

Thornton Benchmarking Analysis

Commercial, Industrial, and Institutional Indoor Water Use



CASE STUDY: THORNTON CITY BUILDINGS

Category:

City of Thornton Municipal Buildings



Location:

Thornton, CO



Building Size Range:

Approximately 2,600 square feet to 94,000 square feet



Indoor Water Use Range:

Approximately 21,000 to 858,000 gallons per year; 1.4 to 9.5 gallons per square foot annually (indoors)



BACKGROUND

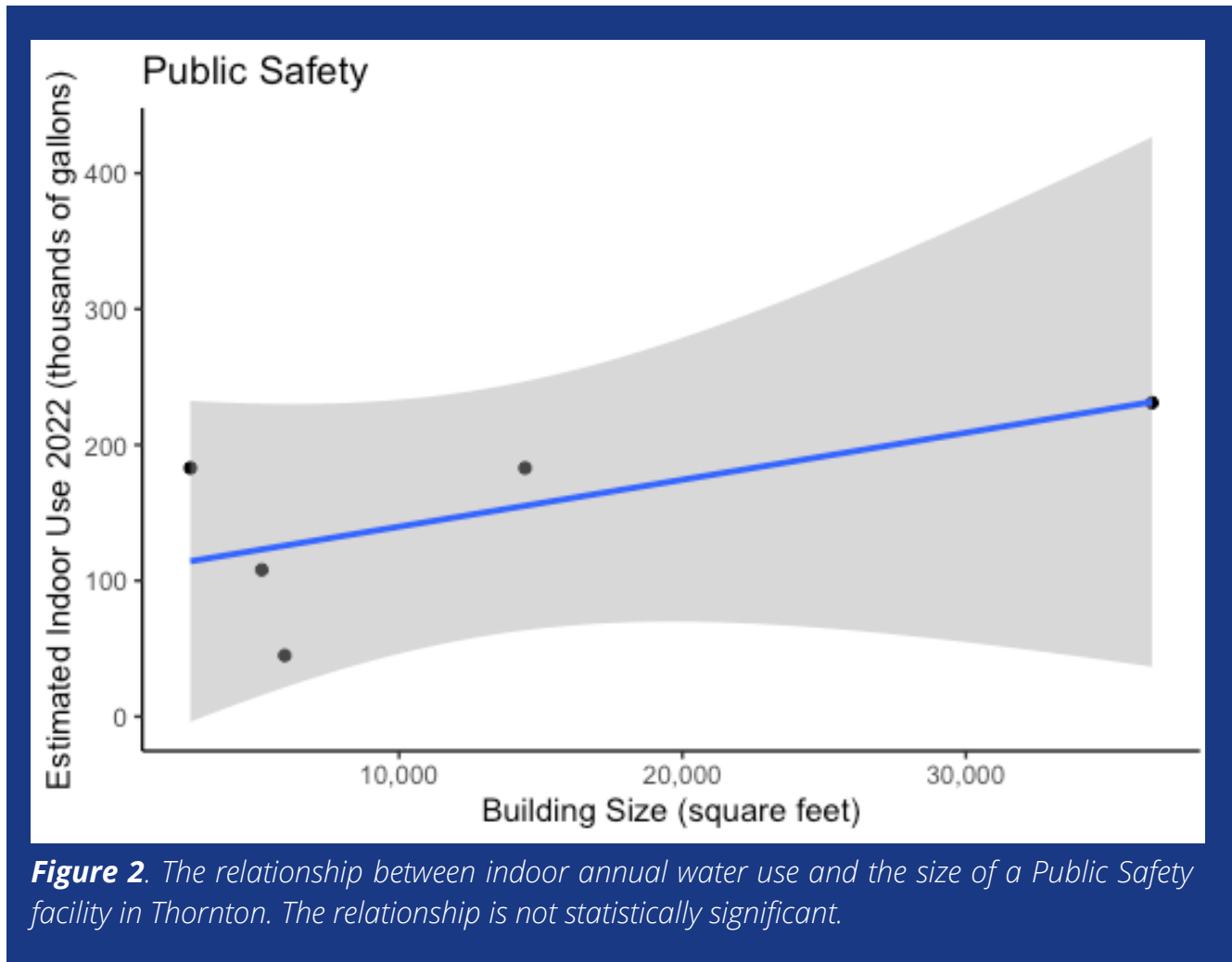
The City of Thornton owns and operates 22 municipal buildings, including two water treatment facilities, two recreation centers, a community center, an active adult center, an arts and culture center, a golf course, a police training center, seven fire stations, a fire museum, and three administration buildings, including Thornton Civic Center (see **Figure 1**), the Justice Center, and the Infrastructure Maintenance Center (IMC). These facilities support a wide range of essential community services, from administrative functions to emergency response and public recreation. Due to their diverse functions and varying occupancy levels, water use differs significantly across these building types. The Civic Center is predominately administrative but has a cooling tower system which contributes to water consumption. Fire stations, which operate 24/7, have substantial water needs for living quarters, vehicle washing, and other operational activities. The Justice Center also operates around the clock, resulting in high water usage due to regular employee shift changes, showers, and bathroom use, including touchless flush toilets that automatically activate once every 24 hours. The IMC includes an administrative building and most of the field operations for the city (streets, environmental services, traffic, water and wastewater crews staging areas). Most of its indoor water use is from bathroom/locker room use. Recreation centers, with their high visitor numbers and indoor pool areas, experience substantial water consumption (see **Figure 4**). In recent years, some of these facilities have experienced leaks due to aging infrastructure. To improve data access for water consumption throughout the city, Thornton is installing advanced metering infrastructure (AMI) across the city. This technology will enable real-time monitoring of water use and prompt detection of leaks, helping to reduce water waste and improve overall efficiency. For more details on the locations of these buildings, click [here](#) for an interactive map tour of Thornton's facilities.



WATER USE PROFILES AND BENCHMARKS

The analysis divided these buildings into three categories, which included: 1) Public Safety buildings (i.e. police stations and fire stations), 2) Public Recreation facilities (i.e., recreation centers and golf courses), and 3) a City Buildings category that captured facilities with administrative and other community service functions. Each was evaluated separately for water use. While the relatively small sample size poses a statistical challenge, each category showed different trends.

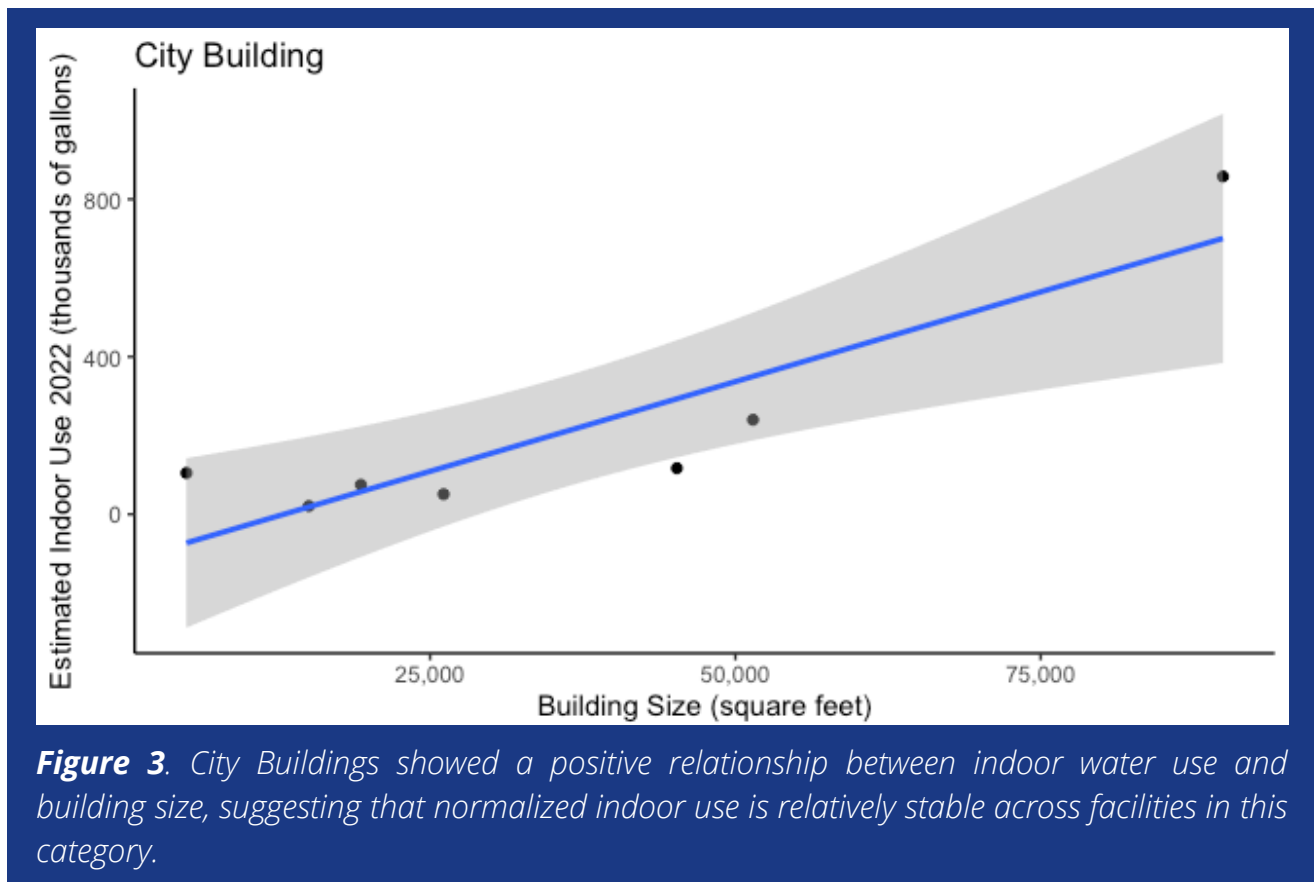
Public Safety buildings showed no statistically significant relationship between building size and water use, with a relatively flat distribution of total water use across all six fire stations for which data was available (**Figure 2**). They compared moderately in terms of normalized use across all commercial, industrial, institutional and multifamily residential users, ranking 12th out of 21 categories, with a median use rate of 12.7 gallons per square foot per year. These buildings used an estimated 20% of their annual water consumption indoors, making them a potential target for indoor conservation practices, but potentially standing to benefit more from outdoor conservation approaches.



WATER USE PROFILES AND BENCHMARKS

There was a trend between building size and water use for Public Recreation facilities, but the limited number of facilities where data was included in the benchmark prevents drawing any strong conclusions. Generally, a large majority of Public Recreation facility water use (an estimated 97%) occurred outdoors, making it difficult to differentiate indoor use and limiting our ability to assess indoor use in this analysis. Outdoor conservation measures will likely yield more water savings than indoor use for these facilities.

City Buildings demonstrated a relatively strong relationship between building size and water use, suggesting that water use per square foot is relatively stable across municipal buildings with administrative and community-centered roles (**Figure 3**). The median City Building used 3.9 gallons per square foot of indoor space per year. High users in this category used 7.1 or more gallons per square foot per year, while low users used 2.3 gallons per square foot per year or less. This reflects the second lowest rate of indoor use across the 21 categories we examined, making City Buildings a very low-using category within the broader landscape of commercial, industrial and institutional water users in Thornton. Like the other city facility categories, a majority (86%) of water use at these facilities occurred outdoors over the course of the year, suggesting that outdoor conservation strategies should be employed alongside the indoor water conservation approaches focused on in this study.



WATER CONSERVATION AND SUSTAINABILITY EFFORTS

Thornton has implemented several initiatives to enhance water efficiency and sustainability in city-owned and managed buildings. The installation of bottle fillers has promoted the use of refillable water bottles, reducing single-use plastic waste. The City has adopted low flow fixtures, including [EPA WaterSense](#) low-flow toilets, air-cooled ice machines and faucet aerators, which can save millions of gallons of water per year. At the Active Adult Center and Thorncreek Golf Course kitchens, a new water saving technology, the Boss Defrost, has been tested along with EPA WaterSense pre-rinse spray valves (PRSVs). Additionally, many of these indoor fixtures are equipped with touchless technology, ensuring that water waste is minimized. These touchless fixtures were originally met with some resistance in some application settings (due to personal preferences) but have since been a key measure in reducing water consumption across many of the facilities.



Figure 4: Thornton City Pool

CHALLENGES AND OPPORTUNITIES

Managing water use across Thornton's diverse facilities presents several challenges and opportunities. Persistent issues like drain blockages, often caused by minerals in the hard water, have necessitated continuous infrastructure maintenance. Balancing water conservation measures with user demands, such as ensuring high water pressure in sinks and showers, particularly in facilities with living quarters or recreational centers, has also been a complex task. Encouraging maintenance teams to prioritize water efficiency and educating employees and visitors about its importance are crucial steps toward achieving the city's conservation goals.



There are significant opportunities for improvement. Increasing education and outreach, especially through bathroom signage and informational campaigns, can foster better water use habits among employees and visitors. Technological upgrades, such as the continued integration of advanced metering infrastructure (AMI) and closed-loop systems, will enhance monitoring capabilities and help reduce water waste. By leveraging these opportunities, Thornton can make substantial progress in its water conservation efforts.



RECOMMENDATIONS AND NEXT STEPS

To further enhance water efficiency across Thornton's facilities, several key actions are recommended. First, the city could continue to implement advanced metering infrastructure (AMI) to enable real-time monitoring of water usage and provide building maintenance staff with this data. This will allow for faster detection and response to leaks and inefficiencies. Additionally, developing comprehensive educational programs for employees will emphasize the importance of water conservation and provide practical steps they can take to contribute to these efforts. Engaging stakeholders, including building staff and visitors, in water conservation initiatives is crucial. Their feedback should be incorporated into the planning and implementation of these programs to ensure they are effective and well-received.



Additionally, continuing to incorporate infrastructure improvements (i.e., upgrading sinks, facets, and toilets to low-flow and touchless fixtures) alongside regularly scheduled maintenance practices will ensure that facilities are operating at their optimal efficiency. Lastly, allocating resources effectively to support ongoing and future water conservation initiatives is essential. This involves leveraging both internal teams (i.e., City of Thornton water efficiency staff and programs) and external partners (i.e., local and state funders, local non-profit water conservation organizations, EPA WaterSense program, etc.) to achieve the highest levels of water efficiency. By focusing on these strategies, Thornton's buildings can continue to make significant strides in its water conservation and sustainability efforts.