



Special Research Study

Nationwide Pipe Length and Cost Savings Evaluation

Client: American Chemistry Council

**BCC Research
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Wellesley, Massachusetts
USA**

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EXECUTIVE SUMMARY

The American Chemistry Council (ACC) retained BCC Research to develop a study that presents information on markets for pipe used in municipal water supply and stormwater systems on a nationwide basis. BCC has to date completed several municipality focused regional studies in representative states in the US Midwest, South, and Southeast. These documented historic differences in costs of pipe depending on the specifications for type of pipe material noted in municipality-issued requests for proposals (RFPs). In each of these regions previously investigated by BCC Research, it is evident that municipalities where there is an open bidding process and plastic pipe is included in the specifications of materials, there is a significant cost advantage to the municipality and its taxpayers.

BCC Research compiled data from these prior studies, along with additional nationwide pipe installation data available internally to BCC Research, and from pipe installation data provided by various other municipalities, the federal government, trade associations, corporate data, and industry organizations and publications. These data were used to quantify the overall national market for pipe installation, including historic data for 2014 through 2016, and future projected values for 2017 through 2026, reported both in terms of linear feet of installed pipe and pipe capital cost. These activities were completed for both water supply and stormwater pipe applications.

Results indicate robust and significant taxpayer and ratepayer cost savings from a transition to a wholly open competition process, in comparison to a closed competition process.¹ For water supply pipes, the following cost savings of an open competition process in comparison to business as usual were generated based on prior studies of municipalities in Ohio, North and South Carolina, and Michigan, completed by BCC Research. These indicated the following pipe capital cost savings for utilizing wholly open competition:

- 8-inch pipe: \$12.66 savings per foot
- 12-inch pipe: \$22.87 savings per foot
- Weighted average of 8-inch and 12-inch according to existing pipe installations: **\$15.93 savings per foot**

These values translate into the following weighted average cost savings per mile of installed pipe:

- **\$84,102 in savings per mile**

As shown in the tables below, cumulative US water pipe installations during 2017 through 2026 will reach 244,822 miles. This translates into a total savings potential of:

¹ In total, we estimate that 22% of municipalities use an open competition process, while the remaining 78% use a closed competition process. This proportion was determined based on a review/survey of over 250 bid documents and other available data from select municipalities nationwide, and their procurement processes. Please refer to the Methodology section of the full report for additional details.

- **\$20,590,000,000 in 2017 to 2026 pipe cost savings** potential that could be realized by transitioning to wholly open competition process.

For stormwater conveyance pipes, the following cost savings of an open competition process in comparison to business as usual were generated based on a prior study of municipalities in Texas, completed by BCC Research. These indicated the following pipe capital cost savings for utilizing wholly open competition:

- 18-inch pipe: \$23.50 savings per foot
- 24-inch pipe: \$29.57 savings per foot
- 36-inch pipe: \$48.84 savings per foot
- Weighted average of 18-inch, 24-inch, and 36-inch pipe according to existing pipe installations: **\$35.20 savings per foot**

These values translate into the following weighted average cost savings per mile of installed pipe:

- **\$185,833 in savings per mile**

As shown in the tables below, cumulative US water pipe installations during 2017 through 2026 will reach 120,209 miles. This translates into a total savings potential of:

- **\$22,338,000,000 in 2017 to 2026 pipe cost savings** potential that could be realized by transitioning to wholly open competition process.

Table A: Water Supply Existing (2016) and Forecast (2017, 2021, and 2026) Annual and Cumulative Pipe Installation (Linear Feet per Year)

Pipe Diameter	2016	2017 (f)	2021 (f)	2026 (f)	CAGR (2017-2026)	Cumulative Total, 2017-2026
8"	47,058,786	52,780,579	83,771,407	150,174,737	11.0%	939,178,362
12"	17,711,765	19,865,307	31,529,489	56,522,062	11.0%	353,483,541
Total	64,770,551	72,645,886	115,300,895	206,696,799	11.0%	1,292,661,903

Source: BCC Research.

Table B: Stormwater Existing (2016) and Forecast (2017, 2021, and 2026) Annual and Cumulative Pipe Installation (Linear Feet per Year)

Pipe Diameter	2016	2017 (f)	2021 (f)	2026 (f)	CAGR (2017-2026)	Cumulative Total, 2017-2026
18"	13,711,941	14,836,320	20,334,581	30,155,848	7.4%	216,979,355
24"	16,044,015	17,359,624	23,793,008	35,284,637	7.4%	253,882,362
36"	10,353,817	11,202,830	15,354,539	22,770,528	7.4%	163,840,011
Total	40,109,773	43,398,774	59,482,129	88,211,013	7.4%	634,701,728

Source: BCC Research.

INTRODUCTION

PURPOSE AND METHODOLOGY

The primary goal of this study was to evaluate the potential cost savings, on a nationwide basis, that could be achieved if all US municipalities followed an open competition process for the bidding and purchase of pipe used for water supply and stormwater conveyance. To achieve this goal, BCC Research assembled US nationwide annual pipe installation data for the 2014 to 2016 period, along with typical pipe costs for municipalities that followed either an open or closed competition process. Specifically, data were collected for the following pipe categories:

- Water supply (force main):
 - 8-inch diameter pipe
 - 12-inch diameter pipe
- Stormwater conveyance (gravity feed):
 - 18-inch diameter pipe
 - 24-inch diameter pipe
 - 36-inch diameter pipe

Based on current and anticipated future industry trends, anticipated pipe installation lengths were estimated for a 10-year period: 2017 through 2026. Total pipe market values were also estimated. Pipe values were estimated based on 2015 average pipe capital costs, which were assumed to be fixed / unadjusted for inflation during the projection period. This approach was taken to ensure that projected cost savings associated with shifting to only open bidding in the US were estimated as conservatively as possible.

Data to support this analysis were assembled from a variety of sources. These included:

- Prior studies by BCC Research investigating pipe installation and cost for open and closed competition municipalities in the following states: Ohio, North and South Carolina, Michigan, and Texas.
- Packaged BCC Research market research analyses relevant to pipes and pipelines, including:
 - US Market for Plastic Pipe (PLS053A)
 - Water Infrastructure Repair Technologies: North American Market (ENV026A)
 - Water and Wastewater Technologies: Global Markets (ENV008D)
 - Water Infrastructure Repair Technologies: Global Markets (ENV027A)
- Pipe installation data available from industry and government organizations including
 - Cities and other municipalities
 - Federal government (US EPA, US Census Bureau)
 - Trade publications
 - Industry organizations (i.e., AWWA)

- Corporate data
 - Corporate revenue data
 - Corporate buyout data

Markets were evaluated using a combination top-down and bottom-up analysis. Overall markets were estimated based on available data on regional pipe installation rates. These were benchmarked against data from specific cities and municipalities, by calculating typical per capita annual pipe installation rates, and projecting those nationwide. Pipe cost estimates for closed and open competition municipalities, for each pipe category and diameter, were developed using data previously developed by BCC Research for ACC. Future projections of market values considered national level projections for pipe infrastructure replacement and new installations. However, these were tempered based on historic deployment rates and likely future pipe replacement and installation rates, in lieu of theoretical market potential.

The proportion of US municipalities that subscribe to an open competition, rather than a closed competition bid process is important in evaluating the potential impact of a possible transition from a closed to a wholly open competition process. Precisely determining this proportion presents several challenges, because municipalities may change their bidding requirements over time, for specific projects, or may follow an open competition process for some project categories but not others. To gain a better understanding of this proportion, BCC Research reviewed / surveyed over 250 bid documents and other available data from select cities and procurement processes nationwide. Based on results from this effort, it was estimated that approximately 22% of municipalities follow a strictly open competition process, while the remaining 78% follow a closed or constrained competition process, where adherence to a specific pipe material is required under the solicitation and/or as municipal standard policy most of the time. These percentages also vary regionally. Based on available data and conversations with industry experts, we estimate that these proportions may vary substantially, on a state by state basis, reaching as high as 90% closed or constrained, or to as much as 60% open, in select markets. This regional variability, in turn, informs the degree to which transition to a wholly open competition process could benefit municipalities (and thereby ratepayers) in a given region.

WATER SUPPLY PIPE (FORCE MAINS)

According to the US EPA and the American Water Works Association (AWWA), domestic water supply infrastructure, including pipes, is in dire need of updating. The US EPA, in its 2011 Drinking Water Infrastructure Needs Survey and Assessment,² identified a 20-year need of \$384.2 million in federal capital investment in water infrastructure (water treatment, storage tanks, pipes, appurtenances) for US water systems to continue to provide safe drinking water to the public. The AWWA characterized the need as much larger, also considering need for investment dollars sourced outside of the federal government. Considering replacement of ageing

² US EPA, 2013. Drinking Water Infrastructure Needs Survey and Assessment: Fifth Report to Congress. EPA 816-R-13-006. April, 2013.

infrastructure alongside demand for new facilities, the AWWA identified pipe infrastructure investment demands of about \$35 billion per year in 2015, increasing to nearly \$50 billion per year in 2045.³ Assuming that pipe capital costs represent approximately 35% of this total needed investment, consistent with data collected by BCC Research, this translates to up to a \$17.5 billion per year investment needed in pipe capital costs to support water infrastructure.

Within this framework, BCC Research collected and compiled national data on pipe infrastructure investments. Results from this effort show that actual investment in pipe replacement and new pipe installation is lagging far behind the targets identified by AWWA. In 2015, for example, total water system pipe investment reached \$7.96 billion, indicating that substantial additional investment in pipe infrastructure will be needed. This investment will translate directly into increased demand for allocations of taxpayer dollars from the federal government, combined with increased revenue needs – and ratepayer rate hikes – for water utilities.

In a series of focused studies completed to date, BCC Research considered the effects of municipal bid processes on installed pipe capital costs. These studies focused on a subset of the most commonly installed water supply pipe diameters – 8-inch and 12-inch, including plastic and ductile iron materials. Findings from these studies indicated that municipalities that followed an open competition process, agnostic of pipe material, enjoyed reduced pipe costs above those that followed a closed competition process, where the pipe material was pre-determined before going out to bid. Cost reductions were observed irrespective of pipe material that was ultimately selected for project installation.

Results from the present effort scale up those cost reduction findings to a national level, based on current and anticipated future pipe replacement markets. As shown in the tables below, during 2016, almost 65 million linear feet (12,300 miles) of 8-inch and 12-inch water supply pipe were installed in the US, translating to a value of \$3.7 billion. Based on anticipated market demand through 2026, annual installed pipe lengths will advance considerably (although are expected to remain short of AWWA's needs estimate), reaching nearly 206 million linear feet (39,000 miles) of 8-inch and 12-inch pipe installed during 2026, at a value of \$11.7 billion. In total, cumulative pipe installations during 2017 through 2026 will total 1.29 billion linear feet (244,000 miles) of 8-inch and 12-inch pipe, with a value of \$73 billion.

This estimated \$73 billion represents a business as usual scenario, where an estimated 78% of municipalities nationwide rely on a closed competition bid process, while only 22% rely on open competition.⁴ Comparing these numbers, which are reflected in the tables below, to hypothetical costs under a wholly open competition scenario yield a significant reduction in pipe capital costs through 2026.

³ AWWA, 2012. Buried No Longer: Confronting America's Water Infrastructure Challenge.

⁴ This proportion was determined based on a review/survey of over 250 bid documents and other available data from select municipalities nationwide, and their procurement processes. Please refer to the Methodology section of the full report for additional details.

The following cost savings of an open competition process in comparison to business as usual were generated based on prior studies of municipalities in Ohio, North and South Carolina, and Michigan, completed by BCC Research. These indicated the following pipe capital cost savings for utilizing wholly open competition:

- 8-inch pipe: \$12.66 savings per foot
- 12-inch pipe: \$22.87 savings per foot
- Weighted average of 8-inch and 12-inch according to existing pipe installations: \$15.93 savings per foot.

These values translate into the following weighted average cost savings per mile of installed pipe:

- \$84,102 in savings per mile

As shown in the tables below, cumulative US water pipe installations during 2017 through 2026 will reach 244,822 miles. This translates into a total savings potential of:

- **\$20,590,000,000 in 2017 to 2026 pipe cost savings** potential that could be realized by transitioning to wholly open competition process.

Table 1: Installed Water Supply Pipe Length, 2014-2016 (Linear Feet)

Pipe Diameter	2014	2015	2016	CAGR
8"	39,247,733	42,538,247	47,058,786	9.5%
12"	14,771,877	16,010,345	17,711,765	9.5%
Total	54,019,610	58,548,592	64,770,551	9.5%

Source: BCC Research.

Table 2: Projected Water Supply Pipe Installations, 2017-2026 (Linear Feet)

Pipe Diameter	2017	2021	2026	CAGR (2017-2026)	Cumulative Total, 2017-2026
8"	52,780,579	83,771,407	150,174,737	11.0%	939,178,362
12"	19,865,307	31,529,489	56,522,062	11.0%	353,483,541
Total	72,645,886	115,300,895	206,696,799	11.0%	1,292,661,903

Source: BCC Research.

Figure 1: Pipe Materials for Water Supply Force Mains, 2014 to 2016

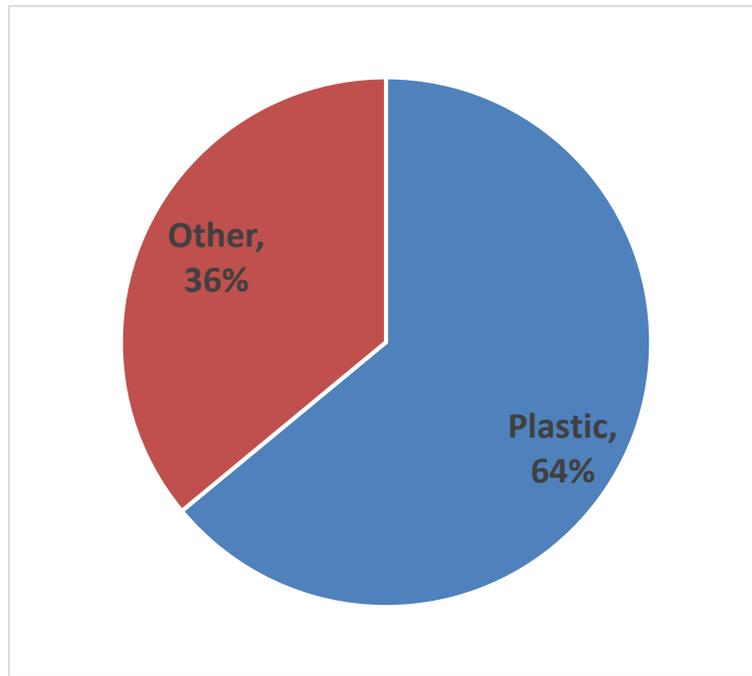


Table 3: Installed Water Supply Pipe Market Value, 2014-2016 (\$ Millions)

Pipe Diameter	2014	2015	2016	CAGR
8"	\$ 2,076	\$ 2,250	\$ 2,489	9.5%
12"	\$ 977	\$ 1,059	\$ 1,171	9.5%
Total	\$ 3,053	\$ 3,309	\$ 3,660	9.5%

Source: BCC Research.

Table 4: Projected Water Supply Pipe Market Value, 2017-2026 (\$ Millions)

Pipe Diameter	2017	2021	2026	CAGR (2017-2026)	Cumulative Total, 2017-2026
8"	\$ 2,792	\$ 4,431	\$ 7,943	11.0%	\$49,676
12"	\$ 1,314	\$ 2,085	\$ 3,738	11.0%	\$23,377
Total	\$ 4,105	\$ 6,516	\$ 11,681	11.0%	\$73,053

Source: BCC Research.

STORMWATER CONVEYANCE PIPE (GRAVITY FEED)

A similar study was conducted for gravity feed stormwater conveyance pipe, in order to determine if open competition could produce similar cost savings results in that space. BCC Research followed a similar methodology, as discussed above, for stormwater as compared to water supply. Results from the stormwater effort, as shown in the tables below, indicate that in 2016, almost 30 million linear feet (5,600 miles) of the most commonly installed diameters of stormwater pipe (18-inch, 24-inch, and 36-inch) were installed in the US, translating to a value of \$2.99 billion. Based on anticipated market demand through 2026, annual installed pipe lengths will advance considerably, reaching nearly 88 million linear feet (16,700 miles) of 18-inch, 24-inch, and 36-inch pipe installed during 2026, at a value of \$6.5 billion. In total, cumulative pipe installations during 2017 through 2026 will total 634 million linear feet (120,000 miles) of pipe, with a value of \$47 billion.

This estimated \$47 billion represents a business as usual scenario, where an estimated 78% of municipalities nationwide rely on a closed competition bid process, while only 22% rely on open competition.⁵ Comparing these numbers, which are reflected in the tables below, to hypothetical costs under a wholly open competition scenario yield a significant reduction in pipe capital costs through 2026.

The following cost savings of an open competition process in comparison to business as usual were generated based on a prior study of municipalities in Texas, completed by BCC Research. These indicated the following pipe capital cost savings for utilizing wholly open competition:

- 18-inch pipe: \$23.50 savings per foot
- 24-inch pipe: \$29.57 savings per foot
- 36-inch pipe: \$48.84 savings per foot
- Weighted average of 18-inch, 24-inch, and 36-inch pipe according to existing pipe installations: \$35.20 savings per foot

These values translate into the following weighted average cost savings per mile of installed pipe:

- \$185,833 in savings per mile

As shown in the tables below, cumulative US water pipe installations during 2017 through 2026 will reach 120,209 miles. This translates into a total savings potential of:

- **\$22,338,000,000 in 2017 to 2026 pipe cost savings** potential that could be realized by transitioning to wholly open competition process.

⁵ This proportion was determined based on a review/survey of over 250 bid documents and other available data from select municipalities nationwide, and their procurement processes. Please refer to the Methodology section of the full report for additional details.

Table 5: Installed Stormwater Conveyance Pipe Length, 2014-2016 (Linear Feet)

Pipe Diameter	2014	2015	2016	CAGR
18"	11,698,742	12,743,439	13,711,941	8.3%
24"	13,688,418	14,910,794	16,044,015	8.3%
36"	8,833,661	9,622,507	10,353,817	8.3%
Total	25,387,160	27,654,234	29,755,956	8.3%

Source: BCC Research.

Table 6: Projected Stormwater Conveyance Pipe Length, 2017-2026 (Linear Feet)

Pipe Diameter	2017	2021	2026	CAGR (2017-2026)	Cumulative Total, 2017-2026
18"	14,836,320	20,334,581	30,155,848	7.4%	216,979,355
24"	17,359,624	23,793,008	35,284,637	7.4%	253,882,362
36"	11,202,830	15,354,539	22,770,528	7.4%	163,840,011
Total	43,398,774	59,482,129	88,211,013	7.4%	634,701,728

Source: BCC Research.

Table 7: Installed Stormwater Conveyance Pipe Length, 2014-2016 (\$ Millions)

Pipe Diameter	2014	2015	2016	CAGR
18"	\$700	\$762	\$820	8.3%
24"	\$886	\$966	\$ 1,039	8.3%
36"	\$965	\$ 1,052	\$ 1,132	8.3%
Total	\$ 2,552	\$ 2,780	\$ 2,991	8.3%

Source: BCC Research.

Table 8: Projected Stormwater Pipe Capital Cost, 2017-2026 (\$ Millions)

Pipe Diameter	2017	2021	2026	CAGR (2017-2026)	Cumulative Total, 2017-2026
18"	\$887	\$ 1,216	\$ 1,804	7.4%	\$12,979
24"	\$ 1,124	\$ 1,541	\$ 2,285	7.4%	\$16,440
36"	\$ 1,224	\$ 1,678	\$ 2,489	7.4%	\$17,907
Total	\$ 3,236	\$ 4,435	\$ 6,577	7.4%	\$47,327

Source: BCC Research.