Development of an Asset Management Plan for a Small Municipal Wastewater System

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ABSTRACT

The objective of this paper is to demonstrate how an Asset Management Plan (AMP) for a small municipal wastewater system was developed and the value the town derived from having the AMP. The methods utilized in the development of the AMP included two important components. One was obtaining "buy-in" from the elected officials and town staff; and the other was inventorying system assets. Many of the principles used to develop the AMP were based on training materials published by the Buried Asset Management Institute - International (BAMI-I). A key result of the AMP was that the town's elected officials supported rate increases to properly operate, maintain, and rehabilitate the assets of the wastewater system. The conclusion is that a properly developed and implemented AMP can benefit a small municipality in the operation, maintenance, and rehabilitation of the assets of the wastewater system.

KEYWORDS: Asset Management Plan, small municipality wastewater system, rates, rehabilitation, management

INTRODUCTION

The development of an Asset Management Plan (AMP) for a public utility is very important for the health and stability of that utility. It enables the proper operation, maintenance and rehabilitation of the assets within the public utility, both buried and above ground. Financially strong public utilities (water, wastewater, stormwater) in turn promote public health and economic development within the community. However, few public utilities for water infrastructure have a fully developed and implemented AMP, particularly small systems. Small systems are those serving less than 10,000 people and constitute about 90% of the public water and wastewater systems in the USA. This paper focuses on the development of an AMP for a small wastewater public utility serving a population of less than 5,000 people. It will show how the AMP benefitted this small community. The AMP was developed utilizing the principles established by the Buried Asset Management Institute – International (BAMI-I). The goal of this paper is to provide context for the AMP through background on the town of Spindale, to explain how the AMP began, to present the basic steps that were undertaken by the town to develop the AMP, to address the challenges associated with the development of the AMP, and the benefits to the town in having an AMP.

CONTEXT

Background on the Town of Spindale

Spindale is located in Rutherford County, North Carolina, approximately 50 miles south east of Asheville and approximately 70 miles west of Charlotte.

Figure 1. The three largest towns in Rutherford County by population are Forest City (7,472), Spindale (4,321), and Rutherfordton (4,059).

Figure 2: The Three Largest Towns in Rutherford County.

The town owns and operates its own wastewater system. A regional water authority provides water. The AMP was only for the wastewater system for the Town of Spindale.

It was not until the coming of textile mills that Spindale became a town in its own right. The founder of the mills in Spindale was an entrepreneur by the name of Simpson Bobo (S.B.) Tanner. He began with two mills that started operations in 1916, and several others quickly followed. The largest mill, Stonecutter Mills, was founded in 1920. It consisted of immense manufacturing floors and storage areas of approximately 600,000 square feet (nearly 14 acres). It integrated several operations, including spinning, dyeing, and weaving. Throughout most of its existence, it was the town's largest employer.

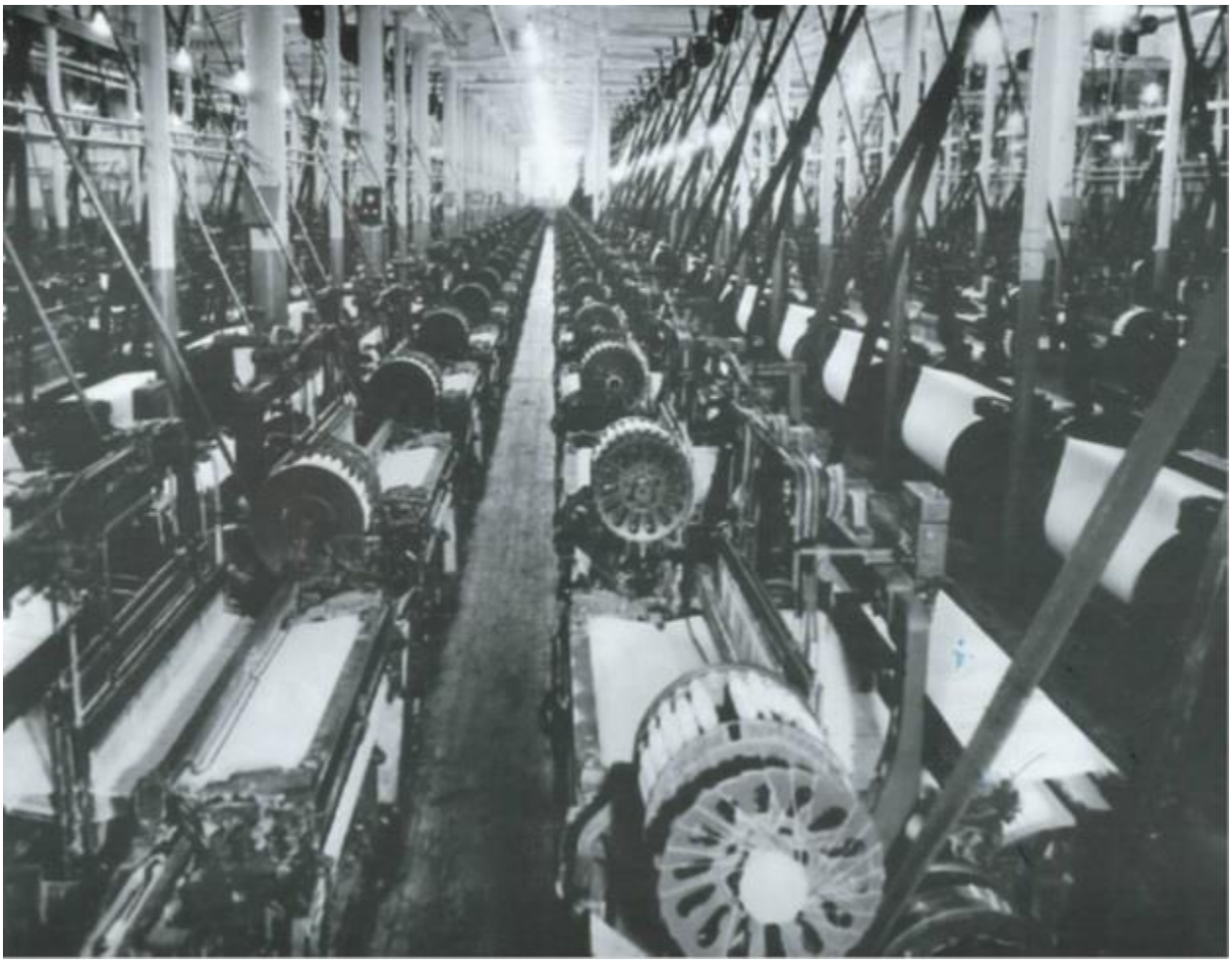

Figure 3: Stonecutter Mills (Lattimore, 2009).

Along with the development of the mills, Mr. Tanner also provided for the development of infrastructure in the area, such as rail lines, a network of streets and boulevards, and a large complex of detached single family housing for employees with accompanying water and sewer infrastructure. By 1923, Tanner's mills surpassed the productivity and number of employees in any other part of the county, including Forest City or Rutherfordton. This almost overnight

growth resulted in a community that would soon become a municipality. The Town of Spindale was officially chartered by the State of North Carolina on August 21, 1923.

The fortunes of the Town of Spindale have been directly connected to the mills. 50 years from its incorporation, the Town of Spindale experienced economic growth and vitality along with the mills. In the 70s, the mills began to experience international competition that began to put stress upon their economic viability. Nonetheless, they were able to adapt and remained vital through the 90s. However, they were unable to overcome a long slow decline that was affecting the textile industry throughout the United States. During the 90s, the town witnessed a succession of closings of each of the mills that had been founded in the 20s. The largest employer, and the last of the original mills, Stonecutter Mills was shut down effective July 12, 1999. As of 2014, 100% of the buildings, even the foundations, of Stonecutter Mills have been razed. Today, only a vacant lot exists where it once stood.

Figure 4: Closing of Stonecutter Mill (Lattimore, 2009).

The loss of a large employer on a small community is difficult. The mill companies took some measures to blunt the effects felt due to the loss of jobs by providing a considerable financial cushion for the laid off workers. But with respect to the revenue stream for the Town of Spindale in its general fund and sewer fund, the effect of the plant closings were felt almost immediately.

Currently, the Town of Spindale is in the midst of wrestling with the need to make up for shortfalls in the revenue stream of its Enterprise Fund, which is the account for the town's wastewater collection, conveyance and treatment system. Until the mid-1990s the industrial customer base supported 80% of the wastewater system's funding, with the residential

community supporting the remaining 20%. Since the closing of the plants, this ratio has almost entirely reversed.

As of the Census of 2010, there were 4,321 people in the Town of Spindale with 1,740 households and 1,071 families residing in the town. This represents a 7.4% increase over the 2000 census, which recorded 4,022 people. The land size within the town limits is 5.53 square miles. Thus, the population density was 781 people per square mile. There were 2,051 housing units at an average density of 371 per square mile.

Based on US Census Data taken from 2005 to 2009, median income for a household in the town was $31,477 compared with $46,291 statewide, and the median income for a family in town was $34,794. The per capita income for the town was $15,524. Approximately 20% of the population was below the poverty line, compared with 16% statewide.

In 2012, the unemployment rate in Spindale averaged 14.2%, which represents a decline from the 16% peak experienced in 2010.

QUICK FACTS – GENERAL	
Population	4,321
Number of Connections to the Wastewater System	1,700
Land Area	5.5 square miles
Median Household Income	$31,477 per year
Poverty Rate	20 %
Unemployment rate	14.2%

QUICK FACTS – WASTEWATER SYSTEM	
Miles of Sanitary Sewer Pipe	61 miles
Number of Manholes	1,132
Number of Pump Stations	7

PROCESS

How the Asset Management Plan Began

The AMP for the town of Spindale, North Carolina originated with an application for funding for a sanitary sewer (s.s.) project. The application was for Clean Water State Revolving Fund (CWSRF) money through the North Carolina Department of Environment and Natural Resources (NCDENR). The funding contained features such as one half of the debt incurred for the cost of the project forgiven ("principal forgiveness"), and zero percent financing for the remaining half. The application afforded a significant number of "points," which rated the project's chances of receiving CWSRF funds, if the town of Spindale promised to complete an AMP. The town decided to develop an AMP and applied for the additional points. The s.s. project was funded. The town through its consultant, Kurt D. Wright & Associates, Inc. (now SDG Engineering, Inc.), commenced to complete the AMP. It took approximately one year to complete the AMP. The AMP followed the guidelines of BAMI-I through its Certification in Training in Asset

Management program (CTAM). The Spindale AMP received very favorable comments from the North Carolina state review agency.

Basic Steps Undertaken to Develop the Asset Management Plan
Two fundamental steps in any Asset Management process are obtaining "buy-in" from the owner (in this case the town's elected officials and staff) and inventorying the assets. Due to the fact that this was the first AMP for the town, attention was focused on knowing what the town had in its wastewater collection, conveyance and treatment system and where it was located—fundamental asset management principles included in BAMI-I's training materials. The process enjoyed the benefit of successfully tackling these steps.

A significant effort was put forth to educate the elected officials and the town staff. Within several months, both caught on to the principles of asset management. The town manager became a very enthusiastic supporter as he could see that asset management was the best method to address the severely distressed financial condition of the wastewater system.

Challenges in the Development of the Asset Management Plan
One of the most significant challenges faced during the development of the AMP was the GIS database for the wastewater system. Although the town had employed two professional engineering firms to develop a GIS database of the wastewater system, it was discovered that the entire GIS database needed to be redone. This was a significant blow and required several strategy sessions to determine how to tackle this problem. An effective strategy was developed that enabled 100% location of every manhole in the system with sub centimeter accuracy. Each manhole was attributed and the information was entered into the GIS database along with pipe attribute information. As a result of this process, it was discovered that instead of 30, the town actually had 61 miles of pipe. And instead of having 900 manholes, the town had 1,132 manholes. One of the basics tenants of the CTAM training program is to "know what you have and where it is located" (Buried Asset Management Institute-International).

Benefits of Having the Asset Management Plan
One of the key benefits of the AMP was the development of a strategy to address the revenue shortfalls experienced in the Enterprise Fund by implementing a rate increase plan.

A rate structure for any municipal utility should effectively capture a revenue stream that can pay for the revenue requirements of the system. Revenue requirements generally consist of operations and maintenance costs of the system, debt service, and the costs for the rehabilitation and replacement of the assets over time. The challenge for the Town of Spindale in meeting this goal for its wastewater system has been aggravated in recent history because of the loss of the textile mills, which were a chief source of revenue for the Enterprise Fund.

Without sufficient revenue to properly maintain the wastewater system's assets a municipality cannot make the needed investments to ensure the long term health of its system. A healthy rate structure is one that captures sufficient funds to cover these essential categories:

1. Normal Operations and Maintenance (O&M) Expenses:
    a. Administrative Department
    b. O&M Costs for the Wastewater Treatment Plant (WWTP)

c. O&M Costs for Wastewater Collection and Conveyance System
2. Debt Servicing for Past Projects and Currently Obligated Projects
3. Monies to be set aside into the Capital Reserve Fund. This will allow for Debt Servicing for future Capital Improvements Projects to rehabilitate and replace system assets over time. Typically this fund would be utilized to help pay for the projects identified in the Capital Improvement Program (CIP)

It is important to again point out that water and wastewater service is provided to the citizens of Spindale by two entities:

- Water---The Broad River Water Authority (BRWA)
- Wastewater---The Town of Spindale Wastewater Department

The water meter readings from the BRWA are conducted by the water authority, and used for assessing sewer rates. Thus, they form the basis for Spindale's sewer rate structure.

Spindale implemented a rate increase in fiscal year (FY) 2010 in order to generate additional revenues needed to service the debt on some newly funded capital improvements projects. Since then issues regarding the needs of the wastewater treatment plant necessitated another evaluation of the rate structure.

Table 1: Rate Structure from years 2010 to 2012, Town of Spindale.

Town of Spindale Existing Rates (Adopted in 2010)		
Customer Category	**Base Rate ($/1st 1,000 Gallons)**	**Commodity Rate ($/1,000 Gallons after Base Rate)**
201=Residential-Inside	$12.00	$4.75
202=Commercial-Inside	$12.00	$4.75
203=Residential-Outside	$24.00	$9.50
204=Commercial-Outside	$24.00	$9.50
205=Inside Industrial	$0.00	$3.00
206=Outside Industrial	$0.00	$5.00

Under this rate structure, a typical monthly wastewater bill for a residential-inside customer at 5,000 gallons would be calculated as follows:

The First 1,000 Gallons = $12.00 per user	$12.00
The Next 4,000 Gallons at a rate of $4.75 per 1,000 gallons, (4 X $4.75)	$19.00
Total for an Inside Residential Customer at 5,000 gallons / mo.	$31.00

According to a March 2012 study entitled "Water and Wastewater Rates and Rate Structures in North Carolina" and co-authored by the North Carolina League of Municipalities and the UNC Environmental Finance Center, the median wastewater bill for the average resident within a municipal boundary at 5,000 Gallons/Month is $33.50. Thus, the average resident in Spindale is paying just below the median level.

Kurt D. Wright & Associates, Inc. (now SDG Engineering, Inc.) met with the town staff to discuss budget issues. Table 2 provides an overview of the revenue requirements of Spindale's current fiscal year (2012-13), broken down into its Normal O&M and Debt Servicing categories.

Table 2: Overview of Revenue Requirements, FY 2012-2013.

Normal O&M Expenses:			
Administrative Dept.:	$	73,978.77	
WWTP:	$	275,804.89	
Sewer Collection:	$	253,417.11	
Subtotal, Normal O&M Expenses:	**$**	**603,200.77**	
Debt Servicing Expenses:			**Retirement Schedule**
Backhoe/Leaf Vacuum:	$	17,156.85	FY2012-13
Oakland Sewer:	$	68,153.55	FY2018-19
Annexation Sewer:	$	95,209.24	FY2021-22
Force Main:	$	39,989.86	FY2022-23
2009 ARRA Sewer Replacement:	$	19,798.50	FY2030-31
Internal Debt Service:	$	59,500.00	FY2032-33
Subtotal, Debt Service:	**$**	**299,808.00**	
Contingencies:	**$**	**29,566.97**	
Grand Total, FY2012-13:	***$***	***932,575.74***	

The information in Table 2 served as a basis for the computer model used in forecasting long-term revenue requirements over a 20-year period. The normal O&M expenses provided a base line for the future forecasts. To account for inflation, the computer model utilized a 3% per annum increase over the following 20 year planning horizon.

In addition to factoring in the above information, the rate structure needs to take into account paying for anticipated future projects, specifically, when to schedule a capital improvements project. During the sessions with the town officials, one of the questions posed was "what future projects can wait until some of the existing debt service payments are retired?" This produced a list of critical projects that must be completed in a relatively short time frame.

The result was that a substantial rate increase was required to capture the anticipated revenue requirements to service the debt for these new capital improvements projects. Table 3 provides a tentative target date for the beginning of future projects identified in the Capital Improvement Program. It includes hypothetical financing terms that were used to project future revenue requirements and then analyze the effect of various rate increases to address these future requirements.

Table 3: Debt Service Calculations & Schedule for Capital Improvement Projects.

Priority List & Project Identification	Project Cost	Financing Terms	Funding Source	Calculated Annual Payment/Fiscal Year
SHORT TERM PRIORITIES (0-5 Year Time Frame)				
No.6: WWTP Upgrade *(Committed)*	$5,000,000.00	50% Debt Forgiveness up to a maximum of $2Million. *Remaining $3Million:* Financed at Zero % Interest over 20 years	Clean Water State Revolving Fund (CWSRF)	$150,000/ Payments beginning in FY 2014/2015
No.'s 2 & 3: AMP and 2012 San. Swr. Replacement project *(Obligated)*	$997,000.00	50% Debt Forgiveness/Remaining 50% financed over 20 Years @ 2.5%	CWSRF	$31,794/ Payments beginning in FY 2013/2014
No.'s 1, 4, & 5: VFD Installation @ Fairgrounds P.S. and Continued Studies of Condition of Existing System	$195,000.00	100% Financing over 20 Years @ 3.5%	Internal Financing	$13,571/Payments beginning in FY 2015/2016
SHORT TERM PRIORITIES (5-10 Year Time Frame)				
No. 7: Outfall Line A3	$734,870.00	50% Debt Forgiveness/Remaining 50% financed over 20 years @ 2.5%	CWSRF	$23,365/Payments beginning in FY 2019/2020 (coincides with retirement of debt service for Oakland Swr.: 7140-995)
INTERMEDIATE TERM PRIORITIES (10-20 Year Time Frame)				
No.'s 8 & 9: Outfall Line A2 and Southern Segment of Oak St. Outfall Line	$1,768,830.00	50% Debt Forgiveness/Remaining 50% Financed over 20 Years @ 2.5%	CWSRF	$56,238/Payments beginning in FY 2023/2024 (coincides with retirement of debt service for Force Main: 7141-700)

Along with Table 2, the information in Table 3 provides the basis for projecting revenue requirements identified in the 20-year revenue requirements forecast mentioned above. The calculated annual payments in the far-right column of Table 3 are inserted into the corresponding Fiscal Year column in the 20-year forecast, and from that year forward, are integrated into the revenue requirements for the wastewater system. The totals are shown in the bottom of the spreadsheet for each year through fiscal year 2032-33.

As an overarching summary, moving forward from the current FY, the revenue requirements increase from a figure of $958,360 projected in FY 2013-14 to $1,477,300 by FY 2032-33. But it is instructive to view the increase in revenue requirements in the first four years as shown in Table 4.

Table 4: Revenue Requirements From Current Fiscal Year to FY 2016/2017.

Fiscal Year	Projected Revenue Requirements	New Project to Be Financed	Annual Service Payment
FY 2012/13 (Current)	$932,575	NA	NA
FY 2013/14	$958,360	2012 SSSR/IFS Project No. CS370621-03	$31,794.12
FY 2014/15	$1,123,000	Wastewater Treatment Plant Upgrade	$150,000.00
FY 2015/16	$1,152,000	Engineering Studies/VFD Installation	$13,571.04
FY 2016/17	$1,168,000	NA	NA

After a 2.7% increase from FY 2012/13 to FY 2013/14, the revenue requirements increase $164,640 for FY 2014/15, representing a 17% increase over the previous year. This is due to the financing for the WWTP upgrade. This becomes the driving force in determining a rate structure increase that can sustain the long term needs of the sewer system.

There are many rate increase scenarios that could be evaluated. It was not the intent of the AMP to evaluate all possible scenarios or recommend a particular rate increase to the town. Rather, it was the intent to show the town officials what order of magnitude of increase will be needed to establish a healthy rate structure based on certain assumptions. Three approaches were considered in regards to the rate structure (refer to Table 5):

1. What will be the outcome if the rates remain the same (i.e., “do nothing”)?
2. What rate increase is required to achieve a break even outcome (i.e., “get by”)?
3. What rate increase is required to ensure a viable wastewater system for the foreseeable future (i.e., Asset Management)?

Table 5: Three Different Scenarios Compared.

Fiscal Year	Revenue Requirements	Projected Revenues in accordance with Different Rate Structures Scenarios (Dollars)		
		Keep Existing Rates	Rate Increases to Break Even	Rate Increases to Generate Capital Reserve Fund
FY 2012/13	$932,575	$945,858	$945,858	$945,858
FY 2013/14	$958,360	$953,611	$1,072,686	$1,145,637
FY 2014/15	$1,123,000	$961,365	$1,080,977	$1,153,834
FY 2032/33	$1,477,000	$1,100,922	$1,394,387	$1,524,822
Cumulative Debt/Surplus after 20-Years		$4,269,189	$20,376	$2,113,493

Implementation of the Asset Management Plan

As a result of the AMP, the town developed the rate increase strategy presented in Table 6. This strategy will bring the Enterprise Fund back to a healthy financial footing. The proposed rate increases are for commodity rates only. Each year, the proposed rate increase will be checked against the UNC Rate Dashboard to compare it with neighboring municipal rates. The current strategy maintains the Base rate throughout which is $12.00 per month per inside residential customer for the first 1,000 gallons, and $16.00 per month per inside commercial customer for the first 1,000 gallons. The base rate is doubled for outside customers. There is no base rate for industrial customers.

Table 6: Commodity Rate Increase Strategy.

Customer Sector	*Current*	*Proposed Rate Increases*								
	2012-13	2013-14		2014-15		2015-16		2016-17		Proposed Overall Increase from FY 2012-13 to FY 2016-17
	Rate	Rate	Percent Increase	Rate	Percent Increase	Rate	Percent Increase	Rate	Percent Increase	
Residential (inside town)	$4.75	$5.69	20%	$6.65	17%	$7.60	14%	$7.90	4%	66%
Residential (outside town)	$9.50	$11.37	20%	$13.30	17%	$15.20	14%	$15.81	4%	66%
Commercial (inside town)	$4.75	$5.69	20%	$6.65	17%	$7.60	14%	$7.90	4%	66%
Commercial (outside town)	$9.50	$11.37	20%	$13.30	17%	$15.20	14%	$15.81	4%	66%
Industrial (inside town)	$3.36	$4.02	20%	$4.70	17%	$5.37	14%	$5.58	4%	66%
Industrial (outside town)	$5.00	$5.99	20%	$7.01	17%	$8.01	14%	$8.33	4%	67%
Note: For all Customer Sectors except Industrial the commodity rate starts after the first 1,000 gallons.										

The elected officials readily adopted the first of this series of rate increases in June 2013 due to the fact that the AMP was the basis for their decision. The AMP provided a robust and reliable basis for the Elected Officials to act when the motion to raise the wastewater rates was on the

table. The rates shown above for FY 2013-14 are now in place. The town manager proposes to recommend the next round of rate increases for FY 2014-15.

CONCLUSION

The state of North Carolina provided an incentive to encourage certain municipalities to develop an Asset Management Plan. Spindale took the incentive and developed an AMP. The AMP followed the BAMI-I guidelines contained in the CTAM training program. The state of North Carolina had very favorable reviews of the Spindale AMP. The Spindale AMP greatly facilitated the town staff to educate and encourage the elected officials to support the rate increase strategy that was an outcome of the AMP. The elected officials readily adopted the first of these series of rate increases due to the fact that they were based on an AMP. The successes enjoyed by the Town of Spindale, North Carolina can be duplicated in other small water and wastewater systems which constitute 90% of the public systems in the USA.

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