NACWA

The Cost of Wipes On America's Clean Water Utilities

An Estimate of Increased Utility Operating Costs

The National Association of Clean Water Agencies

Washington, DC
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Collaborating Organizations

APWA

Association of Missouri Cleanwater Agencies

BACWA Bay Area Clean Water Agencies

CASA

cwea Chesapeake Water Environment Association

NACWA

Protecting Water Quality Every Day
North Carolina Water Quality Association

SCAP
Southern California Alliance of Publicly Owned Treatment Works
Reuse · Bringing Water Full Circle · Waste Treatment

SCWQA
Water Quality Through Sound Science

Water Environment Federation
the water quality people®

The Cost of Wipes on America's Clean Water Utilities

In 2019, the National Association of Clean Water Agencies (NACWA), along with other water associations, conducted a nationwide study of the impact of wipes on the operating costs of America's clean water agencies. NACWA worked closely with other national and state organizations to conduct this analysis. This special report presents the results of NACWA's work.

Background

It is estimated that North American businesses and households spent some $2.5 billion on personal wipes in 2019. There are no reliable statistics about how many wipes are flushed down toilets, but there are hundreds of reports each year of clogged household plumbing and costly damage to public sewer systems and treatment plants caused by wipes when they are flushed.

Not all wipes cause damage when flushed and not all wipes are labeled as "flushable." The wipes industry has already taken steps to encourage wipes manufacturers to label their products as flushable or non-flushable based on these products meeting a series of tests. But according to a 2019 study conducted at Ryerson University in Toronto that examined 101 single-use wipes products – including 23 wipes products labeled as "flushable" by the manufacturer - none of these products fell apart or dispersed enough to safely pass through an average home's plumbing system to the public sewer, and through the sewer system for 30 minutes, without "a risk of clogging or causing damage to infrastructure."

Accordingly, this study is designed to help wipe manufacturers, wipe users, and policy makers better understand the cost of wipes when they are either flushed down toilets despite being labeled as "not flushable," or flushed as "flushable" wipes that in practice do not degrade sufficiently to prevent clogs in household plumbing and/or on-site or municipal wastewater collection and treatment infrastructure.

Study Design

This study was designed to provide reasonable, but conservative estimates of the likely costs of wipes at the national and US state levels. As such, the research leading to such estimates followed a five-step process:

Step 1	Utility Cost Model Cases	• Assemble utility cost estimates and explore drivers of costs and factors affecting drivers • Examine alternative utility-scale models of the cost of wipes
Step 2	Cost Mode Standardization	• Test cost components, examine alternative model structures, test linear, non-linear regressions • Formulate model hyopthesis for further testing
Step 3	NACWA Member Estimates	• Collect data from 15-20 NACWA members applying the standard model and report results
Step 4	Cost Model Verification	• Interpret utility results and reformulate national model as needed • Select and document a best-fit model using statistical measures of "goodness of fit" across all utility results
Step 5	Scale to State and Nation	• Usuing nationally consistent measures of as many independent variables as available, scale model to nation, break-out state-by-state

STEP 1 | UTILITY COST MODEL

NACWA conducted a thorough literature search from which we prepared a standard utility cost model that captured the major costs of wipes as reported by clean water utilities. The standard model considered both capital and operating costs and followed the hydrology of a municipal wastewater utility from collection to treatment, to disposal of residuals.

During this step, we noted that most utilities reported costs of cleaning and maintenance of conveyance infrastructure and fewer reported capital replacement costs associated with wipes. This was taken into consideration in subsequent steps where we requested documented cost data from our sample of wastewater utilities.

NACWA did not document costs associated with plumbing systems or laterals that connected households, businesses, or industries to public collection systems. NACWA also did not document the cost of wipes within on-site septic systems. The literature is clear that these costs exist and for some locations, the literature suggests these costs are substantial. This is the first area where our national model is conservative.

STEP 2 | MODEL STANDARDIZATION

Based on results of step 1, the following standard cost model emerged:

Collection System

- Cleaning and unclogging
- Sanitary sewer backup remediation from clogs

Lift Stations

- Cleaning bar screens of accumulated wipes
- Upgrading screens/etc. to accommodate wipes
- Pump maintenance from clogs due at least in part to wipes
- Pump/grinder pump replacement after failure due to clogs
- Acquisition of new grinder pumps to accommodate wipes
- Extra electricity costs due to wipe-clogged pumps
- Extra disposal costs due to wipes

Headworks

- Extra maintenance of bar screens due to wipes
- Upgrading screens/etc. to accommodate wipes
- Extra disposal costs due to wipes
- Extra electricity costs due to wipe-clogged pumps

Treatment Works

- Maintenance of clogged primary clarifier equipment due to wipes
- Maintenance of clogged primary sludge pumps due to wipes
- Maintenance of mechanical mixers in secondary treatment chambers due to wipes
- Maintenance of clogged pumps/equipment in aeration tanks
- Extra vactoring in secondary settling tanks due to wipes clogs
- Maintenance/replacement of activated sludge pumps due to wipes
- Maintenance of chlorine contact tanks due to wipes
- Maintenance of sludge thickening equipment/grinder pumps due to wipes clogs
- Maintenance/replacement of sludge dewatering pumps and centrifuges due to wipes overloading/clogs

Combined Sewer Overflows (CSOs)

- CSO remediation from clogs
- Fines and penalties for excess CSO events

General and Administrative Costs

- Public education on proper wipe use and disposal

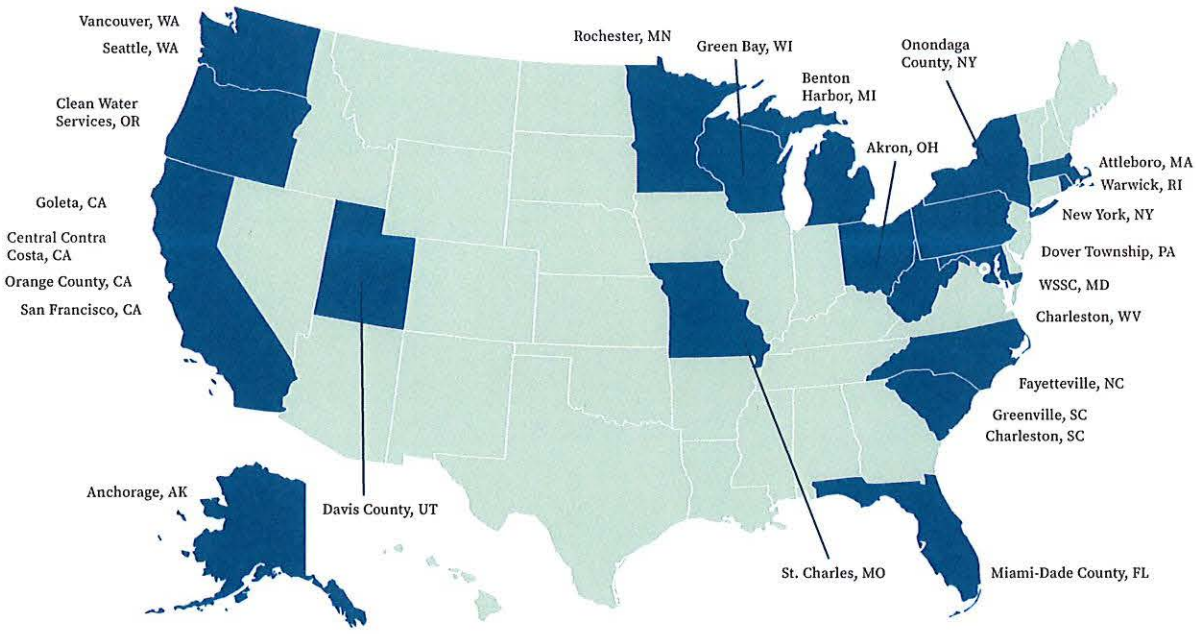
Environmental

- Sewer overflows due to wipes clogging conveyance networks or causing pumps to fail

These types of costs are widely reported in the literature, although not every utility reported costs in every category. NACWA tested this model with members and adjusted line items to ensure that the model was comprehensive and easy to understand. But it is important to note that costs vary considerably from one utility to the next, depending on their size, the topography with their service area, population density, and many other factors.

STEP 3 | UTILITY DATA COLLECTION

NACWA provided a standard cost model template to members and other utilities through partner state clean water utility associations. An attempt was made to collect actual costs from a variety of large and smaller utilities located in geographies that were broadly representative of the population of utilities in the US. We encouraged utilities to provide detailed narratives to explain how frequently operating and capital costs were incurred, how costs were calculated (e.g., direct only, or direct plus indirect costs), and any other information that might inform our subsequent analyses. Twenty-five utilities from 19 states (shown in dark blue) provided inputs:



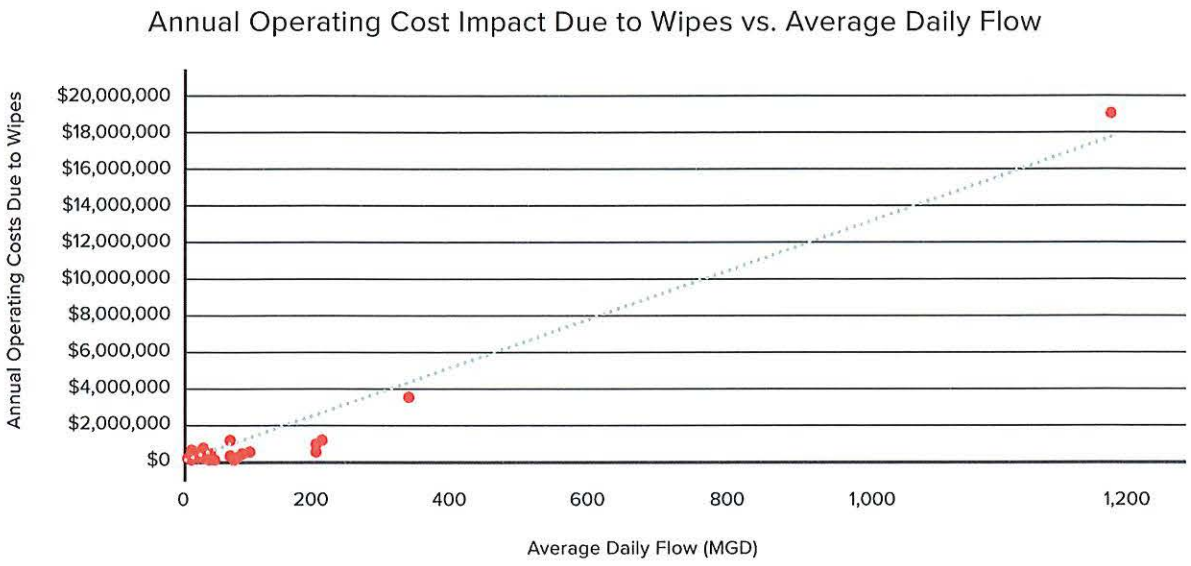
STEP 4 | MODEL VERIFICATION

NACWA cleaned, verified, and analyzed data from these 25 utilities to assure that inputs were comparable across all utilities. While some utilities submitted capital costs associated with wipes such as pump replacement from clogged impellers, we concluded that we had insufficient information on capital costs to include them in our national estimate. The inclusions of only operating and no capital costs in our final cost estimate is the second area where our national cost model is conservative.

Annual operating costs associated with wipes were then regressed against four independent variables to test the predictive value of one or more combinations of the following:

- Average Daily Flow
- Miles of Sewers
- Number of Lift Stations
- Population Served

Both linear and non-linear forms of relationships between combinations of independent variables and annual operating costs of wipes were modeled for goodness of fit. Since the independent variables are themselves correlated, not surprisingly, the simplest one-variable models produced nearly as strong a relationship as more complex combinations of independent variables. We chose a simple model using average daily flow as the basis of our final national cost model:



In the above relationship, variation in flow explains a little more than 95 of the variation in cost (R2=95.4%), which indicates a strong statistical fit of this regression line to the 25 observations.

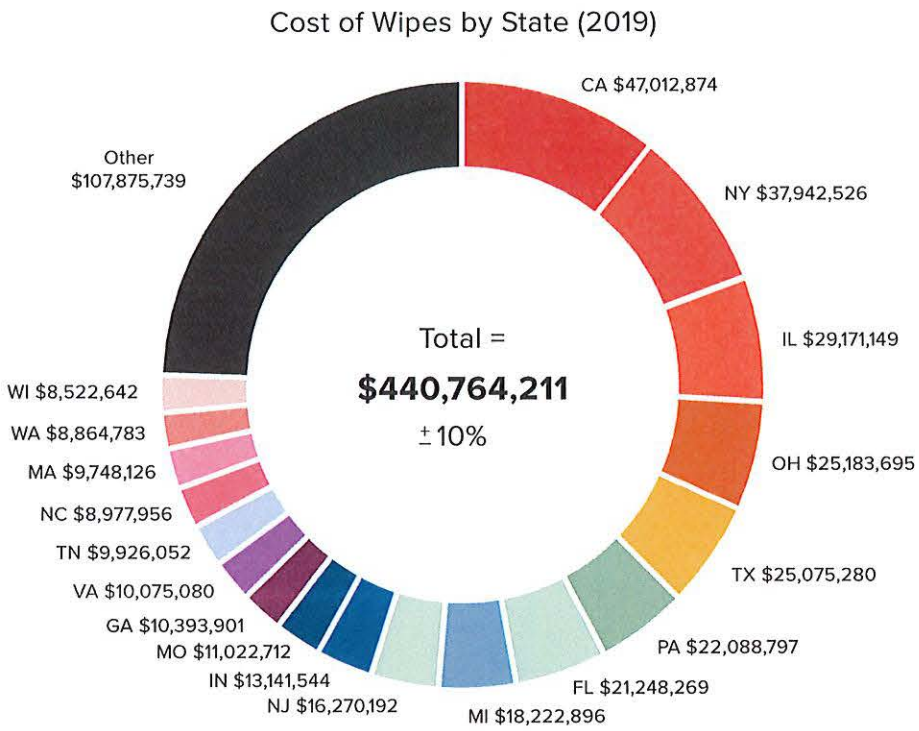
STEP 5 | SCALE UP TO THE NATION

In the final step, NACWA applied the model above to data extracted from the US Environmental Protection Agency's most recent Clean Watersheds Needs Survey for 14,467 utilities in 50 states plus the District of Columbia and Puerto Rico with collection systems. Treatment-only utilities were excluded from our scale-up since our data collection step indicated that most costs were associated with collection infrastructure. This is the third factor that helps keep our analysis conservative.

Results were then summarized by state in terms of the most likely value as well as a lower and upper 95% confidence interval around the most likely value. Statistically, these lower and upper bounds represent a range within which we can be 95% certain the most likely value will fall.

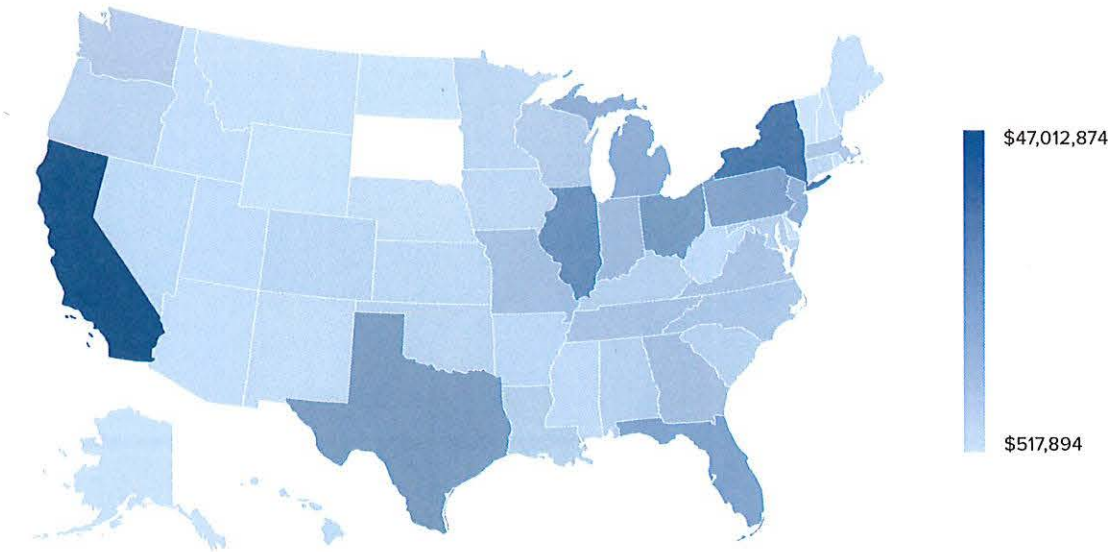
Results

NACWA estimates that wipes result in about $441 million a year in additional operating costs at US clean water utilities. The distribution of these costs by state, which generally corresponds with wastewater flow volumes by state, is presented in the graphic below:



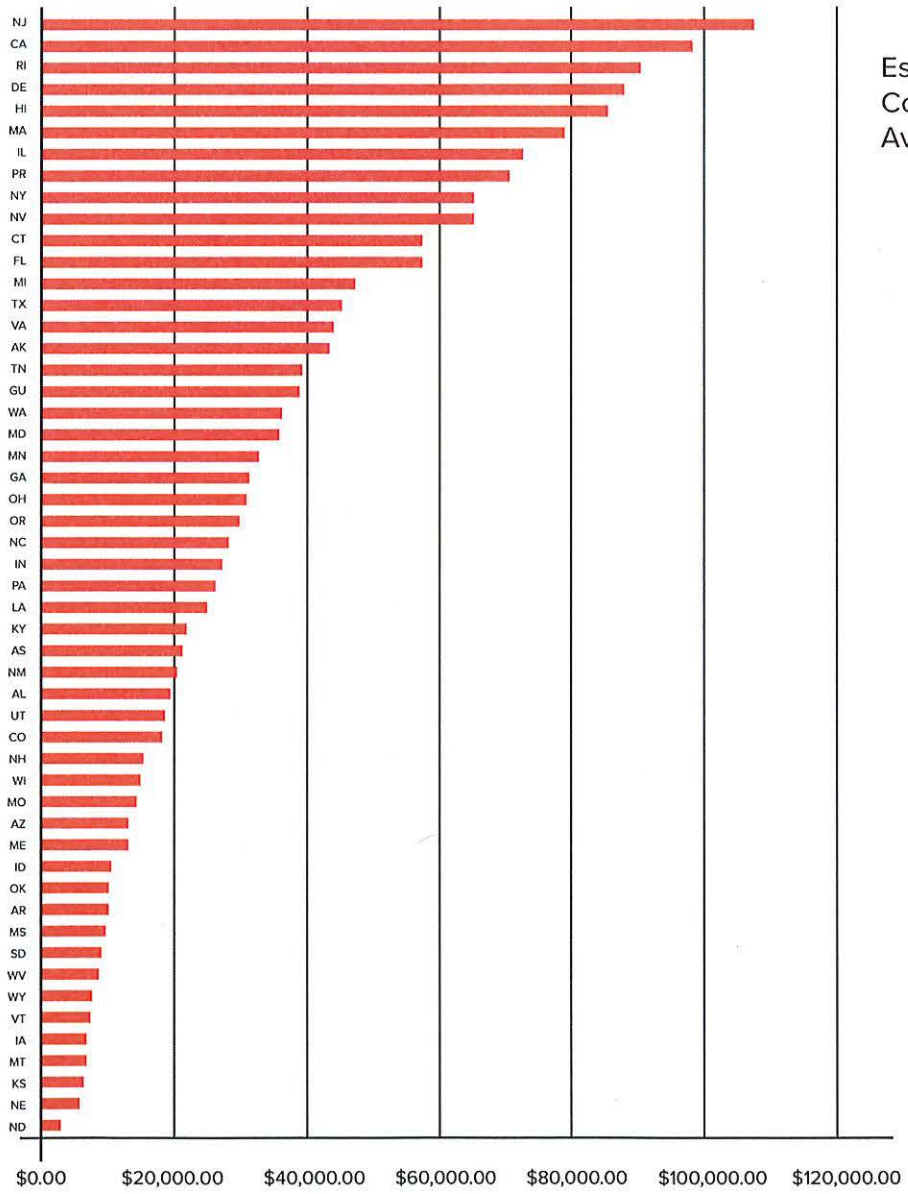
Not surprisingly, the 18 states with the highest levels of wastewater collection account for about 75% of total national costs of wipes. Eight states account for about half of the total US costs of wipes.

States with the highest costs of wipes tend to be located along the coasts and in heavily populated industrial portions of the Midwest, as indicated in the map below:



Upper and lower bounds on our estimates of the costs of wipe by state are provided in the graphic below:

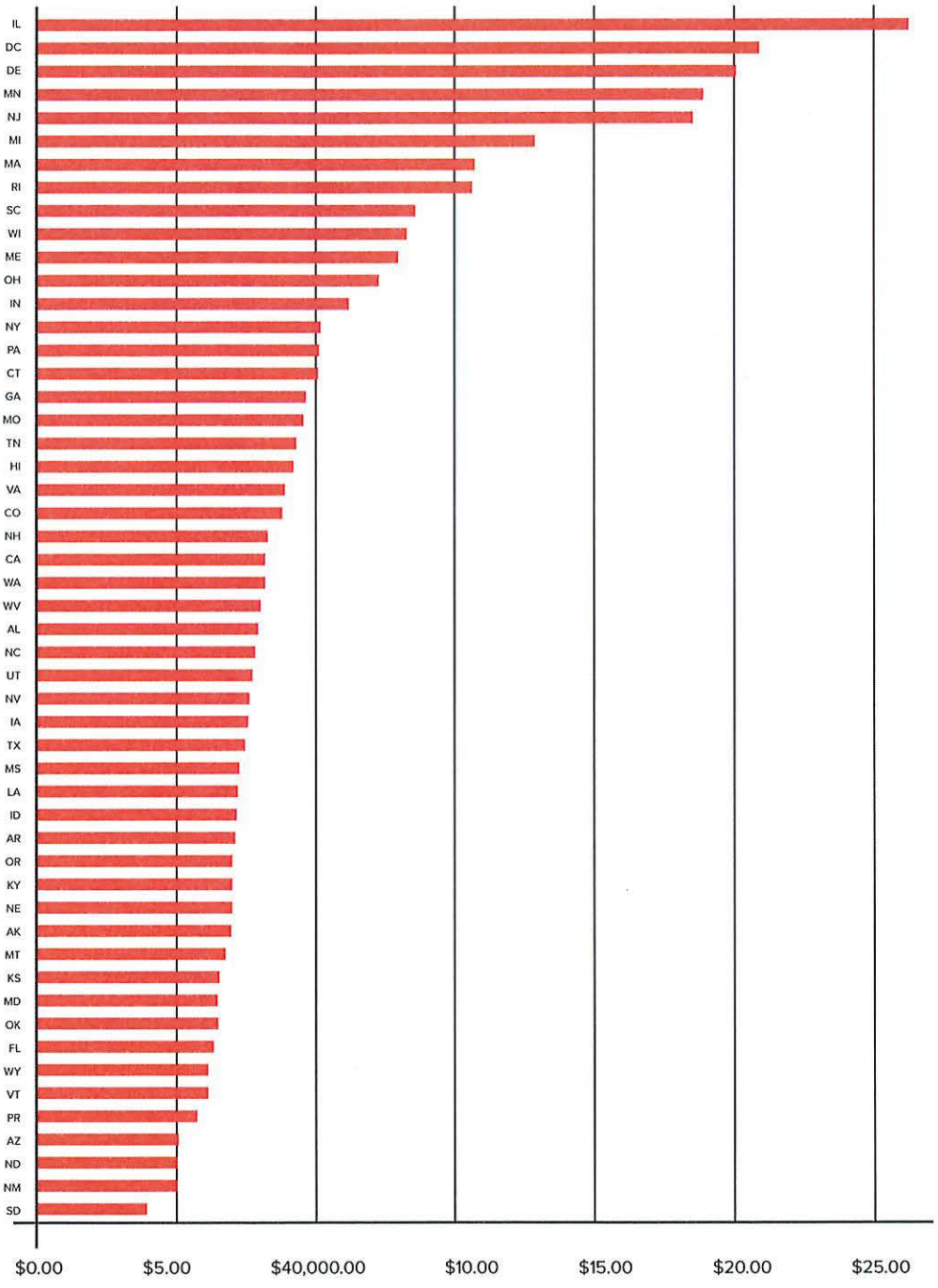
Based on these estimates, wipes impose $30,467 a year in additional operating costs on the average utility nationwide. In many states, especially those with relatively few utilities with high flows at each, however, the average utility pays significantly more than this figure (see graphic below). Utilities in California and New Jersey, for example, pay on average about $100,000 a year in additional operating costs because of wipes.



Estimated Annual Cost of Wipes at the Average Utility (2019)

Wipes impose tangible costs at the household level, but these vary considerably from state to state, as shown below. The average annual cost is $7.65 per household, with a high of just under $25.00 per household (Illinois) to a low of less than $5.00 per household (Kansas, Oklahoma, Maryland, Puerto Rico, Vermont, Wyoming, Florida, Arizona, New Mexico, North Dakota, South Dakota).

Estimated Annual Household Cost of Wipes (2019)



Concluding Thoughts

This is the first comprehensive examination of the cost of wipes on operations of US clean water utilities. Because we made four conservative assumptions that eliminated certain costs from our estimates despite ample anecdotal evidence that they exist in practice, NACWA believes that these estimates are substantially less than actual costs in any given year. First, our estimates did not consider costs associated with household, commercial, or industrial plumbing or laterals that connect these systems to public collection infrastructure. Second, NACWA did not consider damage that wipes may cause to on-site septic systems. Third, NACWA did not include any capital replacement costs in our forecast. Our estimates at the national, state, and utility levels include only operating costs associated with wipes. The study does not include costs associated with Clean Water Act fines for sanitary sewer overflows attributed to wipes. Finally, since our survey data indicated that most of the problems, and therefore costs of wipes, in clean water utilities occur within collection systems, NACWA did not include any costs that wipes may impose on treatment infrastructure or in the environment.

Other factors must be considered, however, that may affect the cost estimate. First, it must be noted that survey data were insufficient to estimate the probability that wipes will cause problems when flushed, although actual cost data were collected from a wide variety of locations, size systems, conveyance materials, and system configurations, which in itself is an indicator that when flushed, wipes can create problems virtually anywhere. Instead, our forecast assumed that if flushed, wipes will on average, cause problems in collection systems regardless of the type, size, or location of collection infrastructure. Second, while EPA's 2012 Needs Survey contains the most current, internally consistent and nationally comprehensive utility-scale data available, we would have preferred a more recent set of data on which to scale up our model to the nation. Our assumptions in using these data are that on average, flows and population served are the same today as they were in 2012. There is evidence that municipal water use (and by extension, wastewater flows) on average across the US declined as much as 10% between 2000 and 2005. No one knows whether this trend has continued since 2005, although more recent surveys suggest that between 2010 and 2019, demand for municipal water supplies was up in some locations and down in others, but nationally, they appear to have remained steady. Continued growth in population served across the US since 2012 will tend to offset any flow effects in our estimates of costs at the household level.

Endnotes

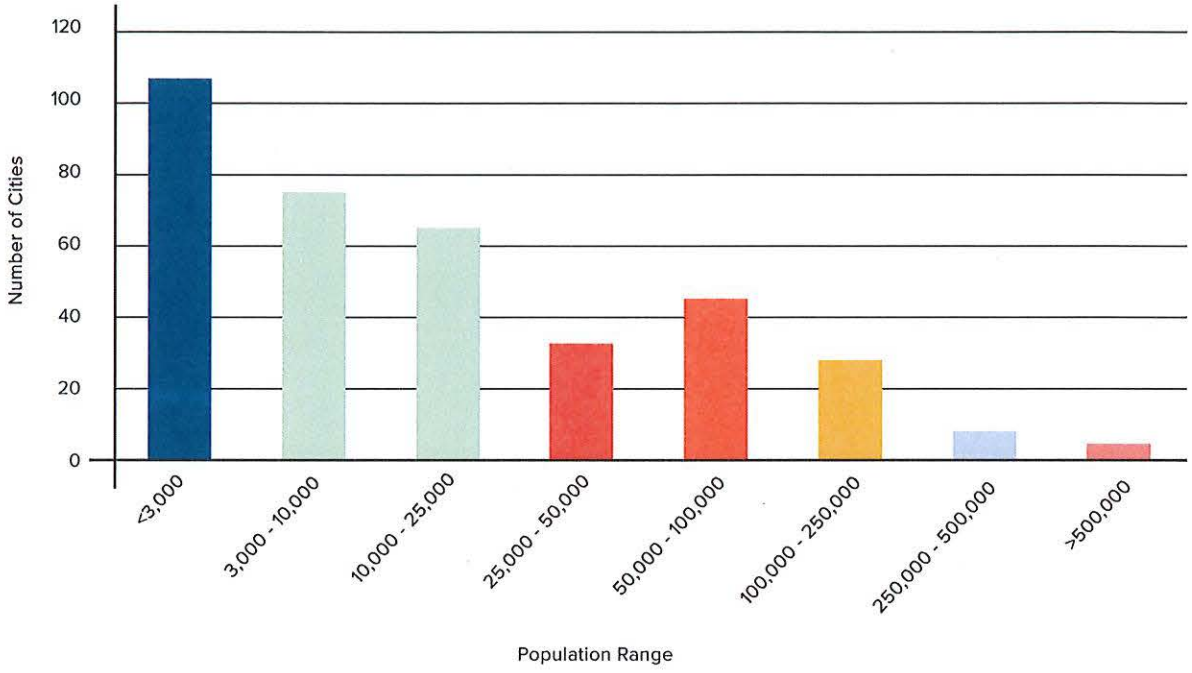
1. This figure is extrapolated from an estimated market of $2.2 billion in 2015, growing at 3% a year, including general purpose wipes, baby wipes, feminine hygiene wipes, and cosmetic wipes, as reported by Brad Kalil, Director of Market Research and Statistics, INDA, the Association of Nonwoven Fabric Industry, based on Euromonitor International's report, Wipes in the US, and presented at the 2016 World of Wipes Conference in Chicago Il June 7-10, 2016.
2. According to INDA's Guidelines for Assessing the Flushability of Disposable Nonwoven Products, as updated in 2018, a product is flushable when it "clears toilets and properly maintained drainage pipe systems...; passes through properly maintained wastewater conveyance systems and is compatible with wastewater treatment, reuse, and disposal systems without causing [problems]; and is unrecognizable in effluent leaving on-site and municipal treatment systems and in digested sludge from wastewater treatment plants..."
3. See: Defining "Flushability" for Sewer Use, Ryerson University, Final Report, prepared for the Municipal Enforcement Sewer Use Group of Canada by Anum Khan, Barry Orr, and Darko Joksimovic, March 31, 2019.
4. For details, see: https://www.epa.gov/cwns/clean-watersheds-needs-survey-cwns-2012-report-and-data#access Note that these data do not contain any entries for collection systems in South Carolina, so cost for that state was estimated based on total population.
5. See, Dieter, C.A., and Maupin, M.A., 2017, Public Supply and Domestic Water Use in the United States, 2015: U.S. Geological Survey Open-File Report 2017-1131, 6 p., https://doi.org/10.3133/ofr20171131.
6. See, for example, American Water Works Association, 2019 State of the Water Industry Report, https://www.awwa.org/Portals/0/AWWA/ETS/Resources/2019_STATE%20OF%20THE%20WATER%20INDUSTRY_post.pdf

California Addendum

This addendum provides more information about the estimated increased operating costs due to wipes in California communities. The model developed to estimate these costs can be used to complete this type of analysis for any other state.

The most recent data show 365 cities in California served by one or more collection systems. These cities are predominantly small, with sewered populations of less than 25,000.

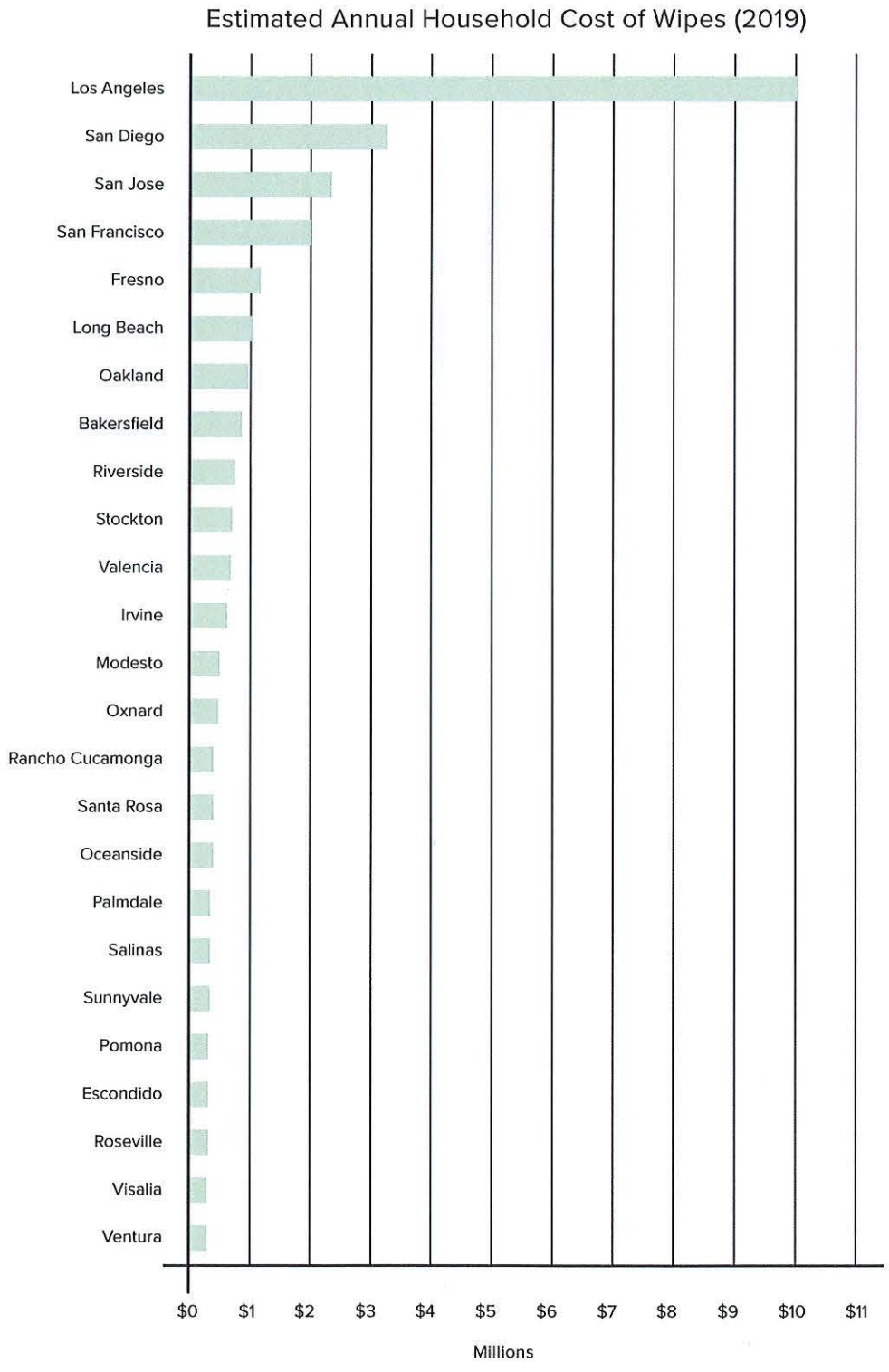
Number of California Cities with Collection Systems by Population Ranges



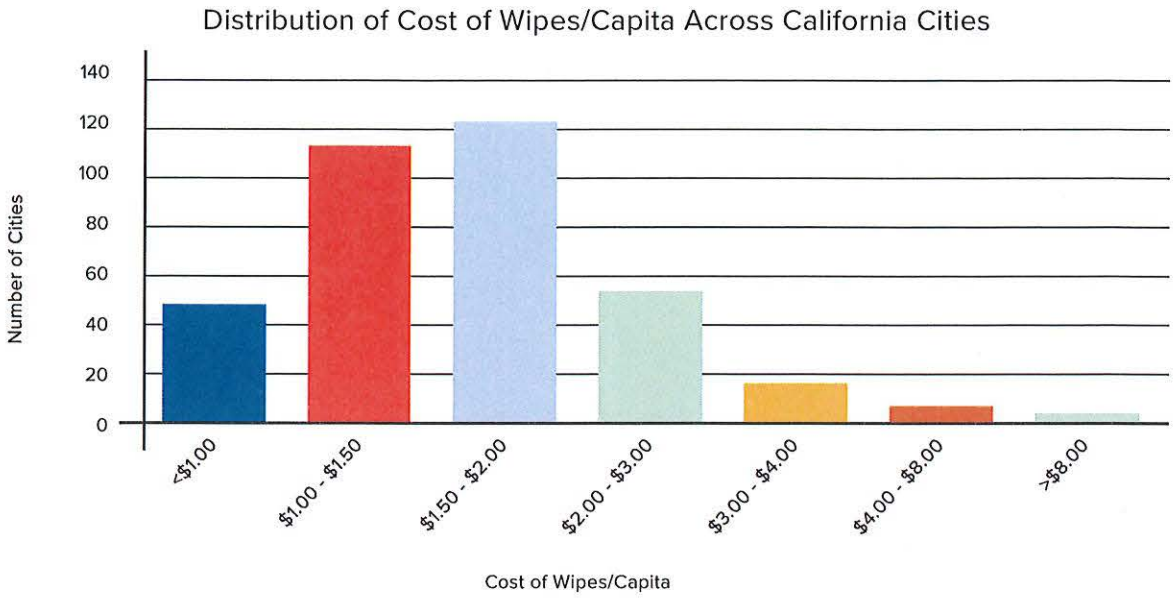
Ten of the largest of these cities account for nearly half of the total cost of wipes for all cities with collection systems in California, $47,012,874 a year.

Cost of Wipes in California Cities: Top Ten

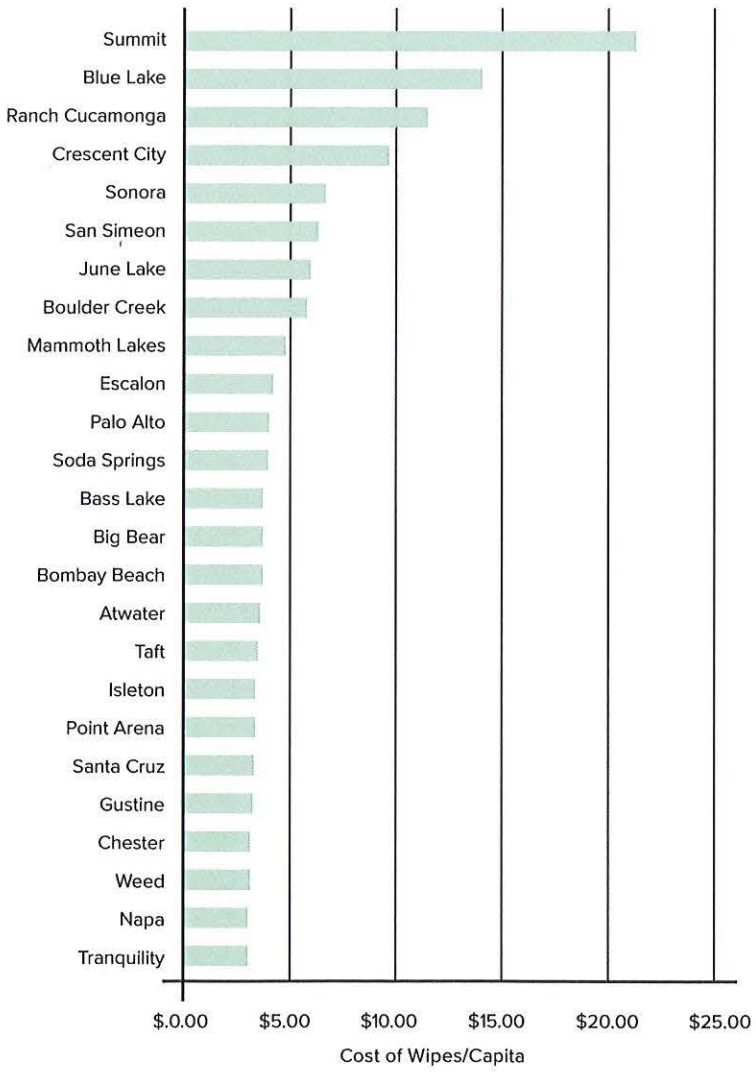
The cost of wipes across these 365 cities ranges from about $100 a year to about $9 million a year, with an average cost of wipes of $129,000 a year. But since there are so many more small and medium sized cities than there are larger ones, the median cost of wipes is much smaller, about $23,000 a year. The graphic below presents cost of wipes for the top 25 California cities:

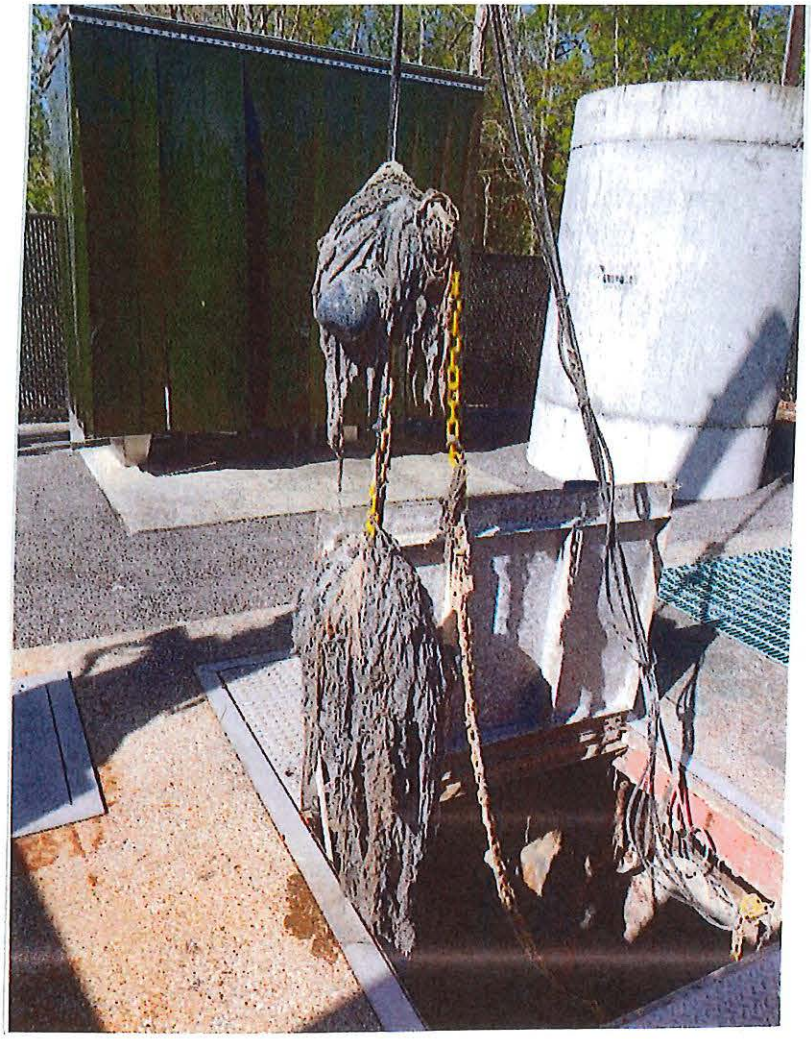


Wipes cost the average individual in California about $1.85 a year, although that figure varies considerably from city to city, with people in the highest cost city paying $21.39 a year and those in the lowest cost city paying $0.23 a year.



The cost of wipes per capita tends to be higher in smaller cities. In fact, the ten most expensive cities in terms of cost of wipes/capita have populations less than 7,500. With the exception of Palo Alto, Santa Cruz, Atwater, and Napa, the 25 cities with the highest cost of wipes per capita all have populations less than 10,000.





damage to pumps caused by wipes/rags improperly discharged into sewer