New Braunfels Utilities Rebate Program

Market Analysis Regarding Incentives

for Managing Water Usage in New Braunfels

By Kyndell Newton, Hunter Sundbeck, and Marc van Bree

A report submitted to the McCoy College of Business of Texas State University in partial fulfillment of the requirements for the degree of Master of Business Administration

July 2019

Committee Chair:

Dr. Dennis Smart

Client:

Suzanne Williams
Environmental Affairs Manager
New Braunfels Utilities

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Executive Summary

Water management is one of the key issues needing to be addressed to sustain communities in Texas. Counties and cities across the state are on the precipice of a crisis with increasing drought risks intensified by high population growth. New Braunfels Utilities (NBU) is a proactive, community-owned, nonprofit, public utility service provider. NBU has requested an analysis of the current water conservation rebate program for efficiency, appropriateness, and sustainability, with the primary objectives of aligning with the true cost of water and reducing total water consumption expressed in gallons per capita per day (GPCD).

In this report, we look a strengths, weaknesses, opportunities and threats of the program and formulate a measure of return on investment (ROI) and a measure of effectiveness based on spending. We found that for every $1 in rebate investment, a customer needs to save equal to or more than 63 gallons of water per year, or equal to or more than 252 gallons of water over the 4-year recoupment period, to return a positive ROI. In other words, the rebate amount should be less than $0.016 per gallon of water saved.

Based on the current program analysis, we make further recommendations on additions to the rebate program, marketing the program, use of data and modeling, and differentiation in water usage and rebates by geography and customer type. Along with a new perspective on measuring the ROI based on the cost of water, we believe these recommendations can contribute to more effective water conservation efforts as NBU makes progress towards its goal moving its customers from 168 GPCD to 120 GPCD.

Contextual Analysis

The Macro Environment

Around the globe, water supplies face several critical issues, scarcity being the chief among them. If not addressed, water supply scarcity will negatively impact supply chains and economic growth (Cespedes & Peleg, 2017). Water management is one of the key issues needing to be addressed to sustain communities. In Texas, water is a particularly difficult issue, as captured in a quote from a state meteorologist in the 1920s, who described Texas as "a land of perennial drought broken by the occasional devastating flood" (Grubbs et al., 2019).

From 2010 through 2014, Texas saw the second-worst drought on record, with 2011 being the single driest year in the state's recorded history. The conditions in that year cost the state's agricultural sector an estimated $7.6 billion and the Texas Water Development Board (TWDB) estimates a future devastating drought could reduce income of Texas businesses and individuals by $73 billion in 2020 (Grubbs et al., 2019). That is nearly 5% of the state's annual GDP. Locally, demand for water in the New Braunfels Utilities service area may exceed supply as early as 2020 (New Braunfels Utilities, 2018a).

Amplifying water supply issues is the exceptional high growth of population in water-scarce areas like Texas. From 2016 to 2017, Texas was home to seven of the nation's 15 fastest-growing cities and New Braunfels was the second-fastest growing city nationally (Warner, 2018).

New Braunfels Utilities

NBU is one of approximately 2,000 community-owned, nonprofit, public utilities around the country. This means NBU's customers have "reliability, local control, low rates, and a focus on customer service" (New Braunfels Utilities). NBU is governed by a Board of Trustees consisting of local residents appointed by the New Braunfels City Council and any profits are invested back into the community system. NBU also returns an annual payment to the City of New Braunfels to pay for other public services including fire, police, and parks departments (New Braunfels Utilities).

NBU provides three main services: electric power, water, and waste water management. The areas for each respective service are of different size and may extend beyond the New Braunfels city limits or even its 3.5-mile extraterritorial jurisdiction. This means that NBU may provide services to subdivisions outside of New Braunfels jurisdiction. This brings opportunities and challenges. See Appendix A for maps of the NBU service area and New Braunfels municipal jurisdiction.

NBU has identified five strategic initiatives to increase and better manage its water supply, including increased and upgraded storage, maximizing surface water rights, increasing the capacity of treatment plants and wells, rehabilitating aging infrastructure, and most pertinent to our project, water conservation through taking advantage of opportunities from Advanced Metering Infrastructure (AMI), water efficiency rebates, and education programs (New Braunfels Utilities, 2019).

Spurred by state legislation and a study making the case for its cost-efficiency, NBU has been replacing water meters with smart water meters. By the end of fiscal year 2019, nearly 75 percent of meters should be replaced with AMI. In fiscal year 2018, NBU provided 3.98 billion gallons of water to just over 39,000 water meters. Residential usage makes up nearly 55%; commercial just over 20%, agricultural irrigation nearly 18%, multi-unit buildings 6.5%, and other services just over 1% (New Braunfels Utilities, 2019).

Statement of Work

NBU is requesting an analysis of its water conservation rebate program, a program that is part of the Environmental Affairs department. NBU is focused on reducing the gallons per capita per day (GPCD) from 168 currently to 120. Part of that effort involves the NBU water rebate programs for NBU customers. They are working towards ensuring they are investing the right amount of money in this program to reflect the true cost of water. NBU would like the Texas State team to look into the rebate program and analyze whether they have the right rebate program for their customers.

General Scope and Goals

1. Reduce the gallons per capita per day (GPCD) in the NBU service area;
2. Improve the efficiency of the rebate program and optimize the program budget;
3. Identify differences in program areas, including geography, customers, and service type.

Deliverables

1. Cost-benefit analysis and analysis of current rebate program;
2. Recommendations on the future of the rebate program, implementation, and impact on budget with an analysis of the four marketing P's;
3. Recommendation on the differentiation within the program's three distinct segments.

Program Analysis

Strengths, Weaknesses, Opportunities, and Threats

Through the initial environmental analysis and early scoping conversations with NBU staff, we were able to look at the strengths, weaknesses, opportunities, and threats facing the NBU rebate program in particular.

The strengths include NBU's reputation and community standing. The team has won many conservation and community service awards and by its very nature, has local representation. Through conversation with NBU staff it became apparent that within the budgetary constraints of the program, there is a lot of flexibility in how to structure and present the rebate program. However, it has been difficult to gain an understanding of the true efficiency of the program due to the reliability of the data that is available and there is a low awareness in the community about the program.

The drought years of the recent past have created opportunities as social trends are swaying toward understanding the need for conservation. This is a big opportunity for NBU to

capitalize on with education and outreach, making it attractive for developers to include water conservation, and working with local governmental bodies to include water conservation in regulations and ordinances. On the other hand, the fast population growth, worsening climate conditions, and current lack of consequences (customers have not yet run out of water and have not faced a scenario similar to South Africa's Cape Town, a city of 4 million, which announced in 2018 it was three months away from running out of municipal water), are all a threat to water conservation or make the need for conservation even greater.

Strengths	Weaknesses
• Flexibility in program • NBU reputation	• Low awareness • Data reliability
Opportunities	**Threats**
• Education and outreach • Attractive to developers • Regulation	• Lack of consequence • Population growth • Climate conditions

Analyzing the Rebate Program

The analysis of the rebate program we received from NBU was based on historical water usage, before and after rebate, and on estimated savings from the Environmental Protection Agency (EPA) or NBU. As directed by the client, we needed to look at efficiency based on the true cost of water. This called for a new perspective. Based on common business practices, our team formulated a measure of return on investment (ROI) and a measure of effectiveness based on spending.

We were able to establish a few ground rules to create a measure of success and a formula to calculate the return on investment and effectiveness of each rebate. These ground rules were given to us as criteria by NBU:

1. NBU has a targeted recoupment period of 4 years. This means the invested amount has to be earned back within 4 years. With earned back we mean saving the cost of water equal to or larger than the investment made.
2. The true cost of water is $1,300 per acre foot, which can be reformulated to $0.004 per gallon.

Based on those two ground rules, we found that for every $1 in rebate investment, a customer needs to save equal to or more than 63 gallons of water per year, or equal to or more than 252 gallons of water over the 4-year recoupment period, to return a positive ROI. In other words, the rebate amount should be equal to or less than $0.016 per gallon of water saved.

Now that we have established those benchmarks, we can process and analyze the cost effectiveness of each rebate. NBU provided estimates for the amount of water saved based on the EPA estimates or the department's own calculations. Spreading those estimates over the 4-year recoupment period, assigning the average rebate amount to the respective programs, and using the $1,300 per acre foot costs, yielded insights on the effectiveness. See table 1 for full results.

Table 1: ROI Analysis of Estimated Water Conservation per Rebate

Program	Average Rebate Amount	Total Gallons Saved (4 years)	ROI per Dollar Invested (4 years)	Gallons per Dollar Invested (4 years)	Months to Recoup Rebate
Washing Machine	$100	22K	$0.89	223	54
Mulch	$62	126K	$8.12	2,036	6
Rain Barrel	$125	48K	$1.53	384	31
Artificial Turf	$970	158K	$0.65	162	74
Grass Replacement	$510	332K	$2.60	651	19

However, NBU provided its own analysis of actual water savings for each of the rebates based mostly on year-over-year water usage. Plugging these numbers in our ROI formula yielded considerably different results. The washing machine and rain barrel rebates performed better than the estimates, whereas the mulch, artificial turf, and grass replacement rebates performed worse than the estimates. See table 2 for full results.

Table 2: ROI Analysis of Actual Water Conservation per Rebate

Program	Average Rebate Amount	Total Gallons Saved (4 years)	ROI per Dollar Invested (4 years)	Gallons per Dollar Invested (4 years)	Months to Recoup Rebate
Washing Machine	$100	52K	$2.07	518	23
Mulch	$62	21K	$1.37	343	35
Rain Barrel	$125	103K	$3.27	820	15
Artificial Turf	$970	119K	$0.49	123	98
Grass Replacement	$510	119K	$0.93	234	51

Our own analysis of the provided water usage data, yielded yet more different results (see Appendix B for a comparison in gallons saved by each analysis). In this case, the mulch rebate program seemed to increase water usage rather than conserve water. But therein lies the key to the analysis; it is only as good as the data used.

There are many factors that affect water usage. The rebate program is one such factor, but this analysis does not consider weather and precipitation, soil, socio-economic status of the household, or any other factor that may play a role. A more in-depth analysis and better attribution of gallons saved is needed to provide more accurate ROI information.

While it was not in the scope of this project, a multiple regression model could be used to find if variables such as rebates and rebate amounts are significant predictors to explain a dependent variable of gallons of water used. This model could also look at other available data including location data, demographic data, billing data, and other variables that may predict

water usage. This project provided a new perspective on finding a standard to measure the efficiency the rebate program, but more accurate data on actual water usage and the significance or the rebates is needed.

Overall, using our cost formulation and the given $180,000 rebate budget, the minimum goal for annual water conservation with a positive return on investment equals 11.34 million gallons. These savings equal 781 people or 282 households moving from the targeted 168 GPCD to 120 GPCD. Putting this in perspective, New Braunfels has more than 25,000 households. If the rebate program was solely responsible for the targeted GPCD number, this would require a $16 million rebate budget with the assumption of a minimum ROI.

Recommendations

Proposed Rebate Program Additions

We propose four new rebates for NBU to explore. Due to the lack of actual usage data for new rebates, the total gallons saved for these new rebates are based on EPA estimates and spread over the 4-year recoupment period. Using the benchmark of $0.016 per gallon, we can formulate a maximum targeted rebate amount to maintain a positive ROI.

Maximizing the ROI per dollar or gallons saved per dollar may be a tempting approach, however, that would minimize the rebate amount. A rebate of $5 per faucet, for example, would double the ROI and gallons per dollar. However, the rebate would become much less attractive for customers. Our recommendation is to maintain a positive ROI based on estimated water savings, but make the rebate as attractive as possible for the customer.

Table 3: ROI Analysis of Proposed Water Conservation per Rebate

Program	Maximum Rebate Amount	Total Gallons Saved (4 years)	ROI per Dollar Invested (4 years)	Gallons per Dollar (4 years)	Months to Recoup
WaterSense Faucets	$40	11K	$1.12	280	43
WaterSense Shower	$40	11K	$1.08	270	45
Residential Toilets	$200	52K	$1.04	260	46
WaterSense Pool Cover	$100	48K	$1.91	480	25

Assumptions for Proposed Rebate Program Additions

- **WaterSense faucets**: 700 gallons per faucet per year (EPA). Estimated 4 faucets per household replaced for a rebate of $10 per faucet.
- **WaterSense showerheads**: 2,700 gallons per household per year (EPA). Estimated 2 showerheads per household replaced for a rebate of $20 per showerhead.
- **Residential toilets:** 13,000 gallons per household per year (EPA). Estimated 2 toilets per household replaced for a rebate of $100 per toilet.
- **WaterSense pool cover**: 12,000 gallons per year (EPA) based on 500 square feet (this may be up to 31,000 gallons per year in the Southwest). Cover the cost of a WaterSense pool cover up to $100.

Marketing the Rebates

One of the challenges for the rebate program is the low awareness. Currently, less than 2% of households in New Braunfels have taken advantage of a rebate program. We propose that NBU invests more in marketing the program to increase the utilization of the rebates. Here are our recommendations:

- **Place:** currently the rebate program details are available from the NBU website with forms to print out and submit. We recommend removing some barriers by making an online application available. In addition, arm NBU staff with training and collateral to speak about the rebate program when interacting with customers.
- **Product**: as we have recommended above, there are more potential rebates to add for residential customers. We also recommend gearing specific custom programs to developers and commercial properties. More on the specific recommendations below.
- **Price**: we recommend NBU revise pricing on rebates as better water usage information becomes available. We have shown rebates should be priced below $0.016 per gallon saved to maintain a positive ROI. However, to make the rebate as attractive as possible, pricing should maximize the savings for the customer while maintaining a positive ROI.
- **Promotion**: NBU can utilize many vehicles to increase the awareness of the rebate program including advertising, public relations, social media, and direct mailing. In addition, we recommend building a library of case studies with real customer stories to show the positive effects of conserving water and saving money.

The East-West Divide

In our analysis, we found that households west of Interstate 35 that took advantage of rebates saved on average 2.5 times the amount of water compared to those located east of Interstate 35. We recommend NBU perform a deeper analysis into the factors that may cause this differentiation. One possible factor is the difference in soil and geology. Could replacing grass perhaps be more effective when the underlying drainage speed is different? Or perhaps there could be socio-economic factors in play. A better understanding of these differences could lead to better targeting of specific rebates.

Smart Meters, Data, and Modeling

With the right buy-in and implementation, water utilities and management can benefit greatly from big data and its variety of applications (Shafiee, Barker, & Rasekh, 2018). Smart meters alone can bring in 35,000 data points per year per customer (with 1 read per quarter hour) and that can be paired with a myriad of other sources, including sensors, GIS and GPS data, climate and weather data, municipal demographics and utility billing information.

This allows utility companies to model and provide faster and more effective responses to critical changes in the environment. As mentioned above, it is crucial for the rebates to reflect not only the true cost of water, but the true water savings of each rebate. Smart meters and various additional data sources should allow the creation of a multi-regression model that could solve some of the data reliability issues. The Texas State Graduate College recently launched a new graduate degree in Data Analytics and Information Systems. As NBU has an existing

working relationship with the university, we recommend a collaboration with this new department to help in creating new models to measure the effects of the rebate program and conservation efforts.

Lastly, there are two more key benefits to the Advanced Metering Infrastructure. In distribution, utilities can use smart meters to move from leak detection and response to leak prevention and in service management they can transform data into actionable information, directly to customers, to improve efficiency and water conservation through services like WaterSmart software.

Commercial Customers, Developers, and Governmental Bodies

The program analysis focused on the residential rebates. The single example of a commercial program used by an NBU customer was the toilet replacement rebate, which per our ROI measurement yielded a $47.07 return and saved nearly 12,000 gallons for every dollar invested over four years. While this is of course a wildly successful example, with only a single datapoint, it is hard to make sweeping generalizations. With the commercial sector accounting for 20% of water usage, and the potential for greater returns of dollars invested, we recommend NBU identify further commercial rebates, for example in collaboration with its famed local waterpark Schlitterbahn. However, should the true cost of water for commercial property be higher, a new ROI calculations should be implemented.

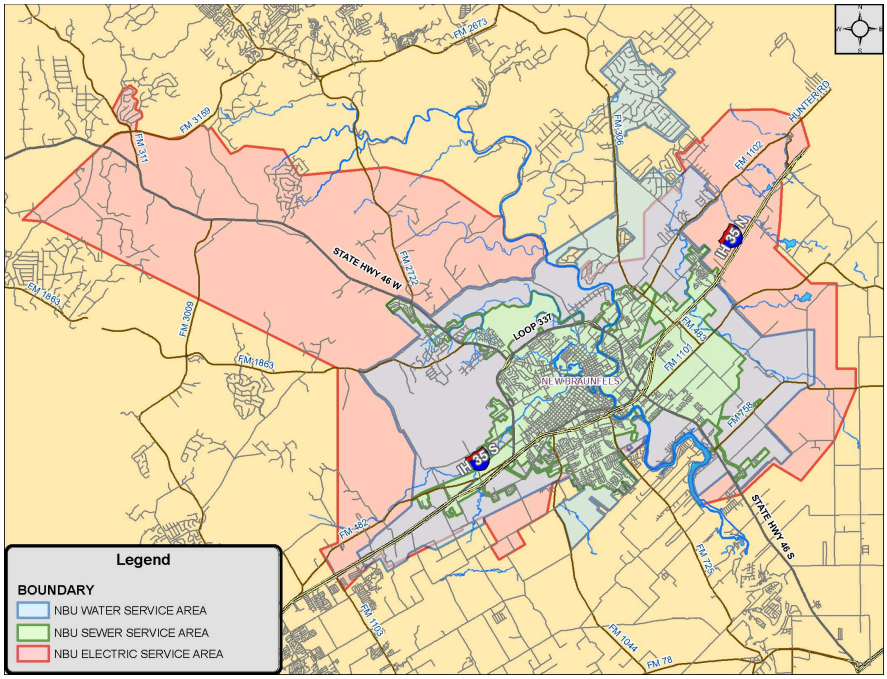
Another opportunity for NBU is to negotiate with both residential and commercial developers. Staff gave our team one such example in the Brandt Ranch, a residential development consisting of 423 acres and 300 lots. NBU worked with the developer to incentivize

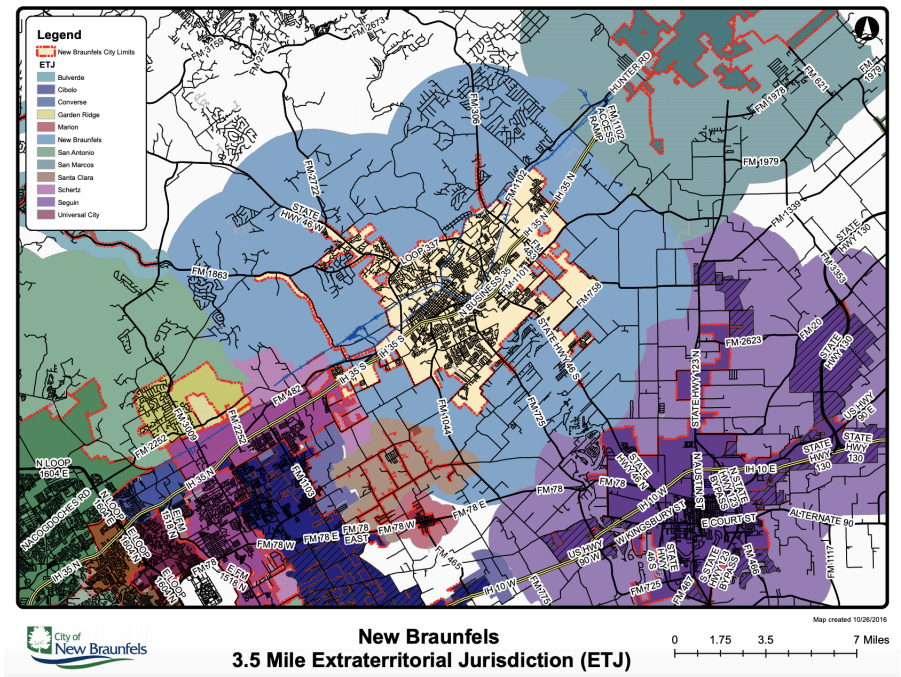
the installation of WaterSense appliances and other conservation-friendly measurers in each home. This was attractive to the developer for the rebates earned per home and attractive to increasingly socially- and environmentally-conscious buyers. Unique to this custom, negotiated program was a measure to increase requirements for native and unirrigated land and apply stricter watering restrictions to the Homeowners Association (HOA) bylaws in return for a $500 NBU credit to each home. These provisions cannot be removed from the HOA rules without NBU's expressed permission. We recommend NBU track the true water savings and price the rebates according to the established ROI measurement. The risk here is that with 300 homes, NBU could deplete its rebate budget quickly.

The opportunity to include restrictions in HOA rules can also be extended to other governmental bodies. We recommend NBU engage with the local school district, the city and county to determine new areas of collaboration, particularly in new construction or renovation projects. One example of a school district taking steps to conserve water is the One Water School being built in Wimberley, Texas (Huff, Dornak 2019). This school district voted unanimously to use HVAC condensation and rainwater, in addition to regular water uses, to help construct the school. Several water savings fixtures will also be installed to help the school conserve water and re-use water that would otherwise be lost to evaporation. This project will also reduce usage from the Trinity Aquifer by 90% when compared to traditional construction standards. Other examples for NBU could include working with New Braunfels' Parks & Recreation Department to find conservation opportunities in its parks, splash pads, and public pools.

While much of the current program is focused on residential rebates, we recommend NBU looks for high-impact opportunities within the commercial sector, with real estate developers, and with the wide array of governmental bodies and departments.

Appendix A: Service Areas and City Limits





Appendix B: Rebate Program Water Savings

Program	Criteria and Requirements	Average Rebate Amount (NBU)	Estimated Savings per Month (EPA, NBU)	Actual Savings per Month (NBU)	Actual Savings per Month (Meter Data)
Washing Machine	$100 rebate per ultra high efficiency washing machine. Limit one.	$100	465	1,079	1,014
Mulch	$12.50 per cubic yard of mulch. Maximum rebate of $100 per NBU fiscal year.	$62	2,630 Based on 5 cubic yards	443	-252
Rain Barrel	$0.50 per gallon of storage toward the purchase of rain barrels. Maximum rebate of $250 dollars.	$125	1,000 Based on 125 gallon barrel	2,137	1,386
Artificial Turf	$2.00 rebate per sq ft. Limit one per unit. Maximum rebate of $1,000 per fiscal year.	$970	3,288 Based on 485 sq ft	2,484	n/a
Grass Removal	$0.50 rebate per sq ft. Limit one per unit. Maximum rebate amount of $1,000 per fiscal year.	$510	6,916 Based on 1,020 sq ft	2,848	1,655
Irrigation Zone Removal	$100 per irrigation zone retired from use, up to 6 zones. Additional $50 for removal of all irrigation zones on the property.	$650	7,500 Based on removal of 6 zones	No data	No data
Drought Tolerant Trees	$25 rebate for one tree, up to 3 trees per location during the month of October.	No data	No data	No data	No data

Appendix C: Complete ROI calculations

See separate Excel file attached to this report.

Appendix D: Presentation of the Findings

See separate PDF file attached to this report.

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