

# ECONOMICS & AFFORDABILITY OF LOW-INTEREST LOANS

April 20, 2023  
12-1 PM ET  
Virtual Webinar

Presented by  
Dr. Kristen Downs, Project Director  
[UNC Environmental Finance Center](#)

 **UNC** | SCHOOL OF GOVERNMENT  
Environmental Finance Center



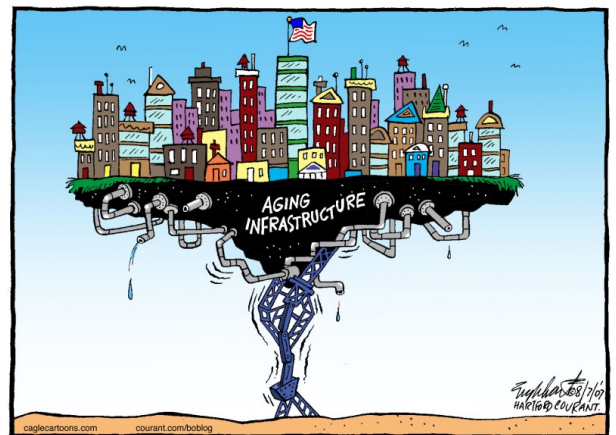
## ABOUT US



The UNC EFC is dedicated to enhancing the ability of governments and other organizations to provide environmental programs and services in fair, effective, and financially sustainable ways.

## PART 1: CAPITAL FINANCING FOR INFRASTRUCTURE

FINANCING & DEBT BASICS



## CAPITAL IMPROVEMENT PROJECTS IN MOUNT ANYTOWN

- Mount Anytown, USA
  - 1,145 residential connections
  - has a need for several capital improvement projects (estimated \$2.8M).
- Right now, they need upgrades for:
  - Pump station improvements (\$2.2M)
  - Main sewer interceptor improvements (\$600k)

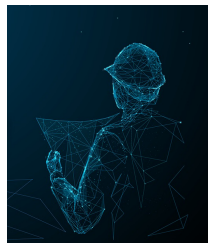


Image credit: <https://sagewater.com/financing-capital-improvement-projects-for-condominiums/>



Turning a blind eye makes nothing disappear.  
-Unknown



The [person] who moves a mountain begins by carrying away small stones.  
-Confucius

## WHY IS DEBT A GOOD SOURCE OF CAPITAL FOR INFRASTRUCTURE?

- Debt is also known as “pay-as-you-use” financing
  - The cost of infrastructure is paid off as it is used
  - Considered more equitable
    - Those using the infrastructure (or with access to the infrastructure) pay for it
- For its capital upgrades, Mount Anytown could:
  - Use cash (money accumulated from existing ratepayers - who may or may not be current or future ratepayers)
  - Issue debt (loan or bond) that is paid back over the life of the asset using revenues from current ratepayers
    - e.g., 30-year life of the upgrades → 30-year loan or bond



Image credit:  
<https://www.pumpsandsystems.com/wastewater-pump-station-rehabbed-flexible-technology>

## DEBT BASICS: LOANS

- Loans:** Money borrowed from a financial intermediary, like a bank or insurance company
  - Principal:** the amount borrowed
  - Interest rate:** the amount a lender charges a borrower – a proportion of the principal
  - Length of the loan:** how long you have to pay back the principal (and the time over which interest accumulates)
- May be market rate (unsubsidized) or low-interest (subsidized) loans



Typically borrowed through one entity

Rascher, D.A. (2021). Chapter 7: Debt and Equity Financing. In M. T. Brown, D.A. Rascher, M. S. Nagel, & C. D. McEvoy (Eds.), *Financial Management in the Sport Industry* (3rd ed., pp. 230–251). Routledge.

## DEBT BASICS: BONDS

- Bonds:** A bond is a promise to pay back borrowed money plus interest to the investor who has purchased the bond.
  - Par value (or Face value):** the amount of principal that the bond will be worth at maturity.
  - Coupon Rate:** the rate that the organization is paying for use of the money, the equivalent of an interest rate.
  - Maturity:** the number of years from issuance until the principal (or par value) will be paid back
- Multiple types of bonds (e.g., general obligation bonds, revenue bonds, etc.)

Total debt issuance is the sum of each bond.  
 May be purchased by many people!



Rascher, D.A. (2021). Chapter 7: Debt and Equity Financing. In M. T. Brown, D.A. Rascher, M. S. Nagel, & C. D. McEvoy (Eds.), *Financial Management in the Sport Industry* (3rd ed., pp. 230–251). Routledge.

## PICKING BETWEEN FINANCING TYPES... WHAT DO YOU NEED TO KNOW?

- How long do we have to pay this back?**
  - Time value of money! Do you value money now or into the future? What is the opportunity cost of paying in cash vs. issuing debt?
  - What is the life of the asset/project you're financing?
  - How does interest accumulate over time?
- What is my interest rate?** Interest rates are influenced by:
  - What secures the financing agreement,
  - The length of the payback period, and
  - The tax status of the financing option.
- What other costs might be required to issue this debt?**
  - For bonds, there are typically underwriters
  - For loans, might be an administrative fee, etc.



Image credit: Edureka

## MOUNT ANYTOWN SEEKS A LOAN

- Mount Anytown wants to take on another loan (\$2.8M estimated project costs)
- Loans will increase debt service
  - Need more revenue to cover added expenses
  - Extra revenue comes from rate increases!
- What loan options does Mount Anytown have?
- What are the implications of a loan on utility and customer affordability?



Image credit: Nora Carol Photography/Getty Images

## PART 2: WHAT ARE LOW-INTEREST LOANS?

AND WHY ARE THE STATE REVOLVING FUNDS WORTH CONSIDERING?

## LOANS: CURRENT MARKET RATE VS. SUBSIDIZED

### Market Rate (\$\$) Loans

- From bonds or a bank
- Higher interest rates
- Shorter-term length
  - Higher payments for shorter periods of time (5-10 years)
- May be beneficial for shorter project lengths if subsidized loan not available for same period
- Many lenders available



Image credit: Vecteezy

### Subsidized (\$) Loans

- Loans that are subsidized by a governmental agency:
  - State Revolving Fund (SRF)
    - Clean Water SRF (CWSRF)
    - Drinking Water DRF (DWSRF)
  - USDA loans
- Lower-interest options
- Longer periods of time available (e.g., 20-40 years)
- Popular because of low interest

13

## BONDS VS. REVOLVING FUND LOANS (RLFs)

Bonds	Revolving Loan Funds
Driven by need of borrower	Driven by needs of borrower AND lender
Profitable	Breaking even and self-sustaining
Private capital	Public (federal and state match)
Low risk (backed by clear revenue stream with bond rating or tax dollars)	Low to moderate risk (because not backed by taxes)

14

## CLEAN WATER STATE REVOLVING FUND (CWSRF)



“The Clean Water State Revolving Fund (CWSRF) program is a **federal-state partnership** that provides communities **low-cost financing** for a wide range of **water quality infrastructure projects**, including:

- municipal wastewater facilities,
- nonpoint source pollution control,
- decentralized wastewater treatment systems,
- stormwater runoff mitigation,
- green infrastructure,
- estuary protection, and
- water reuse.”

<https://www.epa.gov/cwsrf>

15

## POLL

Has your utility applied for any type of State Revolving Fund (SRF) loan or have you worked with a utility on an SRF application?

- Yes, my utility or community has applied for an SRF loan.
- Yes, I've worked with a utility/community on an SRF application or loan.
- No, my utility/community has not applied for an SRF loan.
- No, but my work involves SRF applications or loans in some capacity.
- No, I have not done work related to SRF applications or loans.

16

## COMPARING SUBSIDIZED FINANCING OPTIONS: USDA VS. SRF

### USDA Loans → Water & Waste Disposal Grant & Loan Program

- Loan payback period: up to 40 years
- Only available to communities >10,000 people
- Fixed interest rates ranging from 2.25% to 3.75%, higher than typical SRF rates
- Grants and loans available, but typically awards loans

### State Revolving Fund (SRF) Loans

- Loan payback period: up to 30-years
- Any utility in the state is eligible to apply
- Lowest loan options (typically 1/2 of current market rate)
- Offers loans and principal forgiveness loans
- Covers more eligible project costs, like engineering reports

17

## WHO IS ELIGIBLE FOR THE STATE REVOLVING FUND (SRF)?

### Eligibility for DWSRF + CWSRF

- Water/Wastewater Systems:
  - Public
  - Private
  - Non-profit non-community, and
  - New community
- Local Government Units (counties, cities, towns, sanitary districts, etc.)

### Additional CWSRF Eligibility\*

- Intermunicipal / interstate / state agencies
  - Non-profit entities
  - Private / for-profit entities
  - Watershed groups
  - HOA's
  - Individuals
- \*depends on the project

\*confirm with your state\*

18

## BIPARTISAN INFRASTRUCTURE LAW (BIL) & SRF

49%  
CWSRF

• 49% of BIL's CWSRF General Supplemental funds as **grants and forgivable loans** to communities that meet **state's affordability criteria or other project types in CWA §603(i)**

49%  
DWSRF

• 49% of BIL's DWSRF General Supplemental & LSL Replacement funds as **grants and forgivable loans** to **Disadvantaged Communities**

25%  
DWSRF EC

• 25% of BIL's DWSRF Emerging Contaminants (EC) funds to **Disadvantaged Communities or Public Water Systems serving <25k persons**

<https://www.epa.gov/system/files/documents/2022-03/bil-srf-memo-fact-sheet-final.pdf>

## LOANS ARE NOT GRANTS! BUT SOME HAVE PRINCIPAL FORGIVENESS



While many subsidized financing options offer grants and principal forgiveness loans, these options often will *not* cover the full cost of the project



**Principal forgiveness & grant options** reduce the principal and interest that you will pay back

\$2,800,000 loan approved  
- \$700,000 of principal forgiveness  
=  
\$2,100,000 principal + interest

## SRF PRINCIPAL FORGIVENESS VARIES BY:



**State:** Disadvantaged Community (DAC) definitions set by states



**Disadvantaged Status:** disadvantaged vs. significantly disadvantaged



**SRF Type:** DWSRF vs CWSRF



**Project Type:** green projects, affordability projects, non-viable utility, lead service lines (LSL)

## SRFs ON BALANCE

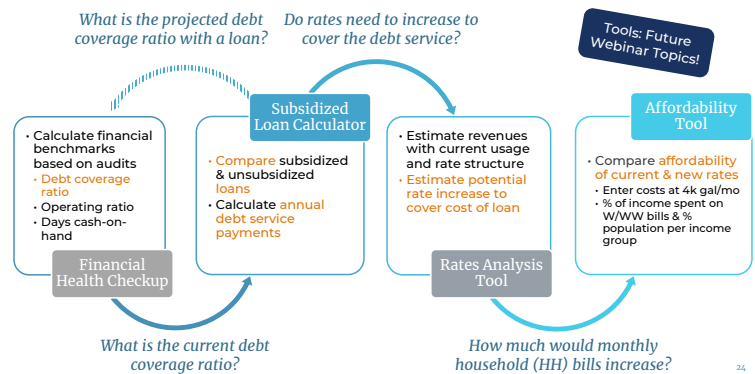
Review

- For most (particularly small) communities, the benefits of SRFs outweigh the challenges
  - Relatively easy to access funding below market rate
  - Potential for added subsidy or principal forgiveness
  - State assistance
    - Application
    - Potential bundling with other government funding for most cost-effective solution
  - Additional BIL funding
- Large cities with strong financial position may find selling bonds works better IF...
  - If they have the **staffing** to manage the bond issuance process
  - If they have **good credit** → good bond rating → lower interest rates
  - If **interest rates are relatively low**

Slide Source: Tate, Mike (2013, March 16). *Why Small Communities Should Consider CWSRF Funding*. CWSRF Funding Process Virtual Workshop Series. EFCNetwork webinar.

## PART 3: THE MATH BEHIND LOANS

### DEBT SERVICE COVERAGE RATIO & ANNUAL LOAN PAYMENTS



Tools available at: <https://efc.sog.unc.edu/dashboards/>

## DEBT SERVICE COVERAGE RATIO

$$\text{Debt Service Coverage Ratio} = \frac{\text{Operating Revenues} - \text{Operating Expenditures (excludes depreciation)}}{\text{Principal + Interest Payments on Long-term Debt}}$$

- A measure of the ability to pay debt service with operating revenue:
  - Operating Revenue left over after daily operation expenditures, divided by (%) Debt Service
- Inputs
  - Operating Revenues
  - Operating Expenditures (excludes depreciation)
  - Principal + Interest Payments on Long-term Debt (annual)



Natural Benchmark: > 1  
Recommended: ≥ 1.2

25

## DEBT SERVICE COVERAGE RATIO

Let's Calculate!

$$\frac{\$444,231 - \$368,985}{\$36,783} = 2.05$$

Operating Revenues (1)    Operating Expenses (2-3) (excluding depreciation)  
 Principal & Interest on Long-Term Debt (4)

OE \$511,448  
 - Dep \$142,463  
 = \$368,985

P \$29,655  
 + I \$7,128  
 = \$36,783

Natural Benchmark: > 1  
Recommended: ≥ 1.2

26

## POLL

Do you know how to calculate a loan payment based on loan terms (principal, interest, and length of loan)?

- Yes
- No

27

## ANNUAL LOAN PAYMENTS (SUBSIDIZED)

Let's Calculate!

**Formula**

$$P = \frac{r(PV)}{1 - (1 + r)^{-n}}$$

$$P = \frac{0.02(\$2,800,000)}{1 - (1 + 0.02)^{-30 \text{ yr}}}$$

$$P = \$125,020/\text{yr}$$

**Excel PMT() Formula**

$$P = PMT(r, n, PV)$$

$$P = PMT(0.02, 30, \$2800000)$$

$$P = \$125,020/\text{yr}$$

*P = Payment (i.e., principal + interest annual payment)*  
*PV = Present Value (i.e., principal) = \$2,800,000*  
*r = rate per period (i.e., interest rate) = 2% = 0.02*  
*n = number of periods (i.e., loan term in years) = 30 years*

28

## ANNUAL LOAN PAYMENTS (UNSUBSIDIZED)

Let's Calculate!

**Formula**

$$P = \frac{r(PV)}{1 - (1 + r)^{-n}}$$

$$P = \frac{0.045(\$2,800,000)}{1 - (1 + 0.045)^{-30 \text{ yr}}}$$

$$P = \$171,896/\text{yr}$$

**Excel PMT() Formula**

$$P = PMT(r, n, PV)$$

$$P = PMT(0.045, 30, \$2800000)$$

$$P = \$171,896/\text{yr}$$

*P = Payment (i.e., principal + interest annual payment)*  
*PV = Present Value (i.e., principal) = \$2,800,000*  
*r = rate per period (i.e., interest rate) = 4.5% = 0.045*  
*n = number of periods (i.e., loan term in years) = 30 years*

29

## UNC EFC SUBSIDIZED LOAN CALCULATOR

- Subsidized Loan Calculator tool can help to:
  - determine principal and interest payments over the course of the loan agreement
  - compare interest rates from different financing options
- Mount Anytown estimates:
  - Project costs: \$2.8M
  - Interest rates: 2.0% vs. 4.5%
  - Loan term: 30 years

What is the Value of an SRF Loan?

Subsidized Loan Calculator

Estimated Project Cost (\$): \$2,800,000

Subsidized Interest Rate (%): 2.0%

Market Interest Rate (%): 4.5%

Loan Term (years): 30

Principal Forgiveness (\$): \$0

Interest Savings (Nominal \$): \$1,406,296

30

### What is the Value of an SRF Loan?

Subsidized Loan Calculator  
Using the parameters below, calculate the cost of a subsidized loan versus a traditional market based loan. The value at the bottom of the dashboard represents the "grant equivalent" of the subsidized loan given the parameters selected from the dropdowns and average market interest rate. The calculations include and assumptions used in each calculation can be found by hovering over the resulting value.

Estimated Project Cost: \$2,800,000 | Loan Term (in Years): 30 | Subsidized Interest Rate: 2.0% | Principal Forgiveness: \$0

\*Market Rate Represents an Interest Rate of 4.5%

#### Approximate Schedule of Loan Payments

Subsidized		Unsubsidized	
Year of Loan	Payment	Year of Loan	Payment
17	\$125,000	16	\$171,896
17	\$125,000	17	\$171,896
18	\$125,000	18	\$171,896
18	\$125,000	19	\$171,896
19	\$125,000	20	\$171,896
20	\$125,000	21	\$171,896
21	\$125,000	22	\$171,896
22	\$125,000	23	\$171,896
23	\$125,000	24	\$171,896
24	\$125,000	25	\$171,896
25	\$125,000	26	\$171,896
26	\$125,000	27	\$171,896
27	\$125,000	28	\$171,896
28	\$125,000	29	\$171,896
29	\$125,000	30	\$171,896
30	\$125,000	31	\$171,896

Subsidized Annual Payments: \$125,020/yr

Unsubsidized Annual Payments: \$171,896/yr

### What is the Value of an SRF Loan?

Market Rate (4.5%) vs. SRF (2%) Loan  
Subsidy (Nominal \$): \$1.41M  
Subsidy (Real \$): \$1.05M

#### Approximate Loan Payment Streams in Real Dollars

Subsidized		Unsubsidized	
Year of Loan	Payment	Year of Loan	Payment
21	\$80,868	21	\$113,413
22	\$80,868	22	\$113,413
23	\$79,282	23	\$109,009
24	\$77,727	24	\$104,876
25	\$76,203	25	\$100,974
26	\$74,709	26	\$97,292
27	\$73,244	27	\$93,818
28	\$71,808	28	\$90,543
29	\$70,400	29	\$87,467
30	\$69,020	30	\$84,589
31		31	

Net Present Value \$2,800,000 | Net Present Value \$8,849,868

Subsidy in Real Dollars \$1,049,868

### PROJECTED DEBT SERVICE COVERAGE RATIO

Let's Calculate!

Subsidized Annual Payments: +\$125,020/yr

$$\$444,231 \text{ (Operating Revenues (1))} - \$368,985 \text{ (Operating Expenses (2-3) excluding depreciation)} = \$75,246$$

Debt Service Coverage Ratio =

$$\frac{\$75,246}{\$36,783 + \$125,020 \text{ (Principal \& Interest on Long-Term Debt (4))}} = 0.47$$

See Financial Health Checkup Tool

P \$29,655 + 1 \$7,128

Natural Benchmark: > 1  
Recommended: ≥ 1.2

### REVENUE NEED PROJECTED FOR DEBT SERVICE COVERAGE

Let's Calculate!

$$\$444,231 + X \text{ (Operating Revenues (1))} - \$368,985 \text{ (Operating Expenses (2-3) excluding depreciation)} =$$

Debt Service Coverage Ratio =  $\frac{\$36,783 + \$125,020 \text{ (Principal \& Interest on Long-Term Debt (4))}}{1.2} =$

$$\frac{\$36,783 + \$125,020}{1.2} = \$161,803$$

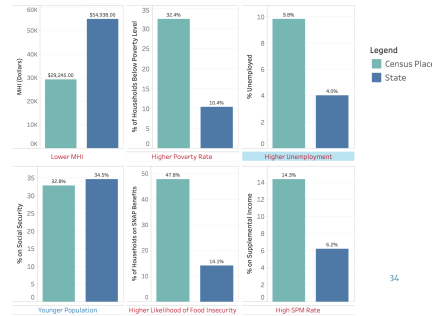
Additional revenue for debt service coverage =  $X = 1.2 (\$161,803) + \$368,985 - \$444,231 = +\$118,918 / \text{yr}$

Monthly bill increase per household =  $\frac{\$118,918 / \text{yr}}{12 \text{ mo / yr} \times 1145 \text{ households}} = +\$8.65 / \text{mo / connection}$

\*more accurate rate changes can be modeled with a rates analysis

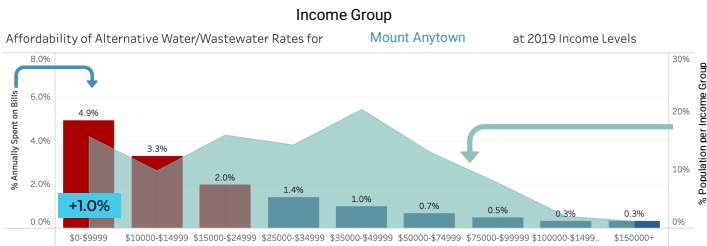
### EFC AFFORDABILITY ASSESSMENT TOOL: SOCIODEMOGRAPHICS

- Monthly residential charge at 4k gallons
  - Original: \$32.33/mo
  - Alternative charge at 4k gallons
    - New: \$32.33 + \$8.65 = \$40.98/mo
- Compares Census Place vs. State:
  - MHI (\$)
  - % HHs below Poverty Rate
  - % Unemployed
  - % on Social Security
  - % of HHs on SNAP Benefits
  - % on Supplemental income



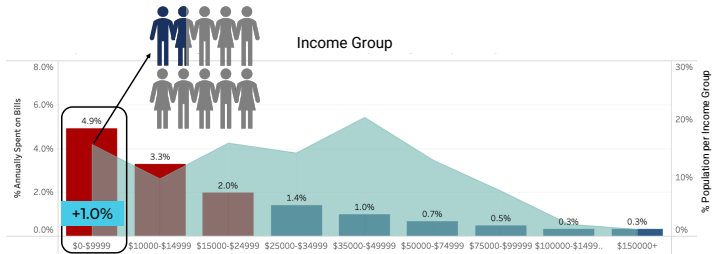
<https://public.tableau.com/app/profile/efc-atunc/viz/AffordabilityAssessmentTool/inputs>

### AFFORDABILITY ASSESSMENT TOOL: ORIGINAL VS. NEW RATES



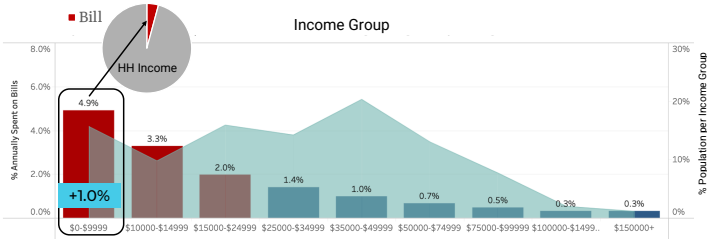
The green area graph represents the distribution of the population across the income groups. The percentage of annual income that is spent on bills is represented by the red (low-income customers) or blue columns.

### AFFORDABILITY ASSESSMENT TOOL: ORIGINAL VS. NEW RATES



The green area graph represents the distribution of the population across the income groups. The percentage of annual income that is spent on bills is represented by the red (low-income customers) or blue columns.

## AFFORDABILITY ASSESSMENT TOOL: ORIGINAL VS. NEW RATES



The green area graph represents the distribution of the population across the income groups. The percentage of annual income that is spent on bills is represented by the red (low-income customers) or blue columns.

37

## PART 4: SRF IN ACTION

### EXAMPLES OF CWSRF COMMUNITY APPLICATIONS

### CASE A: MOUNT ANYTOWN



#### Community Overview

- Project costs: **\$2.8 million**
  - pump station improvements
  - main sewer interceptor improvements
- Community designated as **significantly disadvantaged** by their State DAC definition
- # Households (HHs): 1,145



#### SRF & Principal Forgiveness (PF) Eligibility

- Mount Anytown applies for the CWSRF
- Eligible for **100% PF**
  - Significantly disadvantaged status
  - Project under \$20 million

39

### CASE A: MOUNT ANYTOWN

#### SRF (100% PF) Loan:

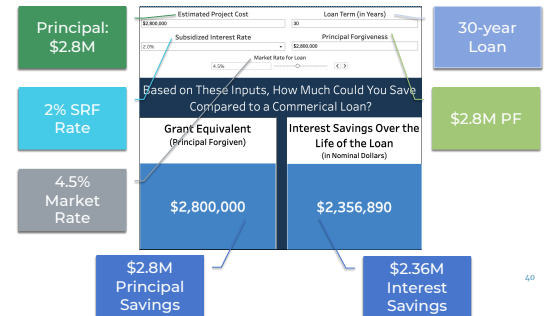
- \$0 total
- \$0/yr

#### Market Rate Loan:

- \$5,156,890 total
- \$171,897/yr

#### SRF (100% PF) Savings:

- \$5,156,890 total**



40

### CASE A: MOUNT ANYTOWN

- Feasible and Affordable**
  - 100% Principal Forgiveness
    - \$0 principal
    - \$0 interest
- Customers will have **\$0 increase** on their utility bills

41

### CASE B: BARNSVILLE



#### Community Overview

- Project costs: **\$9 million**
  - Wastewater treatment plant (WWTP) upgrade and modernization
- Community **not** designated as disadvantaged or small (<25k persons) by their State DAC definition
- # Households (HH): 29,100



#### SRF & Principal Forgiveness (PF) Eligibility

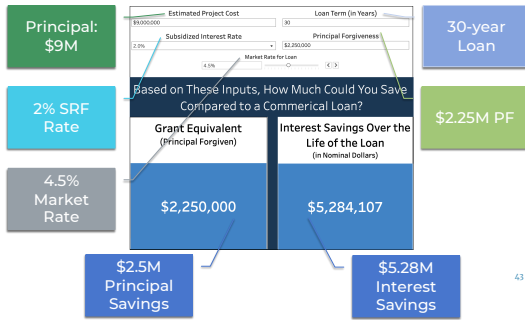
- Barnsville applies for the CWSRF
- Eligible for **25% PF**

42



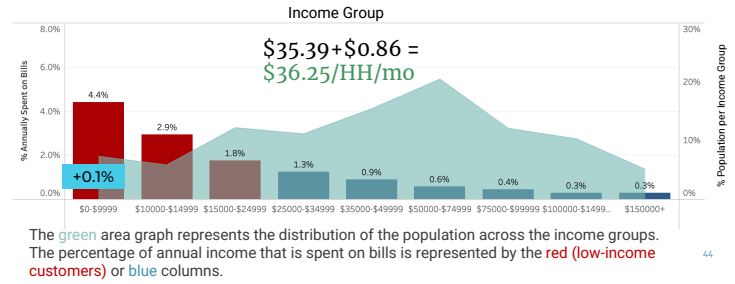
## CASE B: BARNSVILLE

- SRF (25% PF) Loan:**
  - \$9,041,609 total
  - 301,387/yr
  - Avg. Monthly HH Costs:  $\$35.39 + \$0.86 = \$36.25$
- Market Rate Loan:**
  - \$16,575,717 total
  - \$552,524/yr
- SRF (100% PF) Savings:**
  - \$7,534,107 total



43

## CASE B: BARNESVILLE'S HH AFFORDABILITY (AFTER RATE INCREASE)



44

## CASE B: BARNSVILLE

- Feasible and Affordable**
  - After 25% PF, left with \$6.75M CWSRF loan + interest
  - Customers will have **\$0.86** increase on their utility bills
  - Lowest income households (LIH) pay **0.1%** more on bills with increase for a total of **4.4%** of income spent on bills

45

## CASE C: CREEKSIDE VILLAGE



### Community Overview

- Project costs: **\$15 million**
  - Upgrades to failing water system infrastructure
- Community designated as **disadvantaged** by their State DAC definition
- # Households (HH): 200



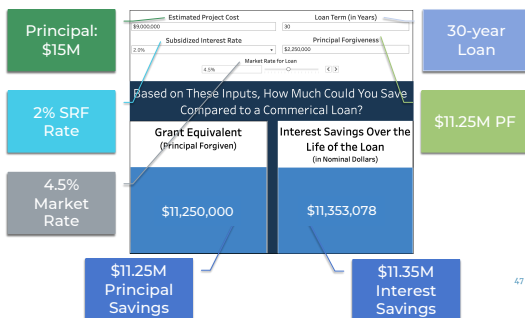
### SRF & Principal Forgiveness (PF) Eligibility

- Creekside Village eligible for the DWSRF
- Eligible for **75% PF**
  - Disadvantaged status
  - Project under \$20 million

46

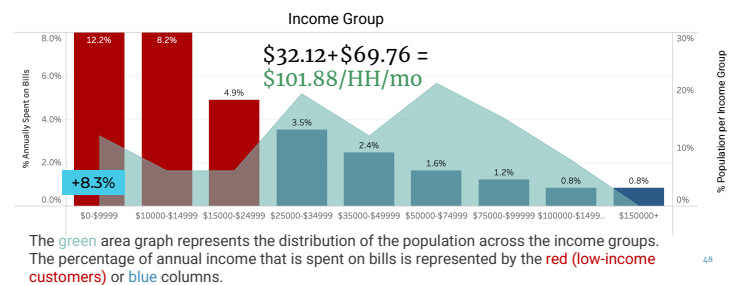
## CASE C: CREEKSIDE VILLAGE

- SRF (25% PF) Loan:**
  - \$5,023,116 total
  - 167,437/yr
  - Avg. Monthly HH Costs:  $\$32.12 + \$69.76 = \$101.88$
- Market Rate Loan:**
  - \$27,626,194 total
  - \$920,873/yr
- SRF (100% PF) Savings:**
  - \$22,603,078 total



47

## CASE C: CREEKSIDE VILLAGE'S HH AFFORDABILITY (AFTER RATE INCREASE)



48



## CASE C: CREEKSIDE VILLAGE

- Infeasible due to affordability concerns
  - After 75% PF, left with \$3.75M CWSRF loan + interest
  - Customers will have **\$69.76** increase on their utility bills
  - Lowest income households (LIH) pay **8.3%** more on bills with increase for a total of **12.2%** of income spent on bills



49

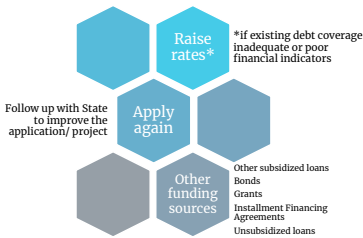
## CASE C: CREEKSIDE VILLAGE

- Challenge: Very small population (<200 connections)
- Next Steps
  - Creekside Village believes that the census data is not representative and greatly overestimates their median household income (MHI)
    - Pursuing third-party income survey reassessment with the aim to be reclassified as significantly disadvantaged (90+% PF) before the SRF application is due
    - NOTE: All findings of the third-party income survey are binding (whether greater or less than previous)
  - Seek additional funding to supplement SRF
    - Ex: infrastructure project grants

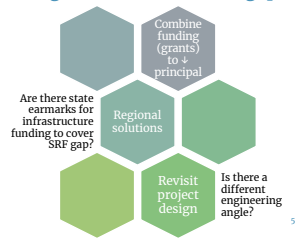
50

## WHAT ARE OTHER AVENUES TO CONSIDER IF SRF DOESN'T WORK?

If you don't get the loan?



If unaffordable with principal forgiveness or with SRF gap?



51

## APPLICATION TO COMMUNITY: TAKEAWAYS

Feasible

- Low interest and principal forgiveness make projects more equitable and accessible than market rate loans (unsubsidized) or USDA loans (subsidized at higher interest + longer terms)

Finance

- SRF are loans not grants
- Require careful analysis of a town's financial feasibility to take them on

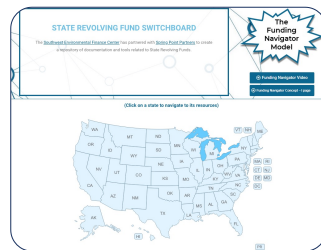
Fills a niche

- Alternative to market loans and subsidized USDA loans

52

## CWSRF RESOURCES

- EPA's CWSRF Factsheets
  - <https://www.epa.gov/cwsrf/clean-water-state-revolving-fund-cwsrf-factsheets>
- SW EFC SRF Switchboard: <https://swefcsrfswitchboard.unm.edu/srf/>
- EFC Network Funding Tables: <https://efcnetwork.org/resources/funding-tables/>



53



## EFC TOOLS

- EFC Network Tools: <https://efcnetwork.org/resources/tools-and-publications/>
- UNC EFC Tools: <https://efc.sog.unc.edu/dashboards/>
  - Financial Health Check-up (FHCU)
  - Subsidized Loan Calculator
  - Plan-to-pay tool
  - Rates Analysis tool
  - Affordability Assessment tool

Future Webinar Topics!

54

## NEED HELP? REQUEST EFC NETWORK TECHNICAL ASSISTANCE

- Technical assistance available for small water and wastewater systems
  - Particularly for **small wastewater systems (<1 MGD)**
- Contact the **EFCN**: <https://efcnetwork.org/get-help/>



55

## THANK YOU!

### General Contact Information

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