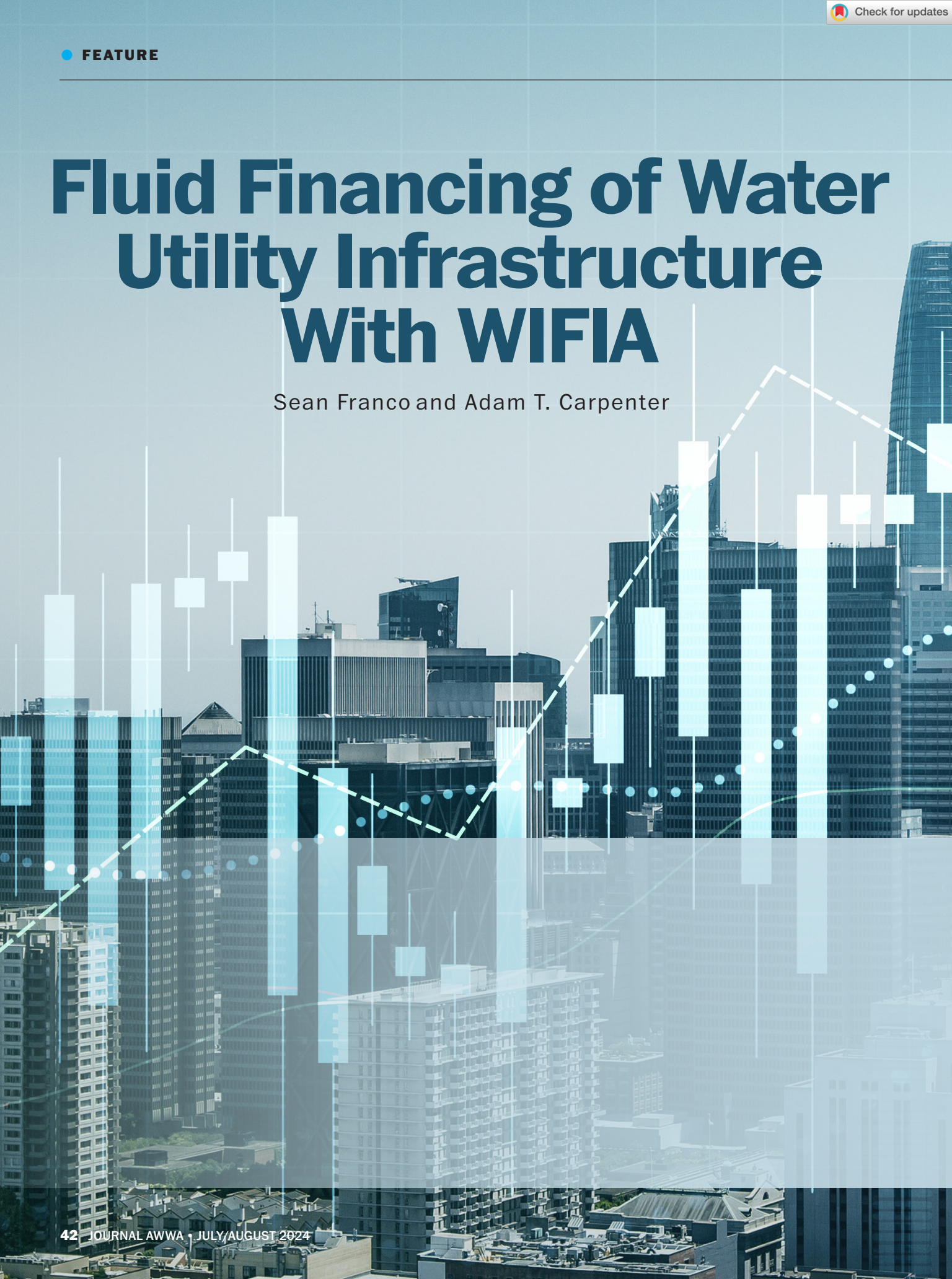
Fluid Financing of Water Utility Infrastructure With WIFIA

Sean Franco and Adam T. Carpenter



Key Takeaways

The Water Infrastructure Finance and Innovation Act (WIFIA) is a US Environmental Protection Agency finance program that has gained bipartisan support over its decade of existence.

WIFIA is designed to accelerate nationally or regionally significant infrastructure projects by providing low-interest loans for water projects.

Loan amounts vary across project types, but not among project types per capita.

Generally, stormwater and drinking water project types have lower loan amounts, while wastewater and reuse project types have a wider range.

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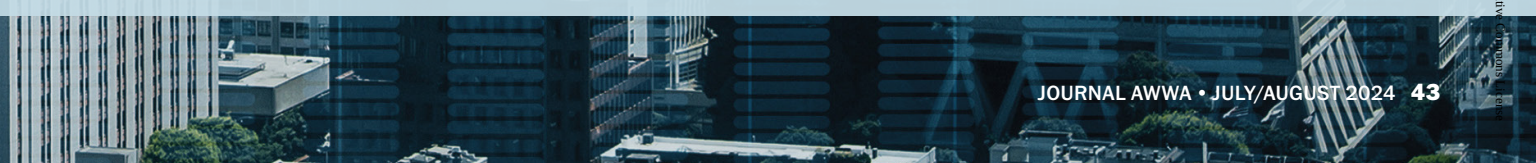

Water infrastructure is needed to treat and deliver safe drinking water, collect and treat wastewater, manage stormwater, prepare water for reuse, and other activities. In the United States, this infrastructure is built to meet the requirements of public health and environmental laws such as the Safe Drinking Water Act and the Clean Water Act. Even with clear public benefits, water infrastructure is typically undervalued socially, which makes public and private financing of water utility projects challenging (Gebhardt et al. 2022, OECD 2017). When a utility needs to finance capital improvements, a lower interest rate or more generous financing terms will lower the overall cost, reducing the amount that will need to be paid back over time.

State revolving funds (SRFs) are a means to address water quality projects. SRFs are financed from a combination of federal grants and require state matching contributions. SRFs are typically used to mitigate immediate challenges to health, environment, or regulatory compliance, and they are prohibited from financing projects related to infrastructure expansion or repair not related to health or compliance.

The Water Infrastructure Finance and Innovation Act (WIFIA) program (PL 113–121 2014) supplements SRFs with broader project eligibility and annual federal funding sufficient to support loans for much larger projects. (EPA 2024, 2023, 2020; Gebhardt et al. 2022; Humphreys 2020; Vedachalam & Geddes 2017). The WIFIA program can bridge financing gaps for growth projects or programs that require additional financing beyond SRFs funds.

WIFIA was originally established by Congress as a five-year pilot program under the Water Resources Reform and Development Act of 2014 (PL 113-121). WIFIA legislation was based on the highly successful Transportation Infrastructure Finance and Innovation Act (DOT 2023) passed in 1998 to advance surface transportation capital projects.

General Terms

The WIFIA program offers loans at a fixed interest rate not less than the yield on US Treasury State and Local Government Series interest rates, typically with 20- to 30-year rates (US Treasury 2023). The program offers a maximum maturity period of 35 years after the substantial completion of the project, with a deferral option of up to five years.

The WIFIA program was intended to complement financing for water infrastructure projects like tax-exempt debt, but while it can finance up to 49% of eligible project costs, the total federal financing contributions to a WIFIA-assisted project cannot exceed 80% of total project costs. Additionally, if projects have combined financing with SRFs, the SRF interest rates will be matched to the project's WIFIA interest rate.

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The minimum project sizes are $5 million for communities serving 25,000 people or fewer, and $20 million for communities serving more than 25,000 people. Borrowers can meet these requirements by combining multiple smaller projects under a single loan with a common security pledge (EPA 2024, 2023, 2020; Gebhardt et al. 2022; Humphreys 2020; Ryan 2023, 2020; OECD 2017; Vedachalam & Geddes 2017).

The WIFIA program depends on annual appropriations, and per the budget scoring treatment of the loan programs under the Federal Credit Reform Act, those appropriations need only finance the subsidy cost of the loans (i.e., the calculated risk of loss to the federal government as lender). As a result, the program offers a maximum maturity period of 35 years after the substantial completion of the project, with a deferral option of up to five years. With WIFIA assistance capped at 49% of project costs, this means each dollar appropriated to the WIFIA program supports more than $200 in water investment.

Application Process

A wide range of applicants have secured WIFIA loans, including state, corporate, and private sector utilities. Applicants must submit a letter of interest (LOI) to EPA addressing project impacts, technical feasibility, and borrower creditworthiness. Project impacts examine how the construction serves EPA's designated priorities, which include considerations for economically stressed communities, climate change, drought, and cybersecurity. Technical feasibility involves the scope and level of engineering planning for particular projects. Borrowers must have an investment-grade creditworthiness evaluation, which could be performed internally at EPA or at an accredited rating agency (EPA 2024, 2023, 2020; Gebhardt et al. 2022; OECD 2017).

The Office of Management and Budget (OMB) also conducts a budget scoring analysis to ensure compliance with the Federal Credit Reform Act of 1990 (PL 101-508), consistent with OMB's June 2020 guidance on this subject. After evaluations by EPA and OMB, projects that satisfy

all these requirements are invited to apply to the program. With the application, project applicants submit a preliminary rating opinion letter. LOIs are a zero-fee appraisal by EPA, in which successful applicants are invited to apply to the program.

Currently, the WIFIA program has successfully awarded more than 100 loans, with numerous pending applications. EPA reviews applications on a rolling basis, and holding one WIFIA loan does not preclude applying for a second should there be another appropriate project. Borrowers have the opportunity to roll an unmatured WIFIA loan into a master loan on the basis of additional criteria (EPA 2024, 2023, 2020).

Program Impacts

The relatively high credit rating of water utilities reduces the subsidy costs of WIFIA loans. One study found that every $1 in water infrastructure investment generally stimulates around $6 (in 2018 dollars) of economic activity (GAO 2022, Mortimer & Leongini 2018). Additionally, from 2018 to 2023, the WIFIA program facilitated a total of $19 billion in credit assistance for essential infrastructure projects, out of total project costs around $43 billion, creating 143,000 jobs that serve 63 million people (EPA 2024, 2023; Humphreys 2020; Vedachalam & Geddes 2017). For reference, in 2020, The WIFIA program was appropriated $60 million (nominal) (Humphreys 2020). This study analyzes awarded application project overviews to showcase project attributes. Dollar amounts were adjusted for inflation to 2023 dollars using the average consumer price index (CPI) from the Bureau of Labor Statistics (BLS) from each project's loan year (EPA 2024, 2023; Webster 2024).

Analysis

This analysis included more than 100 projects that were awarded WIFIA assistance through December 2023. Pending project applications under EPA review were not included in this study. Data were gathered using a Python script scraping information from awarded loan project overview PDF files from EPA's WIFIA website (EPA 2024). The script extracted loan amounts, total project costs, population served, number of jobs created, project locations, and the borrower information. Each loan project overview was also analyzed for project type keywords: "stormwater," "drinking water," "wastewater," and "reuse." Project overviews that contained multiple keywords were verified for the most pervasive project type by project description and project benefits section evaluations. Descriptive statistical analyses of project types are found in Tables 1 and 2. Maps were created to showcase the distributions of key variables, shown in Figures S1, S2, S3, and S4 (this information has been collected separately and is available for download as supporting information).

Only two observations were removed from the data. Baltimore's wastewater application projected no additional jobs created (which was confirmed through consulting with an EPA WIFIA analyst); its inclusion is

> **Wastewater and reuse projects had wider and higher ranges of loan amounts than stormwater and drinking water projects.**

Category Totals by Project Type

Project Type	Count	Jobs Created	WIFIA Loan—*$ billion*	Population Served—*million*	Project Costs—*$ billion*
Reuse	18	29,415	5.3	22.0	10.8
Wastewater	40	46,929	8.7	28.4	18.3
Drinking water	37	40,437	5.6	29.5	12.6
Stormwater	10	8,921	1.4	7.5	3.1

WIFIA—Water Infrastructure Finance and Innovation Act

Table 1

Summary Statistics of the Data Set After Outliers Were Removed

Variables	Minimum	Q1	Median	Mean	Q3	Maximum
WIFIA Loan—*$ million*						
Reuse	50.6	106.7	243.4	296.1	425.8	884.1
Wastewater	19.3	82.1	190.5	217.9	317.1	852.7
Drinking water	13.0	37.3	91.7	153.3	217.7	821.5
Stormwater	41.0	50.6	74.5	142.3	104.9	642.9
Project Costs—*$ million*						
Reuse	103.4	217.9	526.9	600.0	868.4	1,650
Wastewater	41.1	167.7	394.2	459.3	656.6	1,741
Drinking water	27.0	76.8	187.0	341.2	463.9	1,582
Stormwater	84.0	111.1	165.3	310.9	216.6	1,469
Population Served—*n*						
Reuse	10,600	185,500	813,000	1.2M	1.7M	6.4M
Wastewater	10,574	189,750	358,500	711,998	762,500	5.0M
Drinking water	29,302	136,000	277,000	798,010	764,000	5.8M
Stormwater	90,000	192,500	474,431	752,570	1.3M	2.0M
Jobs Created—*n*						
Reuse	266	591	1,265	1,634	2,351	4,800
Wastewater	95	390	1,018	1,173	1,800	3,300
Drinking water	100	288	565	1,092	1,761	4,745
Stormwater	70	275	454	892	825	4,185

M—million, Q—quantile, WIFIA—Water Infrastructure Finance and Innovation Act

Table 2

unrepresentative, so it was removed. New Jersey's loan amount finances projects across the state, which was the first awarded state WIFIA (SWIFIA) loan. New Jersey's SWIFIA loan is not comparable on the same scale with the remainder of the projects, so it was excluded from the analysis. For reference, compared with the other observations on job creation, New Jersey's application estimate is about four times the next highest amount.

The CPI from the BLS was applied to convert all loans into 2023 amounts. To ensure the accuracy of this analysis, borrowers with multiple loans were amended into their master loan arrangements. Each loan that was part of the master loan was adjusted using the corresponding average CPI year adjustment to 2023 dollars (Webster 2024, EPA 2020).

To showcase the relationship of the variables for each observation, a linear regression was specified according to the WIFIA loan amount, population served, jobs created, and project type. Initially, a simple linear regression was created, with step-wise inclusions of variables and transformations to determine a best-fit model. An analysis of variance (ANOVA) test compared each regression with inclusions in Table 3 to determine the best-fit model. As specified in model 3 of Table 3, a multilinear regression was the best-fit model, shown in Eq 1.

$$\log(\text{WIFIA LOAN}) = \beta_1 \log(\text{POPULATION SERVED}) + \beta_2 \log(\text{JOBS CREATED}) + \beta_3 \text{PROJECT TYPE} + \epsilon \quad (1)$$

Table S1 (see tables S1 and S2 separately available for download as supporting information) shows the regression results. A robust linear regression was also

performed on the basis of model 3 to provide a lower bound range of coefficient results to complement the multiple linear regression model shown in Table S1.

Results

The four main project types—stormwater, drinking water, wastewater, and reuse projects—are shown in Figure 1, along with their WIFIA loan amount distributions. Tables 1 and 2 show project type descriptive statistics. Stormwater and drinking water project loans have lower medians and a narrower 25th to 75th percentile (inter-quartile) range. In comparison, wastewater and reuse project loans have higher medians and a wider loan inter-quartile range. Reuse project types are a combination of project types, which may explain why it has the widest loan inter-quartile range, as referenced in Figure 1. Within the data set of successful, closed loan applications, these inter-quartile ranges show ballpark, historical loan ranges.

The bubble plot in Figure 2 shows how loan amounts vary by project type and serviced population. Wastewater and reuse projects had wider and higher ranges of loan amounts than stormwater and drinking water projects. The WIFIA loan amounts by project type are mapped in Figure S1, while Figure S2 maps population served by project type.

Additionally higher counts of jobs created by project type are observed for reuse, wastewater, and drinking water projects are shown in Figure S3. Figure S4 shows per capita loan amounts across all project types. Of all projects, 79% are below $1,000 per capita served, which suggests that loan per capita are similar among all four project types. However, this finding also highlights a population density divide, where low- and high-density populated areas have similar per capita costs.

ANOVA Regression Results

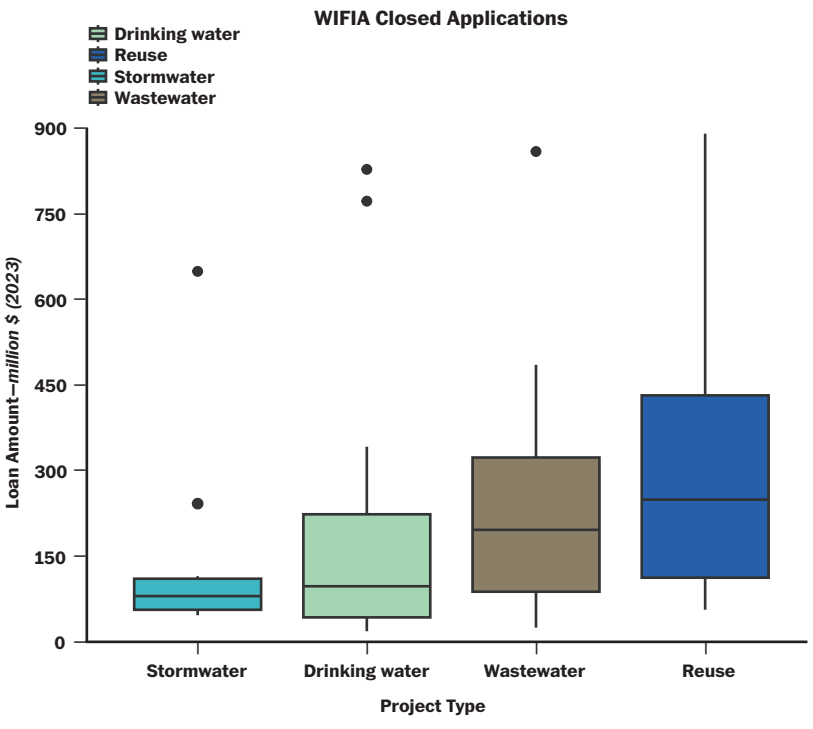
Model	Res Df	RSS	Df	Sum of Squares	*F*	Pr(>*F*)
1	103	91.89		—	—	—
2	102	25.13	1	66.76	306.16	<0.001
3	99	21.59	3	3.55	5.42	0.002

ANOVA—analysis of variance, df—degrees of freedom, *F*—*F*-test result, Pr(>*F*)—*p*-value, res df—residual degrees of freedom, RSS—residual sum of squares

Model 3 was selected as the best fit.

Table 3

Boxplots of WIFIA Loan Amounts by WIFIA Project Types



WIFIA—Water Infrastructure Finance and Innovation Act

Figure 1

Other key information and variables can better predict loan amounts. EPA's evaluation criteria in the LOIs include project impacts, project feasibility, and

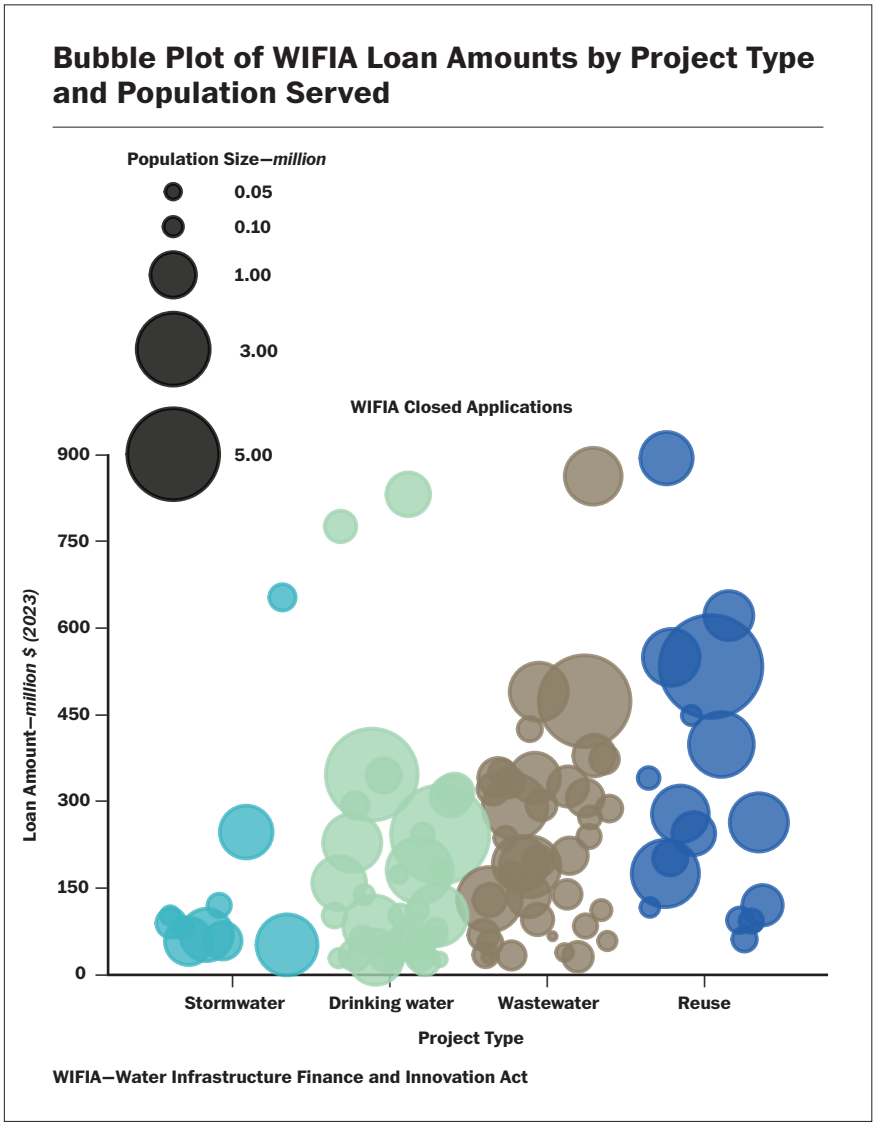


Figure 2

creditworthiness. In the absence of the specifics of how EPA evaluates these criteria, which are not publicly available, the regression fit (see Eq 1) is the best approximation (see Table 3 on ANOVA).

Additionally, with all variables held equal, a 10% increase in population served increases the WIFIA loan amount by 0.5% to 1.5%. A 10% increase in jobs created increases the loan amount by 7.7% to 9.1%. Holding all variables equal, wastewater and reuse project types increase the loan amount by approximately 0.2% to 0.4%.

Fitting median population served (from Table 2) and jobs created by project types into Eq 1 for both the ordinary least squares and robust linear regressions (see Table S1) yields informed, predicted WIFIA high- and low-loan ranges. Reuse projects exhibited a predicted WIFIA loan of $227.7 million to $254.4 million. Wastewater projects exhibited a predicted WIFIA loan range of $176.8 million to $186.3 million. Drinking water and stormwater projects exhibited a predicted WIFIA loan range of $76.7 million to $82.1 million and $81.5 million to $90.0 million, respectively (Table S2). These findings align with Tables 1 and 2 and Figures 1 and 2.

Insights for New WIFIA Applicants

Investment in water infrastructure generally stimulates economic activity and contributes to US job creation (GAO 2022, Mortimer & Leongini 2018). EPA's WIFIA program offers individualized, low-interest federal loans to finance infrastructure projects. Since WIFIA's first awarded loan in 2018, the program has provided $19 billion in credit assistance to support $43 billion in total project costs, creating 143,000 jobs and supporting water systems that serve 63 million Americans (EPA 2024, 2023, 2020).

Of the four major project types, reuse projects on average had the largest loans but also the greatest variety of loan sizes. Wastewater had the second largest loan sizes, followed by drinking water and then stormwater. For each project type, the WIFIA program finances a wide range of utility service populations. Across the four project types, 79% of WIFIA loans were below $1,000 per capita. There is a wide geographic distribution of WIFIA loans, with several loan clusters in the Southern and Bay areas of California and the Baltimore–Washington corridor.

The regressions show that a 10% increase in population served resulted in a 0.5% to 1.5% increase in the WIFIA loan amount. Similarly, a 10% increase in jobs led to a 7.7% to 9.1% increase in the WIFIA loan amount. Wastewater and reuse project types increase the loan amount between 0.2% to 0.4%. Predicted median loan ranges (based on

Since 2018, WIFIA has provided $19 billion in credit assistance to support $43 billion in total project costs, creating 143,000 jobs and supporting water systems that serve 63 million Americans.

median population served and jobs created in Table 2) for project types are as follows:

- $176.8 million to $186.3 million for wastewater
- $227.7 million to $254.4 million for reuse
- $76.7 million to $82.1 million for drinking water
- $81.5 million to $90.0 million for stormwater

Reuse and wastewater projects exhibit larger WIFIA loans, with a wider range of loans compared with drinking water and stormwater projects, which exhibit lower loan amounts and a smaller loan range. These relationships and predictions offer insight for new applicants into the WIFIA loan application process based on estimates from successfully awarded loans. However, each applicant enters a tailored loan agreement based on specific project attributes, needs, and other criteria.

Supporting Information

Additional information may be found online in the Supporting Information section at the end of the article.

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About the Authors

Sean Franco is a graduate student at George Washington University and at the time of this article's writing was a water policy intern with AWWA, Washington, D.C.; sean.franco@gwmail.gwu.edu

Adam T. Carpenter is the manager of energy and environmental policy with AWWA, Washington, D.C.

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AWWA Resources

- **Show Me the Money: WIFIA Success Stories. Cheng RC, Lindsey L, Chamberlain J, et al. 2021. *Journal AWWA.* 113:4:42. https://doi.org/10.1002/awwa.1709**
- **Integrated Asset Management of Urban Water and Wastewater Systems. Ganjidoost A, Haas CT, Knight MA, et al. 2022. *AWWA Water Science.* 4:5:e1309. https://doi.org/10.1002/aws2.1309**
- **What We've Learned in the Two Years of WIFIA's Existence. Vedachalam S, Lindquist A. 2019. *Journal AWWA.* 111:3:33. https://doi.org/10.1002/awwa.1251**

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