Water Conservation in the City of Brooklyn Park, Minnesota

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Resilient Communities Project:

Water Conservation in the City of Brooklyn Park, Minnesota

University of Minnesota Twin Cities
PA 5721-Energy & Environmental Policy

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Preface

This policy memo was produced by a team of graduate students at the University of Minnesota for a class assignment in PA 5721: Energy and Environmental Policy, during fall semester 2016. The memo constitutes the final written report on a collaborative project undertaken with Jon Watson, Public Utilities Superintendent for the City of Brooklyn Park, with support from the Resilient Communities Project at the U of MN.

In addition to this policy memo, the student team produced a 5-minute video designed to underscore the importance of water conservation in Brooklyn Park for the public and policy makers. The video can be viewed on RCP's YouTube Channel at https://youtu.be/eFGXf9NQI90.

City Background and Issue Framing

Located just 20 minutes from downtown Minneapolis is the city of Brooklyn Park (Appendix, Figure 1). Brooklyn Park is a first-ring suburb that burgeoned from a township in 1852 and is now the sixth largest city in the state, home to almost 80,000 residents and an unemployment rate of 5.3% as of 2015.[1] Officiated as a city in 1968, Brooklyn Park is comprised of 52.3% people of color and 47.7% Caucasian.[2] Approximately 1/5th of the population is foreign born and ¼ of the population speak english as their second language.[2] Additionally 60.4% of the population is between the ages of 18 and 64.[2] Residents also have a median household income above both the national and state averages. In short, Brooklyn Park is a diverse community mainly comprised of middle aged residents. As it stands today, the community is approximately 90% developed, with around 1,100 businesses which provide approximately 30,000 jobs to the residents of Brooklyn Park and surrounding communities.[2]

Minnesota has a vast amount of water resources, including underground aquifers, 11,842 lakes (larger than 10 acres in length) and another 6,500 miles of rivers and streams.[3] The City of Brooklyn Park is situated on an array of underground aquifers but recently the city has come under scrutiny by the Minnesota Department of Natural Resources (DNR) for their water usage, according to city staff.[4] The consumption target goal for the DNR is 75 gallons per person per day - approximately 82,000 gallons per year.[5] Currently, water consumption rates in Brooklyn Park are comprised of approximately 74% residential, 13% commercial and 13% irrigation.[4] Although there is no immediate threat of water resource scarcity, the consumption trends for the city of Brooklyn Park have been steadily increasing over the past ten years.[4] This trend is two-fold--although consumption per capita has slowly decreased, overall consumption has increased due to the growth of both population and commercial use. This increase in water usage is seen throughout Minnesota as well. Groundwater consumption, specifically water supply, in the state of Minnesota has increased by almost 75 billion gallons since 1988 levels, indicating a much larger trend of increased consumption.[6] While Brooklyn Park may not currently be facing water shortages, consideration for long range resource sustainability is paramount. At about $2.00 per 1,000 gallons, the Brooklyn Park water rates are competitive for the Twin Cities metro area. For comparison, in other areas of the Twin Cities rates can go as high as $5.00 per 1,000 gallons, and the lowest water price in the Metropolitan area is Maple Grove at $1.00 per 1,000 gallons .[4] With extremely competitive rates, the water utility of Brooklyn Park faces a challenge of encouraging efficient and conservative water consumption while remaining a fiscally stable and operational utility.

Without conservation efforts on the local level, water resources will become a leading concern for citizens and policymakers alike. This brief provides an analysis of Brooklyn Park's water resources, consumption trends and demand, and an analysis for alternative policy and programming to target water conservation, specifically focusing on residential consumption with minor consideration for other sectors.

Surface and Groundwater Resource

Surface water is open to the surrounding environment and exposed to human activity. Because of this, surface water often contains contaminants like microorganisms and chemicals such as road salt or fertilizers. Due to this potential for contamination, cities often favor groundwater over surface surface as their

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[1] City of Brooklyn Park

[2] http://www.mncompass.org/profiles/acs1/brooklyn-park

[3] https://www.reference.com/geography/many-lakes-minnesota-actually-33b3246b3220ee57#

[4] City of Brooklyn Park Staff

[5] Minnesota Department of Natural Resources, "Local Water Supply Plan Template Third Generation for 2016-2018" (http://files.dnr.state.mn.us/waters/watermgmt_section/appropriations/plan_template.pdf)

[6] https://www.eqb.state.mn.us/sites/default/files/documents/DNR%20-%20Water%20Availability%20Rept-Final.pdf

municipal water source. Groundwater is more cost effective during the treatment process since there are less contaminants that require treatment. Using groundwater as the municipal water source also does not disturb local ecosystems and natural habitats.

Brooklyn Park has a combination of unconfined and confined aquifers. In an unconfined aquifer, water moves freely and is not restricted to an area due to geological structures. A confined aquifer is one where water movement is restricted due to impermeable geological layers, usually comprised of clay or shale, which contain a limited supply of water that can not be replenished.[7] Since unconfined aquifers do not have those restrictions, the water table can raise and lower based on the use and replenishment of the aquifer itself. If demand exceeds resupply, wells will eventually have to be deeper in order to have access to the remaining water. Brooklyn Park currently draws from ten municipal wells for their water, although the city owns and monitors a total of 18 wells.[4] These wells are located throughout the city, vary in size and depth, and draw from several aquifers. Approximately 10% of municipal water in Brooklyn Park is drawn from the confined Franconian aquifer, and 90% is drawn from unconfined aquifers.[4] With the availability of many aquifer layers, the city is not restricted in water availability. However, surface water levels have recently declined and has drawn the attention of the DNR due to the effects on surface water ecosystems, showing that current water consumption in the city may not be sustainable for the environment.

Water Utilities

The water utilities of Brooklyn Park serve the vital role of providing clean, reliable water to the city's population. Water utilities in Brooklyn Park are considered a business of city government, which means that the water utility relies on ratepayers to cover the costs of services the utility provides, including water treatment, metering, upkeep and maintenance of the water treatment facility, and managing the water supply.

Water use in Brooklyn Park, and across the United States, is seasonal and weather dependent. In winter months, water use decreases significantly because residents tend not to water their lawns and wash their cars. Water consumption peaks in summer months; hot years with periods of drought are associated with the highest consumption rates. Although peak water usage occurs only during the hottest months of the year, the costs required for maintaining the infrastructure necessary to meet that peak demand are high. Therefore, encouraging behavior that reduces the height of the summer peak benefits residents and the utility, because neither entity will need to build and maintain more infrastructure.

Brooklyn Park Water Utility has an interest in encouraging water conservation for several reasons. First, keeping overall water consumption low, by decreasing summer water usage, prevents the costly need to build future expansions to the water treatment facility. Second, the utility is interested in supporting long-term viability of Brooklyn Park, which means drawing water from the underground aquifers at a sustainable rate. However, if demand for water is too low, the utility loses money and the financial burden of that deficit falls on the city. Therefore, a "sweet spot" needs to be identified and maintained, wherein the demand for water is high enough where the utility can cover operational costs and maintain a profit margin, yet ratepayers are not consuming water at an unsustainable rate.

One method to promote water conservation, reduce summer peak demand, and avoid infrastructure expansion costs is to alter the pricing tier structure. Increasing rates for consumers that use more water discourages excessive use and helps to smooth the summer water consumption peaks. Brooklyn Park's current water rates set the first tier residential users (< 40,000 gallons) at $1.90. This increases to $2.85

[7] http://water.usgs.gov/edu/earthgwaquifer.html

between 41,000 and 80,000 gallons, and reaches the maximum price of $3.60 after 80,000 gallons. Non-residential users have a flat rate of $1.90.[8]

Consumption Trends

The consumption rates in Brooklyn Park have been steadily increasing over the past 10 years. This increase has been most notable in the residential sector, as there has been a parallel increase in residential density throughout Brooklyn Park[9]. As of 2015, total water consumption in Brooklyn Park was about 3.1 billion gallons, and single-family residential water consumption was well over three quarters of the cities demand (Appendix, Figure 2)[10]. Single family residential was followed by multi-family residential in terms. Considering the residential sector in total, a disproportionate amount of water is being used by residences--almost 2.3 billion per year, or 74.2% of Brooklyn Park's total water demand. With 80,000 residents, Brooklyn Park is seeing an annual residential water use of 28,750 gallons per person or the equivalent of almost 79 gallons per person per day.[12] This is above the target set by the DNR and shows that a decrease in water use per person per day is needed. However, the total city per capita use is around 38,750 gallons per person when all sectors (commercial, industrial, etc.) are considered.[4]

For context, the city of Minneapolis, which supplies water to its residents, as well as 22 suburban customers (ranging in location from Bloomington to Columbia Heights)[11] ends up using a total of around 21 billion gallons of water per annum, which is pumped directly from the Mississippi River. Using 40% of that water supply, Minneapolis residents average 21,000 gallons per year, which results in approximately 57.5 gallons per person per day. This figure is significantly smaller than that of Brooklyn Park residents, and due to the larger population of Minneapolis residents, speaks to notable differences in water efficiency and use applications. Some of this variation can be attributed to smaller lawn sizes, more single family residences than multi-family or townhouse units, or due to the fact that Minneapolis has been steadily increasing the rate prices for water (from $3.29 in 2013 to $3.45 in 2016, which excludes the 7.75% water tax).[12] However, it also stands to reason that Brooklyn Park consumers are just using more water. With this context, it is reasonable to assert that Brooklyn Park could benefit from an evolution in their water pricing structure, or an overall residential conservation initiative.

[8] http://www.brooklynpark.org/city-government/public-works/utility-billing-rates/

[9] http://www.mncompass.org/profiles/acs1/brooklyn-park

[10] Water Utilities - Consumption Data 2015, City of Brooklyn Park

[11] http://www.minneapolismn.gov/publicworks/water/water_waterfacts

[12] http://www.minneapolismn.gov/utilitybilling/utility-billing_rates

Recommendations

Recommendations to address consumption in Brooklyn Park focus on three main objectives:

1. Progressive Rate Structure - Seasonal, Added Tiers (and types), and Month-to-Month Billing

Changes in the current tier pricing and billing process will incentivize users who use less water and discourage excessive use by those who use more. Additionally the progressive structure will allow for greater distinction between types of uses while still keeping the city utility in a competitive market to supply water and meet their financial goals and infrastructure needs. A redesigned rate structure respects those that use less and disincentivizes high water usage. Cities such as Coon Rapids, Maple Grove and Woodbury were used as both examples and comparatives when designing a new rate structure format.[13,14,15] (Appendix, Figure 3)

The recommended tier structure for Brooklyn Park will vary by season, charging users more during the summers months (May through September) to decrease peak demand, and slightly less in the winter months (October through April) to ensure that users are not seeing an overall increase in water costs. As opposed to three tiers, Brooklyn Park should add at least one more tier, which will break up their high-mid user group into two sub groups, incentivizing conservation. (Appendix, Figure 4) Lastly, Brooklyn Park should adopt a month-to-month billing structure. Residents who receive a monthly bill will be more responsive to any rate changes, more in tune with their water use, and more likely to pay a utility bill that they receive on the same schedule as their other bills. The costs to the city of initiating month-to-month billing can be recouped through a more efficient water utility infrastructure, and will decrease the number of residents for whom *not* paying their water utility can result in risk of foreclosure when the interest accrued on the unpaid bill comes back as a property tax in the next fiscal cycle. In this way, month-to-month billing is a more equitable approach to water pricing.

2. Smart Irrigation Systems

Smart irrigation systems use local meteorological data and weather conditions to ensure watering occurs only as necessary. They can have a programmable sensor in home or the irrigation system can be synced to your cell phone for easy monitoring. Smart irrigation systems can also be individually customized to your home conditions by programming into the system your type of grass or soil moisture content. This eases the burden of homeowners in terms of being aware of when watering needs to occur. It additionally ensures the health of the lawn by supplying it with necessary water amounts at the correct time. Smart irrigation systems are fairly inexpensive to install and can be incentivised with rebates that the city already provides. This option serves a three prong purpose: decreasing (and thus saving) costs for the consumer, "softening" the peaks of summer demand and thus saving on the infrastructure for the city, and finally decreasing overall consumption rates by only using what is necessary. Smart irrigation systems are also a good long term investment for the city because the irrigation system's life expectancy is increased since it is not consistently running and is programmed to turn on when necessary for a given amount of time. This option is more politically feasible and socially palatable than an outright increase in cost.

3. Education & Outreach

Increasing users individual knowledge about their water usage is an important component to any conservation efforts. With a diverse population, it will be important to reach out to all citizens of Brooklyn

[13] https://metrocouncil.org/Wastewater-Water/Publications-And-Resources/WATER-SUPPLY-PLANNING/Twin-Cities-Regional-Water-Billing-Analysis-(Print.aspx

[14] http://www.ci.coon-rapids.mn.us/560/Water-Sewer-Rates

[15] http://ci.woodbury.mn.us/finance/utilities/residential-utility-rates#water-rates

Park to determine their knowledge base and increase information efforts based on these understandings. Additional efforts can be made by providing "comparisons" to neighbors and adding informational inserts to bills to all consumers to make conscious efforts based on information provided to them. The city can also provide informational workshops, such as a "Build Your Own Rain Barrel," to empower citizens on their own initiatives.

Summary

Water resources are plentiful in the state of Minnesota and the City of Brooklyn Park is one of many cities that utilizes underground aquifers for their water supply needs. Currently the city is not facing a water shortage, but increasing usage rates have raised concerns over long-term consumption and the city should seize the opportunity to be proactive *before* there is a real problem. In an effort to reduce consumption, the city focused on conservation efforts to ensure security of future water use. The following analysis provides a recommendation for the most cost effective, politically feasible, and efficient of the three options that Brooklyn Park has for decreasing water consumption and proactively increasing water efficiency.

	Cost effectiveness	**Political Feasibility**	**Efficiency**	Total
Progressive rate structure	3	1	4	8
Smart irrigation	4	4	5	**13**
Education	3	4	3	10

Based on our overall analysis, a conservation approach that that combines technology, education, and smart pricing will achieve the most significant water savings for Brooklyn Park, while remaining cost effective and politically feasible. In the immediate term based on the ranking system above, we recommend smart irrigation technologies as the first priority for water conservation. By encouraging these technologies, the highest users will begin to curtail their high, seasonally-dependent consumption and the peak demand in the summer will begin to decrease. These initial efforts will be the basis to start water conservation efforts city wide by targeting the highest users.

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Appendix

1. City of Brooklyn Park
2. 2015 Brooklyn Park Consumption Comparison Per Sector
3. City Tier Structure Comparison
4. Example Tier Restructure

Figure 1. Brooklyn Park, MN

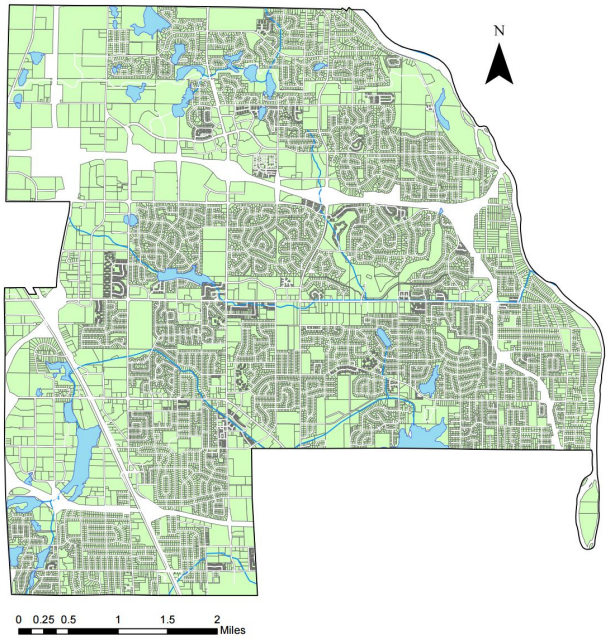

Figure 2. Residential Water Consumption Per Sector

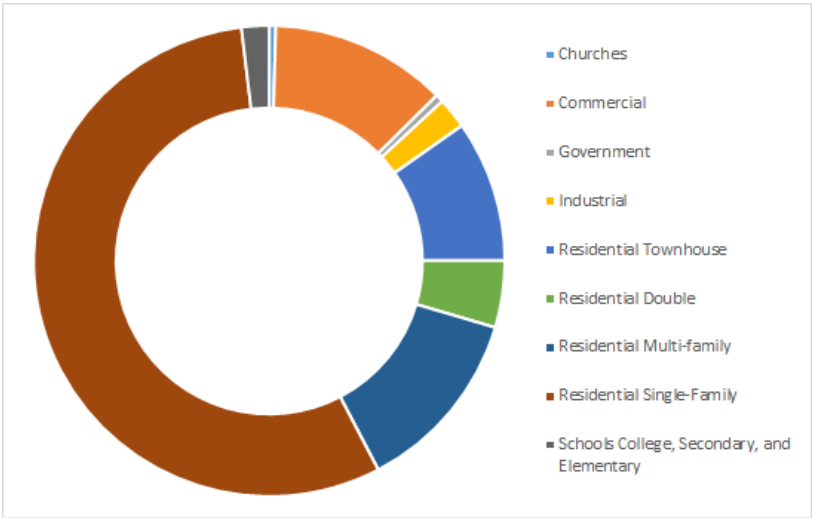

Figure 3. City Tier Water Price/Tier Comparison
(Coon Rapids, Maple Grove, Woodbury, and Brooklyn Park respectively)

Figure 4. Example Tier Restructure