NORTH CASTLE WATER DISTRICT NO.2

Water Main Replacement Project

Public Hearing

August 15, 2012

Presentation Overview

- Water District History and Background
- Existing Conditions
- Purpose and Scope of Study
- GHD Distribution System Hydraulic Model Study
- Findings
- Recommendations
- Project Cost Estimates
- Project Timeline

Water District History

- The water district originally started out as a private farm-estate back in the 1920s. During the 1940s it was sold to developers who began selling lots and building custom homes. Drinking water was supplied to these early homeowners from wells powered by windmills through what was then a very small distribution system. Hence, the community was named Windmill Farm. Over time, the wells in the windmills were converted to an electrically powered hydro pneumatic system. As the community reached full development during the 1950s and early 1960s the distribution system was modified, storage was added, and new wells were installed. At that point, the windmills became strictly ornamental.

- The Water District was formed by the town in 1973 with input from the residents. Town operations began in late 1976. The district is known today as North Castle Water District No.2.

- When the district was created the residents established the method of payment for any capital improvements by choosing to pay per lot as opposed to an assessment based calculation. Capital costs, include the paying back of the bond for the initial district purchase and any future capital improvements to the infrastructure, i.e. new water tank. There are 379 lots who are part of the district calculation.

- Residents proposed that any outside district users would pay double the inside water rate because the properties are not subject to capital improvement costs and are not geographically located within the district boundaries. (Coman Hill School & Brynwood)

Water District Statistics & Relative Assets

Year of Inception	1940s---Water District No. 2 was established 1973- operation began 1976
Service area	Windmill Farm Area
Population Served	1,200
Service Connections	374
Fire Hydrants	75
Water Distribution Valves	72 +/-
Miles of Distribution Mains	8.1 — 70% is asbestos cement
Average annual water sales	44,573,593 gallons
Storage capacity	600,000 gallons—Concrete wire wound standpipe built 2006
Compliance Issues	There are no compliance issues, full compliance
Waivers	None
Water Supply	
Wells 2,3,4,5	All gravel pack wells the newest being Well 5 -online 2011
Structures	
74 Windmill Road	Approx. 900 sq/ft single story wood frame structure constructed 1981, building- houses Well No.4, pumping equipment, controls & an emergency generator.
Pump House No.1	Single story concrete building approx. 320 sq/ft houses controls and abandoned well no.1 constructed 1950s.
Pump House No.2	Approx. 100 sq/ft block building houses well no.2 & controls
Fuel Oil building	Approx. 320 sq/ft block building houses a 2,000 gallon steel double walled fuel oil storage tank, used for emergency power & heating. Constructed 1982
Storage Tank 600,000 gals	Evergreen Row
Windmill Road Windmill Spruce Hill Road Windmill Maple Way Windmill	All three windmills are part of the water district responsibility, this was established when the district was formed.
Watershed	
Gravel pit	Approximately 72 acres including a pond

Water District No. 2 – Recent Improvements

- New 600,000 gallon water storage tank (2006)
- New production well (online 2011)
- New booster pumps (2011)
- New controls (2011)
- Federal Groundwater Rule continuous chlorine monitoring (2011)

Water District Existing Conditions

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Water District Existing Conditions----Why a modeling study?

Late November 2011 the Town Board approved going ahead with a distribution system modeling study. The purpose of the study was to confirm and identify potential weak points in the distribution system, due to the consistent water breaks experienced over the years. The study utilizes distribution system characteristics, pipe lengths, pipe type, valve locations, etc. The information is entered into a computer modeling program where the performance of the system can be evaluated. The information derived from the model would produce a plan for areas of concern for ultimate replacement.

Purpose of the Model

- Identify problem areas – find the "weak links" of the system
- Develop conceptual level alternatives and costs for solutions
- Provide a planning basis – a "road map" to implement improvements
- Support the most efficient use of funds – best "bang for the buck"

Water District Existing Conditions----Scope Modeling of study

- Collect data
- Construct computer model of district
- Calibrate model using existing hydrant flow test data
- Perform simulations
- Identify necessary upgrades
- Perform simulations on upgraded system model
- Collect and evaluate historical failure/repair data
- Generate recommendations and cost estimates

Water District Existing Conditions---- Model / Study Evaluations

- **Fire Flow**
- Test fire hydrants to determine available flow during peak demands
- Modify model and re-test until acceptance criteria is met
- Criteria is minimum 500 gpm during peak demand with at least 20 psi for all system users
- **Line Breaks**
- Identify pipes with a high consequence of failure
- Simulate line breaks in selected pipes
- Quantify number of users with less than 20 psi
- **Pressure and Flow**
- Identify and rank pipes with a high likelihood of failure
- Rank pipes by pressure and resistance to flow
- **Historical Evaluation**

Collect and evaluate historical information to identify locations of

- Frequent failures
- Known construction issues

The Model / Study Discovered

- Inadequate fire flow
- Undersized mains
- Corroded pipes
- Problem areas
- Poor construction techniques
- Inferior construction materials
- Disparate construction materials
- History of numerous line breaks and spot repairs

Water District Existing Conditions----Model / Study Evaluations

Excerpt from GHD Model Study Report

5.3 Summary of Simulation Results

1. The existing system was identified as having undersized mains, uneven pressure distribution, and low carrying capacity due to possible tuberculation or scaling of aged pipes.
2. The existing system can meet demand requirements for average daily, maximum day, and peak hour demand conditions.
3. The existing system cannot provide fire flow of 500 gpm to all hydrants while maintaining 20 psi during the peak hour demand simulation.
4. The pipe along Evergreen Row south of the storage tank connection has a high consequence of failure, in that about half of the system would lose adequate pressure during a line break event. However, this area does not have a history of failures.
5. High pressure, which causes high internal pipe stress, was identified in Long Pond Road (145 psi), Thornwood Road (137 psi), and Windmill Road (103 psi). These pipes are asbestos cement and are considered to have a higher likelihood of failure due to their material of construction and high pressure.
6. Distribution mains on Evergreen Row near the 0.6 million gallon storage tank have low static pressure. Pressure as low as 28 psi was identified during average daily demand conditions. This location is at a high elevation relative to most of the system.

6 Prioritization and Ranking of Pipe Replacements

To assist the District in developing a capital improvement plan to improve the distribution system, this study assigns a replacement priority to each pipe segment. In order to mitigate the budgetary impact of extensive system upgrades, improvements may be implemented over a period of time and through sequential capital projects. The cost benefit achieved by a capital improvement project can be maximized by limiting the scope of the near-term project to higher priority pipes. To provide a basis for this prioritization, three criteria were developed:

1. Provide fire flow of 500 gpm during peak hour demand for each hydrant in the system, while maintaining minimum residual pressure at all system nodes greater than or equal to 20.0 psi.
2. Based on information provided by the Owner, identify lines that are known to have reliability issues due to poor construction methods and materials.
3. Identify lines that have a high consequence of failure. This assessment is based on simulations of pipe breaks.
4. Identify lines with the apparent greatest likelihood of failure. This assessment is based on observed node pressures, pipe friction factors (C-values) as determined by the model, and pipe material.

Using these criteria, each pipe segment was assigned Priority 1, 2 or 3.

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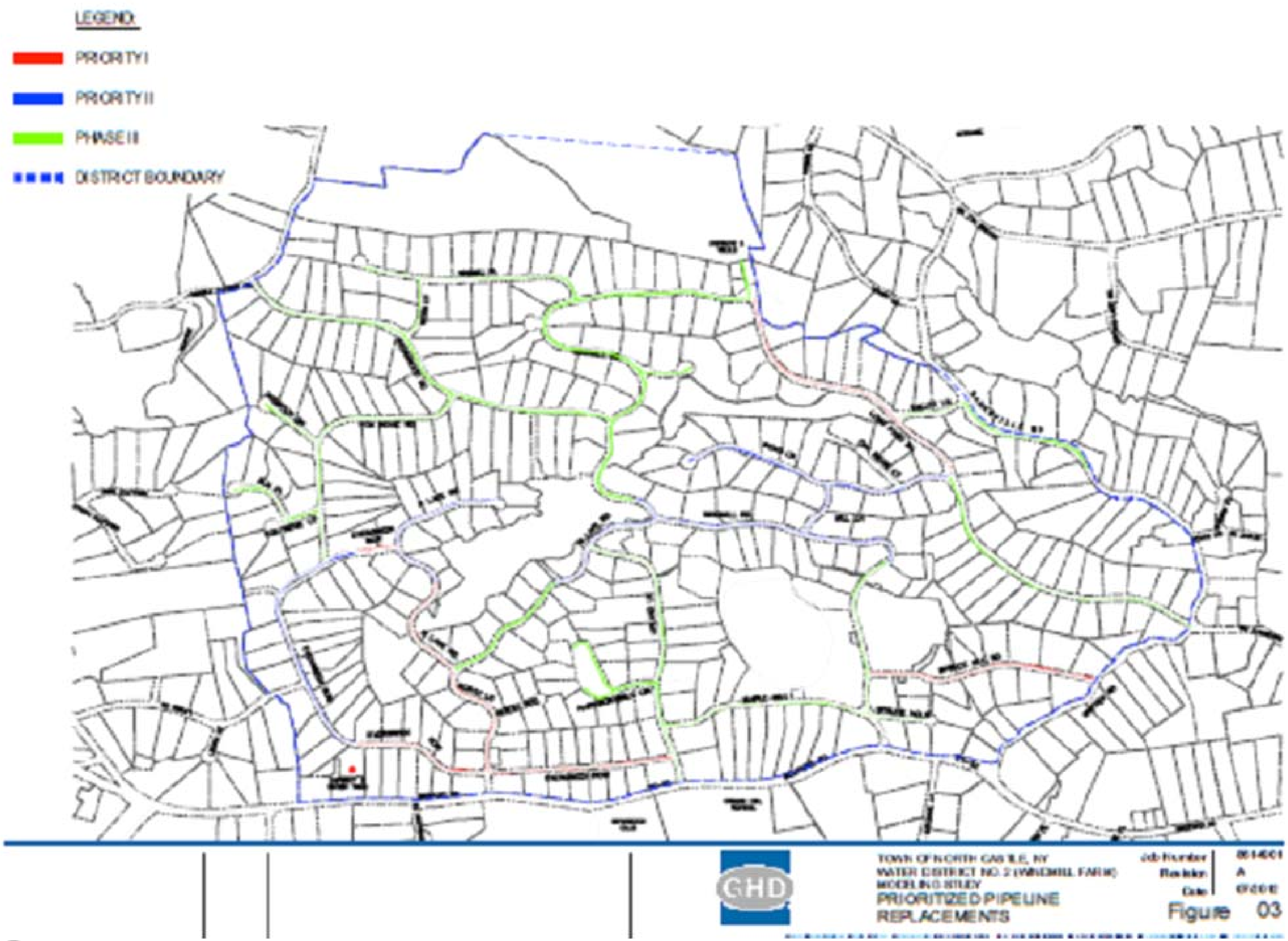
8 Recommendations

The District should plan to design and construct the Priority 1 and Priority 2 replacements in the near term. The Priority 1 upgrades are anticipated to improve available fire flow. Implementation of Priority 2 replacements is anticipated to improve system reliability and reduce the incidence of line breaks and unplanned outages.

Based on the known history of the design, construction, and condition of the existing pipe network, the District should develop a long-term plan to replace the Priority 3 pipes in the system. A preventive approach may avoid the inconvenience of unplanned water outages and reduce operation and maintenance costs.

Water District Existing Conditions----Model / Study Evaluations



AC (Transite) Pipe Facts

- Asbestos cement (AC) was initially developed in Italy and introduced to the U.S. market in the late 1940s. Being non-metallic, AC pipe was not subject to galvanic corrosion. However, soft water will remove calcium hydroxide (free lime) from the cement and eventually lead to deterioration of the pipe interior (softening accompanied by release of asbestos fibers). External exposure to acidic groundwater (e.g., mine waste) or sulfates in the soil can also lead to deterioration of the cement matrix. Type II Portland cement, which reduces the negative impact of sulfate, was not always used. The production of AC pipe ceased in the U.S. in 1983. However, despite the cessation of production, approximately 15 percent of all water mains today are asbestos-cement. This percentage is much higher on the West coast (closer to 20 percent) where AC pipe was more widely used.

Water Distribution Systems by Material (AWWA, 2004)

Material	Miles Installed	% of Total
Asbestos Cement	136 196	15.8
Cast Iron unlined	153 415	17.8
Cast Iron cement mortar lined	159 824	18.5
Cast Iron	28 476	3.3
Concrete Prestressed	23 584	2.7
Ductile Iron unlined	35 916	4.2
Ductile Iron cement mortar lined	150 705	17.5
Ductile Iron other lining/lining not known	2 494	0.3
GRP	665	0.08
PE	3 349	0.4
PVC	114 152	13.2
Steel	34 047	3.9
Other/Not known	20 169	2.3
Total	863 000	100

Source: EPA -Deteriorating Buried Infrastructure Management Challenges and Strategies

http://water.epa.gov/lawsregs/rulesregs/sdwa/tcr/upload/2007_09_04_disinfection_tcr_whitepaper_tcr_infrastructure.pdf

National Distribution Pipe Fact Sheet

Timeline of Pipe Technology in the U.S. in the 20th Century

MATERIAL	JOINT	Corrosion Protection INTERIOR	Corrosion Protection EXTERIOR	1900's	1910's	1920's	1930's	1940's	1950's	1960's	1970's	1980's	1990's
Steel	Welded	None	None										
Steel	Welded	Cement	None										
Cast Iron (pit cast)	Lead	None	None										
Cast Iron	Lead	None	None										
Cast Iron	Lead	Cement	None										
Cast Iron	Leadite	None	None										
Cast Iron	Leadite	Cement	None										
Cast Iron	Rubber	Cement	None										
Ductile Iron	Rubber	Cement	None										
Ductile Iron	Rubber	Cement	PE Encasement										
Asbestos Cement	Rubber	Material	Material										
Reinforced Conc. (RCP)	Rubber	Material	Material										
Prestressed Conc. (PCCP)	Rubber	Material	Material										
Polyvinyl Chloride	Rubber	Material	Material										
High Density Polyethylene	Fused	Material	Material										
Molecularly Oriented PVC	Rubber	Material	Material										

Commercially Available | Predominantly In Use

Source: EPA -Deteriorating Buried Infrastructure Management Challenges and Strategies

What are EPA's drinking water regulations for asbestos?

- In 1974, Congress passed the Safe Drinking Water Act. This law requires EPA to determine the level of contaminants in drinking water at which no adverse health effects are likely to occur. These non-enforceable health goals, based solely on possible health risks and exposure over a lifetime with an adequate margin of safety, are called maximum contaminant level goals (MCLG). Contaminants are any physical, chemical, biological or radiological substances or matter in water.

- The MCLG for asbestos is 7 MFL. EPA has set this level of protection based on the best available science to prevent potential health problems. EPA has set an enforceable regulation for asbestos, called a maximum contaminant level (MCL), at 7 MFL. MCLs are set as close to the health goals as possible, considering cost, benefits and the ability of public water systems to detect and remove contaminants using suitable treatment technologies. In this case, the MCL equals the MCLG, because analytical methods or treatment technology do not pose any limitation.

- The Phase II Rule, the regulation for asbestos, became effective in 1992. The Safe Drinking Water Act requires EPA to periodically review the national primary drinking water regulation for each contaminant and revise the regulation, if appropriate. EPA reviewed asbestos as part of the Six Year Review and determined that the 7 MFL MCLG and 7 MFL MCL for asbestos are still protective of human health.

Source: http://water.epa.gov/drink/contaminants/basicinformation/asbestos.cfm

District AC Pipe Sampling Results

Water District No. 2 --Water Sample Test Results 1991-2012

EPA Maximum for Asbestos = 7.0 Million Fibers per Liter (MFL)

Date	Distribution System Tests Coman Hill School (a)		District 2 Well Tests			
	MFL Result	% of EPA	Well 2	Well 3	Well 4	Well 5 (b)
Mill La. Hyd 6/13/2012	<0.190	0.027%				
23 Pond La. 6/13/2012	<0.190	0.027%				
8/5/2011	<0.190	0.027%	<0.190	<0.190	<0.190	<0.970
7/30/2008	<0.240	0.034%	<0.120	*Composite Sample Wells 1-4*		
7/29/2005	<0.190	0.027%	<0.190	*Composite Sample Wells 1-4*		
8/7/2002	<0.080	0.011%				
7/28/1999	<0.084	0.012%				
8/21/1996	<0.081	0.012%				
9/2/1995	<0.084	0.012%				
7/12/1995	<0.087	0.012%				
3/30/1994	<0.059	0.008%				
11/18/1993	<0.073	0.010%				
8/13/1993	<0.040	0.006%				
11/4/1991	<0.033	0.005%				

(a) *Water at Coman Hill School has traveled the longest distance through Transite pipe*

(b) *Well #1 has been taken out of service and has been replaced by well #5*

Asbestos Cement Drinking Water Pipes and Possible Health Risks

Summary Statement

The possibility of health effects from asbestos fibres in drinking water has been widely studied but with little evidence for any concern.

The World Health Organisation considered asbestos in drinking water arising from asbestos cement pipe in their 1993 edition of the Guidelines for Drinking Water Quality. The guidelines state "Although well studied, there has been little convincing evidence of the carcinogenicity of ingested asbestos in epidemiological studies of populations with drinking water supplies containing high concentrations of asbestos. Moreover in extensive studies in laboratory species, asbestos has not consistently increased the incidence of tumours of the gastrointestinal tract. There is therefore no consistent evidence that ingested asbestos is hazardous to health and thus it was concluded that there was no need to establish a health-based guideline value for asbestos in drinking water".

Although many countries throughout the world, including many European countries, still have asbestos cement water pipes, there appears to be no concern for health of consumers receiving the water and no programmes to specifically replace asbestos cement pipe for this reason.

Source: The Drinking Water Inspectorate-May 2002

Water District Distribution System Upgrade –Scope & Opinion of Costs

Excerpt from GHD Map, Plan & Report

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2 Description of Proposed Project

Based on the above need, the District has decided to replace most or all of the ±45,000 linear feet (LF) of existing piping, 77 existing hydrants, and 55 existing isolation valves within the distribution system. New service connections, including curb stops, will be provided for all existing in-District users. Construction and provision of new piping, hydrants, and valves will be in accordance with *"Recommended Standards for Water Works, 2007"*.

New pipe material will be either Class 52 cement-lined ductile iron or AWWA C-900 PVC, depending on costs of material at the time of bidding. This will replace the existing mix of cast iron, ductile iron, asbestos cement, and copper. As this project is a replacement of the system, new pipe will be installed in the same roadways and approximate locations as the existing pipe to the extent practicable.

Figure 2 shows a plan of the proposed pipelines to be replaced.

Water District Distribution System Upgrade –Scope & Opinion of Costs

3 Opinion of Project Cost

Table 3-1 presents the Engineer's anticipated opinion of project cost.

Table 3-1 Distribution System Improvements, Opinion of Probable Costs

Item	Opinion of Cost
New installed 8-inch Class 52 DIP (push-on joint, cement lined, Class 52) (includes trenching, excavation, bedding, backfill, pavement repair, and fittings), ±44,000 LF	$5,200,000
New installed 12-inch DIP (push-on joint, cement lined, Class 52) (includes trenching, excavation, bedding, backfill, pavement repairs, and fittings), ±1,000 LF	$140,000
New installed fire hydrants (includes removal of existing fire hydrant when necessary)	$510,000
New installed isolation valves	$150,000
New service lateral connections	$600,000
Rock removal	$240,000
Project contingency	$1,400,000
Construction Subtotal	**$8,240,000**
Fiscal, Legal, Administrative, Engineering	$1,400,000
PROJECT COST	**$9,640,000**

Notes:
1) New fire hydrant installation and removal of old fire hydrant every 500 LF.
2) New service lateral connection every 100 LF.
3) New isolation valve installed every 1000 LF and at every major intersection.
4) All pipe installation is in asphalt roadway.
5) New pipe installed in proximity to existing pipe with abandonment of existing pipe (does not include cost of removing existing piping).
6) Figures are rounded.

Water District Distribution System Upgrade –Scope & Opinion of Costs

4 Project Financing

4.1 Bond Cost Estimate

For the purposes of analysis in this Map, Plan and Report, it is proposed to finance this project through the Town's issuance of serial bonds or similar municipal funding sources. The bonding costs as calculated herein are based on 25-year bonds at an annual interest rate of 4 percent. Based on this criteria, the District's annual bond redemption charges are projected as follows:

Total cost $9,640,000

Bonding time .... 25 years

Interest rate .... 4 percent

Approximate annual debt service charge $618,000

4.2 Estimated Water Service Charges

Capital improvement costs, as well as the existing District debt, would be paid for by the entire District. The repayment of the bond indebtedness of Water District No. 2 is based on a "property unit" basis. Units are assessed to each property based on land area and current use. The total number of property units for the District is anticipated to be 379 at the time of bond payment, with a typical single-family residence being assessed 1 unit. The projected annual water charge has therefore been developed as follows:

4.2.1 Proposed Improvement Charges

Based on the projected approximate debt service charge of $618,000 associated with this project, the annual water charge is:

$$\text{Annual Debt Service/Property Unit}: \frac{\$618,000}{379} = \$1,630/\text{Property Unit (rounded)}$$

4.2.2 Existing District Authorized Bonding

The current annual charge for existing debt service to a single property unit family residence in the Water District for 2012 is $453 (rounded).

4.2.3 Operation and Maintenance Charge

The annual O&M budget for the District for 2012 is $280,359, which is paid through water rates. The average total annual water sales for the years 2001-2011 was 44,664,145 gallons. Approximately 91 percent of sales are to in-District users and 9 percent to out-of-District users. The current 2012 rate is $7.50 per 1,000 gallons for in-District users and $15.00 per 1,000 gallons for out-of-District users. There are 372 in-District users (households) and 2 out-of-District users (a school and a country club). Based on the above, the average in-District annual O&M charge per residence is calculated as follows:

0.91 x 44,664,145 gallons/372 = 109,259 gallons/residence

109,259 gallons/residence x $7.50/1,000 gallons = $820 (rounded)

Water District Distribution System Upgrade –Scope & Opinion of Costs

4.2.4 Approximate Total Annual Charge

Debt service charge (this project)	$1,630	(rounded)
Debt service charge (existing District)	$453	(rounded)
O&M charge	$820	(rounded)
Total Projected 2013 Charge	**$2,903**	(rounded)

Town of North Castle

2012 Water (Serial) Bonds, 25 Years

$9,640,000

September 1, 2012

Debt Service Schedule

Date	Principal	Coupon	Interest	Total P+I
09/01/2013	230,000.00	4.000%	385,600.00	615,600.00
09/01/2014	240,000.00	4.000%	376,400.00	616,400.00
09/01/2015	250,000.00	4.000%	366,800.00	616,800.00
09/01/2016	260,000.00	4.000%	356,800.00	616,800.00
09/01/2017	270,000.00	4.000%	346,400.00	616,400.00
09/01/2018	280,000.00	4.000%	335,600.00	615,600.00
09/01/2019	295,000.00	4.000%	324,400.00	619,400.00
09/01/2020	305,000.00	4.000%	312,600.00	617,600.00
09/01/2021	315,000.00	4.000%	300,400.00	615,400.00
09/01/2022	330,000.00	4.000%	287,800.00	617,800.00
09/01/2023	345,000.00	4.000%	274,600.00	619,600.00
09/01/2024	355,000.00	4.000%	260,800.00	615,800.00
09/01/2025	370,000.00	4.000%	246,600.00	616,600.00
09/01/2026	385,000.00	4.000%	231,800.00	616,800.00
09/01/2027	400,000.00	4.000%	216,400.00	616,400.00
09/01/2028	415,000.00	4.000%	200,400.00	615,400.00
09/01/2029	435,000.00	4.000%	183,800.00	618,800.00
09/01/2030	450,000.00	4.000%	166,400.00	616,400.00
09/01/2031	470,000.00	4.000%	148,400.00	618,400.00
09/01/2032	490,000.00	4.000%	129,600.00	619,600.00
09/01/2033	505,000.00	4.000%	110,000.00	615,000.00
09/01/2034	530,000.00	4.000%	89,800.00	619,800.00
09/01/2035	550,000.00	4.000%	68,600.00	618,600.00
09/01/2036	570,000.00	4.000%	46,600.00	616,600.00
09/01/2037	595,000.00	4.000%	23,800.00	618,800.00
Total	**$9,640,000.00**	-	**$5,790,400.00**	**$15,430,400.00**

Yield Statistics

Bond Year Dollars	$144,760.00
Average Life	15.017 Years
Average Coupon	4.0000000%
Net Interest Cost (NIC)	4.0000000%
True Interest Cost (TIC)	4.0000000%
Bond Yield for Arbitrage Purposes	4.0000000%
All Inclusive Cost (AIC)	4.0000000%

IRS Form 8038

Net Interest Cost	4.0000000%
Weighted Average Maturity	15.017 Years

Water District -Current plus proposed "Capital Debt"

Fiscal Year	Remaining Current Debt		New Borrowing $9,640,000 Bond 25 year @ 4%	Total Annual Capital Debt Includes P&I	Annual Cost Per Parcel 379
	Controls 400K Ban 5 Year	Tank & Well 1,650,000 Bond 15 year			
2013	$80,000	$143,292	$615,600	$838,892	$2,213.44
2014	$80,000	$146,706	$616,400	$843,106	$2,224.55
2015	$80,000	$146,403	$616,800	$843,203	$2,224.81
2016	$80,000	$149,440	$616,800	$846,240	$2,232.82
2017		$148,617	$616,400	$765,017	$2,018.51
2018		$150,983	$615,600	$766,583	$2,022.65
2019		$149,614	$619,400	$769,014	$2,029.06
2020		$151,576	$617,600	$769,176	$2,029.49
2021		$153,271	$615,400	$768,671	$2,028.16
2022		$151,230	$617,800	$769,030	$2,029.10
2023			$619,600	$619,600	$1,634.83
2024			$615,800	$615,800	$1,624.80
2025			$616,600	$616,600	$1,626.91
2026			$616,800	$616,800	$1,627.44
2027			$616,400	$616,400	$1,626.39
2028			$615,400	$615,400	$1,623.75
2029			$618,800	$618,800	$1,632.72
2030			$616,400	$616,400	$1,626.39
2031			$618,400	$618,400	$1,631.66
2032			$619,600	$619,600	$1,634.83
2033			$615,000	$615,000	$1,622.69
2034			$619,800	$619,800	$1,635.36
2035			$618,600	$618,600	$1,632.19
2036			$616,600	$616,600	$1,626.91
2037			$618,800	$618,800	$1,632.72

Timeline for project

- **Secure funding** *(purpose & outcome of public hearing)*
- **RFP for professional engineer** *(Should be out by mid October, award engineering by second week of November)*
- **Design Phase** *(Can take at least two to three months, should be complete with bidding documents, Health Department approvals by mid February)*
- **Bid Construction** *(Between March and April)*
- **Award Contract** *(Late April -secure contractor bonds, insurance etc.)*
- **Construction begins** *(Mid May)*
- **Construction can take up to two years**

QUESTIONS & COMMENTS