal. In any event, for purposes of this study, the full replacement costs will be used.
- Replacement costs for pipelines reflect the work associated with existing laterals.
- Minimum size for gravity sewers is 8". Existing mains that are smaller will be replaced with this minimum size.
- Replacement costs for the wastewater treatment facilities reflect the costs associated with the replacement and installation of the existing equipment at the facilities.

3.2 Expected Service Life

3.2.1 3.2.1 General

There are no absolutes in expected life of facilities. Variables include:

- Definition of "life" – This definition is at the heart of the need for an infrastructure replacement program. Expected life could be defined as:
  - The time when a component completely fails or is so unreliable that failure has in essence occurred.
  - The time when repairs on a component become so frequent and costly that its retention can not be justified. "Failure" may not be at hand in terms of reliability, but the economics dictate replacement.
  - Some period before the repairs accelerate in frequency or before a component becomes unreliable. This is the "fix-it before it breaks" approach.

- For pumps and similar equipment, the time when the lost efficiency makes it beneficial for replacement. Lost efficiency translates into increased power costs.
- For certain facilities where critical fire protection is required, a time period before any significant failures occur which impact public safety.
- The SRF Replacement Guidelines life expectancy or IRS depreciation life.

- Variability in "life" – The typical "life" periods used in replacement studies, by other purveyors, often are less than what may be experienced in the field. That relates to the need for prudent planning, assuming a conservative approach. Also, if there is any error, it is better to be on the early side of the issue.
- Materials influence "life" – For example, AC pipelines have a tendency to be brittle and their life may be less than actual internal and external corrosion would indicate. On the other hand, PVC pipelines (AWWC 900 for water or D-3034 for wastewater) have longer anticipated lives, although the materials in PVC pipeline construction have not been in existence long enough to know precisely their "life".
- Need to be conservative – For planning purposes, it is better to underestimate useful life when given a choice. That provides fiscal prudence with respect to replacement of facilities. It is important to recognize that for public purveyors any funds collected in excess of true need are retained instead of provided to stockholders as may be the case for private companies. These retained earnings will be reflected in future rates.
- The life expectancies presented represent numbers based on experience with similar systems. However, it should be explained that the term "life" is variable. For purposes of this report "life" is assumed to precede experiencing problems. Realistically, many water or wastewater systems function for a number of years with problems such as line breaks which are simply fixed as they occur and indeed many pipelines have lasted 60 years or more. For planning purposes a more aggressive replacement schedule is assumed. If the District's replacement program actually is less aggressive, then the funds will still be designated for the replacements/repairs – only later than expected.

3.2.2 3.2.2 Water System

Comments are:

- The pipeline systems have the longest life expectancy.
- The wells with mechanical and electrical systems require more frequent replacement.
- Replacement of reservoir coatings is critical because if not done when needed, full reservoir replacement may be required earlier than expected.

3.2.3 3.2.3 *Wastewater System*

Comments are:

- The corrosive environment for lift stations and wastewater plant equipment reduces life expectancy.
- Manhole life can be extended through the use of one of the lining products, i.e. PVC T-lock, polyurethane coating.

Table 3-1
Replacement Cost Estimates and Probable Service Lives for Non-Pipeline Assets

System				Replacement Cost (2007 $)	Service Life (years)
	Subsystem				
		Component			
			Location		
Water System					
	Well Sites				
		Well and Casing			
			Church #2 Well	$47,000	40
			Blacklake #3 Well	$67,000	40
			Dana #1 (Cheyene) Well	$67,000	40
			Dana #2 (Mandi) Well	$67,000	40
			Knollwood Well	$67,000	40
			Olympic #2 Well	$67,000	40
			Bevington #2 Well	$114,000	40
			Blacklake #4 Well	$114,000	40
			Via Concha Well	$166,000	40
			Sundale Well	$194,000	40
			Eureka Well	$222,000	40
		Water Pumps			
			Church #2 Well	$8,000	15
			Blacklake #3 Well	$13,000	15
			Dana #1 (Cheyene) Well	$13,000	15
			Dana #2 (Mandi) Well	$13,000	15
			Knollwood Well	$13,000	15
			Olympic #2 Well	$13,000	15
			Bevington #2 Well	$19,000	15
			Blacklake #4 Well	$19,000	15
			Eureka Well	$22,000	15
			Via Concha Well	$22,000	15

System				Replacement Cost (2007 $)	Service Life (years)
	Subsystem				
		Component			
			Location		
			Sundale Well	$22,000	15
		Motors and Engines			
			Bevington #2 Well	$28,000	10
			Blacklake #3 Well	$20,000	10
			Blacklake #4 Well	$28,000	10
			Church #2 Well	$12,000	10
			Dana #1 (Cheyene) Well	$20,000	10
			Dana #2 (Mandi) Well	$20,000	10
			Eureka Well	$32,000	10
			Knollwood Well	$20,000	10
			Olympic #2 Well	$20,000	10
			Via Concha Well	$32,000	10
			Sundale Well – Natural Gas	$250,000	10
		Site Piping – all well locations		$15,000	50
		Well Building			
			Eureka Well	$11,000	30
			Via Concha Well	$11,000	30
			Sundale Well	$11,000	30
			Bevington #2 Well	$11,000	30
		Well Head Meter – all well locations		$6,000	15
		Electrical and Controls – all well locations		$15,000	25
		Chlorination System – all well locations		$15,000	15
		SCADA equipment – all well locations		$6,000	4
	Tank Sites				
		Replace Tank			
			Blacklake Tank	$600,000	50
			Quad Tank #1	$750,000	50
			Quad Tank #2	$750,000	50
			Quad Tank #3	$1,500,000	50
			Quad Tank #4	$1,500,000	50
			Standpipe	$1,500,000	50
		Interior Coating and Repairs			
			Blacklake Tank	$120,000	15
			Twin Tanks #1	$130,000	15

System				Replacement Cost (2007 $)	Service Life (years)
	Subsystem				
		Component			
			Location		
			Twin Tanks #2	$130,000	15
			Quad Tank #3	$160,000	15
			Quad Tank #4	$160,000	15
			Standpipe	$160,000	15
		Exterior Coating			
			Blacklake Tank	$19,000	10
			Twin Tanks #1	$22,000	10
			Twin Tanks #2	$22,000	10
			Quad Tank #3	$35,000	10
			Quad Tank #4	$35,000	10
			Standpipe	$35,000	10
		Site Piping		$15,000	50
		Mixing System - Standpipe		$35,000	25
		Cathodic Protection		$25,000	15
		SCADA upgrade		$6,000	4
		Access Road and Fencing			
			Blacklake Tank	$12,000	20
			Standpipe	$15,000	20
			Twin Tanks #1	$20,000	20
	Blacklake Interconnection – Transfer Pump				
		Piping		$25,000	25
		Pump		$40,000	15
		Motor		$40,000	10
		Electrical Controls and Generator		$40,000	25
	Blacklake Interconnection – Booster Station				
		Piping		$120,000	25
		Pump		$170,000	15
		Motor		$170,000	10
		Electrical Controls and Generator		$170,000	25
	SCADA System Upgrade				
		Blacklake		$5,000	4
		Town		$15,000	4
	SCADA System Replacement				
		Blacklake		$40,000	10
		Town		$120,000	10

System				Replacement Cost (2007 $)	Service Life (years)
	Subsystem				
		Component			
			Location		
Wastewater					
	Lift Stations				
		Wet Well Replacement		$144,000	50
		Site Piping, lids, etc.		$25,000	25
		Electrical and Controls		$6,000	25
		SCADA upgrade		$6,000	4
		Pumps			
			Tefft	$28,000	10
			other locations	$20,000	10
		Motors			
			Tefft	$42,000	10
			other locations	$30,000	10
	Wastewater Treatment Plants				
		Flow Meter			
			Blacklake WWTF	$20,000	15
			Southland WWTF	$55,000	15
		Piping and valves			
			Blacklake WWTF	$50,000	25
			Southland WWTF	$200,000	25
		Grinder			
			Blacklake WWTF (2 @)	$20,000	10
			Southland WWTF (2 @)	$44,000	10
		Lift Station Pump			
			Blacklake WWTF (2 @)	$20,000	10
			Southland WWTF (2 @)	$28,000	10
		Lift Station Motors			
			Blacklake WWTF (2 @)	$15,000	10
			Southland WWTF (2 @)	$20,000	10
		Pond Liners			
			Blacklake WWTF - 3 ponds @	$51,000	15
			Southland WWTF - 4 ponds @	$146,000	15
		Electrical and Controls			
			Blacklake WWTF	$50,000	25
			Southland WWTF	$480,000	25

System				Replacement Cost (2007 $)	Service Life (years)
	Subsystem				
		Component			
			Location		
		Aerator Electrical Connections (per aerator)		$3,000	25
		Aerators (each)		$6,000	15
		Auto-Sampler		$5,000	15
		Backup Power		$80,000	25
	SCADA System				
		System Upgrade			
			Blacklake	$5,000	4
			Town	$15,000	4
		Replace System			
			Blacklake	$40,000	10
			Town	$120,000	10

Table 3-2
Replacement Cost Estimates and Probable Service Lives for Pipeline Assets

Service Life (in years)	
80	PVC Pipelines
55	AC Pipelines
80	DIP and CIP Pipelines
Water Pipeline Unit Cost (includes pavement repair, new services, new hydrants, valves, engineering, and contingency.)	
Diameter (inches)	Unit Cost ($/foot in 2007)
6	160
8	160
10	170
12	240
14	260
16	310
18	330
20	400
24	450
Sewer Pipeline Unit Cost (includes manholes)	
Diameter (inches)	Unit Cost ($/foot in 2007)
Force Mains	
6	150
8	160
10	170
12	240
Gravity Mains	
6	210
8	210
10	240
12	270
15	310
18	360
21	420
24	470
27	540
30	610
36	760

4.0 Replacement Schedules and Costs

4.1 Overview

In this section, the inventory information from **Section 2** is combined with the replacement costs and life expectancies established in **Section 3** to determine:

- The Estimated Present Replacement Cost (i.e., the cost to replace each asset now);
- The Projected Future Replacement Cost (i.e., the present replacement cost with an inflation rate applied until the end of each asset's "life");
- The Required Annual Savings Rate to replace each asset (i.e., a constant series of annual set-asides accruing interest at an assumed interest rate);
- The Required Present Value of Accrued Annual Savings (i.e., the amount of money which should now be in a savings account allocated for future replacement projects); and
- The Remaining Service Life as a fraction of total system service life.

The amounts expressed are in terms of present worth dollars, as of December, 2007. The assumed interest rate for savings is 4.5%. The assumed inflation rate is 3.0%.

4.2 Funding Programs

Many different approaches to funding asset replacement costs are possible. To assist the District in determining the preferred funding approach, three different funding programs are developed. These programs are described below.

4.2.1 Model 1: 20 Year Savings Program

"Single year" costs are predicted costs which are based on the assumption that each asset will need replacement during the year it reaches the end of its assumed service life. However, single-year costs are not likely to be encountered in actual practice. For example, all the water pipe installed in 1966 with an estimated service life of 55 years will not be replaced in the year 2021. Some pipes will require replacement earlier, and some will require replacement later. Therefore, under Model 1 single year costs are "spread" over a period defined by a normal cumulative probability function with a standard deviation of 3 years. This "spreading" results in 90% of the replacements occurring within ±5 years of the end of service life.

These spread costs are funded by setting up a savings program that begins to save for each year's anticipated costs 20 year in advance. The savings rate is structured so that a constant amount is saved each of those 20 years. Every year the rate of savings increases or decreases depending on the anticipated costs 20 years hence, and the anticipated cost in the present year. The required accumulated savings balance can also increase or decrease year to year.

4.2.2 *Model 2: Service Life Savings Program*

Under Model 2, single year costs are funded by saving over each asset's service life. For example, if an asset has a service life of 10 years, a 10-year savings program is started the year the asset is placed in service. Likewise, an asset with an 80 year service life will require an 80-year savings program. Therefore, at any particular time the District will be saving for costs anticipated 1 to 80 years hence, at a variety of savings rates. (Note that in order to simplify calculations, single year costs are not "spread" in this model. The resulting long-term savings programs for the assets overlap and result in an aggregated savings program that effectively spreads the annual savings requirements.)

The savings rate for a particular asset remains constant until the asset is replaced. When the asset is replaced the savings rate increases to account for the anticipated future replacement cost increase due to inflation. As can be seen from the Figures 4-2 and 4-3, the savings rate under Model 3 always increases because replacement costs are assumed to always increase due to inflation.

4.2.3 *Model 3: Pay-as-you-go Set-Aside Program*

Under Model 3 single year costs are "spread" over a period defined by a normal cumulative probability function with a standard deviation of 3 years (as in Model 1). This results in 90% of the replacements occurring within ±5 years of the end of service life.

Each year "set-aside" sufficient funds to cover that year's predicted costs. The resulting set-aside rates will vary from year to year. Because this model is not a "savings" program, no accrued savings are required.

Model 3 may function as a "savings" program if actual replacement costs are less than predicted replacement costs. In this case, the excess funds could then be retained to earn interest and to fund subsequent replacement needs, or reduce subsequent annual set-asides.

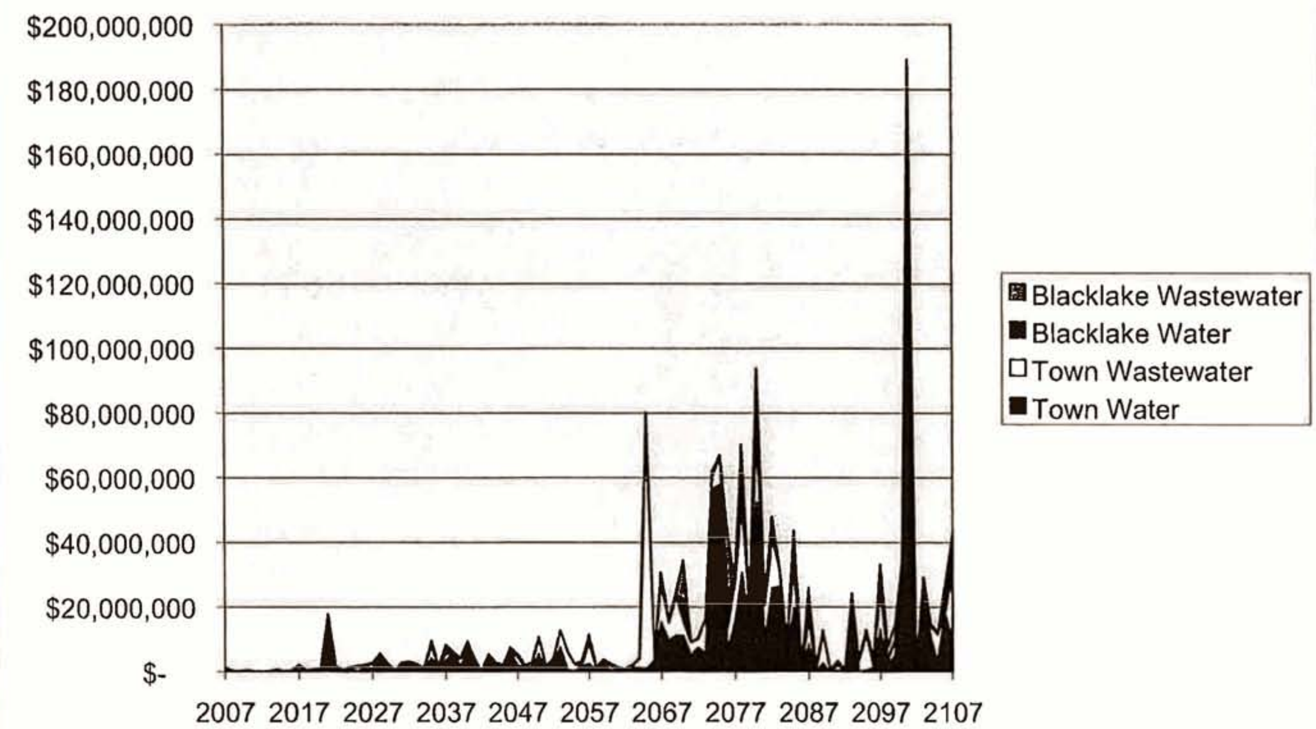
The development of these funding models is discussed below.

4.3 *Replacement Cost Schedule Development and Results*

4.3.1 *Single Year Costs*

The simplest approach for cost scheduling assumes that each asset will be replaced during the year that it reaches the end of its service life. Under this assumption, the expected replacement cost schedule for the next 50 years is shown below.

Figure 4-1: 100 Year Replacement Cost Schedule
Annual Costs (without "spreading")



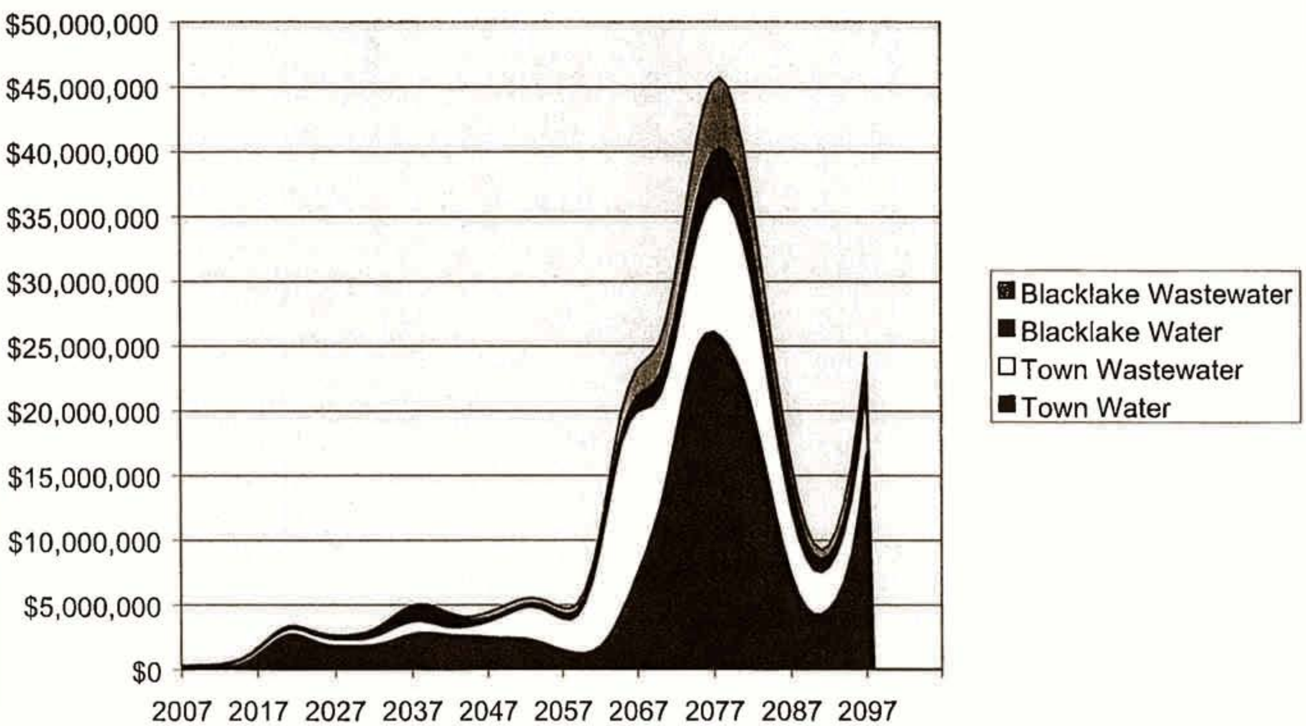
The first large spike in replacement costs in the year 2021 corresponds to the end of the 55 year service life of the ACP water pipes installed in 1966. The next large spike in 2065 corresponds to replacement of the PVC sewer pipes installed in 1985. The increased costs between 2065 and 2085 correspond to replacement of PVC pipes installed between 1985 and 2005.

These costs are used as inputs to Model 2, the Service Life Savings Program.

4.3.2 "Spread" Costs

In reality, some system components will need to be replaced earlier than predicted, while others will not need to be replaced for much longer. To account for this variability in replacement date, replacement costs shown above were averaged using a normal probability distribution with a standard deviation of 3 years. Under this "spread" model, 90% of costs occur within ±5 years of the specified date, resulting in the replacement cost schedule shown below.

Figure 4-2: 100 Year Replacement Cost Schedule - Costs Spread with 10-Year Normal Curve



These "spread" replacement cost schedules show distinct "humps", but the annual costs are lower than the single-year model. (These "10-year spread" cost estimates do not extend past 2097 because the calculations were based on single-year cost estimates through 2107.)

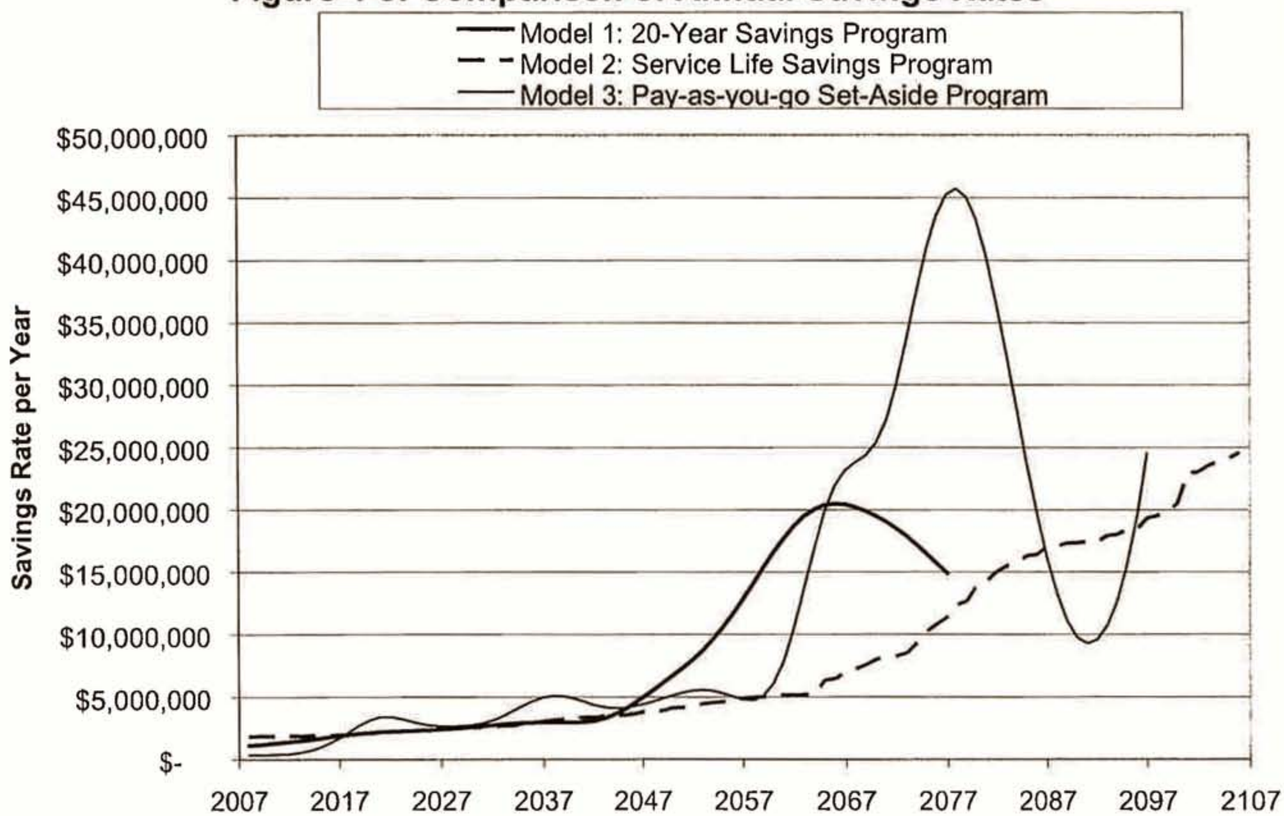
The first significant replacement cost peak is expected to occur around the year 2021 when the asbestos cement (AC) water pipe installed in 1966 is replaced after its 55 year life span. The second peak occurs near 2040 and will be caused by the need to replace AC pipe which was installed in the Town and Blacklake divisions during the late 1980s. The much larger peaks in 2065 and 2080 are the expected replacement of the PVC water and wastewater pipes installed 1985 and 2000.

These "spread" costs are used as inputs to Model 1, the 20-Year Savings Program, and to Model 3, the Pay-as-you-go Set-Aside Program.

4.4 Savings and Set-Aside Schedules

As noted above, three different savings models are presented to either account for the need to build up savings for future replacement of assets, or to set-aside the amount predicted to be needed for asset replacement during the present year. The required savings or set-aside rates for the next 100 years under these models are shown below.

Figure 4-3: Comparison of Annual Savings Rates



Savings rates rise gradually under Model 1, the 20-year Savings Program, for the next 35 year, and then increase fairly rapidly to meet significant replacement costs expected in 2065. Model 2 rises gradually until 2065, and then rises more rapidly. Model 3, the Pay-as-you-go Set-Aside Program represents an estimate of the annual replacement costs and fluctuates more rapidly than the other values.

Of greater interest are the *near term* savings rates and accrued savings balances that are required under these models, as shown below.

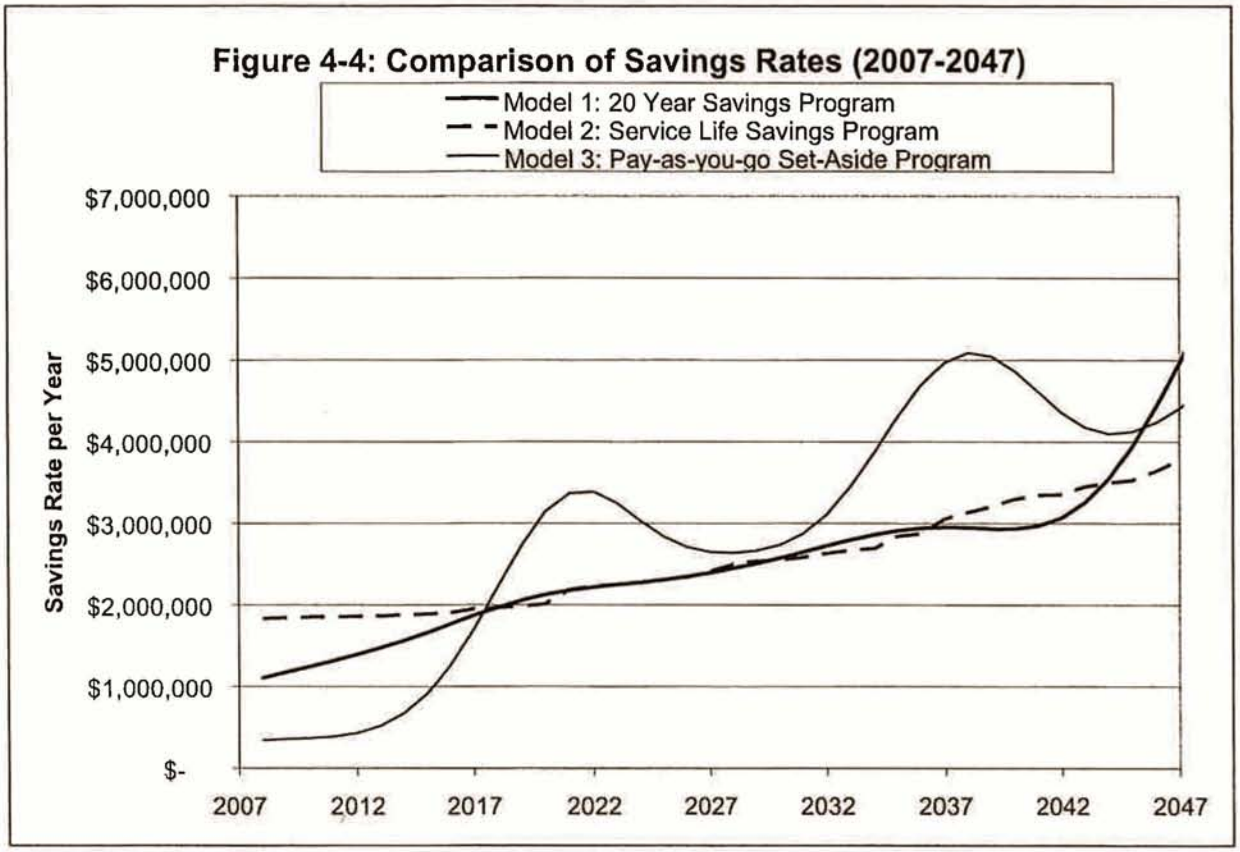


Figure 4-4: Comparison of Savings Rates (2007-2047)
Model 1: 20 Year Savings Program
Model 2: Service Life Savings Program
Model 3: Pay-as-you-go Set-Aside Program
Savings Rate per Year
$7,000,000
$6,000,000
$5,000,000
$4,000,000
$3,000,000
$2,000,000
$1,000,000
$-
2007
2012
2017
2022
2027
2032
2037
2042
2047

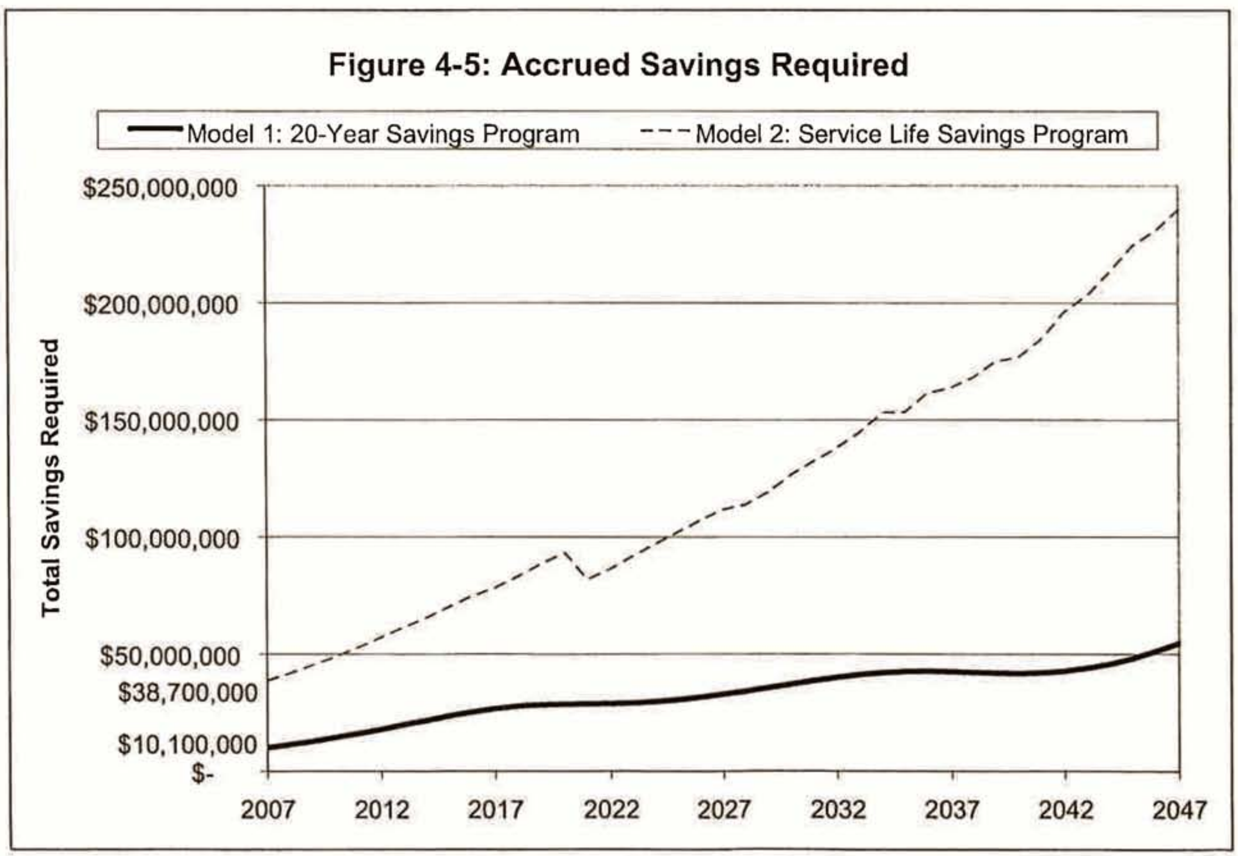
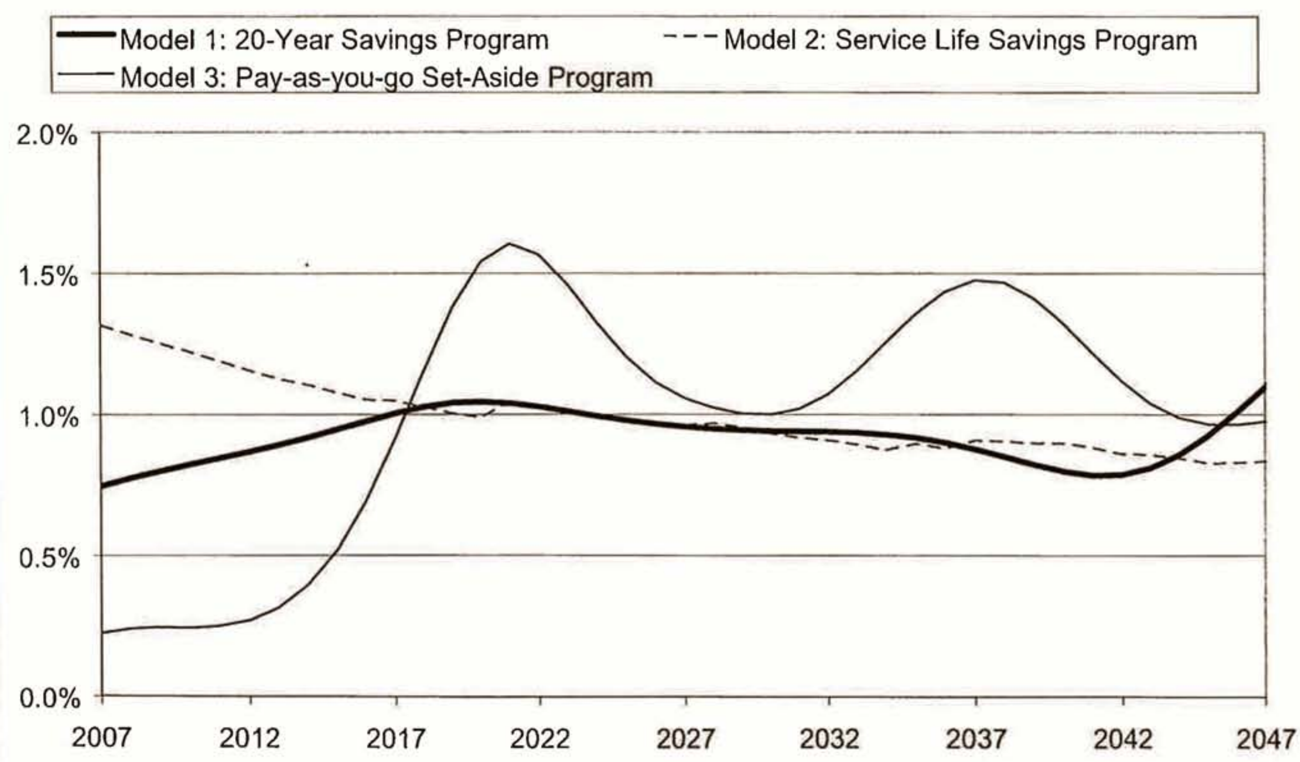


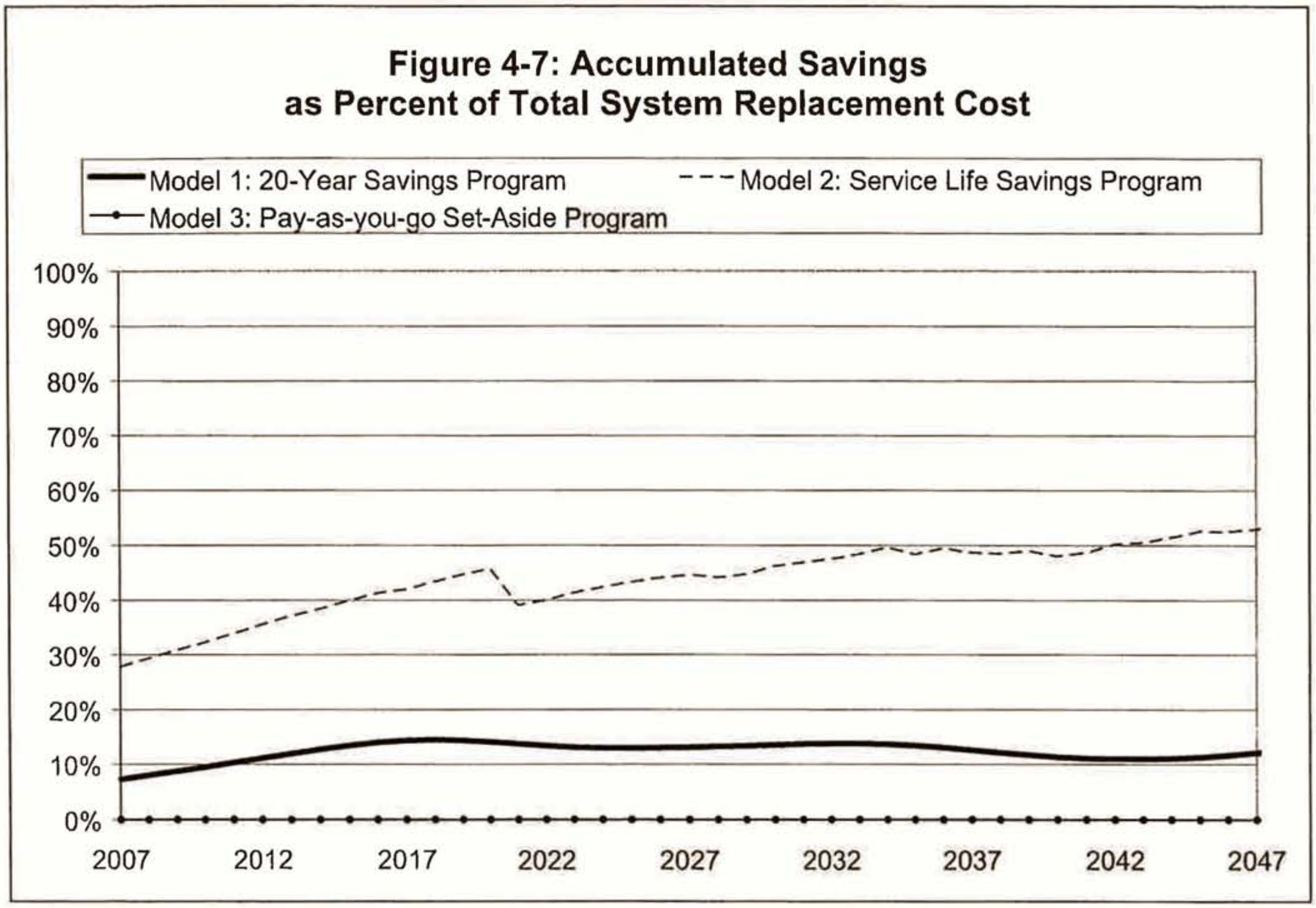
Figure 4-5: Accrued Savings Required
Model 1: 20-Year Savings Program
Model 2: Service Life Savings Program
Total Savings Required
$250,000,000
$200,000,000
$150,000,000
$100,000,000
$50,000,000
$38,700,000
$10,100,000
$-
2007
2012
2017
2022
2027
2032
2037
2042
2047

Under the 20-year Savings Program (Model 1) approximately $10 million should be accrued by the year 2007 for future replacements. Under the Service Life Savings Program (Model 2), approximately $40 million should be accrued by this time. These amounts represent the funds the District would have in savings *if* the savings approaches described had been followed since the systems had been installed. (No accrued savings are shown for the Pay-as-you-go Set-Aside Program (Model 3) because under this program sufficient funds are set aside each year to pay for *that year's* scheduled replacements and no savings accrue.)

To factor out the effect of inflation, annual replacement costs and accumulated savings as a fraction of total system replacement cost are shown below. As can be seen, all three models require a savings rate equal to approximately 1% of the total system replacement cost. Model 1 requires accumulated savings of between 7% and 15% of total replacement cost, while Model 2 requires accumulated savings of between 30% and 55% of total replacement cost.

Figure 4-6: Annual Savings (or Costs) as Percent of Total System Replacement Cost





The amount of Service Life remaining within each division, and within the combined system, is shown below. These calculation were performed assuming each asset is replaced at the end of its service life (i.e., no cost "spreading" was applied) and each asset "ages" in a linear manner. For example, the calculations assume that an asset with a 20-year service life will be replaced exactly 20 years after being placed in service, and that after 15 years 25% of its Service Life remains. Therefore the curves are more erratic than expected in actual practice. However, several observations can be made regarding the "age" of the system:

- The assets are relatively "young". Each division has between 70% and 83% of its overall Service Life remaining.
- Significant renewals are anticipated where the curves show a sharp upward movement. The Town Water division can expect to see significant renewals around the year 2020, and the Blacklake Water division can expect significant renewals around the year 2040.
- The 20-year period starting in approximately 2065 will see significant renewal of the system as a whole

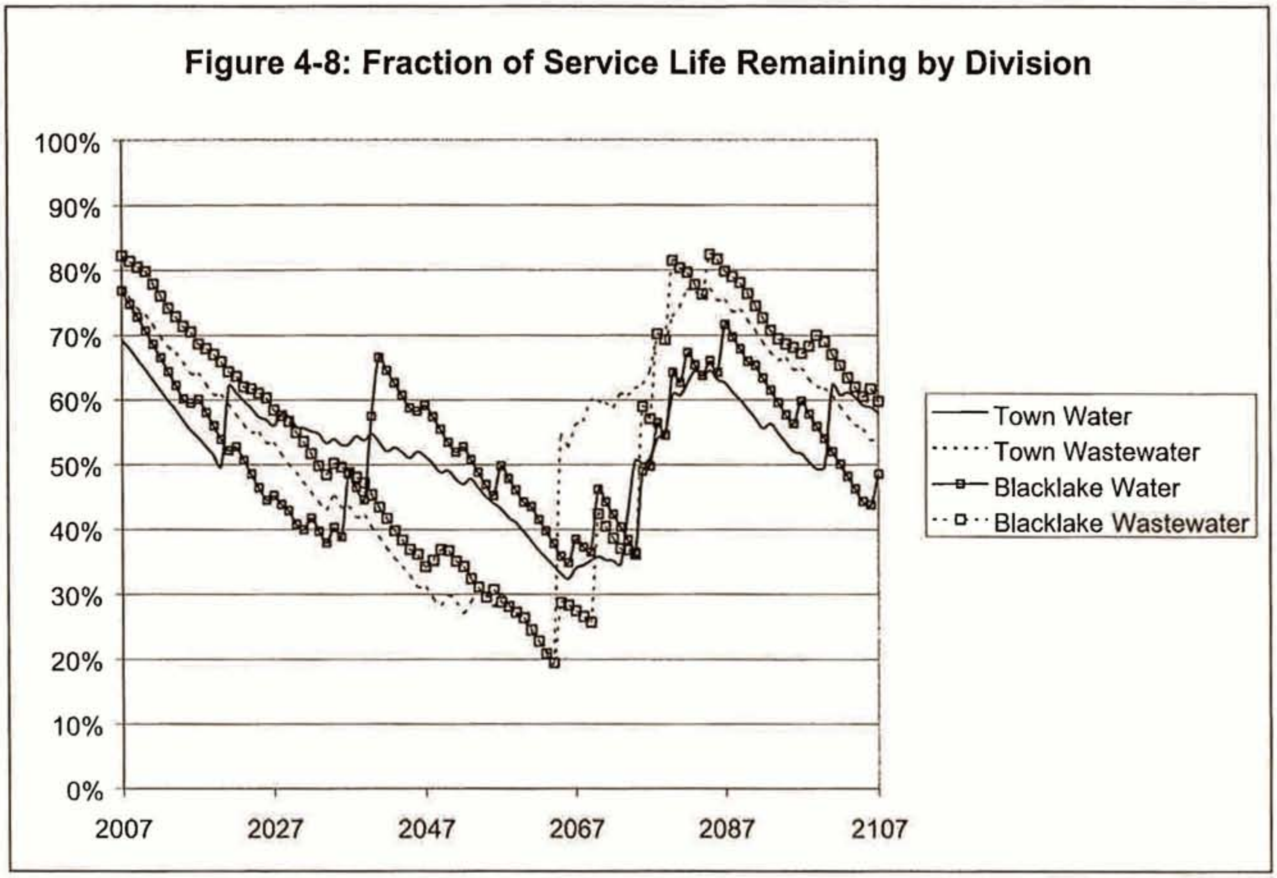
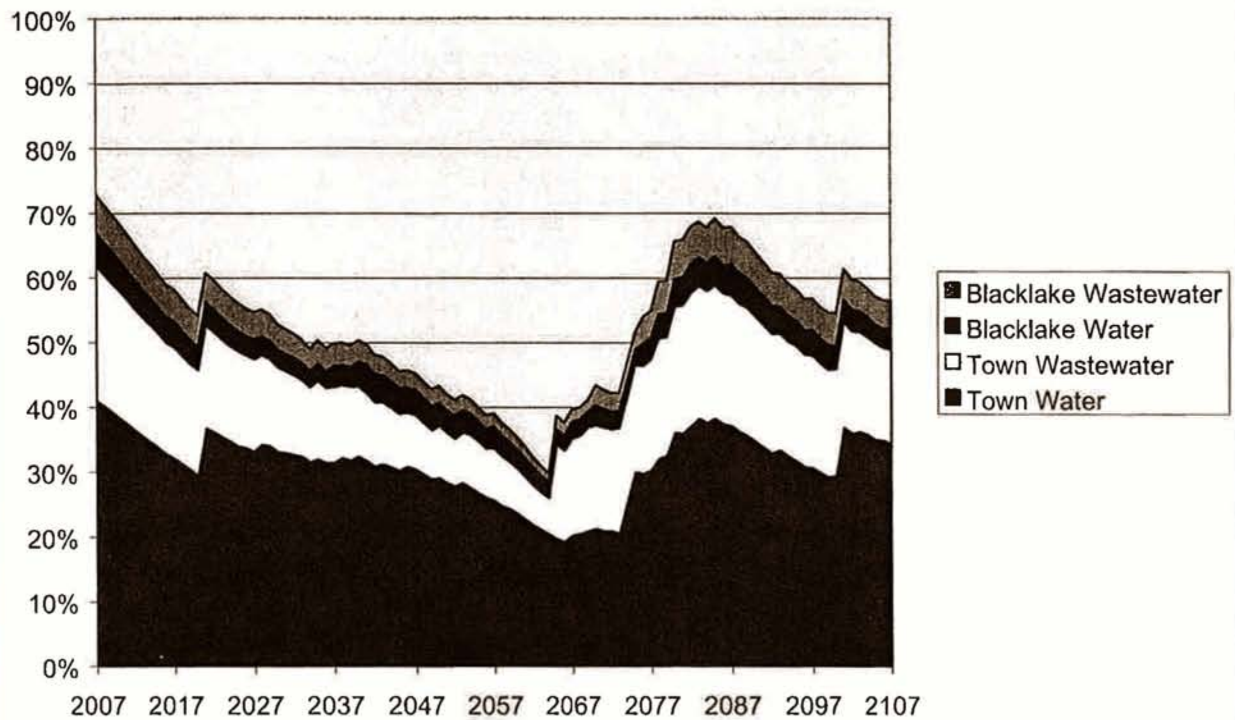


Figure 4-8: Fraction of Service Life Remaining by Division
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
2007
2027
2047
2067
2087
2107
Town Water
Town Wastewater
Blacklake Water
Blacklake Wastewater

Figure 4-9: Service Life Remaining in Total



A spreadsheet detailing these calculations is contained in Appendix F.

Key findings for the separate divisions are summarized below.

4.5 Water – Town System

- 2007 Replacement Cost: $82,000,000

Year	Pay-as-you-go Set-Aside Program (Model 3)	20-Year Savings Program (Model 1)		Service Life Savings Program (Model 2)	
	Annual Set-Aside Rate	Annual Savings Rate	Required Value of Accrued Savings	Annual Savings Rate	Required Value of Accrued Savings
2007	$114,000	$750,000	$6,700,000	$950,000	$26,000,000
2008	120,000	800,000	7,700,000	$960,000	$28,000,000
2009	120,000	850,000	8,900,000	$960,000	$30,000,000
2010	117,000	910,000	10,200,000	$960,000	$32,000,000
2011	125,000	960,000	11,600,000	$960,000	$35,000,000
2012	148,000	1,010,000	13,000,000	$960,000	$37,000,000
2013	203,000	1,070,000	14,600,000	$960,000	$40,000,000
2014	312,000	1,120,000	16,100,000	$970,000	$43,000,000
2015	500,000	1,180,000	17,600,000	$970,000	$45,000,000
2016	793,000	1,240,000	18,900,000	$970,000	$48,000,000
2017	1,195,000	1,290,000	20,000,000	$990,000	$51,000,000

4.6 Water – Blacklake System

- 2007 Replacement Cost: $9,600,000

Year	Pay-as-you-go Set-Aside Program (Model 3)	20-Year Savings Program (Model 1)		Service Life Savings Program (Model 2)	
	Annual Set-Aside Rate	Annual Savings Rate	Required Value of Accrued Savings	Annual Savings Rate	Required Value of Accrued Savings
2007	$12,000	$44,000	$470,000	$171,000	$2,300,000
2008	13,000	49,000	530,000	171,000	2,600,000
2009	14,000	55,000	610,000	171,000	2,900,000
2010	16,000	61,000	690,000	171,000	3,200,000
2011	21,000	69,000	780,000	172,000	3,500,000
2012	29,000	78,000	880,000	172,000	3,900,000
2013	40,000	89,000	980,000	172,000	4,200,000
2014	55,000	103,000	1,100,000	172,000	4,600,000
2015	70,000	119,000	1,220,000	172,000	5,000,000
2016	83,000	139,000	1,360,000	177,000	5,200,000
2017	92,000	163,000	1,520,000	186,000	5,200,000

4.7 Wastewater – Town System

- 2007 Replacement Cost: $37,000,000

Year	Pay-as-you-go Set-Aside Program (Model 3)	20-Year Savings Program (Model 1)		Service Life Savings Program (Model 2)	
	Annual Set-Aside Rate	Annual Savings Rate	Required Value of Accrued Savings	Annual Savings Rate	Required Value of Accrued Savings
2007	$140,000	$190,000	$2,300,000	$540,000	$8,500,000
2008	160,000	200,000	2,500,000	540,000	9,400,000
2009	170,000	210,000	2,600,000	550,000	10,300,000
2010	180,000	220,000	2,800,000	560,000	11,000,000
2011	190,000	230,000	3,000,000	560,000	12,000,000
2012	200,000	240,000	3,200,000	560,000	13,100,000
2013	220,000	250,000	3,300,000	560,000	14,100,000
2014	250,000	270,000	3,500,000	570,000	14,900,000
2015	280,000	290,000	3,700,000	580,000	16,000,000
2016	300,000	310,000	3,900,000	580,000	17,300,000
2017	330,000	330,000	4,100,000	610,000	17,700,000

4.8 Wastewater – Blacklake System

- 2007 Replacement Cost: $9,900,000

Year	Pay-as-you-go Set-Aside Program (Model 3)	20-Year Savings Program (Model 1)		Service Life Savings Program (Model 2)	
	Annual Set-Aside Rate	Annual Savings Rate	Required Value of Accrued Savings	Annual Savings Rate	Required Value of Accrued Savings
2007	$43,000	$55,000	$660,000	$159,000	$1,800,000
2008	51,000	58,000	700,000	162,000	2,000,000
2009	55,000	61,000	740,000	165,000	2,100,000
2010	56,000	63,000	790,000	168,000	2,300,000
2011	55,000	65,000	840,000	168,000	2,500,000
2012	55,000	68,000	890,000	168,000	2,800,000
2013	56,000	71,000	950,000	168,000	3,100,000
2014	61,000	75,000	1,020,000	170,000	3,400,000
2015	69,000	80,000	1,080,000	171,000	3,600,000
2016	78,000	86,000	1,140,000	175,000	3,900,000
2017	88,000	91,000	1,200,000	175,000	4,200,000

4.9 Discussion – Projections vs. Recent Costs and Savings

The projected replacement costs and required savings and set-asides listed above are compared to recent expenses from District Replacement Funds, annual allocations to these funds, and current balances in these funds.

Table 4-1: Recent and Predicted Replacement Costs

Fund	Replacement Costs				Predicted 2007 "Spread" Costs (used in Model 1 and Model 3)
	2005/06 (actual)	2006/07 (estimated)	2007/08 (budgeted)	3-year Average	
#800 – Town Water	$150,322	$50,000	$392,000	$197,441	$114,000
#810 – Town Sewer	114,937	0	351,000	155,312	140,000
#820 – Blacklake Water	27,638	50,000	-	38,819	12,000
#830 – Blacklake Sewer	238,839	0	40,000	92,946	43,000
Combined Total	$531,736	$100,000	$783,000	$471,579	$309,000

This table shows that predicted 2007 replacement costs are in line with recent actual, estimated, and budgeted costs, and may underestimate actual costs slightly. This "reality check" provides assurance that the underlying cost estimates and service life assumptions used in this study are reasonable.

Table 4-2: Budgeted and Modeled Replacement Funding

Fund	Budgeted Replacement Funding			2007 Savings or Set-Aside		
	2005/06	2006/07	2007/08	20-Year Savings (Model 1)	Service Life Savings (Model 2)	Pay-as-you-Go Set-Asides (Model 3)
#800 – Town Water	$93,678	$88,000	$392,000	$750,000	$950,000	$114,000
#810 – Town Sewer	200,738	256,000	351,000	190,000	540,000	140,000
#820 – Blacklake Water	-	-	-	44,000	171,000	12,000
#830 – Blacklake Sewer	34,000	23,000	40,000	55,000	159,000	43,000
Combined	328,416	367,000	783,000	1,039,000	1,820,000	$309,000

Examination of this table leads to the following observations:

- Recent Town Water replacement *funding* rates are in line with the Pay-as-you-go Program, but are far short of the annual savings needed for either the 20-year Savings Program or the Service-Life Savings Program.

- Recent Town Sewer replacement *funding* rates exceed the Pay-as-you-go Program and the 20-year Savings Program, but are insufficient to be considered a Service-Life Savings Program.
- There have been no additional funds allocated for Blacklake Water asset replacement within the last three fiscal years.
- Recent Blacklake Sewer replacement funding rates are slightly below the Pay-as-you-go Program and the 20-year Savings Program, and significantly lower than the Service-Life Savings Program.
- Looking at all four systems together, funding allocated in 2005/06 and in 2006/07 was very close to the Pay-as-you-go Program. The 2007/08 budget rate approaches the 20-year Savings Program, but is far below the savings rate needed for the Service-Life Savings Program.

Table 4-3: Modeled Replacement Funding as percent of 2007/08 Operating Budget

Fund	2007/2008 Budgeted Operating Revenue	Annual Replacement Funding as Percent of Operating Revenue		
		20-Year Savings (Model 1)	Service Life Savings (Model 2)	Pay-as-you-Go Set-Asides (Model 3)
#800 – Town Water	$2,393,000	31%	40%	5%
#810 – Town Sewer	829,000	23%	65%	17%
#820 – Blacklake Water	378,000	12%	45%	3%
#830 – Blacklake Sewer	245,000	22%	65%	18%
Combined	$3,845,000	27%	47%	8%

Examination of this table leads to the following observations:

- When taken as a combined system, replacement funding levels for 2007 should equal between 8% and 47% of the system's operating budget.
- The sewer divisions' replacement funding needs are larger in comparison to their operating budgets than the water divisions' replacement funding needs.
- At the present time the Pay-as-you-go Program (Model 3) requires a lower set-aside rate than the savings programs.

Because the 20-Year Savings Program and the Service-Life Savings Program make use of interest earned on accrued savings, the preceding discussion of <u>savings rates</u> is incomplete without a consideration of <u>accrued savings</u>. This information is provided below.

Table 4-4: Actual and Modeled Replacement Fund Balances, 7/1/2007

Fund	Balance 7/1/07	Accrued Savings Required		
		20-Year Savings (Model 1)	Service Life Savings (Model 2)	Pay-as-you-Go Set-Asides (Model 3)
#800 – Town Water	$1,954,212	$6,700,000	$26,000,000	$0
#810 – Town Sewer	2,755,915	2,300,000	8,500,000	0
#820 – Blacklake Water	349,170	470,000	2,300,000	0
#830 – Blacklake Sewer	(26,123)	660,000	1,800,000	0
Combined Total	$5,033,174	10,130,000	38,600,000	$0

As a combined total, the balances shown are insufficient for either of the two savings programs noted. When considered separately, this conclusion remains valid, with the exception of the Town Sewer system. More than sufficient funds are accrued to adopt the 20-year Savings Program for the Town Sewer System, although insufficient funds are available to adopt the Service Life Savings Program.

5.0 Funding Alternatives

5.1 General

This section discusses the funding programs described above, presents advantages and disadvantages, and provides a sensitivity analysis.

5.1.1 Comparison of the Funding Programs

The funding programs are summarized and compared in the following table.

Table 5-1: Funding Model Comparison

Consideration	20-Year Savings Savings Program (Model 1)	Service Life Savings Program (Model 2)	Pay-as-you-Go Set-Aside Program (Model 3)
Annual Savings or Set-Aside Rate - Initial Rate	Medium	High	Low
Annual Savings or Set-Aside Rate - Variability	Medium variability. Required savings rate is at times higher than Model 2 savings rate.	Low variability, but the rate always rises.	High variability. In some years the required set-aside will exceed Model 1 and Model 2 savings rates.
Accumulated Savings Required	Medium	High	(None)
Cost Allocation	Allocated to users during last 20 years of service life.	Allocated to users over full service life.	None - "pay as you go" aspect allocates cost to all existing users of the system.

5.1.2 Sensitivity Analysis

The funding models are based on the following assumptions:

1. 2007 Replacement Cost as estimated elsewhere in this report.
2. Service Life in years as estimated elsewhere in this report.
3. The Inflation Rate which is applied to replacement costs is assumed to be a constant value of 3.00%.
4. The Return on Savings which is applied to saved funds is assumed to be a constant value of 4.50%.

5. "Single year" costs in Models 1 and 3 are "spread" over a period defined by a normal cumulative probability function with a standard deviation of 3 years.

To determine the sensitivity of the models' results to these assumptions, each of these assumptions (except Replacement Cost) was increased by 10% of its value and the results of the "perturbed" model are compared to the original model. (Service Life values were increased by whole year increments, or at least one year.) Results are shown in Appendix C and discussed below.

Replacement Cost was not subjected to sensitivity analysis because the model is linear with regards to this variable. In other words, a 10% across-the-board increase in the Replacement Cost assumption would translate into a 10% increase in all costs for all models.

Key results of the sensitivity analysis include:

- As expected, extending the assumed Service Life for all assets will generally lower costs. However, because each component is replaced later, inflation will increase the eventual cost of replacement. Models 1 and 3 are more sensitive to changes in Service Life because the "shape" of the replacement cost schedule will change. ("Peaks" may become "valleys" and vice versa.) Under Model 2 a 10% increase in Service Life will translate into a fairly consistent 10% drop in required savings rate for the next 50 years.

- As expected, an increase in the assumed Inflation Rate will result in higher costs. Model 1 is less sensitive than Model 2 to a change in inflation rate, although under both models annual savings rates will be between 20% and 25% higher in 2060 than under the original assumption. Model 3 is least sensitive to changes in Inflation Rate.

- As expected, an increase in the assumed Return-on-Savings Rate will generally lower costs. If Model 1 is used, then a 10% increase in the assumed Return-on-Savings Rate results in a 5% decrease in the required savings rate. If Model 2 is used, a 10% increase in the assumed Return-on-Savings Rate will result in required savings rates 11% to 16% lower than the original analysis.

- Increasing the "spread" (i.e., the uncertainty in replacement year for individual components) by 10% has a negligible (-1% to +2%) impact on Model 1 savings rates, no impact on Model 2 (because "spread" is not used). The effect on Model 3 will be to make any particular year's cost between 5% lower and 14% higher than under the original analysis, but the overall effect is negligible.

6.0 Conclusions and Recommendations

6.1 Conclusions

The three funding programs presented in this report offer a range of approaches to the challenge of providing sufficient funds to replace system components when they reach the end of their service lives. Key findings are summarized below.

Table 6-1: Implications the Savings or Set-Aside Programs

Savings or Set-Aside Approach	Reasons for Adopting this Model	Implications of Adopting this Model
20-Year Savings Program (Model 1) Save 20 years in advance of expected costs.	A 20 year planning horizon may be sufficient for planning purposes.	A moderate, but fluctuating, annual savings rate will be required. The required savings rate is somewhat higher than currently budgeted. A moderate increase in reserves is needed. The required reserves are less than Model 2.
Service-Life Savings Program (Model 2) Begin saving for each asset's eventual replacement as soon as the asset is installed.	This approach spreads the cost of replacement over the life of each asset.	Annual savings rates are more stable than Model 1. A significant increase in reserves and annual saving rates are required.
Pay-as-you-go Set Aside program (Model 3 Use conservative predictions of service life, and assumptions of service life variability, to set aside sufficient funds each year for anticipated replacement needs.	Use of conservative assumptions will result in a build-up of reserves over time.	Highly variable annual set-aside rates. No reserve required.

6.2 *Recommendations*

Replacement costs are expected to rise significantly within the next 15 to 20 years. The District can reduce the "shock" of these future cost increases by continuing their asset replacement savings program.

Therefore, the Pay-as-you-go Set-Aside Program (Model 3) is not recommended. However, short-term budgetary considerations may preclude annual contributions to a "savings" program. Therefore, the Pay-as-you-go Set-Aside Program may provide a lower bound for a prudent set-aside program. Should the pay-as-you-go approach be adopted, it will be important to accurately predict needed replacement costs in the immediate future.

The most equitable savings approach, the Service-Life Savings Program (Model 2), may be impractical to implement at this time because there are insufficient reserves. However, if over time sufficient reserves accrue, the more stable funding approach of Model 2 should be adopted.

Therefore, Boyle recommends that the District adopt the 20-year Savings Program described by Model 1. To implement this approach, the District will need to adopt the annual savings rates noted, and should also adjust these savings rates upward or downward to bring the reserved fund balance in line with the required balance. The funding approaches detailed below will accomplish this realignment within 10 years.

Table 6-2: Adjusted 20-year Savings Program (Model 1) for Town Water Division

Year	Projected Replacement Costs	Model 1 Annual Savings Rate	Required Reserve Balance	Projected Reserve Balance	Catch-Up Adjustment	Total Adjusted Savings Rate
2007	$114,000	$750,000	$6,700,000	$1,954,212*	$645,000	$1,395,000
2008	120,000	800,000	7,700,000	3,323,152	645,000	1,445,000
2009	120,000	850,000	8,900,000	4,797,693	645,000	1,495,000
2010	117,000	910,000	10,200,000	6,388,590	645,000	1,555,000
2011	125,000	960,000	11,600,000	8,114,076	645,000	1,605,000
2012	148,000	1,010,000	13,000,000	9,959,210	645,000	1,655,000
2013	203,000	1,070,000	14,600,000	11,914,374	645,000	1,715,000
2014	312,000	1,120,000	16,100,000	13,962,521	645,000	1,765,000
2015	500,000	1,180,000	17,600,000	16,043,834	645,000	1,825,000
2016	793,000	1,240,000	18,900,000	18,090,807	645,000	1,885,000
2017	1,195,000	1,290,000	20,000,000	19,996,893	645,000	1,935,000

* Balance 7/1/2007.

Table 6-3: Adjusted 20-year Savings Program (Model 1) for Town Wastewater Division

Year	Projected Replacement Costs	Model 1 Annual Savings Rate	Required Reserve Balance	Projected Reserve Balance	Catch-Up Adjustment	Total Adjusted Savings Rate
2007	$140,000	$190,000	$2,300,000	$2,755,915*	$(50,000)	$140,000
2008	$160,000	$200,000	$2,500,000	2,879,931	(50,000)	$150,000
2009	$170,000	$210,000	$2,600,000	2,999,528	(50,000)	$160,000
2010	$180,000	$220,000	$2,800,000	3,124,507	(50,000)	$170,000
2011	$190,000	$230,000	$3,000,000	3,255,110	(50,000)	$180,000
2012	$200,000	$240,000	$3,200,000	3,391,590	(50,000)	$190,000
2013	$220,000	$250,000	$3,300,000	3,534,211	(50,000)	$200,000
2014	$250,000	$270,000	$3,500,000	3,673,251	(50,000)	$220,000
2015	$280,000	$290,000	$3,700,000	3,808,547	(50,000)	$240,000
2016	$300,000	$310,000	$3,900,000	3,939,932	(50,000)	$260,000
2017	$330,000	$330,000	$4,100,000	4,077,228	(50,000)	$280,000

* Balance 7/1/2007.

Table 6-4: Adjusted 20-year Savings Program (Model 1) for Blacklake Water Division

Year	Projected Replacement Costs	Model 1 Annual Savings Rate	Required Reserve Balance	Projected Reserve Balance	Catch-Up Adjustment	Total Adjusted Savings Rate
2007	$12,000	$44,000	$470,000	$349,170*	$35,000	$79,000
2008	13,000	49,000	530,000	431,883	35,000	84,000
2009	14,000	55,000	610,000	522,317	35,000	90,000
2010	16,000	61,000	690,000	621,822	35,000	96,000
2011	21,000	69,000	780,000	729,804	35,000	104,000
2012	29,000	78,000	880,000	845,645	35,000	113,000
2013	40,000	89,000	980,000	967,699	35,000	124,000
2014	55,000	103,000	1,100,000	1,095,245	35,000	138,000
2015	70,000	119,000	1,220,000	1,227,531	35,000	154,000
2016	83,000	139,000	1,360,000	1,366,770	35,000	174,000
2017	92,000	163,000	1,520,000	1,519,275	35,000	198,000

* Balance 7/1/2007.

Table 6-5: Adjusted 20-year Savings Program (Model 1) for Blacklake Wastewater Division

Year	Projected Replacement Costs	Model 1 Annual Savings Rate	Required Reserve Balance	Projected Reserve Balance	Catch-Up Adjustment	Total Adjusted Savings Rate
2007	$43,000	$55,000	$660,000	$(26,123)	$91,000	$146,000
2008	51,000	58,000	700,000	75,701	91,000	149,000
2009	55,000	61,000	740,000	177,108	91,000	152,000
2010	56,000	63,000	790,000	282,078	91,000	154,000
2011	55,000	65,000	840,000	392,771	91,000	156,000
2012	55,000	68,000	890,000	511,446	91,000	159,000
2013	56,000	71,000	950,000	638,461	91,000	162,000
2014	61,000	75,000	1,020,000	773,192	91,000	166,000
2015	69,000	80,000	1,080,000	912,986	91,000	171,000
2016	78,000	86,000	1,140,000	1,056,070	91,000	177,000
2017	88,000	91,000	1,200,000	1,202,593	91,000	182,000

* Balance 7/1/2007.

The recommended savings rates are converted to a per-customer basis below to show the potential impact to bi-monthly utility rates.

Table 6-6: Recommended Adjusted 20-year Savings Program for All Divisions

Division	Town Water	Town Wastewater	Blacklake Water	Blacklake Wastewater
Customers	3,428	3,055	589	558
Year	**Per-Customer Recommended Bi-Monthly Savings Rate**			
2007	$68	$8	$22	$44
2008	70	8	24	45
2009	73	9	25	45
2010	76	9	27	46
2011	78	10	29	47
2012	80	10	32	47
2013	83	11	35	48
2014	86	12	39	50
2015	89	13	44	51
2016	92	14	49	53
2017	94	15	56	54

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7.0 Information Sources

Nipomo Community Services District, 2008, Geographic Information System database.

Nipomo Community Services District, 2005, 2006, and 2007, District Budget.

The Reed Group, 2007, Nipomo Community Services District, Town Sewer System Financial Plan, User Rates, and Capacity Charges, August 24, 2007.

The Reed Group, 2007, Nipomo Community Services District, Blacklake Sewer System Financial Plan and User Rates, August 24, 2007.

The Reed Group, 2007, Nipomo Community Services District, Combined Water System Financial Plan and User Rates, September 14, 2007.

Reed, Robert, 2008, personal communication, March 4, 2008.

Errata and Clarifications

Errata

Location of Error	Correction
ES-1, last line	"20 year in advance" should be "20 years in advance"
ES-17 and ES-18	"Twin Tanks #1" and "Twin Tanks #2" should be referred to as "Quad Tanks #1" and "Quad Tanks #2".
ES-23, last line	"for the next 50 years" should be "for the next 100 years".

Clarifications

Location of Item	Clarification
ES-11	Well production rates noted are estimated values at the time of installation. Actual production rates may be less.
ES-17 and ES-18	Replacement of SCADA equipment every 4 years applies to periodic system upgrades. Replacement of SCADA equipment every 10 years applies to system replacement at the end of its service life.
ES-42 to ES-44	Tables 6-2 through 6-5. The final column (Total Adjusted Savings Rate) is the sum of the 3rd column (Model 1 Annual Savings Rate) and Column 6 (Catch-Up Adjustment). This is the savings rate that will allow the District to accrue sufficient reserves to implement the Model 1 savings approach within 10 years.

Acronyms

Acronym	Explanation
ACP	Asbestos Cement Pipe
AWWC 900	American Water Works (Association) C-900 water pipe standard for PVC pipe used for municipal water supply
D-3034	American Society for Standards and Measurement (ASTM) standard for PVC pipe for gravity sewers
DIP	Ductile Iron Pipe
GUI	Graphical User Interface
IRS	Internal Revenue Service
SCADA	Supervisory Control And Data Acquisition. The primary purpose of SCADA is to monitor, control and alarm plant or regional operating systems from a central location.
SRF	State Revolving (Loan) Fund
STL	Steel (pipe material code from the District's database)
TDH	Total Dynamic Head = sum of pressure, velocity, and elevation energy components in a pumped fluid. Used to select pumps for specific applications. Each pump has a characteristic "pump curve" that relates flow rate to TDH.
VCP	Vitrified Clay Pipe
WWTP	Wastewater Treatment Plant