

Developing a New Framework for Household Affordability and Financial Capability Assessment in the Water Sector

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List of Acronyms and Abbreviations

ACS	American Community Survey
AFF	American FactFinder
ALICE	Asset Limited, Income Constrained, and Employed
AR20	Affordability Ratio at the 20th Income Percentile
AWWA	American Water Works Association
CAP	Customer Assistance Program
CD	Consent Decree
CIP	Capital Improvement Program
COS	Cost-of-Service
CPH	Cost per Household
CPI	Consumer Price Index
CSO	Combined Sewer Overflow
CWA	Clean Water Act
EFAB	Environmental Financial Advisory Board
EPA	United States Environmental Protection Agency
FCA	Financial Capability Assessment
FCI	Financial Capability Index
FLSLR	Full Lead Service Line Replacement
FMR	Fair Market Rent
FPL	Federal Poverty Level
FSCU	Food, Shelter, Clothing, Utilities
GASB	Governmental Accounting Standards Board
HBI	Household Burden Indicator
H2R	Hard-to-Reach
HUD	United States Department of Housing and Urban Development
LIHEAP	Low-Income Home Energy Assistance Program
LQI	Lowest Quintile Income
LTCP	Long-Term Control Plan
MCL	Maximum Contaminant Level
MHI	Median Household Income
MIT	Massachusetts Institute of Technology
MOE	Margin of Error
MOST	Municipal Option Sales Taxes
MSA	Metropolitan/Micropolitan Statistical Area
MSD	Metropolitan St. Louis Sewer District
NACWA	National Association of Clean Water Agencies
NAPA	National Academy of Public Administration

NDWAC	National Drinking Water Advisory Council
NEORS	Northeast Ohio Regional Sewer District
NPDES	National Pollutant Discharge Elimination System
O&M	Operations and Maintenance
OFWAT	United Kingdom Water Services Regulation Authority
OW	United States Environmental Protection Agency Office of Water
PAYGO	Pay-As-You-Go
PRC	Pew Research Center
PUMA	Public Use Microdata Area
RI	Residential Indicator
PPI	Poverty Prevalence Indicator
SAB	Science Advisory Board
SDWA	Safe Drinking Water Act
SNAP	Supplemental Nutrition Assistance Program
SPM	Supplemental Poverty Measure
SRF	State Revolving Fund
USCOM	United States Conference of Mayors
USDA	United States Department of Agriculture
WARI®	Weighted Average Residential Index
WEF	Water Environment Federation
WIFIA	Water Infrastructure Finance and Innovation Act
WQS	Water Quality Standard
WRF	Water Research Foundation

Executive Summary

Purpose

Today, many water systems, and the communities they serve, are faced with difficult decisions as they work to balance regulatory compliance with providing water service at rates that are not beyond the reach of the households they serve. By incorporating additional insight on potential affordability impacts into new and improved regulatory practices, we can increase the likelihood that regulatory objectives are achieved, that water systems remain sustainable enterprises, and that the fiscal stress on low income households is kept from becoming overwhelming.

The American Water Works Association (AWWA), the National Association of Clean Water Agencies (NACWA), and the Water Environment Federation (WEF) engaged the authors of this report to develop recommendations for the United States Environmental Protection Agency (EPA) on a new methodology and guideline for assessing household affordability and community financial capability to replace its current guidance document: *Combined Sewer Overflows – Guidance for Financial Capability Assessment and Schedule Development* (EPA, 1997). This effort was prepared in anticipation of the EPA updating its financial capability assessment (FCA) guidelines.

The most recent critique of EPA’s FCA Guidance was completed by the National Academy of Public Administration (NAPA) for the EPA in 2017 in a report “Developing a New Framework for Community Affordability of Clean Water Services” (the “NAPA Report”). NAPA conducted the study and developed the report in response to a congressional directive to update EPA policies and guidance on affordability. A key focus of this report was an assessment of EPA’s FCA framework for determining the financial capability of permittees to provide clean and affordable water services. The report acknowledged deficiencies in EPA’s FCA guidance and proposed improvements to both the Residential Indicator (RI) and Financial Capability Indicator (FCI) components that would provide a better starting point for EPA and permittees to address clean water compliance schedules. The NAPA Report provided these and other general recommendations, but the report did not outline or detail a new framework or methodology for a revised FCA that encompasses these recommendations. This report is intended to develop a new framework and methodology that EPA can adopt as its new household affordability and FCA guideline to address the shortcomings of the existing guideline and accommodate the recommendations contained in the NAPA Report.

Background

EPA’s existing FCA guidance is divided into two phases. The first phase examines financial capability in terms of impacts to individual households. This phase employs the RI, which examines a snapshot of the average household wastewater cost as a percent of Median Household Income (MHI) and compares it to a 2% threshold. The results of this first phase analysis places a permittee in one of three categories: low financial impact (RI < 1% of MHI), mid-range (RI between 1% and 2% of MHI), or high financial impact (RI > 2% of MHI). The first phase focuses on households, rather than individuals, and assesses

household affordability as a unit that includes both earners and their dependents. The second phase examines several metrics related to the permittee and community, scores them, and combines them into a Financial Capability Index (FCI). The RI and FCI results are then combined and the permittee's financial capability is categorized as Low, Medium, or High Burden. These results are then used to inform the development of a schedule of regulatory compliance for the permittee.

The shortcomings of the existing EPA FCA Guidance, as cited in the literature and in the NAPA report, include the following:

- MHI is a poor indicator of economic distress bearing little relationship to poverty or other measures of economic need within a community.
- The RI is not focused on the poor or the most economically vulnerable users, and MHI does not capture impacts across diverse populations.
- The RI is an incomplete water cost measure that only includes a limited set of wastewater costs and does not include the cost of drinking water or stormwater.
- The estimated costs included in the RI do not reflect the actual water bills that are paid by a residential customer.
- The RI focuses on average per household cost of water-related services rather than basic water use. Basic water use refers to water used for drinking, cooking, health, and sanitation.
- The RI provides a “snapshot” that does not account for the historical and future trends of a community's economic, demographic, and/or social conditions.
- The RI does not account for other non-discretionary household costs, such as the cost of housing or other utilities, which can exacerbate affordability challenges for low-income households.

Criteria for Developing an Alternative Household Affordability and Financial Capability Assessment Framework

A set of criteria for developing a new framework for measuring household affordability and financial capability was prepared based on an extensive literature review, subject matter expert input, and stakeholder outreach to the EPA, water and wastewater utilities, AWWA, NACWA, WEF, low-income advocacy groups, and other academic and consulting specialists in the sector. Many of the criteria that were identified were also recognized in the NAPA Report. The intention of identifying such criteria was to ensure that the recommended metrics would be meaningful for identifying and assessing household affordability and financial capability within a community, implementable for users, and trustworthy (i.e., as accurate and credible as possible). While some criteria apply to both household affordability and community financial capability metrics, others are specific to one of these.

Several criteria emerged as the most important criteria to guide the framework development. The framework should:

1. Reflect all/combined water service costs,

2. Reflect the households that are most economically challenged,
3. Reflect local essential costs of living.

A broader set of criteria was also identified that included the following among others:

- The frameworks should be straightforward, transparent, and support consistent application.
- The framework should encompass both household affordability (rate payer burden) and the financial capability of the water system providing the services and the community receiving the services.
- The framework should use valid and defensible measures that rely upon readily available data from relevant verifiable sources.
- The framework should allow for flexibility in defining and identifying a water system's potential financial and economic burdens.
- The framework should be applicable to a broad range of EPA purposes.
- The household affordability component should be defensible in determining relative burdens.
- The financial capability component should recognize effective financial planning and management to enable rate stability and access to credit on favorable terms.
- The financial capability component should provide for recognition of historic and future trends in a community's socioeconomic, demographic, resiliency, and/or social conditions that affect the community's financial capability.

A literature review and the stakeholder outreach were completed to identify and evaluate various measures of household affordability and community financial capability. These various alternatives were weighted against the criteria to identify the alternatives that individually or in combination best satisfied the criteria developed by NAPA and our working group. It is important to acknowledge that the authors have not found any household affordability metric that is "perfect in every respect." Every candidate metric that was considered has some limitations relative to one or more of the evaluation criteria. Nonetheless, several alternatives were identified that are very strong and suitable candidates for household affordability metrics – either individually, or as a composite -- because they achieve the best balance of the most critical criteria and considerations. Importantly, the proposed methodology addresses limitations of the existing EPA guidance by facilitating effective and transparent decision-making.

Recommended Household Affordability Assessment Methodology

It is recommended that the EPA consider the following combination of measures of household affordability as an alternative to EPA's current RI:

1. The Household Burden Indicator (HBI), defined as basic water service costs (combined) as a percent of the 20th percentile household income (i.e., the Lowest Quintile of Income (LQI) for the Service Area); plus

2. The Poverty Prevalence Indicator (PPI), defined as the percentage of community households at or below 200% of Federal Poverty Level (FPL).

It is recommended that a matrix approach be used to allow the results of both the HBI and PPI to be jointly interpreted. The rationale for the above paired metrics is several fold. The HBI measures the economic burden that relatively low-income households in that community face in paying their water services bills (including water, wastewater, and stormwater bills), and the PPI measures the degree to which poverty is prevalent in the community. Thus, in combination, the metrics indicate both a household-level burden and a community-based level of prevalence of the affordability challenge posed by water sector costs. In addition, pairing of the two metrics addresses several of the key criteria, including:

- Relatively simple, easy-to-implement, and transparent approach
- Relies upon readily available, federally furnished data (e.g., trusted/unbiased/accessible Census data)
- Includes all water sector service costs and therefore provides a more comprehensive picture of household burden.
- Focuses on non-discretionary, basic water service costs, rather than average costs, which are most relevant to low-income households.
- Applies local utility rates to calculate water service costs at a consumption level corresponding to basic usage for a fixed household size, and therefore better reflects the reality of what customers need to pay to cover their basic needs.
- Focuses on local low-income populations to better recognize the distribution of incomes and to examine the segment of the community that is most vulnerable to affordability challenges.

The denominator of the HBI considers the 20th percentile household income for the relevant service area. Households at and below the 20th percentile typically reflect those households that are the most economically challenged members of the community, more so than MHI. The 20th percentile is generally considered the demarcation between low income and middle-class households. Many assistance programs have eligibility cut-offs at or near the 20th percentile, and the data used to define the 20th percentile household income is readily available from the U.S. Census.

The recommended HBI uses total basic water cost for the average household size (rather than examining clean water, drinking water, and stormwater costs individually). This total basic water cost provides a more comprehensive picture of household affordability. However, reflecting total basic water costs adds some complexity to the required analysis (compared to EPA's current approach). For example, the recommended methodology may require coordination with multiple utility agencies and organizations to accurately quantify the total cost of all water services within a community, and there may be circumstances that complicate compiling an aggregate basic water service cost for a community, such as where service area boundaries do not coincide well. However, this added complexity allows for a more comprehensive assessment of household affordability.

The HBI measure that uses total basic water cost can support EPA’s comprehensive Integrated Planning Framework, a voluntary planning process designed to assist communities in meeting Clean Water Act obligations by prioritizing and sequencing stormwater and wastewater projects together. Having a household affordability and community financial capability framework that considers the cost of water, wastewater, and stormwater together reflects a similar approach to the Integrated Planning Framework.

The household affordability methodology recommendation provides for an assessment of current household affordability that may inform initial decision making and also a future assessment of household affordability by evaluating the viability of compliance strategies over time. Projecting potential impacts on household affordability into the future is an essential element of this recommendation.

Note that there was no metric that captures the local cost of other essential household needs for low-income households, along with water services costs, that was found to be broadly applicable, and suitably reliable, and based on readily accessible data. While some metrics exist that capture other essential household needs or the local cost of living, such as the Low Income Housing Burden (available from the U.S. Census for some communities), the Affordability Ratio at the 20th Percentile (Teodoro 2018), and the MIT Living Wage, these measures were found to have limitations or tradeoffs that prevented them from being included as part of the recommended core household affordability assessment methodology. However, it is strongly recommended that supplemental measures that consider the cost of other essential household needs and the local cost of living be presented as supplemental information, where feasible.

An important consideration in establishing a household affordability assessment methodology is the establishment of a set of benchmarks to be used to differentiate between what policy makers and stakeholders consider to be relatively affordable, as contrasted to water costs that may be considered potentially unaffordable (ambiguous), or clearly unaffordable. Ideally, the threshold of what is clearly unaffordable occurs at the point where households cannot afford essential needs and are forced with having to make choices between paying for food, housing, heat, prescription medications, child care, essential transportation and water sector services. There has been some research in the water sector attempting to measure when this threshold is reached, and more research is needed in this area. However, a set of benchmarks are suggested for evaluation that combine the HBI and the PPI to assess household affordability for a community. These benchmarks are summarized in the following matrix.¹

¹ Note that the thresholds suggested for the HBI in the matrix are based on how EPA currently defines water costs per household (CPH), rather than how we recommend calculating the cost of “basic” water uses in the HBI. Therefore, the HBI-related thresholds may need to be adjusted downward, based on further empirical investigation.

HBI - Water Costs as a Percent of Income at LQI	PPI - Percent of Households Below 200% of FPL		
	>=35%	20% to 35%	<20%
>=10%	Very High Burden	High Burden	Moderate-High Burden
7% to 10%	High Burden	Moderate-High Burden	Moderate-Low Burden
< 7%	Moderate-High Burden	Moderate-Low Burden	Low Burden

It is recommended that household affordability for the community be deemed high burden if total basic water costs are a relatively high percentage of household income for the LQI household, *and* a relatively large proportion of the community households are economically challenged (i.e., the upper left portion of the matrix). However, if less than 20% of households are below 200% of FPL, then the community as a whole may be relatively affluent such that relatively high total water costs may not create a high burden for the community, even if water costs are a relatively high percentage of LQI (although there are probably households that will struggle). The matrix approach also reflects that water services may be highly burdensome and unaffordable if a large proportion of the community’s households are below twice the FPL, even if water bills are a relatively low percent of LQI (the lower left portion of the matrix).

Additional research is clearly needed to establish and confirm appropriate affordability benchmarks based on the recommended affordability metrics. At a minimum, additional empirical evaluation must be conducted to more thoroughly assess how these proposed benchmarks perform when applied across of a broader range of actual utility settings and circumstances. Additional empirical evaluation will support a better-informed policy dialogue for how to interpret and possibly modify the suggested benchmarks.

Furthermore, similar to existing EPA CWA guidance for FCA it is strongly recommended that a permittee be allowed and encouraged to provide additional documentation that it believes provides a more complete picture of the unique financial conditions and circumstances facing the households it serves. This may include providing supplemental metrics, such as applying a measure of discretionary income, mapping of total water costs as a percentage of U.S. Census Tract income or presenting other additional household affordability measures identified in the literature or in this report.

Recommended Financial Capability Assessment Methodology

The recommended FCA methodology consists of using long-term cash-flow modeling to inform how and when capital improvements may be implemented within the financial capability of a utility. As a practical matter, FCAs are most naturally conducted at a utility level because permitted water services

providers are primarily responsible for compliance.² Therefore, the recommended FCA methodology is most directly oriented to portraying utility financial capabilities. Water services providers must remain financially viable to sustain service deliveries and the FCA methodology must reflect the basic requirements of enterprise operations. This FCA methodology is readily applied to individual situations during permitting discussions, loan applications, and variance processes. The underlying principles can also inform larger scale activities including rulemakings and watershed-scale planning.

A financial plan, or cash flow forecast, is a relatively straight forward way of projecting the financial viability of a utility. The cash-flow forecast should include projections of annual revenues, utility rates, operation and maintenance expenses, capital needs, debt service requirements, and key fiscal policy measures, such as debt service coverage and projections of fund cash balances. It is recommended that cash flow forecasts be prepared to enable projections of annual utility cash flows under a variety of alternative assumptions (including the specific schedule of capital improvements required to achieve compliance). The modeling exercise requires the forecaster to determine system-wide rate increases required to support system operations and enable financing of planned capital expenditures, while ensuring compliance with fiscal policy targets.

It is recommended that the financial plan forecast then be used iteratively by determining the system-wide utility rates and rate increases required to finance alternative capital program (and related O&M expense) schedules and configurations and selecting a financially viable financial plan. A viable financial plan includes a projection of utility revenues and rates that do not impose too acute financial burdens (indicated through forecasts of established household affordability metrics) while enabling the cost-effective financing of required system improvements, and allow for a reasonable increase in utility rates over time (i.e. rate slope). This rate increase slope effectively defines annual funding constraints within which required system improvements may be funded, and in the consent order context, would be negotiated by the utility and the EPA. Projects and operating initiatives whose funding may exceed annual budget constraints must be deferred and rescheduled to conform to the entity's financing limitations.

As part of the financial capability assessment framework, it is recommended that a number of measures and metrics be calculated in order to help identify viable and implementable financial plans and to help identify when a utility may reach the limits of its financial capability.³ These measures include the following forecasts:

² While FCA analysis occurs at a "utility" level, the total-water framework may necessitate an analysis that encompasses more than one entity. Importantly, only one of the water service providers may be facing a regulatory compliance hurdle, so obtaining adequate inter-agency collaboration will be a practical implementation consideration. Further, to accurately evaluate any utility's financial capability whether individually or together, it is necessary for each utility to adhere to good accounting practices in keeping with available guidance like that from the Governmental Accounting Standards Board.

³ Forecasts of future LQI, median income, households in poverty, and any other incorporated household affordability metrics will be needed to support evaluation of future rate burden. Failing to consider cumulative trends in household level ability to pay five or ten years in the future could lead to either unbearable financial stress or inappropriate delays in necessary capital investments.

- **Cumulative rate increase** – Provides a simple measure of the compounding effect of annual rate adjustments over the forecast period.
- **Typical bills as a percentage of LQI and median income** – Service bills may be calculated for each year of the forecast period and compared to the household affordability benchmarks, and current and projected billings of other similarly situated utilities.⁴ This set of measures represents a direct tie-back to the assessment of household affordability.
- **Outstanding debt per customer account or per capita** –Cash-flow forecasts may readily be constructed to enable forecasts of these metrics, which measure the debt burden placed on a utility and its customer base.
- **Capital structure** – A related, potentially alternative to forecasting absolute indebtedness per account is to forecast the evolution of the utility’s capital structure (e.g. debt/equity ratio) over the forecast – providing an indication of the extent of future leverage and position to fund new requirements.

These and alternative measures developed through cash flow forecasting inform determination of viable rate slopes and projected levels of utility rates that define the financial capability of a utility. These forecasts also align well with some of the key metrics and ratios used by the municipal bond rating agencies to gauge issuer credit worthiness. Maintaining key financial metrics and ratios at levels that allow utilities to finance capital improvements at reasonable interest rates is an important element of assessing a utility’s financial capability through cash flow forecasting.

As noted, a utility’s financial capabilities are largely a function of the annual rates and rate adjustments that are necessary to support the financial plan, which in turn, is a function of the array of factors considered in the development of household affordability measures. For each utility, these considerations are unique. A utility in a service area experiencing trends of outmigration and economic decline must navigate a different landscape relative to utilities challenged by explosive growth; a utility with relatively high rates serving a substantial low-income population likely has notably lower tolerances for further rate adjustments relative to a utility that has deferred rate adjustments and/or serves higher income customers. Therefore, providing supplemental, local socioeconomic information is important to the assessment of a utility’s and community’s financial capability. Yet, while each utility, just like each household served, is unique – several common principles may be used as benchmarks or guides for the determination of viable rate slopes for individual utilities:

- **Inflation / income growth indexing-** Whether in the context of EPA’s regulatory enforcement posture, standard setting, or financing programs, requiring utilities to increase utility rates by at least 1.0 to 1.5 times the general inflation rate assumptions used in cash-flow forecasting is suggested to be a reasonable minimum rate slope requirement.

⁴ In using the phrase “similarly situated utilities” the authors acknowledge that comparison of utility performance is commonplace in benchmarking exercises and routinely used by EPA in enforcement cases as well as rate corporation commissions and others. It is critical to any such comparison that the analysis select an appropriate pool of utilities for comparison and compare like elements among those utilities.

- **Peer utility comparisons** – In the same way that bond rating agencies compare similarly situated credit issuers, comparisons of peer utilities’ current and projected utility rate levels may inform judgments about appropriate rate slopes. These judgments must likewise be informed by consideration of local and regional economic circumstances, differences in cost of living, community and utility-specific conditions impacting costs, and other supplemental factors (e.g., other environmental investment needs). For example, if a utility is not in compliance with a regulation *and* its rates are *significantly lower* than its peers and neighboring utilities, after local cost of living, household affordability, and other socioeconomic factors are taken into account, a relatively steeper rate slope in the initial years of the capital plan may be warranted, such as rate increases of 2.0 or more times the prevailing inflation. In some cases, such rate increases have not, and will not, impose unduly burdensome rates but rather correct for prior deferrals of requisite rate adjustments. In other cases, a steeper slope could catapult a utility into a situation where its rates approach levels that may be deemed unaffordable based on the metrics recommended herein. While affordability is a local context-dependent issue, in principle, utilities that have deferred needed rate adjustments historically should be required to move expeditiously to at least align their rates to peer norms.
- **Ratepayer budgeting** – Determining the extent and pace of rate increase adjustments – the rate slope – must also be gauged by recognition that water services are necessities and relatively price inelastic such that rate increases are typically absorbed dollar-for-dollar. Sharp rate increases impose acute disruptions in ratepayer budgets; relative rate stability is preferred. In general, single year rate increases that exceed 8-10% (or 2.0 to 4.0 times prevailing inflation) should be avoided if possible. Alternatively, a program of more modest annual adjustment is recommended.
- **Regional economic factors** – A program of annual rate increases also should be considered in the context of regional economic conditions that may influence the effective burden of program financing, both with respect to individual households and on job creation and retention in the local business community. Presenting relevant trends in socioeconomic conditions affecting a utility’s market conditions, such as trends in population demographics, unemployment, relative wealth, and impacts on businesses in a community is recommended to help provide a more complete picture of a community’s financial capability. Sharply increasing rate slopes imposed in service areas plagued by economic disadvantage may serve to exacerbate hardship and prevailing injustices (ironically in the name of environmental remedial measures). On the other hand, limiting rate and fee increases (particularly development impact fees) during periods of robust economic activity may unduly delay compliance and delivery of enhanced services.

Guided by these basic principles, cash-flow forecasts may be developed that incorporate rate increase programs that appropriately reflect a utility’s financial capabilities in the context of the cumulative burden of rates associated with all available water services. Given the limitations of these capabilities, defined by an acceptable rate slope and ultimately affordable utility rates, scheduling of system improvements is largely a matter of determining which regulatory compliance projects and programs should be prioritized and sequenced for financing within the defined annual affordability constraints. In

doing so, utilities and regulators will be (appropriately) challenged to define the improvement programs that render the greatest benefits soonest, while also allowing the utility to both provide efficient and effective service delivery and be responsive to utility, and more broadly community needs and financial capabilities.

Notably, this recommended methodology does not render a specific finding that compliance requirements impose a specific level of burden (e.g. high, medium, low) and thereby provide a basis for scheduling. Rather, it focuses directly on the matter of defining a mutually agreeable compliance schedule (and the procedures for later modifications thereto) that will fit within a utility's or community's financial capabilities. It is not recommended that permittees be required to evidence a high burden to secure a manageable compliance schedule; nor regulators be prompted to impose compliance requirements based on what would bring a permittee to a high burden threshold. Rather, it is recommended that the immediate and sustained focus be related to what improvements render the greatest public health and environmental benefits that may be financed within the entity's financial limitations. In other words, household affordability and a utility's financial capability provides limitations on what can be done, or at least the pace at which it can be done, to protect public health.

Furthermore, the recommended methodology ultimately considers customer affordability and financial capability of the service area and the community as a whole. If overall, household affordability and a utility's financial capability is limited, but there are some customers in the community who have the ability to pay more than the rest, the recommended methodology does not advocate for those customers who have the ability to pay more to do so. The recommended methodology is aligned with industry-accepted cost of service principles that promote fair and equitable rates, discourage discriminatory pricing and cross-class subsidization, and minimize the risk of legal challenge.

Combining Household Affordability and Financial Capability

In evaluating both household affordability and financial capability for a water utility and its community, it is recommended that EPA consider both aspects together in the context of the cumulative financial burden associated with all available water services. This differs from the existing EPA Guidance, which specifies a preliminary screening using the RI, and a secondary screening using financial capability measures if the primary screening results in a "high financial impact" RI score. In practice, most utilities have completed both analyses regardless of the results of the RI calculation and evaluation. The scoring matrix used in the EPA guidance to determine the level of burden in a community has clear shortfalls as previously discussed. Though the existing EPA scoring matrix provides a guide for regulators to generate evidence for schedule relief determinations, it is perceived by many to be an inflexible and overly simplistic method of making such determinations.

The household affordability and community financial capability framework proposed in this report can be brought together in an analytical way. The proposed HBI value will likely change over time as the expenditures necessary to address the regulatory requirement are programmed into the permittee's financial plan. That is, those expenditures will likely result in the need for the permittee to generate additional revenues through utility rate increases, which affects the projected HBI. However, due to affordability constraints, there are limitations on how high and how fast utility rates can increase to accommodate the costs associated with meeting regulatory requirements. These limitations impact the

revenue forecast of the financial plan. This inter-play between the financial forecast and the HBI illustrates how the household affordability and utility financial capability frameworks come together. Through this inter-play, the user can then make better judgments about the limits of financing capacity by ensuring forecasted impacts do not push household affordability and utility financial capability metrics beyond reasonable tolerances.

The *Integrated Municipal Stormwater and Wastewater Planning Approach Framework* (EPA, 2012) describes the financial capability analyses that are at the core of the Integrated Planning process as follows:

“For each entity participating in the plan, a financial strategy and capability assessment that ensures investments are sufficiently funded, operated, maintained and replaced over time. The assessment of the community’s financial capability should take into consideration current sewer rates, stormwater fees and other revenue, planned rate or fee increases, and the costs, schedules, anticipated financial impacts to the community of other planned stormwater or wastewater expenditures and other relevant factors impacting the utility’s rate base. Municipalities can use as a guide the document “CSO Guidance for Financial Capability Assessment and Schedule Development,” EPA 832-B97-004) or other relevant EPA or State tools.”

In summary, not only is the recommended pairing of cash-flow forecasts to assess financial capabilities with references to new measures of household affordability a better guide for CWA requirements (particularly scheduling of compliance activities), it may also better inform the other CWA and SDWA regulatory applications by which EPA addresses economic considerations.

1. Introduction

1.1 Purpose and Objectives

The water sector in the United States helps to ensure that all Americans have access to safe, affordable drinking water, wastewater and stormwater services, or “water sector services”.⁵ While water sector services are fundamental to setting a national baseline for ensuring public health, safety, economic well-being, and environmental quality, they can only be provided if they are affordable for ratepayers. Though ratepayer affordability can in some cases be buffered by utilities, state, federal or philanthropic grantors, or other intervenors, before such programs can be assessed, the local affordability challenge must be understood through measurement.

There is an expert consensus that modifying current EPA practices and policies is necessary to further regulatory objectives to promote clean and safe water. Water systems must remain sustainable enterprises, but also must not overwhelm the finances of disadvantaged households in the communities they serve. Water systems and state regulators should not be left to choose between regulatory compliance and providing water service at rates that are affordable.

In anticipation of the United States Environmental Protection Agency (EPA) updating its financial capability assessment (FCA) guidelines, the American Water Works Association (AWWA), the National Association of Clean Water Agencies (NACWA), and the Water Environment Federation (WEF) engaged the authors of this report to provide recommendations to EPA on a new methodology and guideline for assessing household affordability and community financial capability. The purpose of this report is to detail the findings and recommendations that resulted from this association sponsored effort. This report does not address the specific mechanisms for, or timing of, integrating the proposed methodologies or derivative approaches into practice. How such changes should be made is an important future discussion topic.

1.2 Background

1.2.1 Affordability in Context

For the purposes of this report, “affordability” may be considered in three levels or contexts with respect to water sector utility services: household-level, community-level, and national-level affordability as described below.

Household-level affordability refers to the ability of households to pay for water services without facing undue economic hardship. Undue economic hardship refers to the need for

⁵ Note: Water sector service is defined in this report to include drinking water, wastewater, and stormwater-related utility services.

fiscally challenged households to sacrifice other essential goods and services to pay their water sector utility bills. Examples of economic hardship may include forgoing medically necessary prescriptions or doctor visits, sacrificing healthy meals, facing the inability to fully pay for child care, essential transportation, or heating/energy services, or to cover rent or mortgage payments. Households that face water service shut-offs due to arrearages are another example of undue economic hardship, and the loss of water services may in turn result in the loss of the habitability of their home or apartment.

Community level affordability pertains to the collective ability to pay for investments in water sector utility facilities, and operations and maintenance (O&M) expenses required to sustainably deliver services in full compliance with applicable laws and regulations. It reflects both the economic viability of the community, as well as the financial capability of the utility that serves the community.

National affordability refers to the extent to which water sector utilities are able to pay for the cost associated with a specific regulatory requirement - or a combination of compliance mandates and/or other circumstances – and maintain acceptable levels of service, without the creation of an economic burden that is fiscally unsustainable for the communities and households served by the water sector utilities. This definition is relevant to assessing the availability and magnitude of federal grant and loan programs to impacted utilities.

The affordability definitions above cannot be viewed in the context of water service provision alone and, instead, need to reflect a more complete characterization of affordability. Whether considering affordability generally, or for a specific component of household's obligations, such as water sector services, the cost-of-living, which includes "essential" goods and services for housing, medical and child care, food, and all forms of utilities, should also be considered. Essential goods and services are those that are required for a household to meet their most basic needs or to maintain health, cleanliness, and employment in the modern world. To consider only one of these costs in isolation would ignore the realities that households face when allocating scarce income. However, in order to inform the implementation of water sector EPA regulatory requirements, affordability needs to be discussed in the water sector context.

Affordability in the context of water sector services and federal regulatory enforcement should consider household affordability for water sector services, as well as collective community and utility financial capability to provide those services. Historically, household measures have focused on affordability for a typical or median household; more recent critiques of these measures have called for consideration of economically challenged households, which are disproportionately adversely affected by rising water sector service costs. This is a response to the growing recognition that the pronounced trends of increasing water service costs have imposed a disproportionate, and increasingly untenable impact on the low-income population. These impacts endanger the ability of the U.S. to assure universal access to safe and reliable water and wastewater service for the protection of public health.

There are a number of complexities involved in measuring affordability. Water service affordability measurement typically involves multiple metrics with implications for a broad set of stakeholders from federal regulators, to local utility staff, to American communities and households. In our examination of

various metrics, we recognized that the need for meaningful and technically sound metrics extends beyond providing a basis for potential regulatory relief. Sound metrics also are needed that serve as useful indicators for:

1. Defining affordability concerns (to establish a baseline and help define the nature and extent of the problem),
2. Evaluating solutions for addressing the affordability challenge, and
3. Tracking our progress toward improving water service affordability, once one or more solutions are implemented (e.g. so that mid-course corrections may be developed, as may be necessary).

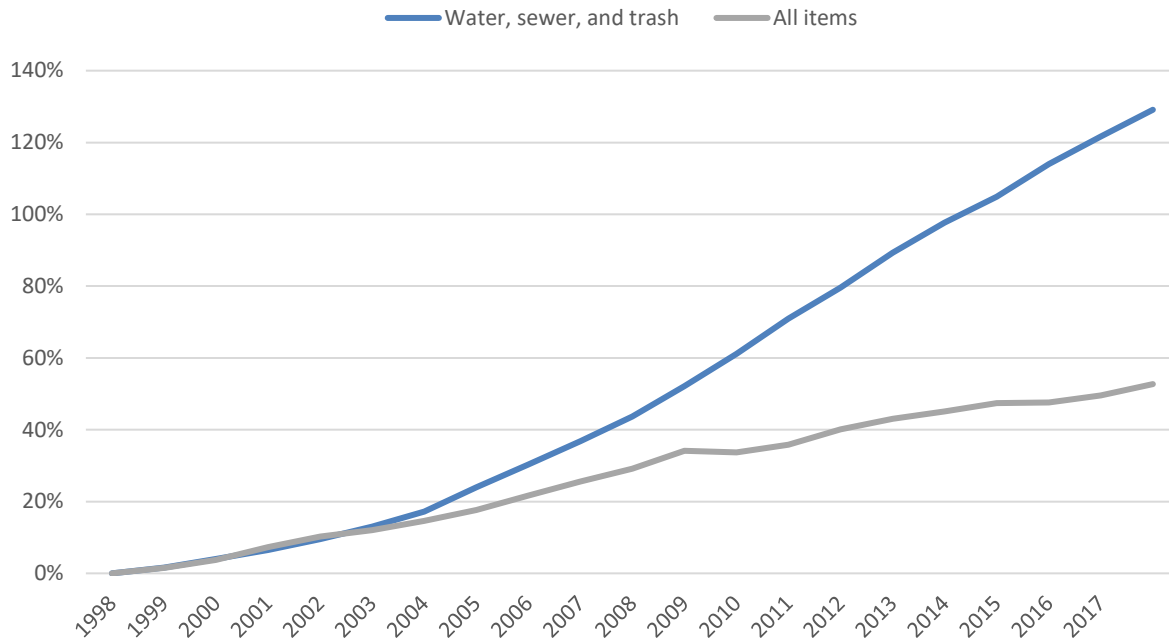
Ultimately, it is important to address the water affordability issue holistically. Cost escalations are due to many factors impacting many water utilities in distinct regulatory and financial contexts. Thus, while this report has been initiated in the context of federal regulatory mandates and the costs they impose, the same metrics should be considered in other contexts where water sector affordability is a concern, such as the prioritization of utility project loans and grants at the state level, as well as other financial award, and regulatory considerations at any level of government. Further, while multiple metrics are proposed in this report to measure affordability and financial capability, it is important to remember that ultimately these metrics should be employed together to make a single determination. While it is important to be careful in the use of the terminology to distinguish metrics for household affordability from community or utility financial capability, both are intended to be used together to inform one assessment. Appendix D includes a review of the most directly relevant federal statutes and related guidance that might be informed by the findings of this report directly or indirectly.

1.2.2 Water, Wastewater, and Stormwater Bill Trends

Over the past several decades, communities throughout the United States have experienced significant increases in the cost of providing water, sewer, and stormwater services. Factors contributing to this escalation in water sector rates have been well documented (e.g., Stratton et al. 2016, Mack et al. 2017); they include challenges associated with aging infrastructure, climate change, increasing regulatory mandates, population declines in urban centers, population growth and shifts to water-strapped areas, and declining demand resulting from conservation efforts.

Increased utility costs have resulted in significant increases in water and sewer rates and associated household bills. From the mid-1980s through 2000, growth in household water and sewer costs outpaced the rate of general inflation (as measured by the Consumer Price Index, (CPI) by approximately 50%, likely reflecting increased costs associated with Safe Drinking Water Act (SDWA) and Clean Water Act (CWA) compliance (Van Abs and Evans, 2018). Over the past two decades, household water and sewer costs have risen more steeply, increasing by close to 130% between 1997 and 2017. This compares to a 52% increase in CPI over the same period (Figure 1-1).

Figure 1-1: Annual cumulative increase in household costs for water, sewer, and trash compared to increase in CPI for all items.



Source: Bureau of Labor Statistics, 2017

Note: BLS does not separately report costs for trash, water, and sewer in its summary tables/data.

The trend of rising water, sewer, and stormwater rates is expected to continue. In many areas, rates are still too low to generate the revenues needed to upgrade, operate, and maintain community water, wastewater, and stormwater systems, much less meet emerging trends related to lead service lines or constituents of emerging concern. AWWA (2012) estimates that the cost to replace aging infrastructure alone in the United States will amount to \$1 trillion dollars over the next 25 years. Other studies estimate that adaptations by water systems to deal with climate change will cost the United States more than \$36 billion by 2050 (Jones and Moulton, 2016; as cited in Mack, 2017). Water and sewer utilities will need to further increase rates to address these and other needs.

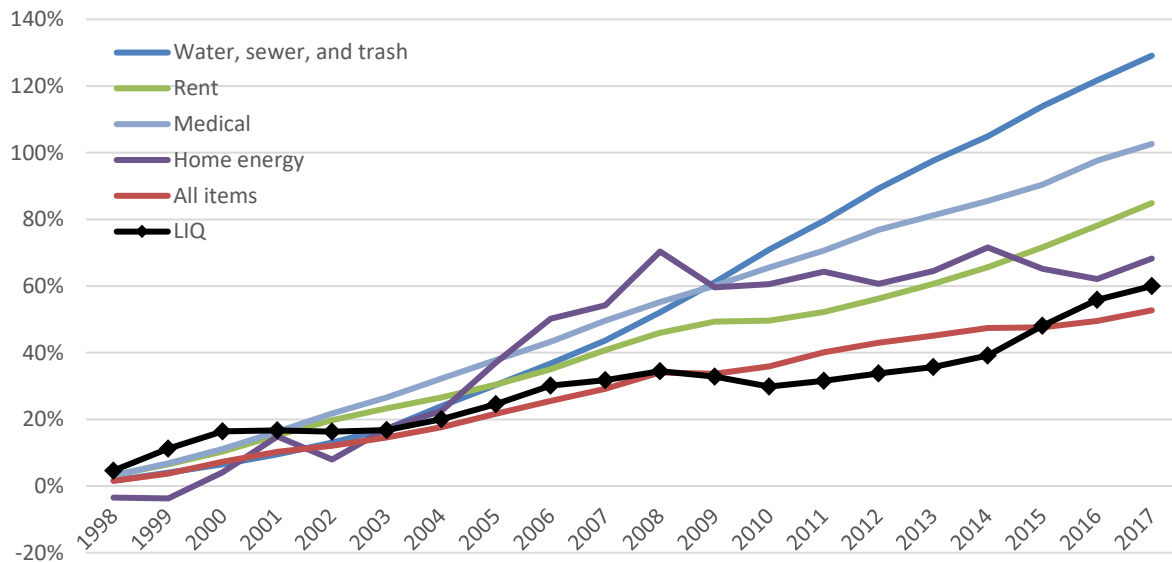
1.2.3 Degree of Economic Hardship Across the U.S.

In every community, there are customers who have difficulty paying their water and sewer bills (EPA 2016). Per the U.S. Census Bureau American Community Survey (ACS), nearly 43 million people in the United States (13.4% of the U.S. population) lived below the federal poverty level (FPL) in 2017 (ACS 2017). Research even shows that many households earning well above the FPL have trouble paying for basic expenses (Gould, Cooke, and Kimball 2015). Federal, state, and local governments frequently set eligibility for social assistance programs at 150% or even 200% of the FPL. Approximately 31% of the U.S. population live in households earning less than 200% of the FPL (ACS, 2017).

At the same time, the cost of basic necessities continues to rise. While growth in household incomes has outpaced the general rate of inflation over the last several years (even at the lower end of the income

spectrum), it has not kept pace with increases in costs for many non-discretionary items. For example, as shown in Figure 1-2, the upper limit of the lowest income quintile (i.e., the 20th percentile household) increased by 60% over the last two decades. This is slightly greater than the increase in the CPI for all items, which grew by 52%. However, over the same period, costs for water and sewer increased by 129%, while the cost of rent, home energy, and healthcare increased by 85%, 68%, and 103%, respectively. This exacerbates the affordability challenge, as despite rising incomes, many households are finding it is increasingly difficult to make ends meet.

Figure 1-2: Cumulative percentage increase in upper limit of the lowest income quintile (LIQ) compared to increase in non-discretionary household expenditures and general CPI



United Way’s ALICE Project provides insights on the percentage of households that face affordability challenges. ALICE, which stands for Asset Limited, Income Constrained, and Employed, includes households with incomes above the FPL, but who do not earn enough to meet basic needs. For 13 states, the ALICE Project has developed a Household Survival Budget, a basic budget that includes the cost of five essential items (housing, child care, food, transportation, and health care), adjusted for different counties and household types. Of the 38 million households in the states that have participated in the ALICE project, United Way estimates that 40% cannot afford the Household Survival Budget and are therefore living below the ALICE Income Threshold (households earning less than the ALICE Income Threshold include both ALICE and poverty-level households). Further, United Way reports that ALICE and poverty-level households are not confined to urban areas; in every county in each of the 13 states, more than 17% of households live below the ALICE Income Threshold (United Way 2017).

Households who struggle to meet basic needs face significant tradeoffs in the allocation of their budgets. For example, small increases in rent or water and sewer bills can adversely affect a households’ ability to pay for needed food, heat, and medical care (e.g., see Raucher et al., 2011). Beyond these direct tradeoffs, United Way’s Consequences of Insufficient Household Income report explores how ALICE and poverty-level families manage when they do not have enough income or assistance to meet basic needs (United

Way, 2017). The authors found that “the larger the gap between income and costs, the more extreme the strategies, and the greater the risks to a family’s immediate health and safety. These strategies have consequences for a family’s employment, for where they live, for what they eat, and for how their children fare in school.” In addition, these choices affect many beyond the immediate household by reducing economic productivity, stressing local health care and education systems, and raising insurance premiums and taxes for everyone (United Way, 2017).

1.2.4 EPA’s Current Method of Assessing Household Affordability and Community Financial Capability

The EPA developed affordability criteria to identify when federal wastewater-related mandates might result in “undue economic hardship” within a community (EPA 1995, 1997). The objective of these criteria was to indicate when EPA might accommodate some flexibility for utilities striving to meet applicable regulatory compliance obligations.

Specifically, EPA’s 1995 Guidance contains a detailed discussion of the analyses a municipality should undertake to evaluate the economic impact of complying with Water Quality Standards (WQS, EPA, 1995; 1995 Guidance). EPA’s 1997 Guidance uses a nearly identical approach to assess whether an extended compliance schedule may be granted to a utility facing affordability and financial capability challenges.⁶ The associated analyses put forth in the EPA guidance documents are divided into two phases:

- The first phase examines affordability in terms of impacts to individual households. This phase employs a Residential Indicator (RI), which examines the average per household cost of wastewater services relative to a benchmark of 2% of service area-wide Median Household Income (MHI). The results of this “preliminary” screening analysis are assessed by placing the utility in one of three categories:
 - Low financial impact: costs per household are less than 1% of MHI. Utilities (or permittees, per EPA guidance) in this group are assumed to be able to afford full compliance with existing WQS or Combined Sewer Overflow (CSO) Control Policy compliance schedules.
 - Mid-range financial impact: average costs per household are between 1% and 2% of MHI. Utilities in this category may face economic difficulty in complying with existing standards, depending on the results of the secondary screening analysis (see below).

⁶ EPA recognizes that the procedures set out in its 1995 and 1997 Guidance are not the only analyses that can be used to evaluate a community’s ability to comply with WQS or meet CSO compliance schedules. For example, with respect to its 1995 Guidance, EPA noted that “*States may also use alternative analyses and criteria to support this determination, provided they explain the basis for these alternative analyses and/or criteria* (EPA, 2001a, p. 31, emphasis added).

- High financial impact: average costs per household are greater than 2% of MHI. Utilities are likely to have an economic hardship in complying with existing standards. This needs to be confirmed with the secondary screening analysis.
- The second phase examines several metrics related to the financial capabilities of the impacted utility. This secondary screening analysis applies the Financial Capability Index (FCI). The FCI involves the calculation of a score that is a simple arithmetic average of six economic indicators, including bond rating, net debt as a percentage of full market property value, MHI, local unemployment, property tax revenues as a percent of full market property value, and property tax collection rate within a service area. Lower FCI scores imply weaker economic conditions and relatively lower financial capability.

The EPA's two-phased approach to assessing the economic impact and feasibility of water sector services includes two distinct, though inter-related concepts: household affordability and utility financial capability:

- Household affordability refers to the financial impact on households served by water sector utilities.
- In contrast, financial capability refers to the ability of the utility (or community as a whole) to gain access to financing and adequate revenue to invest in necessary capital improvements, cover associated operation and maintenance costs, and maintain a suitable reserve for contingencies and periodic equipment replacement.

While these two concepts are distinct, they are closely inter-woven, and both are important in making informed regulatory decisions. They are highly inter-connected because the ability of the utility and community to access financing and associated fiscal resources to properly develop, improve, and maintain a water sector utility depends on the ability (and willingness) of its residential and other customers to provide sufficient revenue to assure sustainable utility operation and credit-worthiness. For this report, we focus primarily on the inter-connected concepts of household affordability and community affordability/utility financial capability. Given the inter-connected nature of the concepts, our recommended approach is to examine both household affordability and utility financial capability concurrently (rather than in a phased approach as currently applied by EPA). The approach recommended in the report is consistent with EPA fully implementing 33 U.S.C. § 1342 (q) and is sufficient for use in connection with long-term control plans and consent decrees for CSO controls.

While EPA's consideration of affordability for *wastewater* compliance is aimed at assessing an individual community's ability to comply with regulatory mandates and schedules, EPA's consideration of affordability in the context of potable water supply is limited to assessing the national-level affordability of regulatory options for small communities. Specifically, EPA has stated that it would consider a National Primary Drinking Water Regulation to be unaffordable to small communities (those with populations under 10,000 people served) if the standard would result in a household drinking water bill in excess of 2.5% of the national MHI in such communities. In this context, MHI is evaluated based on all small community water systems collectively (i.e., MHI is not considered for any individual utility, but for all small utilities lumped together). To date, EPA has never determined that a drinking water regulation is unaffordable for small systems. If EPA were to make such a finding, it would be required to identify

technologies for small systems that might not result in meeting a particular drinking water standard but are found to protect public health. Then, on a case-by-case basis, states may approve the use of such affordable small system technologies (called a small system technology variance) or approve an extended deadline for compliance (called an exemption).

EPA's stated view on potable water—that it is affordable if it costs less than 2.5% of small community MHI—has influenced the perceived affordability of combined water and wastewater bills. Specifically, it is commonly inferred that EPA would consider a combined annual water and wastewater bill of less than 4.5% of MHI to be affordable (2.5% for water, plus 2% for wastewater services and CSO controls). However, as described below, and shown in Figure 1-3, MHI (and EPA's RI) can be a highly misleading indicator of household affordability.

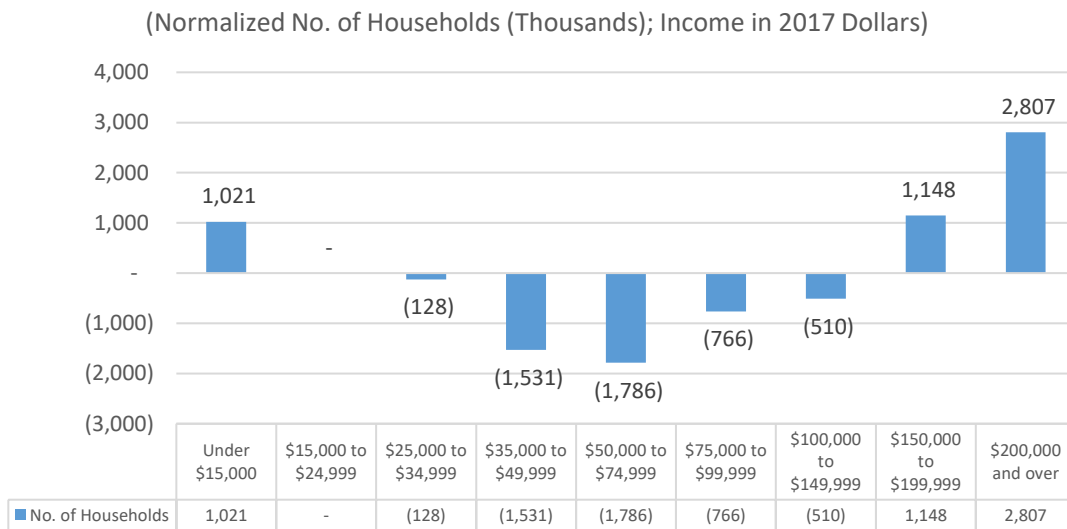
1.2.5 The Limited Relevance of the Median Household and the EPA Residential Indicator

Examining household incomes within a community helps to understand broader affordability concerns. The EPA has relied on a RI -- defined as the percent of average household wastewater costs divided by the area's MHI -- as its metric for delineating affordable from unaffordable water sector regulatory costs. However, EPA's reliance on the RI as the primary indicator of affordability can be misleading, for several reasons, many of which were cited in the 2017 NAPA Report:

- MHI is a poor indicator of economic distress bearing little relationship to poverty or other measures of economic need across the households that make up a community. For example, an analysis of MHI and poverty data for the 100 largest cities in the United States shows that for 21 cities identified as having an MHI within \$3,000 of the 2010 national MHI (\$50,046), there is no discernible relationship between MHI and the incidence of poverty. Indeed, within these 21 cities, the poverty rate ranged from a low of 14.1% to a high of 23.3% (AWWA, 2012). This is also exemplified when considering differences for urban and rural areas. According to the 2011-2015 ACS, the MHI for rural households was \$52,386 (5-year average estimate), about 4.0% lower than the MHI for urban households, \$54,296. However, the average poverty rate for rural areas (2011 – 2015) was 13.3%, compared to 16.0% for urban areas.
- The RI is not focused on the poor or the most economically vulnerable users, and MHI does not capture impacts across diverse populations. In many areas, income levels are not clustered around the median, but are spread over a wide income range or concentrated at either end of the income spectrum, making MHI a less meaningful metric. A 2016 report by the Pew Research Center (PRC) reports that in 2014, the Gini index (a common measure of inequality) reached its highest level since 1967 (and has increased slightly in 2017). Based on data from 2010 to 2014, PRC estimated that 41% of all counties in the U.S. have high levels of both poverty (i.e., higher than 15.5%) and inequity (i.e., with a Gini Index of greater than 0.43). In addition, the authors report that while income inequality and poverty have historically intersected primarily in rural counties, the share of high-inequality, high-poverty counties in large metropolitan areas nearly doubled between 1989 and 2014. Further, PRC's analysis indicates that 46% of counties in small and mid-sized cities experienced high levels

of inequality combined with high poverty rates, a 24 percentage-point increase since 1989. Poverty and inequality also increased in rural areas, but at a slower pace compared to counties in metropolitan areas. Indeed, an analysis of the national distribution of households by income range from 2000 to 2017 shows that the trend away from the range containing MHI (\$50,000-74,999) continues (Mumm, 2018, US Census, 2017) as reflected in Figure 1-3.

Figure 1-3: Change in Households by Income Level 2000 to 2017 (Mumm, 2018, US Census 2017)⁷



- The RI is an incomplete water cost measure. The RI only includes a limited set of wastewater costs and does not include the cost of drinking water or stormwater, and the estimated costs are not the water bills that are actually paid.
- The RI does not fully capture household economic burdens. Economic burdens are commonly measured by comparing the costs of necessities to available household income. The RI is such a measure in that it is used to evaluate the economic burden from average household water costs by comparing those costs to MHI. However, the RI does not account for the costs of other non-discretionary items that make up a household budget (e.g., housing, health care, energy). It therefore does not capture the full economic burdens and associated affordability challenges that lower income households face. This is especially problematic in areas that have a high cost of living index, and particularly, high housing costs.
- The RI focuses on average per household cost of water-related services rather than basic water use for drinking, cooking, health, and sanitation. The numerator in the RI calculation

⁷ (Mumm, 2018) as sourced from U.S. Census Bureau ACS Table H-17. Households by Total Money Income, Race, and Hispanic Origin of Householder: 1967 to 2017, Available at: <https://www.census.gov/data/tables/time-series/demo/income-poverty/historical-income-households.html>

reflects the average per household cost that a utility incurs to provide residential water sector services. It does not reflect the actual amount that low-income households pay, which is often much lower than the average household bill within a service area. As noted by Teodoro (2018), “public policy discussion for water and sewer affordability seldom are concerned with the cost of maintaining large lawns, swimming pools, or other discretionary outdoor use. Rather, affordability is typically thought of as the ability of customers to pay for water and sewer services that are adequate to meet their basic needs for drinking, cooking, health, and sanitation.” Further, the use of averaged water costs does not reflect how sector-specific water rates may favorably support commercial and industrial customers at the expense of the served residential households.

- The RI provides a “snapshot” that does not account for the historical and future trends in annual water sector utility costs or the trends of a community’s economic, demographic, and/or social conditions. This is particularly relevant in areas that may be experiencing economic declines or population losses, which will result in the costs of water and wastewater programs being spread across fewer customers. Without consideration of these and other economic and demographic trends, the affordability determination will overestimate the ability of residents to tolerate rate increases over time.
- The RI does not capture environmental justice concerns. Income distribution and other economic measures can vary widely across different districts and neighborhoods within a city. Thus, the economic hardship associated with increasing water and wastewater bills can be concentrated in a few lower-income neighborhoods. This will compound the economic hardship within the community and may raise issues of environmental justice. These impacts are not captured with the use of service area MHI as a sole indicator.
- The RI does not capture impacts to landlords and public housing agencies. In cities with a high percentage of renters and/or public housing residents, use of MHI and EPA’s reliance on an MHI-based RI does not capture impacts to landlords and public housing agencies, which must often absorb the cost of increased water and wastewater bills. In many cases, higher water bills mean that public housing authorities will be required to reduce the number of needy renters they serve, unless there can be offsetting increases in public housing budgets.

1.2.6 Prior Critiques of EPA’s Financial Capability Assessment Methodology

EPA’s FCA methodology has been the subject of several prior reviews. These critiques are summarized in Table 1-1. Common themes of these reviews include the need to consider economic burdens holistically as opposed to those related to a single utility service or compliance requirement, to gauge impacts on the economically disadvantaged, and to recognize the profound differences in costs of living and water affordability in different geographic settings.

Table 1-1 Prior Reviews of Affordability and Financial Capability Methodologies

Entity	Reference	Findings Summary
EPA Science Advisory Board	Affordability Criteria for Small Drinking Water Systems (2002)	Affirmed basic approach, calls to lower MHI% given lower quintile impacts, and guidance for local water quality variance reviews.
National Drinking Water Advisory Council	Recommendations of the NDWAC to EPA on Its National Small Systems Affordability Criteria (2003)	Affirmed use of MHI as the best metric available at the time but recommended an incremental impact threshold of 1% MHI for each rule to measure rate shock, and also recommended regional metrics to account for cost of living differences, while also raising several concerns about the approach to calculating the expenditure baseline. Finally, recommended more public education when variances are granted.
Environmental Financial Advisory Board	EFAB Analysis and Recommendations on: Draft Financial Capability Assessment Framework (2014)	Called for more expansive evaluation to consider all water resource utility service costs, cost of living measures and housing cost burdens. Noted need to modify financial indicators.
American Water Works Association, U.S. Conference of Mayors, and Water Environment Federation	Affordability Assessment Tool for Federal Water Mandates (2013)	Recommended looking at LQI instead of MHI, all water sector service bills instead of CSO CPH, neighborhood level data, housing and other non-discretionary costs, poverty %, and additional socioeconomic indicators in place of the RI. For FCA the report recommends also looking at local tax revenues as a percent of gross taxable resources, unemployment severity, property tax collection rate, and other unfunded long-term liabilities such as pensions.
National Association of Clean Water Agencies	The Evolving Landscape for Financial Capability Assessment - Clean Water Act Negotiations and the Opportunities of Integrated Planning (2013)	Recommended three primary enhancements to EPA Integrated Planning Guidance-prescribed procedures; 1) watershed or triple bottom-line prioritization analyses, 2) cash-flow modeling analyses, and 3) analysis of disproportionate burden among customer classes.
National Academy of Public Administration	Developing a New Framework for Community Affordability of Clean Water Services (2017)	See below for a detailed review of the NAPA report recommendations.

The most recent critique was completed by the National Academy of Public Administration (NAPA) for the EPA in 2017 in a report “Developing a New Framework for Community Affordability of Clean Water Services” (the “NAPA Report”). NAPA conducted the study and developed the report in response to a congressional directive to update EPA policies and guidance on the affordability of EPA’s water programs. A key focus of this report was an assessment of EPA’s FCA framework for determining the financial capability of permittees to provide clean and affordable water services. The report acknowledged deficiencies in EPA’s FCA guidance and proposed improvements to both the RI and Financial Capability Indicator (FCI) components that would provide a better starting point for EPA and permittees to address clean water compliance schedules. These recommendations included the following:

Panel Recommendation #1: Improve the metrics used for the RI and FCI so that measures meet the following criteria:

1. Readily available from publicly available data sources;
2. Clearly defined and understood;
3. Simple, direct, and consistent;
4. Valid and reliable measures, according to conventional research standards; and
5. Applicable for comparative analyses among permittees.

Panel Recommendation #2: The RI component should be improved by revising the following elements:

1. Include all water costs, not just selected clean water costs, to include all drinking water and clean water costs – CSO control costs, stormwater costs, and other sewer costs, and well as planned water infrastructure investments and any deferred costs of system operation and maintenance, in the burden assessment.
2. Focus on income of low-income users most vulnerable to rate increases rather than MHI.
3. Identify the size of the vulnerable users related to the utility’s total rate payer base.
4. Avoid arbitrary normative thresholds to determine relative burdens.

Panel Recommendation #3: The FCI component should be improved by revising the following elements:

1. Focus on the operational efficiency, debt burden, and managerial effectiveness of the utility supplying clean water services.
2. Expand the socioeconomic components affecting the utility’s market conditions to include trends in population, relative wealth, economic growth, and other economic structural problems in the community served by the utility.

Panel Recommendation #4: The EPA should consider using the improved FCA framework in all of its clean and drinking water regulatory decision processes consistent with current statutory requirements.

The NAPA Report provided these and other general recommendations, but the report did not outline or detail a new framework or methodology for a revised FCA that encompasses these recommendations. Our report is intended to develop a new framework and methodology that EPA can adopt to address the NAPA and other recommendations.

1.2.7 EPA Uses of Household Affordability and Financial Capability Measures

EPA has applied its FCA methodology to addressing economic considerations in a wide variety of applications, including the assessment of the financial capability of utilities implementing CWA and SDWA requirements. In these contexts, the EPA has allowed the consideration of supplemental documentation to more fully characterize specific circumstances. For Consent Decree (CD) negotiations, for example, EPA's CSO FCA guidance states that "...when a permittee believes that there are unique circumstances that would affect the conclusion of this guidance, the permittee may submit documentation of its unique financial conditions to the appropriate EPA or State National Pollutant Discharge Elimination System (NPDES) authorities for consideration (EPA 832-B-97-004, 1997, p. 10)." While there are some important differences, the CSO guidance, affordability criteria used for National Primary Drinking Water Regulations, and other EPA frameworks have referred to alternative measures of compliance costs imposed on households relative to MHI. For community FCAs, these measures of impact on median household affordability have been paired with indexes of community financial performance indicators to assess compliance burdens.

In addition to EPA roles and responsibilities where established legal and regulatory frameworks require focused consideration of household affordability and permittee financial capabilities, economic concerns color the implementation of other federal (and state) programs. A salient example drawn from recent experience is with respect to the minimization of lead in drinking water. Following the Flint Water Crisis, EPA is considering requirements to promote full lead service line replacements (FLSLRs). While most parties concur with calls to "get the lead out", the required pace of the effort will undoubtedly be informed by potential impacts on household water affordability and be a function of community financial capabilities. Household water affordability must be considered in the context of the combined costs and pace of regulatory investments in drinking water, clean water, and stormwater. Indeed, as a practical matter, both EPA's regulatory role and its technical and financial assistance roles must be informed by consideration of the financial impacts of its programs on households. These potential impacts can and should be the basis by which programs and regulations are prioritized and assistance rendered.

Affordability of water services is a challenge that is being faced by regulatory agencies at the state level as well as at the national level. For example, in a recent California court case, the state's Maximum Contaminant Level (MCL) for hexavalent chromium was voided because the judge ruled the state had failed to adequately conduct the California SDWA's required analysis of the "economic feasibility" of the standard (Superior Court of California, County of Sacramento, Gordon D. Schaber, Sacramento County Courthouse, May 2017). The judge went on to further state that: "Whether one uses the term "economically feasible" or the term "affordable," the court is concerned that some families will not have the income or resources to pay a water bill that increases by \$5,600 per year. More important, the court is not convinced that the Department properly considered this fact when it adopted the MCL." (p 13).

As a consequence of this ruling, the state currently is unable to revise or promulgate any new MCLs until it has effectively addressed what “economic feasibility” and “affordability” mean, and then develops an acceptable way of assessing whether a regulatory action conforms with these measures. The California EPA and State Water Quality Control Board are in the process exploring how they can address this challenge.

Since the EPA issued its Integrated Planning Framework in 2012, water utilities have been working to implement system capital improvements to meet regulatory requirements in an integrated fashion (EPA, May 2012). The EPA’s Integrated Planning framework is a voluntary planning process designed to assist communities in meeting CWA obligations by prioritizing and sequencing stormwater and wastewater projects together. It is a framework that allows a municipality to balance CWA requirements in a way that addresses the most pressing health and environmental protection issues first, allows flexibility in the development and adoption of the integrated plans, and it is a starting point for the development of appropriate implementation actions that may include requirements and schedules in enforceable documents. The Integrated Planning framework may also provide a way to best address both CWA and SDWA imperatives together. Having a household affordability and community FCA framework that considers the cost of water, wastewater, and stormwater provision together would support the facilitation of the Integrated Planning Framework.

2. Framework Criteria

A set of criteria for developing a new framework for measuring household affordability and FCA was prepared based on an extensive literature review and stakeholder outreach to the EPA, water and wastewater utilities, AWWA, NACWA, WEF, low-income advocacy groups, and other academic and consulting specialists in the sector. The intention of identifying such criteria was to ensure that the recommended metrics would be *meaningful* for identifying and assessing household affordability and financial capability, *implementable* for users, and *trustworthy* (or as accurate and credible as possible). While some criteria apply to both household affordability and community or utility financial capability metrics, others are specific to one of these.

The literature review focused on criteria that were commonly reported as important for the establishment of a new framework, as well as the rationale and thinking behind the development of affordability metrics found in the literature (see bibliography). Much of the criteria that is presented herein was derived from the Report by a Panel of the NAPA, Developing a New Framework for Community Affordability of Clean Water Services (NAPA, 2017). Other criteria were compiled from the following:

- Policy documents detailing existing metrics used to measure affordability by state and local governments,
- Proposed metrics developed by individuals or groups of government officials, academics, national associations, consultants, or others,
- International meta-analyses of affordability metrics.

Based on the findings of this literature review, input from subject matter experts, and outreach to stakeholders to solicit feedback on the criteria that were identified, a set of revised criteria for establishing the framework was developed.⁸ General comments from the stakeholder groups that were convened included the following:

1. Affordability needs to be viewed in a context that is broader than just customer and community cost related to water services – all “non-discretionary” costs need to be factored in.
2. The purpose for affordability metrics needs to focus on the assessment of needs – what it will take to support CWA and SDWA compliance and utility sustainability while maintaining affordability for vulnerable community members.
3. Customer and community contexts vary substantially – flexibility in the affordability metric(s) and method(s) will be important to avoid uses that fail to recognize there is no “one-size-fits-all” approach.

⁸Water Affordability Stakeholder Meeting, October 29, 2018, Affordability Workshop Synthesis, prepared by Ross and Associates.

4. The affordability metric(s) and method(s) should seek to incentivize good behavior/practices by communities/entities to which the methodology is applied (e.g., robust utility asset management programs, full cost pricing, effective rate design).
5. The metric(s) and method(s) need to consider the major differences under the CWA and SDWA.

Three “pillars” of criteria emerged as common themes which guided development of the framework. The metric(s) should:

1. Reflect all/combined water service costs,
2. Reflect the households that are most economically challenged,
3. Reflect local essential costs of living.

While these three pillars were identified as the most important criteria for framework development, a broader set of criteria was also identified, as summarized below:

2.1 Overall Framework Criteria

The following overall criteria that are relevant to both the household affordability component and the community financial capability component of the framework were developed and compiled. The framework should:

1. Have a clear definition of what household affordability and financial capability mean and how they may be measured, as well as provide clear and practical definitions for operative terms (e.g. non-discretionary household expenditures, relative wealth, etc.) as they are used in the criteria listed below.
2. Focus on both household affordability (rate payer burden) as well as the financial capability (and sustainability) of the water system providing the services and the community receiving the services.
3. Use valid and defensible measures that rely upon readily available data from relevant verifiable sources.
4. Be straightforward, direct, transparent, and consistently applied by water systems, EPA, and state primacy agencies, while preserving regulatory flexibility.
5. Be applicable for comparative analysis among water systems and across water resource services (water, wastewater, stormwater).
6. Allow for flexibility in defining and identifying a water system’s potential financial and economic burdens by allowing for the selection of specific metrics for household affordability and water system financial capability components.
7. Consider the current and future full cost of providing water, wastewater, and stormwater utility services. Full cost reflects that O&M needs are met, an effective asset management plan is in place, and effective plans for sustainability/resiliency.
8. Consider all sources of user charge and tax-derived revenue used to pay for all water costs.

9. Be applicable to a broad range of EPA purposes (e.g., CD negotiations under CWA, approval of WQS variances and use attainability analyses, assessing economic feasibility of rulemakings under the SDWA and CWA, establishing SDWA small system variances, and providing guidance on access to federal funding and financing programs where affordability is a component). However, the framework should allow the level of analytical complexity to vary by application.

2.2 Household Affordability Component Criteria

The following criteria that are relevant to specifically to the household affordability component of the framework were developed and compiled. The household affordability component should:

1. Be defensible in determining relative burdens.
2. Focus on low-income customers and other customers most vulnerable to rate increases.
3. Identify the size and composition of the economically vulnerable customer base (e.g., elderly, low-income, renters) relative to the water system's total rate payer base.
4. Consider the types and level of service provided to customers (e.g., retail vs. wholesale service), appropriate levels of customer water usage (e.g. a level of basic water usage), contractual pricing arrangements, and an allocation of costs among customers served (in proportion to their usage of the system) in estimating a customer's financial burden.
5. Accommodate all current and anticipated future household water costs (drinking water, wastewater, and stormwater, etc.), alternatives to ensure safe drinking water, and other non-discretionary household expenditures.

2.3 Financial Capability Component Criteria

The following criteria that are relevant specifically to the community financial capability component of the framework were developed and compiled. The financial capability component should:

1. Recognize effective financial planning and management to enable rate stability and access to credit on favorable terms. It should consider and advance the sustainability of the water system's finances and consider the community's ability to support it.
2. Provide for recognition of historic and future trends of a community's economic, demographic, resiliency, and/or social conditions.
3. Consider trends in market conditions and socioeconomic factors affecting the community's financial capability, such as trends in population, relative wealth, economic growth, and other economic and structural problems in the community served by the water system, as well as environmental justice and equity considerations.

These criteria were applied to the possible frameworks and metrics that were identified from the literature review and stakeholder outreach. The criteria that were developed were weighted against the household affordability metrics that were identified by the authors of this report. Aggregate criteria-weighted scores for each metric were calculated and ranked to get a sense of the relative performance of each metric based

on the established criteria. As a result of this analysis, candidate household affordability metrics clearly separated into two distinct groups; those metrics that measure household water service cost burden, and those that measure low income prevalence in the community. The highest scoring metrics from each group were advanced for deeper consideration. The results of the metrics scoring were evaluated and used to help develop the proposed household affordability framework. These qualitative and quantitative assessments (summarized in the table shown in Appendix A) coalesced into the set of recommended metrics and implementation procedures detailed in the sections that follow.

3. Household Affordability Assessment Methodology

3.1 Introduction

In this section, alternatives to the EPA RI metric are presented, along with recommendations for an alternative household affordability assessment methodology. The recommended metrics better adhere to the criteria developed in the previous section than EPA’s RI. While one specific recommendation or primary choice is identified, several other metrics were found to be reasonably strong potential complements to -- or alternatives for – the recommended option, and these also are presented.

At the outset, it is important to acknowledge that no one metric was found to be “perfect” in every respect. Every candidate metric that was considered was found to have some limitations relative to the evaluation criteria. Nonetheless, several alternatives were identified that we consider to be very strong and suitable candidates for household affordability metrics – either individually, or as a composite -- because they do a reasonably good job at addressing the most critical criteria and considerations and offer a considerable improvement to the current RI. These critical considerations include:

- Reflecting the affordability challenge that individuals within a community face in a *meaningful* manner by:
 - focusing on households representing the more economically challenged portions of the community,
 - reflecting total water sector costs,
 - accounting for the community-specific cost of living for basic/essential goods and services (e.g., shelter, food, child care, medical care, transportation).
- Relying on *trustworthy*, credible information in a replicable and transparent manner, and
- Providing relatively *easy-to-implement* measures (e.g., using readily accessed information in a fairly straight-forward manner) that can help ensure consistent application, promote better understanding by stakeholders.

It also is important to distinguish here between the metrics under consideration, and the thresholds or benchmarks selected to be applied to those metrics. For this discussion, the following terminology applies:

- A **metric** is defined here as an indicator that is developed to help measure relative affordability. Examples of metrics include “Y% of MHI,” or “X% of household income for a household at the 20th percentile” of the community’s income distribution.
- A **threshold** refers to selecting a specific **cut-off value** for a metric, to create a boundary between what is considered affordable versus unaffordable. An example of a threshold would be opting to use a fixed percentage of MHI as a metric, and then selecting “2%” as the

threshold value for the percent of MHI that separates an affordable compliance schedule from one that is unaffordable.

- A **benchmark** refers here to using a set of ranges and/or other approaches (such as a combination of metrics) to define *relative degrees* of household affordability. For example, a benchmark approach might set ranges that differentiate between what household water costs likely to be affordable, those water costs levels that are potentially unaffordable, and those that are considered unaffordable.

3.2 Alternative Household Affordability Assessment Methodologies

Several alternative household affordability assessment measures were identified from the literature review and the project team's knowledge of various measures that have been developed. A description of the most relevant of these metrics, along with their advantages and disadvantages, are presented below. Further evaluation of these alternatives as they relate to the criteria that have been identified is provided in Appendix A. The alternatives were categorized into two types of measures:

1. Measures of Household Cost Burden
2. Measures of the Prevalence of Low-Income Households within a Community

3.2.1 Measures of Household Cost Burden

The following is an identification, discussion, and evaluation of several relevant measures found in the literature that are intended to measure the cost burden on households within a utilities service area.

3.2.1.1 EPA Residential Indicator (Cost as % of MHI)

The household affordability metric currently used by the EPA was initially developed in 1997 as part of the FCA guidance for the CSO Control Policy and has remained unchanged. Known as the RI, this metric calculates a cost per household (CPH) as a percentage of MHI. The CPH is the residential share of current costs plus projected costs for compliance (including all wastewater and CSO costs) divided by the number of household's in the permittee's wastewater service area. If the best available MHI data for the service area is not from the current year, then an adjustment factor may be applied based on increases in the CPI. In practice an RI of 2% for wastewater and stormwater costs, and informally 2.5% for water costs, have been interpreted as the thresholds above which a community is considered to have a high affordability burden.

Formulas:

$$\text{CPH} = \frac{\text{Residential Share of Current + Projected Costs of WW \& CSO Control for Compliance}}{\text{Number of Households in Service Area}}$$

$$\text{Adjusted MHI} = \text{MHI} * \text{Adjustment Factor (adjusted for inflation using CPI)}$$

$$\text{Adjustment Factor} = \frac{\text{CPI Current Year} - \text{CPI Census Year}}{\text{CPI Census Year} + 1}$$

RI = CPH / Adjusted MHI

Advantages:

- Utilizes readily available data from verifiable sources.
- Relatively easy and straightforward to calculate.

Disadvantages:

Critiques of the RI were well documented in the NAPA Report and by the AWWA in the “Affordability Assessment Tool for Federal Water Mandates” report published in 2013. Refer to Section 1.2.5 for a summary of the disadvantages and shortcoming of utilizing EPA’s existing RI method.

3.2.1.2 Cost of Basic Water Use as % of Upper Limit of Lowest Income Quintile

Measures basic annual water costs (including essential wastewater, water, and stormwater billed to residential customers using 50 gallons per person per day and assuming an average household size) as a percent of the upper limit of the lowest income quintile (i.e., 20th percentile) for the service area.

Formulas:

Utility Costs = ((Wastewater Rate Per Gallon + Water Rate Per Gallon) * Average People Per Household * 50 Gallons Per Person Per Day * 365 Days Per Year) + (Portion of Taxes for Wastewater, Water, and Stormwater Per Year) + Annual Stormwater Cost

20th Income Percentile = Census Data Upper Limit of the 20th Income Percentile for the Service Area

Metric = Utility Costs / 20th Income Percentile

Advantages:

- Includes all water sector service costs and therefore provides a more comprehensive picture of household burden.
- Focuses on non-discretionary, basic water service costs, rather than average costs, which are most relevant to low-income households.
- Uses local utility rates to calculate water service costs at a consumption level corresponding to basic usage for a fixed household size, and therefore better reflects the reality of what customers need to pay to cover their basic needs.
- Using local utility rates allows the measure to reflect the realities of the types and level of service provided to residential households within the service area, as well as any contractual pricing arrangements and the allocation of costs among customers served by the system.
- Focuses on local low-income populations in the denominator to better recognize the distribution of incomes in America today and to focus on the segment of the community that is most vulnerable to affordability challenges.

Disadvantages:

- Less straightforward to understand when assessing affordability for a given utility because this measure uses combined water, wastewater, and stormwater utility costs, and utility boundaries are often different.
- This measure does not directly consider the household burden of paying for water services together with other non-discretionary household expenditures.
- Assuming a fixed consumption level per person per day may not reflect local consumption and therefore may not reflect local water costs (while local consumption averages could be used to mitigate this disadvantage this would make comparisons between utilities more challenging in addition to adding complexity to the analysis).

3.2.1.3 Weighted Average Residential Index

The Weighted Average Residential Index (or WARi®) was developed by financial consultants at Stantec Consulting Services Inc. (Stantec) as an enhancement to EPA's RI to address differences in the distribution of income within a given geographic area and to account for bills paid for water services across the service area. Bills for water services are based on actual average bills from billing data or minimum bills calculated for non-discretionary basic water services by census tract. WARi® first calculates a RI based on tract-specific typical bills (inclusive of any water service costs relevant to the analysis) and the midpoint income for each income bin. A weighted average RI is then calculated for each tract, using the number of households in each income bin as the weight. Finally, the service area WARi® value is the average of the tract-level results weighted by the total number of households in each census tract. ***Formulas:***

Tract-Level Weighted RI = SUM Across Income Bins ((Census Tract-Specific Average Bill or Minimum Bill for Water Services / Income Bin Mid-Point) X % Households in Income Bin))

Service Area WARi® = (SUM Across Census Tracts (Tract-Level Weighted RI X Households per Census Tract)) / Total Households

Advantages:

- Accounts for variations in water usage by geography and better reflects actual costs for water services than EPA's RI by employing the actual average or minimum water service costs charged to users locally.
- Accounts for the full distribution of incomes within census tracts and across the service area.
- Conducive to visual representations of affordability across the service area.

Disadvantages:

- Less straightforward and easy to calculate as compared to EPA's RI due to billing data requirements and census tract-level analysis.

Does not directly consider the household burden of paying for water services together with other nondiscretionary household expenditures.

3.2.1.4 Affordability Ratio at the 20th Income Percentile

The Affordability Ratio at the 20th Income Percentile (AR₂₀) was developed by Dr. Manuel P. Teodoro, a professor at Texas A&M University, as an improved measure of water and sewer service affordability. AR₂₀ calculates the basic monthly cost for water and sewer service as a percentage of the monthly 20th income percentile less essential costs. Basic service costs are defined as indoor household water usage for drinking, cooking, health, and sanitation for a four-person household that uses 50 gallons per person per day. Income is defined as the 20th income percentile less other essential costs. Essential costs are defined to include monthly costs for housing, food, healthcare, home energy, and taxes. An AR₂₀ threshold of 10% is contemplated in the research that introduced the metric based on a preliminary distributional review of available data.⁹

Formulas:

Basic Monthly Cost for Service = ((Wastewater Rate Per Gallon + Water Rate Per Gallon) * 4 People Per Household * 50 Gallons Per Person Per Day * (365 Days Per Year / 12 Months Per Year)

20th Income Percentile = Census Data 20th Income Percentile for the Service Area

Essential Costs = Housing + Food + Healthcare + Home Energy + Taxes

AR₂₀ = Basic Monthly Cost for Service / ((20th Income Percentile - Essential Costs)/12)

Advantages:

- Includes all water sector service costs and therefore provides a more comprehensive picture of household burden.
- Focuses on non-discretionary, basic water service costs, rather than average costs, which are most relevant to low-income households.
- Uses essential water consumption levels across water sector services and actual utility rates to calculate costs and therefore better reflects the cost burden that vulnerable populations must overcome.
- Focuses on local low-income populations in the denominator to better recognize the distribution of incomes in America today and to focus on the segment of the community that is most vulnerable to affordability challenges.
- Directly considers the household burden of paying for water services together with other non-discretionary household expenditures.

⁹ Teodoro (2018)

Disadvantages:

- Less straightforward to calculate when assessing affordability for a given utility because the measurement of non-discretionary expenditures within a community can be challenging.
- Requires assessing low-income household costs for a range of basic, non-discretionary services, which may vary considerable across communities and for which available localized data are limited.
- Assuming a fixed consumption level per person per day may not reflect local consumption and therefore may not reflect local water costs (while local consumption averages could be used to mitigate this disadvantage this would make comparisons between utilities more challenging in addition to adding complexity to the analysis).

3.2.1.5 Hours at Minimum Wage

The Hours at Minimum Wage is defined as the number of hours of work required at the local minimum wage to pay for basic water and sewer service costs for one month. Costs for this metric are based on a four-person household using 50 gallons per person per day. Research on the metric proposed a threshold of 8 hours at minimum wage per month based on distributional analyses, suggesting that more than this indicates an affordability burden.¹⁰

Formulas:

Basic Monthly Cost for Service = ((Wastewater Rate Per Gallon + Water Rate Per Gallon) * 4 People Per Household * 50 Gallons Per Person Per Day * (365 Days Per Year / 12 Months Per Year)

Basic Monthly Cost of Service / Local Minimum Wage = Hours at Minimum Wage

Advantages:

- Uses readily available data from verifiable sources.
- Relatively easy and straightforward to calculate.
- Intuitive and easy to understand.
- Focuses on non-discretionary, basic water service costs, rather than average costs, which are most relevant to low-income households.
- Uses essential water consumption levels across water sector services and actual utility rates to calculate costs and therefore better reflects the cost burden that vulnerable populations must overcome.

¹⁰ Ibid.

Disadvantages:

- This measure does not directly consider the household burden of paying for water services together with other non-discretionary household expenditures.
- The costs of water utility services may not be fully captured by utility rates if utility costs are supported in part by tax revenues.
- Assuming a fixed consumption level per person per day may not reflect local consumption and therefore may not reflect local water costs.
- Less straightforward to understand when assessing affordability for a given utility because this measure uses combined water, wastewater, and stormwater utility costs, and utility boundaries are often different.

3.2.1.6 Percent of Households Delinquent in Paying Bills

The percentage of households that are delinquent in paying utility bills is an indirect measure or symptom of household affordability issues. The utility may include water, sewer, or stormwater services as applicable.

Formulas:

% of Households Delinquent in Paying Bills = Delinquent Households / Total Households

Advantages:

- Relatively straightforward measure.

Disadvantages:

- May be challenging to apply consistently as utilities often track delinquency rates differently.
- This measure does not directly consider the household burden of paying for water services together with other non-discretionary household expenditures.
- May be more indicative of a utility's collection practices than anything else. It does not account for disconnection policies, placements of liens, etc.
- Historically, reviews of data have not shown a clear correlation between delinquencies and known affordability challenges.
- Relies exclusively on self-reported information that is often not publicly available.

3.2.2 Measures of Prevalence of Low-Income Households within a Community

The following is a summary of relevant measures that were found in the literature of the prevalence of low-income households within a community.

3.2.2.1 Percentage of Households Below the Federal Poverty Level

The poverty rate is a local measure of the prevalence of low-income households in a given community and is calculated as a percentage of households in a community that are below a national threshold of income. There are two common measures of poverty currently available from the federal government: the FPL, and the Supplemental Poverty Measure (SPM).

The FPL is a measure of household income that corresponds to a minimum standard of living for households of various sizes based on a historical survey that is updated annually for inflation. The original measure, which is still the base value for CPI adjustments made today, was developed in 1963. The measure was based on the U.S. Department of Agriculture's (USDA) 1961 economy food plan based on survey research from 1955. The economy food plan is essentially a sustaining but emergency level food diet for when funds are low. Other research from 1955 showed that a typical family of four spent about one third of their income on food and so the poverty level was set at three times the economy food plan. The FPL is published annually by the US Census and is updated based on the CPI index for 48 possible thresholds based on age and family size. Comparisons to the FPL must exclude capital gains, non-cash benefits (such as public housing, Medicaid, and food stamps), and tax credits. The FPL does not vary by geography. The percent of the population below a multiple (such as 150% or 200%) of the FPL is often used as a conservative measure of low-income and potentially vulnerable populations in various federal, state, and local contexts.

Formulas:

FPL % = U.S. Census Data County or MSA % FPL (or a multiple of the FPL 150% or 200%) typically)

Advantages:

- Relatively straightforward measure that is easy to understand.
- Uses readily available and verifiable data.
- Applicable for comparative analysis among communities
- Estimates the size of the economically vulnerable customer base in a community.
- Very commonly used throughout the federal government and beyond for a very long time.

Disadvantages:

- National figures that likely do not apply locally due to variations in the cost of living.
- Developed based on outdated data that may not be relevant or accurate today because it does not reflect an assessment of current expenditure requirements for a household.

3.2.2.2 Percentage of Households Below the Supplemental Poverty Measure

The SPM has been developed by the U.S. Census as an attempt at a more rigorous estimate of poverty, though it has not replaced the official poverty measure developed in the 1960s for use in any federal programs to date. The SPM defines poverty as the 33rd percentile of the distribution of household expenditures on food, shelter, clothing, and utilities (FSCU) and multiplies the value times 1.2 to allow

for some extra expenditure. The SPM incorporates a variety of U.S. Census, Bureau of Labor Statistics, and other federal data sources. Unlike the FPL, comparisons to the SPM should include the value of non-cash benefits and exclude income for some expenses not accounted for such as taxes (or plus tax credits), work expenses, out-of-pocket medical expenses, and child support paid to another household. While indices to make adjustments for the SPM housing component costs are available at the county or metropolitan/micropolitan statistical area (MSA) level, like the FPL the SPM is essentially a data point from a national dataset that can be used as a reference for comparisons at the local level.

Formulas:

SPM % = U.S. Census Data County or MSA % SPM

Advantages:

- Measures the size of the economically vulnerable customer base in a community.
- More robust and valid measure than the Federal Poverty Measure as it is based on current survey data and includes consideration of non-cash benefits, such as food stamps, as part of household income, and better reflects the overall resources available vulnerable populations to pay for essential costs of living.
- Accounts for some local cost of living adjustments in shelter costs.
- Relatively easy to understand.

Disadvantages:

- Not readily available for utilities in all locations. Estimates are made at the state level for rural areas, and at the MSA level for non-rural areas. The survey data inputs are mostly national figures that do not reflect local realities attributable to variations in the cost of living, which makes the data less valid.
- Estimates of water utility costs used in the SPM are rough statistics even for a national figure, as they are based on surveys with relatively small samples, which limits their reliability as essential cost expenditure inputs used to develop this income threshold.

3.2.2.3 Percentage of Households Below the Living Wage

The Living Wage is a measure of the amount of income that a household needs to pay for essential living expenses. The Living Wage measure calculates the percent of service area households with income below or within a certain percentage of the “Living Wage”. The Living Wage was developed by the Massachusetts Institute of Technology (MIT). The MIT Living Wage calculator (available online at <http://livingwage.mit.edu>) calculates a minimum wage needed to pay for essential expenditures in several categories, including food, housing (including utility costs), transportation, medical care, child care, and taxes, for different household sizes and arrangements. The housing component of this calculator uses the U.S. Department of Housing and Urban Development’s (HUD’s) Fair Market Rent (FMR), which relies on the ACS Rolling 5-Year Average Gross Rent statistics from 3 years prior, plus water and other utility costs, as well as CPI-based adjustments, and the recent mover adjustment, which

is designed to survey newly leased rents to prevent biases from dated long-term rental agreements. Utility costs include electric, gas, water, sewer, etc.

Formulas:

Living Wage % = % of Community Below a Local Living Wage Measure

Advantages:

- Measures the size of the economically vulnerable customer base in a community.
- Uses several readily available federal data sources.
- It is specific to a local area and not an average national metric.

Disadvantages:

- Analytically complex to calculate the living wage and to determine the percent of a given population living below it, which makes it less practical and transparent for users.
- Published a private university that cannot necessarily be relied on for ongoing production of the metric. Would likely require the formulation and calculation of a similar measure that is maintained by the EPA or another source that could be relied upon as a metric that will continue to be calculated in the future.
- Does not exclusively use federal data, which places the availability of the data into question.

3.2.2.4 Percentage of Household Income Spent on Shelter Cost

Shelter Cost metrics measure the cost of housing in a given area relative to household incomes. The Shelter Cost % may be calculated as the percentage of service area households that spend more than x% of their income on shelter costs. A typical measure of shelter costs is HUD's FMR metric, which includes utility costs and is typically either the 40th or 50th percentile of housing costs in the community. Under existing HUD methodology, low-income households in public housing should not spend more than 30% of their income on shelter costs plus utilities.

Formulas:

Shelter Costs = FMR = HUD Housing Costs + Total Utilities Costs

Shelter Cost % = % of Households Spending > 30% of Income on Rent + Utilities

Advantages:

- Estimates the size of the economically vulnerable customer base in a community.
- Directly considers the household burden of paying for water services together with some (but not all) other non-discretionary household expenditures.
- Easy to understand.

- Readily available.

Disadvantages:

- The utility cost data included in this measure is typically unreliable and lacks validity as it is based on national surveys with small sample sizes and not differentiated locally.
- The metric captures only a select set of non-discretionary household expenditures (utilities), while other metrics better capture the full set of costs for a household's basic needs.

3.2.2.5 Percentage of Households Receiving Public Assistance

This metric measures the percentage of households in the utility service area receiving public assistance in various forms to be defined, such as possibly Low-Income Home Energy Assistance Program (LIHEAP), Supplemental Nutrition Assistance Program (SNAP) etc. and is an indicator of the prevalence of economic hardship within a community. The U.S. Census reports the % of households receiving public assistance income and/or SNAP benefits at the tract level.

Formulas:

$$\% \text{ Public Assistance} = \frac{\text{Number of Households in Service Area Receiving Some Form of Public Assistance}}{\text{Total Households in Service Area}}$$

Advantages:

- Measures the size of the economically vulnerable customer base in a community.
- Easy to understand.
- Readily available.

Disadvantages:

- Uses public assistance as a proxy threshold for defining low-income populations without measuring income directly.
- Does not address local utility costs.

3.3 Proposed Household Affordability Assessment Methodology

3.3.1 Methodology Overview

Several organizations, researchers, and expert panels have proposed metrics that they suggest will provide an improved assessment of affordability compared to the “2% of MHI” guideline embodied in EPA’s RI and related FCA guidance. We have reviewed the numerous options and, by applying the criteria developed in Section 2, have developed several recommendations that define a suite of metrics that best meet the fundamental objectives and criteria for assessing household affordability and improve upon EPA’s existing guidance.

3.3.1.1 Recommended Household Affordability Metrics

The following combination of measures are recommended as an alternative to EPA’s RI:

Household Burden Indicator (HBI): Total basic water service costs (combined) as a percent of the 20th Percentile of Community Household Income (the lowest quintile income, LQI); plus

Poverty Prevalence Indicator (PPI): The percentage of community households at or below 200% of FPL.

The rationale for the above paired metrics is as follows:

- The HBI reflects the economic burden that relatively low-income households in that community face; and
- The PPI reflects the degree to which poverty is prevalent in the community.

Thus, in combination, the metrics indicate both a household-level burden and a community-based level of prevalence of the affordability challenge posed by water sector costs.

As a combination, the metrics should be examined simultaneously. For more sophisticated utilities that want to present additional supplemental information, a number of additional metrics that are identified in Section 3.3.1.4 that, among others, may help characterize their individual situations and provide a more complete picture of household affordability.

3.3.1.2 Alignment of Recommendation to the Framework Criteria

There are several desirable features that apply to our recommended replacement metric for the existing EPA RI. These advantageous features also apply to other potential supplemental household affordability metric alternatives that are recommended (as discussed in the following section 3.3.1.3).

First, we recommend a *focus on the 20th percentile household income* for the relevant community/service area. There are numerous reasons for focusing on the 20th percentile household (rather than the MHI), including:

- Households at and below the 20th percentile typically reflect those households that are the most economically challenged members of the community (e.g., more so than the MHI).
- The 20th percentile is generally considered the demarcation between low income and middle-class households (Brookings, 2018).
- Many assistance programs have eligibility cut-offs at or near the 20th percentile (Teodoro, 2018)
- The data defining the 20th percentile household are readily available from the US Census.

Second it is recommended to *use total basic water sector costs* (rather than examining clean water, drinking water, and stormwater costs individually) because this represents the combined water sector utility burden placed on low-income households. However, we acknowledge that this will add complexity to the methodology as it may require coordination with multiple utility agencies and organizations, and there may be circumstances under which it may be challenging to compile an aggregate water service cost for a community, such as where stormwater-related costs are levied through fees or other mechanisms rather than household utility bills, and/or where service area boundaries do not coincide well. *Basic water cost* refers to using an estimate of water needed for essential water needs (e.g., washing drinking, etc.) rather than average water costs, which include the cost of non-essential usage (e.g. residential irrigation).

A third feature we recommend for an improved household affordability metric is the ability/intent to *reflect important variations in the basic cost of living across communities*. For example, in some communities, the housing cost burden and overall cost of living is much greater than in others. In such communities, households at the lower end of the income distribution have less money available after covering their housing costs to pay for water-related services and other essential expenses. Household affordability metrics are improved if they reflect variations in what it costs to meet all the basic household living requirements in a community. However, no metric was found that was deemed to be broadly applicable, suitably reliable, and based on readily accessible data. Therefore, such a metric was not added to the base household affordability recommendation, but it is highly recommended that a metric that considers variations in the basic cost of living across communities be presented as supplemental information, when available.

Together, the HBI and PPI metrics described above address several of the key criteria. The pairing of the two metrics:

- Offers a simple, easy-to-implement, and transparent approach
- Relies upon readily available, federally furnished data (e.g., trusted/unbiased/accessible Census data)
- Applies broadly accepted concepts (e.g., draws on the long-established and widely applied multiple of the FPL)
- Captures both household and community-oriented (e.g., prevalence) affordability considerations

- Is intended to reflect full cost of water services (drinking water, clean water, stormwater)
- Offers a clear improvement over the existing “2% of MHI” metric currently applied by EPA.

There are some limitations of the recommended methodology that should be acknowledged:

- As a metric based on a national statistic, it does not reflect local or regional cost of living (e.g., housing costs). This limitation may be overcome by using an alternative to the “200% of the FPL” applied in the prevalence-oriented measure, or by adding a third metric that offers insight on local levels of the costs for housing and other non-discretionary expenditures. Examples are offered in the next section.
- Preparing total water services cost may require compiling data from multiple sources and in order to support the household-level metric. This task can be complicated by differences between the clean water and drinking water utilities service areas, and/or stormwater fee collection mechanisms that are not administered by the utility. This task is relevant to any metric that includes all water sector costs.
- For small communities, especially those located in rural areas, Census-level data (and other available data) may not be available at a small enough scale to accurately reflect the affordability-related circumstances of the service area households. In such cases, it will be necessary to either collect data locally or extrapolate from larger-scale data that is generally available. This small system data issue is a challenge that will be faced for most if not all metrics that may be considered to assess household affordability in smaller communities.
- A set of benchmarks need to be defined to differentiate between what may be considered an acceptable level of household affordability from an unacceptable level of affordability. The discussion of benchmarks or threshold values is further developed later in this report. There are two important considerations related to thresholds and benchmarks:
 - Defining any point of demarcation between what is and is not affordable will inevitably be somewhat subjective regardless of what metric(s) is selected.
 - For any metric considered that relies on a household income level other than MHI, an associated threshold of water costs to household income will need to evaluate if and how the current implied EPA combined water benchmark of 4.5% applies. For example, if one were to benchmark total water cost affordability to 4.5% of MHI, then a higher percentage of household income logically would apply to the lower household income at the 20th percentile (perhaps on the order of 8% to 10%, as discussed below).

3.3.1.3 Supplemental Metrics

There are several other metrics that offer considerable improvements upon the existing 2% of MHI approach embodied in EPA’s RI, and that may be considered as supplements to augment the metrics discussed in the prior section. These alternatives are briefly discussed here, and in some detail in an earlier section of this report (Section 3.2) as well as evaluated in Appendix A.

Accounting for Local Differentials in the Basic Cost-of-Living for Low-Income Households

One of the limitations noted in our recommended use of a combined HBI and PPI metrics is that they do not account for local differentials in the basic cost-of-living for low-income households. To address this limitation, it is recommended that a third metric be added, where feasible to convey insight into community-based “discretionary income” so as to reflect local costs for basic necessities. For example, a measure of local housing costs (relative to the national average or compared to household income) may be applied as an additional (i.e., third) metric, as an indicator of the local cost of living more broadly considered. Escalating housing costs have become a significant driver of affordability challenges in many communities, and they may vary considerably between utility service areas. However, finding suitably reliable and accessible data may be a limiting factor. The MIT “Living Wage” provides basic housing and other essential expense levels by county, but it may not be considered a viable option for federal regulatory application because it is not derived and published by a federal agency. Figure 3-1 offers a brief description of several potential data sources that may be useful to develop a supplemental metric to the HBI-PPI pairing, to capturing variations in cost of living across communities.

Low Income Housing Burden: As a potential supplemental household affordability metric, we recommend using data from the U.S. Census, American Community Survey¹¹ to assess the number of low-income households in the community that are paying a disproportionate amount of their income for housing (e.g., more than 50%). This metric is intended to serve as an indicator of the affordability challenges low-income households face with respect to other non-discretionary expenses. Specifically, the U.S. Census publishes data on the percentage of income that households spend on housing, by income group. This information is available for home owners with and without a mortgage, as well as for renters, and includes costs for shelter and some additional housing costs, such as utilities. We suggest the metric include examination of gross rent as a percentage of household income for lower income categories because 1) lower income households are often more likely to be renters, and 2) this metric should provide an indication of housing burden in a given community in general. We also propose examining the percentage of households that pay more than 50% of their income for rent because households within this category are commonly considered to have a “severe” housing burden.

¹¹ The ACS is available at <https://www.census.gov/programs-surveys/acs/methodology/design-and-methodology.html>, and provides data on poverty rate, LQI, and other relevant variables. In some cases, and particularly at small geographic scales such as Census block group and when reporting on subgroups, 5-year averages may be used to increase reliability of estimates.

Figure 3-1: Cost of Living Data Sources

There are several existing data sources that could be integrated into the proposed household affordability metrics (i.e., HBI and PPI), or to develop a supplemental third affordability metric, to account for non-discretionary expenses and variations in cost of living:

Supplemental Poverty Measure (SPM). As noted above, the U.S. Census' SPM reflects poverty level income thresholds based on the 33rd percentile of the distribution of household expenditures on food, shelter, clothing, utilities, and some additional items. The SPM income thresholds also account for the value of non-cash benefits and subtract out taxes (or adds in tax credits), work expenses, medical expenses, and child support paid to another household. The SPM is available for MSAs, and a for non-rural and rural areas by state. If the SPM is significantly higher than the FPL for a given area, this would indicate that there are additional households that struggle to meet basic needs. This could be used as supplemental information as a way to gauge the percentage of households in economic need, beyond the PPI.

Living wage. MIT's living wage is an estimate of the minimum employment earnings necessary to meet a family's basic needs. Living wage estimates are based upon geographically-specific data related to a family's likely minimum expenditures for food, childcare, health insurance, housing transportation, taxes, and other basic items. MIT has developed living wage data for every county in the U.S.; these estimates can be compared to national living wage estimates to help assess cost of living variations and household burdens for low-income households.

ALICE. Similarly, United Way's ALICE Project (Asset Limited, Income Constrained, and Employed) assess the number of households by County (in 13 states) with incomes above the FPL, but who do not earn enough to meet basic needs. For each County, the ALICE Project has developed a basic budget that includes the cost of five essential items (housing, child care, food, transportation, and health care), adjusted for different household types, and has determined the percentage of households that earn less than this amount. In states where this is available, this information can be used to inform supplemental analysis, going beyond the PPI to gauge the percentage of households in economic need.

Housing burden. The U.S. Census ACS publishes readily available information on housing costs and housing cost burden, for households across the income spectrum and at the Census tract level. This information could be used as supplemental information, or as a third metric for household affordability. For example, the ACS reports the percentage of income that households spend on gross rent or selected monthly homeowner costs, by income category. The information included in published tables allows practitioners to calculate the percentage of low-income households that spend more than 50% of their income on housing (considered a severe housing burden) and therefore have little discretionary income. In many urban areas, the percentage of low-income households with a severe housing burden exceeds 60 to 70%.

Alternative income levels for affordability ratios. The research on income levels necessary to meet basic needs, if available locally or from state (or eventually national) sources, may be incorporated into affordability ratios that measure water service costs as a percentage of household income. For example, in California, the State Office of Environmental Health Hazard Assessment recently developed a draft framework for assessing the quality, affordability, and accessibility of drinking water (Balazs et al. 2019). One of the household affordability metrics Balazs et al. (2019) recommends is the AR_{CPT} , an affordability ratio which measures water service costs (numerator) as a percentage of the California county poverty threshold (CPT, the denominator) for a given households size. In this case, the CPT is the income threshold associated with the California County Poverty measure, developed by the Public Policy Institute of California and the Stanford University Center on Poverty and Inequality. The CPT, which is available for every county in the state, incorporates the changes in costs and standards of living since the official poverty measure was devised in the early 1960s—and accounts for geographic differences in the cost of living across the state. It also factors in tax credits and in-kind assistance that can augment family resources and subtracts medical, commuting, and child care expenses.

Affordability Ratio (AR₂₀): Another potential supplemental or alternative metric that considers essential spending required by low income customers on non-water related items is the “affordability ratio” for the 20th percentile household (AR₂₀), as developed by Manny Teodoro (Teodoro, 2018). The AR₂₀ metric has the following core characteristics:

- Focusing on the 20th percentile household income for a community, to reflect the challenge for lower income households. (It typically is developed for a household of four persons but can be developed for any size household).
- Applying a measure of “discretionary income” (rather than total household income) to reflect regional cost of living considerations and tax payments/benefits. The AR₂₀ metric accomplishes this by netting out regional consumer expenditure data for household-level costs for essential goods and services (housing, health care, food, heating/energy, taxes).
- Estimating total water service costs, by accounting for the sum of both drinking water and clean water service costs.
- Reflecting basic levels of household water consumption, by relying on a fixed level of per capita water consumption (50 gallons per capita per day), based on an estimate for essential water needs, which could be updated over time if observed historical declines in consumption continue.
- Relying on readily available data developed and reported by credible sources, such as the U.S. Census Bureau and U.S. Department of Labor.

There are limitations to the AR₂₀ approach, however, that prevented recommendation of this alternative as a household affordability measure for use by all utilities or permittees. The federal Consumer Expenditure Survey used to develop the cost of living estimates for essential services relies on a relatively small sample of households from metropolitan areas and is only available on a relatively large regional scale (e.g., available regionally and for some MSAs). As such, it does not necessarily reflect a geographically well-targeted cost of living estimate for a given community. As with all metrics for affordability, creating a demarcation between an AR₂₀ value that separates affordable from unaffordable water services relies on subjective judgement. Dr. Teodoro, who developed the metric, has opined that an AR₂₀ of 10% may serve as a possible affordability point of demarcation. Given the limitations of the proposed alternative household affordability assessment measures, it is recommended that AR₂₀ be considered as one of the supplemental measures that some permittees may want to calculate and include in their FCA submittal to EPA.

Characterizing Local Drivers for Affordability

In addition to the recommended household affordability metrics presented above, it is recommended that utilities present additional information in their affordability assessment related to the cost impacts on customer bills as follows (USCM, AWWA, and WEF, 2013):

- *Across the income distribution.* Given the relatively large percentage of households in the lower portions of the income distribution in many cities, it is important to examine the effect of rising water bills across the entire income distribution—and especially at the lower end—

rather than simply at the median or the 20th percentile. A key indicator could include the analysis of water, wastewater, and stormwater bills as a percentage of the household income for each income quintile. For example, this percentage would be much higher for lower income quintiles in Atlanta compared to national levels (e.g., see Table 3-1 that shows the income level defining the upper end of the lowest quintile. The lowest 20% of income earners in Atlanta was \$12,294 in 2011; this compares to \$20,585 nationally for the same year) (USCM, AWWA, and WEF, 2013).

EPA's "Guidance for Preparing Economic Analyses" (240-R-00-003) recognizes the legitimacy of assessing impacts to all households across the income distribution, though EPA has not offered illustrations of how such analyses have been conducted in the past or how they've been used in enforcement actions.

- *Across household types.* Average water, wastewater, and stormwater bills can be examined as a percentage of income for potentially vulnerable populations (e.g., renters and elderly households) and for different household sizes.
- *Across neighborhoods* or similar geographic units, such as Census tracts, or Public Use Microdata Areas (PUMAs). Poverty rates and households located in poverty areas can be considered to identify portions of communities that are economically at risk. Maps of income levels by census blocks or tracts can be informative in depicting the income disparities across a service area. Alternative measures of poverty, such as the SPM recently developed by the U.S. Census Bureau, can be especially useful in this respect.¹² The analysis could capture affordability issues in particular parts of a community or service area that may be masked when looking at the area as a whole.

Other supplemental indicators of economic need and widespread impacts can also be considered for the community or parts of the community.¹³ These might include:

- The unemployment rate.
- The percentage of households receiving public assistance such as food stamps or living below the poverty level.
- The percentage of households meeting LIHEAP requirements.
- The percentage of customers eligible for water affordability programs.
- The percentage of households paying high housing costs—for example the percentage of households with housing costs in excess of 35% of income.

¹²The SPM includes changes in the measure of available household resources (e.g., using after-tax income instead of pretax income and taking into account income received through food stamps and other forms of public assistance) and also recognizes some nondiscretionary expenses that such households bear. The SPM also adjusts for different housing status (e.g., renters versus owners). Additional details can be found in the U.S. Census Bureau's SPM (2011a).

¹³ EPA's 1995 *Interim Economic Guidance for Water Quality Standards* provides a good list of these indicators, and also includes economic losses, impacts on property values, decreases in tax revenues, and potential for future job losses, among others.

- Other household cost burdens such as nondiscretionary spending as a percentage of household income for households within each income quintile (Rubin 2003).
- Presentation of the upper boundary of household income for each income quintile (as illustrated in Table 3-1).

Table 3-1 Household Income Quintile Upper Limits in Atlanta, Georgia, and the United States (2017 \$s)

	Atlanta, Ga.	United States
Lowest quintile	17,666	23,584
Second quintile	38,828	45,167
Third quintile	67,435	72,659
Fourth quintile	123,443	116,540
Lower limit of top 5%	250,000+	218,714

Source: U.S. Census Bureau ACS, 2017, 5-year average estimates.

Rate Structure and Customer Assistance Program Information

Supplemental information on the extent that a utility has taken advantage of opportunities to address affordability challenges may also be presented. This information could include a description of (1) elements of a utility’s rate structure that help to address affordability, (2) the use of customer assistance programs (CAPs), and (3) the historical practice and ability of the utility to secure low cost financing and grants to lower its overall cost of service and make utility service more affordable to low income customers. However, in many cases, these opportunities to help address affordability challenges are limited, as described further in Section 6.

3.3.2 Setting Benchmarks for the Recommended Household Affordability Metrics

An important consideration in establishing a household affordability assessment methodology is the establishment of a set of benchmarks to be used to differentiate between what policy makers and stakeholders consider to be relatively affordable, as contrasted to water costs that may be considered potentially unaffordable (ambiguous), or clearly unaffordable. Ideally, the threshold of what is clearly unaffordable occurs at the point where households cannot afford essentials and are forced with having to make choices between paying for food, housing, heat, prescription medications, child care, essential transportation and water sector services. There has been limited research in the water sector attempting to measure when this threshold is reached, and more research is needed in this area. A National Energy Assistance Survey completed in May 2018 found that a significant percentage of LIHEAP recipients were required to go without food, heat, medical and dental care, prescription medications, or make these

essential choices in order to make ends meet (NEADA 2018). Households eligible for LIHEAP are those that have incomes that do not exceed 150% of the FPL or an amount equal to 60% of the state MHI.

In this section, we develop a set of recommended benchmarks for policy consideration and offer a limited set of examples of their application to three water sector utility service areas. However, additional research is clearly needed to establish and confirm appropriate affordability benchmarks based on the recommended affordability metrics. At a minimum additional empirical evaluation should be conducted to more thoroughly assess how these proposed benchmarks perform when applied across of a broader range of actual utility settings and circumstances. Additional empirical evaluation will support a better informed policy dialogue for how to interpret and possibly modify the recommended benchmarks.

3.3.2.1 Total Household Water Costs as Percent of Lowest Quintile Income

As a starting point for establishing a reasonable benchmark for the total basic water costs as a percent of LQI measure, the EPA-implied 4.5% of MHI was considered as a point of reference for high financial burden associated with combined water and wastewater costs. This EPA-implied threshold of 4.5% of MHI can be converted to reflect total water costs as a percentage of LQI (based on the data and simple arithmetic), as follows:

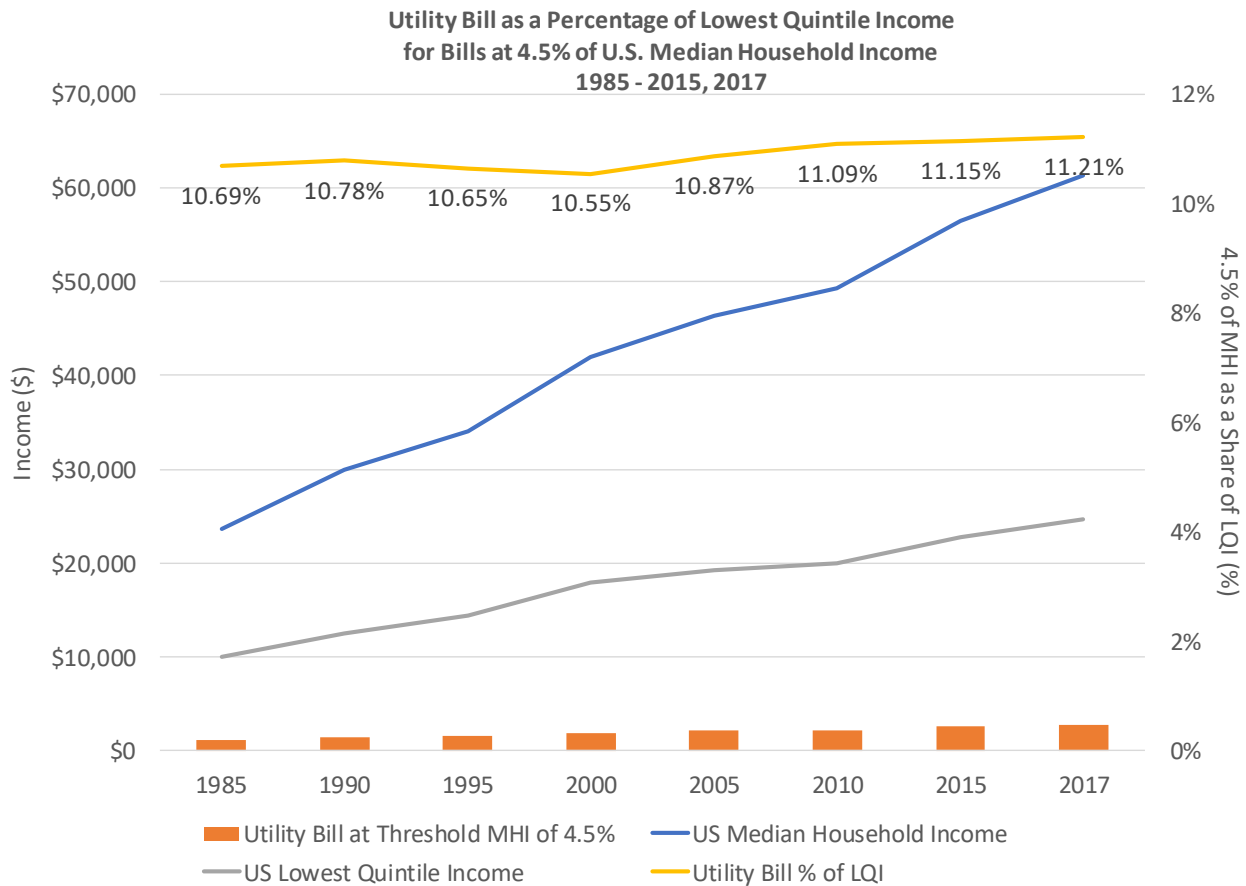
National income distribution data from the U.S. Census indicates the following:

- MHI for the nation in 2017 was \$61,372
- LQI for the nation in 2017 was \$24,638¹⁴

Accordingly, a combined household annual water bill of \$2,762 would amount to 4.5% of national MHI. A household combined water bill of this same value, \$2,762, would amount to more than 11% of national LQI. (Examining data spanning several decades of income data reveals a similar result for how a given percent of MHI converts to a percentage of household income for the LQI as shown in Figure 3-1).

¹⁴ For the purposes of this exercise, including Figure 3-2 the US Census Historical Income Tables H-1 and H-8 were used. These tables can be retrieved from: <https://www.census.gov/data/tables/time-series/demo/income-poverty/historical-income-households.html>. Depending on the margin of error our recommendation for calculation of the HBI in a single year is to source data from the US Census American FactFinder website, and specifically from Tables B19013 and B19080 using either the 1-year or 5-year estimates depending on the observed margin of error for the geography the HBI is being calculated for.

Figure 3-2: Utility Bill as a Percentage of Lowest Quintile Income for Bills at 4.5% of U.S. Median Household Income 1985-2017, 2017¹²



The above mathematical exercise provides the basis for a point of departure from MHI to an LQI-based household affordability metric. However, it does not in and of itself provide the most suitable benchmarks to apply. Additional empirical research is required to disassociate the existing EPA thresholds from suitable benchmarks for the recommended measures. Further considerations include:

- **Whether 4.5% of MHI is the appropriate threshold** from which to infer benchmarks for household affordability for combined water service costs. It may well be the case that 4.0% or some other value is a more suitable point of departure from MHI. For example, a 10% of LQI benchmark corresponds to about a 4.0% of MHI at the national level.
- **What water costs are included in the numerator?** We have referred to the numerator as household total basic water costs, but the estimated costs per household (CPH) for water services can be derived using different methods and data. The long-standing EPA approach is to take the total annualized costs of the water system, allocate a proportion to residential customers (based on the percent of total water services provided to residential versus commercial and other non-residential customers), and divide by the total number of

households served. This CPH method of allocating utility water costs to households can provide inaccurate information for a variety of reasons. For one, EPA's current CPH approach does not reflect the reality of what customers pay and therefore should not be used to measure what they can afford. Additionally, the current theoretical CPH does not reflect the level of service provided to customers, which utility rates are typically designed to do. Therefore, instead, we recommend using a basic level of water use (e.g., such as applied in the AR₂₀ metric advocated by Teodoro, 2018), priced at the rates the utility actually charges its residential customers. Using actual rates and basic water service in the HBI numerator alters how one may compare the 4.5% implied EPA threshold (which is based on EPA's approach to estimating CPH) to the benchmarks that may be deemed suitable for the HBI.

- ***What income measure is used in the denominator?*** The metric we recommend refers to gross household income, as readily reported by the U.S. Census Bureau ACS (see Figure 3-3), as this is widely available across a range of geographic scales. The EPA RI uses the same notion of household income, drawn from the same information source (although EPA uses gross MHI, and we focus on LQI). However, some of the potential supplemental metrics (such as AR₂₀) use *discretionary* income, which nets out basic cost of living considerations such as regional costs for housing, food, transportation, and other essential goods and services. The use of discretionary income helps account for important variations in local cost-of-living realities; however, the data are not as readily available at a local level in federal data. If discretionary income were to be used in the metric (rather than total household income), then the benchmarks would need to be reconsidered to reflect that discretionary income will be a fraction of total income.
- ***What level of prevalence regarding the need to make tradeoffs between essential household expenditures is acceptable,*** and how does that translate to thresholds for the recommended affordability measures?

Given the above considerations, if water costs are calculated in the manner EPA has traditionally done so (but summed across all water services), and if the household income measure used is gross income (as EPA currently applies), then it is recommended that a benchmark of about 10% of LQI serve as an interim demarcation that indicates that total water services are highly burdensome and not affordable. It is also recommended that if combined water costs are between 7% and 10% of service area LQI, then the water costs should be deemed as high burden, and potentially unaffordable. In such instances, additional analysis is warranted to assess both household affordability and the utility/community financial capability. For communities where combined water costs are estimated to remain below 7% of LQI, household affordability may be deemed in the low burden range, although the prevalence of economic hardship (as examined with our PPI metric) needs to be considered simultaneously, for any outcome using the HBI. To be clear, the preliminary HBI thresholds discussed here are roughly estimated by applying current RI thresholds and resulting costs at MHI to LQI, but these would need to be further studied and calibrated in any EPA application for relevant household sizes and consumption levels through distributional analyses across a diverse sample of communities.

Figure 3-3: U.S. Census American Community Survey household income definition

The ACS estimates for household income include the following seven sources of income for households:

1. *Wage or Salary Income*. Total money earnings received for work performed as an employee during the past 12 months, including wages, salary, commissions, tips, and cash bonuses earned before any deductions.
2. *Farm / Nonfarm Self-Employment Income*. Net income (gross receipts minus expenses) from one's own business, professional enterprise, partnership, or from the operation of a farm by a person on his or her own account, as an owner, renter, or sharecropper.
3. *Interest, Dividend, or net Rental Income* -Interest on savings or bonds, dividends from stock holdings or membership in associations, net income from rental property to others and receipts from boarders or lodgers, net royalties, and periodic payments from an estate or trust fund.
4. *Social Security Income*. Social Security pensions and survivor benefits and permanent disability insurance payments made by the Social Security Administration prior to deductions.
5. *Retirement or Disability Income*. Retirement pensions and survivor benefits; disability income; periodic receipts from annuities and insurance; and regular income from IRA and KEOGH plans.
6. *Public Assistance Income* – Includes supplemental security income payments and general assistance.
7. *All other income* - Includes unemployment compensation, Veterans Administration (VA) payments, alimony and child support, contributions received periodically from persons not living in the household, military family allotments, net gambling winnings, and other kinds of periodic income other than earnings

Source: ACS 2018

http://webapp1.dlib.indiana.edu/virtual_disk_library/index.cgi/4291881/FID1867/acs_html/html/meth_doc/datadef/income2.htm

3.3.2.2 Percent of Households Below Twice the Federal Poverty Level

The second metric in our two-metric recommendation for household affordability (the PPI) is the percent of households below 200% of the FPL, which indicates the prevalence of economic distress across the community. Nationally, in 2017, nearly one-third (32.8%) of American households live below twice the FPL (ACS, 2017; five-year running average). In many communities, that figure is considerably greater than the national average.

Given the above recommendations for benchmarks for total water costs as a percent of LQI, the benchmarks for the companion metric of percent households below 200% of FPL should be compiled in a manner that enables both metrics to be interpreted simultaneously, in a combined manner. The matrix approach represented in Table 3-2 reflects a recommended approach for jointly interpreting current household affordability burden using both metrics. The horizontal dimension reflects ranges of the percent of households below 200% of FPL, and the vertical dimension reflects ranges for the annual household total water costs as a percent of household income at the community's LQI.

As shown in Table 3-2, household affordability for the community is deemed high burden if total water costs are a relatively high percentage of household income for the LQI household, *and* a relatively large proportion of the community households are economically challenged (i.e., the upper left portion of the matrix). However, if less than 20% of households are below 200% of FPL, then the community as a whole may be relatively affluent such that relatively high total water costs may not create a high burden

for the community, even if water costs are a relatively high percentage of LQI (although there are probably households that will struggle). This matrix could also be used to identify a specific HBI threshold for the permittee based on the PPI. For example, if the PPI is greater than 35%, then the HBI threshold for determination of a high burden may be lowered to 7% instead of 10%.

Table 3-2 Benchmarks for Recommended Household Affordability Metrics

HBI - Water Costs as a Percent of Income at LQI	PPI - Percent of Households Below 200% of FPL		
	>=35%	20% to 35%	<20%
>=10%	Very High Burden	High Burden	Moderate-High Burden
7% to 10%	High Burden	Moderate-High Burden	Moderate-Low Burden
< 7%	Moderate-High Burden	Moderate-Low Burden	Low Burden

The matrix approach also reflects that water services may be highly burdensome and unaffordable if a large proportion of the community’s households are below twice the FPL, even if water bills are a relatively low percent of LQI (the lower left portion of the matrix).

Table 3-3 offers an initial set of examples of how the proposed metrics apply across three different utility service areas, of varying size and economic circumstances, based on real-world data. As shown, annual water and wastewater bills associated with basic water service (50 gpcd) vary by community, ranging from approximately \$742 in the large urban city example to \$989 in the small economically disadvantaged community.¹⁵ The suburban mid-sized city has a higher LQI compared to the other communities, as well as compared the U.S. as a whole. The HBI for a 2.5-person household is around 2% in both the urban and suburban areas; it is higher for the smaller disadvantaged community due to lower income levels. As evidenced by the PPI, however, the small community has a significant (70.3%) number of individuals living at or below 200% of the FPL, indicating many households likely face affordability challenges. Based solely on the HBI and the PPI, the urban and suburban areas would receive a "moderate low burden" rating. However, the supplemental housing cost metrics indicate that a high percentage of low-income households in these areas pay more than 50% of their income for housing - 53.5% in the urban area and 62.6% in the suburb. In addition, gross rent is much higher in both areas compared to the national average. These metrics indicate that additional information may be needed to make an affordability determination.

¹⁵ Note that we apply our recommended numerator for the HBI calculations in these examples (i.e., based on basic levels of water service), rather than the generally higher per household cost EPA calculates using CPH in developing its RI numerator. The suggested benchmarks for HBI in Table 3-2 are derived using the EPA CPH concept, and therefore need to be adjusted downward to reflect our recommended use of basic water use levels to develop per household water costs.

Table 3-3 Illustration of various affordability metrics applied across three US Communities

Description	U.S.	Large urban city	Suburban mid-sized city	Small economically disadvantaged community^b
Community data				
Annual water and sewer bill – 4-person household, 50 gpcd (2018)	N/A	\$742	\$976	\$989
Annual water and sewer bill - 2.5-person household, 50 gpcd (2018)	N/A	\$503	\$684	\$ 934
20th percentile income (2017)	\$ 24,625	\$25,100	\$ 34,589	\$15,191
MHI (2017)	\$60,336	\$61,105	\$64,214	\$28,508
HBI				
Annual water and sewer bill - 4 person, % of LQI	N/A	2.95%	2.82%	6.51%
Annual water and sewer bill - 2.5 - person, % of LQI	N/A	2.00%	1.98%	6.15%
PPI (Percent below 200% FPL, 2017)	31.0%	29.0%	23.7%	70.3%
Supplemental metrics ^a				
Percentage of households earning less than \$35k that pay more than 50% of income for housing	46.3%	53.5%	62.6%	49.5%
<i>Percentage of households earning less than \$35k</i>	<i>29.40%</i>	<i>24.50%</i>	<i>20.4%</i>	<i>59.5%</i>
Gross rent index	\$1,012	1.27	1.35	0.81

^a Source: ACS 2017

^b Note that the small economically disadvantaged community example includes expected costs of treatment (capital and O&M) for nitrates; which is expected to increase the average water bill by close to 200% relative to scenarios where treatment for nitrates was excluded (not shown). Even in this high-cost, low-income scenario the percentage is still lower than 7% so this community would still not reach a “high burden”, and certainly not a “very high burden” based on the preliminary thresholds developed in this report. This highlights our recommendation that further research is needed to establish thresholds for the HBI metric.

3.3.3 Recommendations

Based on a careful evaluation of the potential metrics and combinations of metrics – compared to the evaluation criteria established here and by NAPA (2017), it is recommended that household affordability be evaluated using a pair of related metrics applied in combination: (1) total annual water sector costs as a percent of household income at the LQI, combined with (2) the percent of households in the community below 200% of the FPL.

There is no “perfect” metric or simple combination of metrics that scores highly across all of the applicable evaluation criteria. However, the metrics we recommend, and as may be enhanced through the addition of suitable supplemental measures, score well relative to the criteria, and are clearly superior to the current RI that is based on MHI. Supplemental metrics that consider the cost of living in a community and the distribution of income levels across a utility’s service area are also recommended. Further, it is recommended that a matrix approach be used so that the results of both recommended metrics are simultaneously interpreted. In addition, we recommend the completion of additional empirical evaluation using a larger sample of case studies of communities reflecting a diversity of size and economic circumstances, to better assess the benchmarks and related affordability interpretations.

4. Recommended Financial Capability Assessment Methodology

4.1 Introduction

As discussed in Section 3, there are a number of alternative household affordability measures identified that attempt to reflect the financial impacts of water service billings on individual customers. These measures are useful for gauging the extent to which individuals may face untenable choices and burdens as well as the potential for losing access to service entirely. The measures can and should inform public policies that speak to protection of public health and welfare through access to affordable water services.

For EPA and state regulatory agencies, a related and similarly challenging issue centers around how enforcement of federal and state laws can appropriately balance compliance requirements with considerations of collective utility financial capability.¹⁶ To date, approaches to these questions have used FCA methods that do not adequately address many of the most salient policy issues. The EPA FCA methodology guidance does not speak to such factors as impacts of total water service costs on lower income customers, regional costs of living, or economic trends.

As measures of household affordability are revised, so too there is the opportunity and necessity to revise how community financial capabilities are assessed. In doing so, federal and state regulatory agencies can benefit from recent methodology reviews, their own enforcement experience to date, and financial sector practice. Those methodology reviews have critiqued the “snapshot” aspect of the EPA guidance worksheets, the equal weighting of selected financial indicators, and the analytical disassociation with actual water service rates and charges. In practice, well-informed federal and state regulators and permittees have de-emphasized guidance prescriptions during negotiations. Instead, they have used more sound, practical, approaches that better reflect how, and over what time frames, a community may finance system improvements required to achieve compliance.¹⁷ Many of these successful negotiations have relied on FCA procedures commonly used in public finance to enable creditors to assess risks of non-payment by debt issuers.

4.2 Recommended Methodology

In developing a revised FCA methodology for enforcement of federal laws, it is suggested that the fundamental problem with prior guidance is not only the reference to a MHI metric.¹⁸ It is also the use

¹⁶ These collective capabilities may be associated with a particular permittee’s service area or taken more broadly to encompass a community or other geographic boundary.

¹⁷ See, for example, the 2010 City of Atlanta Financial Capability-Based Request for CD Schedule Extension, NEORS and Metropolitan St. Louis Sewer District (MSD) Long Term Control Plans.

¹⁸ While the distribution of income has exhibited increasing inequality over the last 2 generations in particular, nationally the relationship between median and lowest income quintile thresholds has remained relatively consistent. As shown in Figure 3-1, in 1985, a water services bill at 2 percent of U.S. MHI represented 4.75% of the LQI threshold; in 2017, a bill at 2 percent of MHI would claim approximately 4.98 percent of the LQI threshold.

of a snapshot of reference indicators and estimated costs to answer questions about capabilities over time. Determining the schedule for meeting compliance requirements places regulations in context. A time dimension must therefore be an aspect of the assessment of financial capabilities. Fortunately, the financial markets themselves- specifically credit rating evaluations - are practiced in assessing the capacity of entities to meet their financial obligations over time. The recommended FCA methodology draws on this proven experience.

The recommended FCA methodology also draws on the common, intuitive connotation of the term: “financial capability” and most households lived experience. Whether at an individual household, utility, or community level, one would assess capabilities to finance capital improvements and operating costs of built infrastructure in similar ways – through projections of cash flows under alternative circumstances. If a homeowner were to assess his or her personal financial capabilities to finance a home improvement, he or she would properly gauge their prospective income stream and likely claims on those future resources. If a utility seeks to finance system improvements through issuance of debt obligations, it is typically required to provide projections of how it will adjust rates and charges to generate adequate revenues to pay for the infrastructure investments (e.g., debt service) after meeting system O&M expenses necessary for the proper delivery of services. The recommended methodology calls for a similar, simple, intuitive approach using long-term cash-flow modeling to inform how and when capital improvements may be constructed, placed into service, and associated O&M expenses incurred. In doing so, the recommended methodology is structured to provide a regulatory compliance context for development of resilient, fiscally sound utilities that are positioned to deliver reliable water services, protect public health and safeguard the environment.

Notably, this recommended methodology does not render a specific finding that compliance requirements impose a specific level of burden (e.g. High, Medium, Low) and thereby provide a basis for scheduling. Rather, it focuses directly on the matter of defining a mutually agreeable compliance schedule (and the procedures for later modifications thereto) that will fit within a utility’s or community’s financial capabilities. Permittees would not be required to provide evidence of a High Burden to secure a manageable compliance schedule; regulators would not be prompted to impose compliance requirements based on what would bring a permittee to a High Burden threshold. Rather, it is recommended that the immediate and sustained focus be related to what improvements render the greatest public health and environmental benefits that may be financed within the entity’s financial limitations.

The recommended methodology consists of two components, utility financial capability and community financial capability that are essentially evaluated together. A detailed description of the recommended methodology follows.

4.2.1 Utility Financial Capability

As a practical matter, FCAs are most naturally conducted at a utility level because permitted water services providers are primarily responsible for compliance. These entities are the permittees authorized to provide services subject to relevant regulations, and who are most responsible for financing the infrastructure improvements and O&M expenses required to achieve compliance. The recommended FCA methodology is therefore most directly oriented to portraying utility financial capabilities, typically

over a 20 to 30-year time frame.¹⁹ Water services providers must remain financially viable to continue to deliver reliable service, and the FCA methodology must reflect the basic requirements of enterprise operations. In order to evaluate a utility's financial capability, it is necessary for the utility to adhere to sound accounting practices in keeping with available guidance like that from the Governmental Accounting Standards Board. Without a clear understanding of current fiscal circumstances that are based on good accounting practices, subsequent analyses will not have an adequate baseline, and consequently, there is more likely to be a lack of clear understanding of any embedded financial issues (e.g., inappropriately low water charges, cross-budget subsidies, incomplete asset depreciation, etc.).

4.2.1.1 Cash Flow Forecasting

Cash-flow forecasts are constructed using tools that enable projections of annual utility cash flows under a variety of alternative assumptions (including the specific schedule of capital improvements required to achieve compliance). Annual revenues are forecast from all sources, including service rates, miscellaneous fees and charges, and interest earnings. These forecasts will reflect assumptions, typically based on historical trends, about prospective changes in water usage patterns, customer account growth, and price elasticities of demand. Similarly, all system expenses are forecasted, including O&M, debt service, and cash-funded capital and transfer payments. O&M expense forecasts are typically based on the current utility operating budget, general inflation rate forecasts, and specifications of additional O&M expenses associated with planned capital additions. Debt service forecasts are developed dynamically as the modeling exercise requires the forecaster to determine system-wide rate increases required to support system operations and enable financing of planned capital expenditures, while ensuring compliance with financial policies, most notably established debt service coverage and fund balance targets. (See Appendix B for a further discussion of cash-flow forecasting procedures).

Strategic financial plans may be developed iteratively by determining the system-wide rate increases required to finance alternative capital program (and related O&M expense) schedules and configurations. A viable strategic financial plan, within a community's financial capabilities, contemplates service area-wide rate increases that do not impose too acute financial burdens (indicated through forecasts of established household affordability metrics) while enabling the financing of required system improvements. Highly burdensome regulatory requirements would impose untenable rate increase requirements and associated impacts on household affordability measures. Fundamentally, cash-flow forecasting requires the (likely negotiated) determination of a rate increase slope and annual cost to customers over the forecast period that is viewed as being within the entity's financial capabilities.²⁰ This rate increase slope and associated customer rate burden effectively defines annual funding constraints within which required system improvements may be funded. Lower priority projects and operating

¹⁹ This time frame reflects practical limitations on forecast horizons for supporting data and assumptions and aligns to the practical limit of potential compliance periods. These forecasts may, in turn, serve as a foundation for system resiliency and sustainability analyses that may embrace more extended forecast horizons.

²⁰ To be explicit, the rate increase slope is delineated by the level of typical bills (for median and/or lowest income quintile customers over the forecast period). A steep slope imposes financial burdens more rapidly; a modest slope is indicative of greater pacing of the imposition of burdens.

initiatives whose funding may exceed annual budget constraints must be deferred and rescheduled to conform to the entity's financing limitations.

4.2.1.2 Measures and Metrics

Cash-flow forecasting does not render a single measure of burden but rather provides a framework for developing a financial plan to enable compliance. However, a number of measures and metrics may be readily derived from the resultant analyses and, in many cases, compared across entities. These include the following:

- **Cumulative Rate Increase** – Provides a simple measure of the compounding effect of annual rate adjustments over the forecast period. By calculating the cumulative rate increase, stakeholders can readily compare the respective ultimate heights of the mandate rate slopes and in so doing gain a measure of the ultimate increase in claims on household incomes. The cumulative calculation homogenizes differences in the timing of individual year rate adjustments and accounts for the compounding of rate adjustments implemented over successive years.
- **Forecasted Typical Bills as a Percentage of Median Income and LQI** – Using a reference value for billable volumes and assumption of uniform application of forecasted service area-wide rate adjustments over the forecast period, service bills and resultant household affordability metrics may be calculated for each year of the forecast period and compared to current and projected billings of other similarly situated utilities.^{21, 22, 23} This set of measures represents a direct tie back to measures of household affordability as described in Section 3, and as described in that section the relevant threshold values for identification of a high burden HBI as part of FCA may shift downward (from 10% to 7% using the presented matrix in Table3-1) if the PPI calculation falls in the highest range (>35%).
- **Forecasted Outstanding Debt per Customer Account or Per Capita** – Though some arithmetic is required to account for both the issuance and retirement of debt principal, cash-flow forecasts may readily be constructed to enable forecasts of these metrics, which measure the debt burden placed on a utility and its customer base. They provide an indication of the extent to which the utility will become leveraged to achieve compliance, may be used to

²¹ The billable volume reference value may be based on data related to household size among low-income populations in the US or more precisely the permittees' service areas, and on typical water usage levels or usage levels associated with basic service requirements. For 2018, U.S. average household size was reported as 2.6. persons per household. Typical U.S. water use per capita values vary significantly across geographies but generally fall within a wide range of between 50 and 100 gpcd (Sources: US Census, USGS), EPA.

²² A default assumption may be that the permittee's existing rate structure is largely preserved over the forecast period, but the forecasting methodology may be structured to accommodate changes in rate design and/or allocations of cost responsibilities across customer classes (e.g., residential, commercial, industrial). Rate designs that limit billings for volumes associated with basic needs – as discussed in Section ___ may be an effective measure to address, in part, water affordability concerns over the forecast period.

²³ These comparisons should not be made by rote or superficially as differences in rate levels or household affordability metrics across systems may reflect a host of factors and differences in utility and economic circumstances. Nevertheless, judgments about acceptable rate slopes are, as a matter of course, based in part on industry and other communities' experiences.

support use of funding programs (WIFIA, SRFs), and speak to the prospective position of the utility to fund improvements to meet new requirements.

- **Forecasted Capital Structure** – A related, potentially alternative to forecasting absolute indebtedness per account is to forecast the evolution of the utility’s capital structure (e.g. debt/equity ratio) over the planning period – providing an indication of the extent of future leverage and position to fund new requirements.

These and alternative measures developed through cash flow forecasting may inform negotiations and determinations of viable rate slopes and projected levels of utility rates that define the financial capability of a utility (as discussed below). They also align well with some of the key metrics and ratios used by the municipal bond rating agencies to gauge issuer credit worthiness.²⁴ Maintaining key financial metrics and ratios at levels that allow utilities to finance capital improvements at reasonable interest rates is an important element of assessing a utility’s financial capability through cash flow forecasting.

Importantly, with respect to the alternative measures of household affordability discussed in Section 3, cash-flow forecasting can provide a basis for forecasting how most of these measures may change over a compliance period. Forecasts of service area-wide rate adjustments may enable calculations of forecasted bills as a percentage of different income metrics (e.g., median, lowest quintile) given assumptions related to usage and income trends. Similarly, forecasted rate adjustments provide a basis for projections of future bills as a share of different measures of disposable income (like the Adjusted Poverty Measure or AR₂₀ metric discussed in Section 3), or compared to housing costs or minimum wages. While these calculations rely on an array of forecast assumptions, the question of financial capability to finance improvements over an (extended) time period inherently involves attendant uncertainties and complexities.

4.2.2 Setting Benchmarks for Utility Financial Capability Assessment

As noted, a utility’s financial capabilities are largely a function of the slope of annual rate adjustments and associated utility rate levels that are tenable for its service area which, in turn, is a function of the array of factors impacting household affordability. For each utility, these considerations are unique. A utility in a service area experiencing trends of outmigration and economic decline must navigate a different landscape relative to utilities challenged by explosive growth; a utility with relatively high rates serving a substantial low-income population likely has notably lower tolerances for further rate adjustments relative to a utility that has deferred rate adjustments and/or serves higher income customers.

²⁴ See, for example, Fitch Rating Services’ 2017 Water and Sewer Medians, Special Report. Notably, several other metrics used by credit rating agencies properly inform the cash flow forecasting process itself. For example, meeting targeted debt service coverage metrics and minimum fund balance levels are threshold conditions for development of a viable strategic financial plan.

Yet, while each utility, just like each household served, is unique – a number of common principles may be used as benchmarks or guides for the negotiation/determination of viable rate slopes and rate levels for individual utilities:²⁵

- **Inflation / Income Growth Indexing-** Arguably one of the reasons that water service utilities face significant economic challenges, and collectively have not adequately re-invested in critical infrastructure is the absence of annual rate adjustments, even at moderate levels. While nominal inflationary price increases across many if not most operating expenses are the norm, and most service area residents see some increases in nominal salary and wage levels, annual rate increases are often not a norm. Whether in the context of EPA’s regulatory enforcement posture, standard rate setting, or financing programs, requiring utilities to increase service rates by at least 1.0 to 1.5 times the general inflation rate is suggested to be a reasonable minimum rate slope requirement.
- **Peer Utility Comparisons** – In the same way that bond rating agencies compare similarly situated credit issuers, comparisons of peer utilities’ rate setting experience, may inform judgments about appropriate rate slopes. These judgments must likewise be informed by consideration of local and regional economic circumstances, differences in cost of living, community and utility-specific conditions impacting costs, and other supplemental factors (e.g., other environmental investment needs). Yet, if a utility is not in compliance with a regulation *and* its rates are *significantly lower* than its peers and neighboring utilities, after local cost of living, household affordability, and other socioeconomic factors are taken into account, a relatively steeper rate slope in the initial years of the capital plan may be warranted. In such cases, rate increases of 2.0 to 4.0 times the prevailing inflation rate may be necessary to build financial capacity to fund compliance measures. In some cases, such rate increases, for which there are ample precedents, have not, and will not, impose unduly burdensome rates but rather correct for past deferrals of needed rate adjustments.²⁶ In other cases, a steeper slope could catapult rates to levels that may be deemed unaffordable based on the metrics recommended herein-and may need to be tempered. In principle, utilities that have deferred needed rate increases and fallen into non-compliance (while peers and neighboring utilities have funded compliance) should be required to move expeditiously to at least align their rates to peer norms – allowing for consideration of supplemental factors.
- **Ratepayer Budgeting** – Determining the extent and pace of rate increase adjustments – the rate slope – should also consider the fact that water services are necessities and relatively price inelastic such that rate increases are typically absorbed dollar-for-dollar. Sharp rate increases disrupt ratepayer budgets; relatively small, smooth, and predictable increases are

²⁵ These principles effectively presume that the utility has some local capacity to increase revenue generation and fund improvements. There may be circumstances, particularly among selected small, rural, and/or economically challenged utilities, where there is no effectively no financial capability to advance compliance without external support. Cash-flow forecasting may be used to demonstrate these circumstances.

²⁶ For example, many major metropolitan areas -- including Atlanta, NEORSD, and Honolulu have catalyzed their compliance programs with several years of double-digit rate increases that were preceded by periods of intermittent and arguable inadequate rate adjustments.

preferred. In general, single year rate increases that exceed 8-10% (or 2.0 to 4.0 times the prevailing inflation) should be avoided if possible. Alternatively, a program of more modest annual adjustment is recommended.²⁷

- **Regional Economic Factors** – A program of annual rate increases also should be considered in the context of regional economic conditions that, as much as anything else, may influence the effective burden of program financing. While there are limited readily defined benchmarks to reference in considering regional economic trends and forecasts, common sense intuitively basic principles. Sharply increasing rate slopes imposed in service areas plagued by economic disadvantage may serve to exacerbate hardship and prevailing injustices (ironically in the name of environmental remedial measures). On the other hand, limiting rate and fee increases (particularly development impact fees) during periods of robust economic activity may unduly delay compliance and delivery of enhanced services.

Guided by these basic principles, cash-flow forecasts may be developed that incorporate rate increase programs that appropriately reflect a utility's financial capabilities. And, given the limitations of these capabilities so defined, scheduling of system improvements is largely a matter of determining which projects and programs should be prioritized and financed within the defined annual budget constraints. In doing so, utilities and regulators will be (appropriately) challenged to define the improvement programs that render the greatest benefits soonest, that facilitate efficient and effective project delivery, and that are responsive to utility and community needs.

4.2.3 Community Financial Capability

As water resources management continues to be addressed (and regulated) more holistically, consideration of financial capabilities **across** multiple utility services and service areas likewise becomes more important. In many communities, water services are provided by a constellation of wholesale and retail services providers, and by different entities depending on the specific service.²⁸ In this respect, stormwater management presents special analytical challenges as services and funding are often provided within local public service functions supported by a myriad of tax and fee arrangements. End-users are impacted by the combined effects of all these individual systems' compliance funding initiatives. As a result, assessing community financial capabilities may be substantially more complicated than evaluating a single utility's cash-flows, forecasted rates, and resulting claims on economically disadvantaged household incomes. Community financial capability assessment is not confined to single enterprise fund forecasting challenges – but must capture the combined impacts of all water service costs across entities serving a single community's ratepayers. Increasingly, the financial capability question relates to how a community may balance financial impacts of water resource management mandates across different entities delivering services under different permits.

²⁷ For example, as discussed above, to have a utility move expeditiously to better align its rates with its sector peers.

²⁸ See, for example, coverage of the noteworthy differences in retail water rates in the Chicago metropolitan region: <http://graphics.chicagotribune.com/news/lake-michigan-drinking-water-rates/lookup.html>

EPA’s integrated planning framework provides an opportunity to adroitly extend individual utility FCA considerations to embrace a community-wide perspective (EPA, May 2012). Integrated planning may be used to stack the claims of potential water service rate increases on common community residents (as well as related construction programs) to holistically evaluate the combined impacts of water resource management initiatives. Integrated planning may help avoid circumstances where regulatory requirements imposed under different permitting regimes do not impose untenable financial burdens individually but are onerous collectively. By enabling consideration of impacts across the spectrum of water resource related services, integrated planning is specifically oriented toward defining and scheduling improvements to: “Maximize the effectiveness of funds through analysis of alternative and the selection and sequencing of actions needed to address human health and water quality related challenges and non-compliance.”²⁹

4.2.3.1 Measures, Metrics, and Policy Considerations

The measures, metrics and benchmarks reviewed above for utility FCA may be employed judiciously across systems and service areas. Conceptually, community FCA requires consideration of the combined effect of individual claims of water-related services on a common population of community residents. Projected rate increases (and associated bill increases) may be aggregated to gauge the community’s collective financial capabilities – with reference benchmarks likewise aggregated across water services. In short, cash flow forecasts would assess whether forecasted combined water, wastewater and stormwater billings are projected to exceed a range of affordability for all services for the lowest quintile residents in the community. In this context, the prevalence of poverty would also be considered and the guiding principles outlined above used to define acceptable individual utility rate slopes (which generally apply across utility systems and service areas).

The recommended financial capability assessment methodology enables recognition of historic and future trends of a community’s economic, demographic, resiliency, and/or social conditions, and can accommodate consideration of trends in market conditions and socioeconomic factors affecting the community’s ability to pay. For example, presenting relevant trends in socioeconomic conditions affecting a utilities market conditions, such as trends in population demographics, unemployment, relative wealth, and status of structural economic problems in a community is recommended to help provide a more complete picture of a community’s financial capability. In addition, communities that have established and forecast funding of low-income customer assistance programs (CAPs) may be less able to ameliorate increasing water service bills than communities that have not explored or leveraged such options.

By expanding the focus of FCAs beyond the boundaries of individual utilities, community stakeholders may also be prompted to consider the relative efficiency of their existing institutional structures. In many cases, opportunities to realize economic efficiencies through regionalization or consolidation of utility systems (both across services and jurisdictions) exist and could provide mechanisms to facilitate compliance and ensure service quality within the larger region’s financial capabilities.

²⁹ Ibid, p. 3.

4.2.4 Overall Financial Capability Assessment

The over-arching context for FCAs calls upon permittees, regulators and other community stakeholders to address a fundamental affordability dichotomy prevalent in the United States. In the absence of a significant federal infusion of financial resources to address water quality issues – whether drinking water, wastewater or stormwater – responsibility for funding required infrastructure renewal and improvements will be borne locally. These investments are critical for the protection of public health and the environment; access to and affordability of the related services is a human right.³⁰ Communities are faced with the requirement to balance and mitigate the impacts of substantial future investment, particularly the profound impacts visited on the economically disadvantaged. Relatively simple cash-flow forecasting provides an intuitive, accessible means to develop a financial strategy that reflects individual communities' financial capabilities.

4.2.4.1 Using “Bands” or “Ranges” to categorize assessment results

As noted, the recommended cash-flow forecasting approach does not render a simple declarative assessment that a particular schedule of improvements is, or is not, unduly burdensome. The approach calls for a measure of interpretation, and typically there are a number of different rate slopes, improvement schedules, and program financing measures that may be deemed viable and within a utility's or community's financial capabilities. Application of common principles for rate slope determinations and transparent use of data-supported assumptions (e.g., account growth rates based on historical trends) will help define a relative range of outcomes that provide for consistent enforcement of environmental regulations. In general, arriving at a mutually acceptable rate slope and program schedule involves community-specific balancing of customer impacts with imperatives to maintain infrastructure, address community needs, meet water quality objectives.

4.2.4.2 Implementation Issues

Using cash-flow forecasting to define commitments to finance water quality improvements, meet new drinking water standards, or service tax-exempt debt obligations requires a measure of judgment and flexibility in practice. Financial capabilities simply cannot be accurately or fairly assessed by inflexible formula. The guiding principles outlined above are instructive, but not all-encompassing, particularly given the fact that the forecasts typically cover 10- to 20-year periods during which market dynamics are far from predictable. Implementation issues include:

- **Pro Forma Fund Summary format** – A basic presentation format for cash-flow forecasts is advisable (and may be drawn from accepted practice in the municipal credit markets) to help ensure consistency, understanding and comparability across regions.³¹ A standard pro forma fund summary will facilitate calculation, reporting and comparisons of key financial

³⁰ http://www.un.org/waterforlifedecade/human_right_to_water.shtml

³¹ See also American Institute of Certified Public Accountants (AICPA) provides guidance on attestation standards related to Financial Forecasts and Projections. <https://www.aicpa.org/content/dam/aicpa/research/standards/auditattest/downloadabledocuments/at-00301.pdf> - Accessed on February 7, 2019

performance metrics while providing flexibility in the level of detail, and to accommodate differences in budgeting practice across systems.

Stakeholder education / financial literacy – Beyond a standard cash-flow reporting format, adopting a revised methodology for financial capability methodology, like the recommended household affordability measures, will require stakeholder education. In particular, advancing basic understanding of how financial performance measures are calculated and serve to convey information about a community’s financial position, credit quality, and financial sustainability is fundamental to any form of assessment. Stakeholder understanding of the import of selected financial ratios (e.g., debt service coverage, days of working capital) and how these ratios change over the forecast period is essential. In this regard, a particular challenge derives from the historical use of 2 percent of MHI as a single threshold measure of financial burden. As discussed in Section 3, movement from a focus on median household income to lowest quintile incomes will, de facto, suggest that substantially higher percentages of the referenced income will be indicative of affordability challenges.

- **Forecast assumptions based on credible data** – Cash-flow forecasting relies on critical assumptions about future economic conditions. This provides the opportunity to ensure that, for example, historical trend information may be meaningfully employed in the capability assessment. At the same time, a body of practice will need to be developed to ensure a measure of consistency and discipline around how critical forecast assumptions are selected so as to ensure references to credible data sources will be required in practice.
- **Legal frameworks** – Determination of viable rate increase slopes and strategies to finance water system improvements must be informed by the different legal frameworks that apply across states. These frameworks place different constraints on utilities’ and communities’ freedom to act with respect to both how improvements are financed and the spreading of associated costs over the income distribution.³²
- **Rate increase expectations** – Building the financial capability to fund required system improvements will require regular, if not annual, rate increases if for no other reason than to preserve purchasing power in the face of inflationary trends. Adoption of the recommended cash-flow forecast methodology – in contrast to a static snapshot approach – places in full view the imperative to effect regular rate increases as a matter of course, while also amplifying the importance of addressing water affordability challenges. Implementing a revised approach to financial capability assessment will require conveying the need for regular, reasonable rate increases to local elected and appointed officials, impacted systems and regulators (AWWA, 2004).

Also, by moving from a point-in-time snapshot approach to a forecast methodology, the implications of market dynamics will be shown in high relief – and will demonstrate that **economic reopeners** (e.g. renegotiation of a consent decree due to new factors and considerations) will be essential for structuring actions based on financial capability assessments. Cash-flow forecasting is exceptionally useful for

³² UNC EFC, 2017.

portraying future financial capabilities in the event that assumptions about market dynamics are reasonably accurate. They may also demonstrate the acute challenges that may be imposed in the event that economic conditions deviate from expectations. There is no rational basis to presume that those assessing financial capabilities today will perfectly predict future conditions, so uses of financial capability assessment methods must be sufficiently flexible to respond to market dynamics. In addition, trending a community's socioeconomic conditions over time can help to identify improving or deteriorating conditions that may be indicative of a change in a community's financial capability, requiring consideration of an economic reopener.

4.2.5 Recommended Methodology Evaluation

The recommended FCA methodology features several important attributes that are specifically responsive to the criteria outlined in Section 2. While the steps used to construct of a cash-flow forecast models are fairly mechanical – the methodology also calls upon permittees, regulators and community stakeholders to employ judgments informed by established guidance principles and locally experienced economic conditions. Key attributes include:

- **Forecasts of Impacts on Economically Disadvantaged Households.** As discussed in Section 3, the recommended measures of household affordability focus on the relatively economically disadvantaged. By applying simplifying assumptions, these alternative measures may also be calculated over cash-flow forecast periods – even including those that reflect regional costs for essential services.³³ In so doing, the recommended cash-flow forecasting methodology can project on impacts on the economically disadvantaged. By using assumptions informed by economic trends, the recommended FCA methodology may also overcome many of the problems associated with analyses based on a snapshot in time of prior guidance.
- **Simplicity and transparency.** Though the recommended methodology does involve greater analytical rigor than prior worksheet approaches, the methods are simple and commonly used in other contexts. In fact, most utilities already develop simple cash-flow forecasts to issue debt, secure loans and conduct regular budgeting. The pro forma fund summary structure summarizing forecasted revenues and expenses is intuitive and lends itself to transparency (as evidenced by the common use of similar forecasts by the municipal credit market).
- **Scalability** – Because basic household budgeting and financial planning follows a similar paradigm of forecasting revenues and expenses under alternative assumptions, the recommended methodology is highly scalable. It has already been used to develop schedules for a wide range of system sizes and applications, from multi-billion dollar CD programs to assessing the capacity of a single mobile home park to comply with drinking water disinfection requirements.

³³ For example, forecasts of typical wastewater bills as a percentage of MHI and LQI have already been successfully used to guide negotiations of CSO/SSO program scheduling for several CD negotiations.

- **Alignment with Other Federal / State Programs** – Because cash-flow forecasting presents the basic financial analyses used to apply for federal and state low-interest loan and grant programs (as well as municipal bond debt), the recommended methodology is fundamentally aligned with other programs. Effectively all information required of these programs will be used or developed through the cash-flow forecasting exercise.
- **National / state comparability** – Though cash-flow forecasting is to be tailored to individual utility and community circumstances, a variety of performance metrics (see Section 4.2.1.2) may be calculated for the forecast period and reported. Negotiations of rate slopes may be informed by comparisons of forecasted rate levels, future indebtedness, and other factors while also considering the import of local and regional economic conditions.

These attributes and the recommended FCA methodology are responsive to the criteria that were identified for the overall framework:

1. The recommended methodology provides a clear framework for assessment of financial capability using practical, familiar financial analysis techniques and well understood definitions for operative terms (e.g. revenues, expenses, reserves).
2. By forecasting household affordability measures, the recommended methodology offers a bridge for placing measures of household affordability (rate payer burden) into context in terms of utility and community financial capability.
3. The recommended methodology uses valid and defensible measures that rely upon readily available data from relevant verifiable sources, and explicitly stated forecast assumptions.
4. The recommended methodology is straightforward, direct, transparent, flexible, and may be consistently applied – as evidenced by its common usage in municipal credit markets.
5. The recommended methodology, as noted above, may be used to develop measures to facilitate comparisons across water resource services (water, wastewater, stormwater).
6. The recommended methodology allows for the selection and referencing of specific metrics for household affordability and water system financial capability components.
7. The recommended methodology may be used to consider the current and future full cost of providing water, wastewater, and stormwater utility services
8. The recommended methodology considers all sources of user charge and tax-derived revenue used to pay for all water costs. For tax and other revenue sources, a conceptual enterprise fund construct may be used to forecast cash flows subsumed within general fund operations.
9. The recommended methodology may be applicable to a broad range of EPA purposes but also allows for the level of analytical complexity to vary by application.

The recommended FCA methodology is also responsive to the criteria that were identified specifically for the Financial Capability Component:

1. The recommended methodology recognizes and embodies effective financial planning and management to enable rate stability and access to credit on favorable terms.

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2. The recommended methodology calls for referencing historic and future trends of a community's economic, demographic, resiliency, and/or social conditions and market dynamics in forming the assumptions critical to effective cash-flow forecasting.

5. Application of the Recommended Household Affordability and Financial Capability Assessment

5.1 Completing the Household Affordability Assessment

The recommended household affordability assessment methodology employs two metrics to measure both (1) the economic burden that relatively low-income households in that community face; and (2) the degree to which poverty is prevalent in the community. Development of the HBI metric (cost as % of LQI) starts with the determination of total basic water sector costs for a household in the service area of the utility being evaluated. Next, the 20th percentile of income for the service area is determined using readily available federal data sources. The household water costs are then divided by the 20th percentile income to determine the Cost as % of LQI measure.

The second metric, the PPI (percentage of community income that is below 200% of the FPL) is available from available federal data sources. The results of these two measures are combined to characterize the household affordability of a community.

A step-by-step process for characterizing a community's household affordability is described below, along with worksheets to aid in developing the recommended household affordability assessment methodology.

5.1.1 Step 1: Estimate Total Water Sector Costs for a Typical Household

The first step of the assessment process is to calculate the current total annual basic water sector costs for a typical household. This process starts with gathering all water sector service rates for residential customers in the service area for the permittee and ensuring that the rates are adequate to cover the existing cost of providing service. If existing rates are insufficient to cover the existing cost of service, they may need to be adjusted prior to completing this step. The total annual basic water sector costs should include the cost for water, sewer, and stormwater, as applicable. If, for example, the permittee is a sewer utility that also employs a separate stormwater fee that is assessed per single family residential unit, then the relevant rates that must be gathered include:

- Sewer rates for residential customers for the utility under review.
- Stormwater fee per residential unit for the utility under review.
- Water rate for all water suppliers found in the service area.

To calculate household costs, volumetric monthly rates should be summed for water and sewer service and then multiplied by 50 gallons per person per household per day, and then by 2.65 persons per household, which is the national average household size.

Using a fixed national average household size ensures consistency in the analysis, reduces the amount of research required of local communities to calculate the HBI and improves EPA’s ability to make comparisons across communities. However, household size and low-income household consumption is likely to vary between communities. Further, the national average household size of 2.65 is not specific to the LQI household. Therefore, communities with local information available about consumption per person or household for the LQI, or household size for the LQI are encouraged to apply this information in calculating a locally-adjusted HBI, and submit such information as a supplement to the calculation of the HBI recommended here.

Any fixed charges for water, sewer, and stormwater service should be added in at the per single family household amount to fully capture household water sector service costs. If a portion of the utility’s revenues are recovered via an ad valorem tax, the typical tax for a single-family residential household in their service area should also be included. Further, other alternative annual costs associated with the provision of water service to a household should also be included in the Total Basic Water Sector Household Cost. Table 5-1 provides a worksheet to guide the user in calculating the Total Basic Water Sector Household Cost.

Table 5-1 Worksheet 1: Total Basic Water Sector Household Cost

Cost Calculation	Value	Line Number
• Sewer Volumetric Rate	_____	100
• + Water Volumetric Rate	_____	101
• x Consumption Per Person Per Household Per Day	<u>50</u>	102
• x Assumed Household Size	<u>2.65</u>	103
• x 365 Days Per Year	<u>365</u>	104
• = Annual Water & Sewer Volumetric Costs	_____	105
• + Sewer Fixed Costs	_____	106
• + Water Fixed Costs	_____	107
• + Stormwater Fixed Costs	_____	108
• Other Water Service Costs	_____	109
• = Total Annual Basic Water Sector Household Cost	_____	110

If the permittee's service area includes more than one utility provider for water, wastewater, or stormwater, then the permittee may calculate a population weighted residential cost for these services for customers located within the utility's jurisdiction and include that cost as part of the current Total Basic Water Sector Household Cost.

In some cases, the permittee may provide a different type or level of service to more than one jurisdiction (e.g., retail utility service for one jurisdiction and wholesale utility service for another jurisdiction). In these cases, the Total Basic Water Sector Household Costs should be based on the jurisdiction where the permittee provides retail utility service. However, the current and projected future Total Basic Water Sector Household Costs for the retail residential customer should reflect a reasonable and defensible allocation of costs between customer service types (e.g. wholesale customers) so as not to over-state or under-state the retail residential customer's cost responsibility.

Once a permittee's financial plan forecast has been developed, as described in Section 4, the annual Total Basic Water Sector Household Cost should be calculated over a long-term forecast period based on the financial plan forecast. This forecast should include an estimate of future utility rates that would be needed to pay for the operating and capital expenditures anticipated to be required to satisfy the regulatory requirement and address other needs of the system (e.g. addressing aging infrastructure replacement needs).

The current annual Total Basic Water Sector Household Cost should reflect the utility rates that have been adopted by the permittee and are in effect at the current time. If there are potential opportunities to mitigate the future annual Total Basic Water Sector Household Cost by modifying the existing rate structure with another accepted rate structure, such scenarios may be considered as part of negotiations with the EPA as the future projections of Total Basic Water Sector Household Cost are prepared based on the permittee's financial plan.

5.1.2 Step 2: Determine the Upper Boundary of the Lowest Quintile Income

The next step is to determine the upper boundary of the LQI for the permittee's retail service area. This is accomplished by first determining the geographic area that the utility service area includes, as well as the water sector service providers that overlap with that service area. Once this has been determined the user must obtain census data for that service area.

U.S. Census data for the upper boundary of the LQI is readily available from the U.S. Census Bureau's ACS at various resolutions including by county, MSA, combined statistical area, consolidated city, principle city, ZIP code, urban area, or, at the most granular level, by census tract. If the utility service area comprises a unique combination of census geographies, then a service area population-weighted statistic can be calculated from the component geography statistics.

The ACS is a household survey conducted by the U.S. Census Bureau with a current annual sample size of approximately 3.5 million households. The ACS replaced sample (long-form) data from the Census

and is now the only source of federal Census data on household income, poverty status, education, employment, and most housing characteristics. ACS estimates are released in three ways: annually (for geographic areas with populations of 65,000 or more); as a three-year average (for geographic areas with populations of 20,000 or more); and as a five-year average (for all geographies, down to the Census Block Group level). The ACS is considered to be a benchmark for reliable, detailed socioeconomic data that is generally available and is the only source of federal data available for many small geographies.

ACS data are available on the Census Bureau’s American FactFinder (AFF) website, which can be found at <http://factfinder2.census.gov>. One-year estimates are typically released for the previous year every September; three-year estimates in October; and five-year estimates in December.

Throughout this chapter, we recommend using the ACS to collect socioeconomic data at the city or service area level (i.e., using single-year or three-year average ACS estimates), as well as at smaller geographic scales (e.g., at the census-tract level using five-year average ACS estimates). Analyses of these data on a smaller scale (such as at the census-tract or neighborhood level) can help to identify vulnerable populations and assess potential environmental justice concerns.

Step-by-step instructions for accessing and reporting both one-year and five-year average ACS estimates are included below. Guidance on navigating the AFF website, specific source tables for socioeconomic data, and how to select the correct geographic area (e.g., place within a state, county, MSA) for your service area is described in Appendix C.

If the utility service area is comprised of a customized combination of geographies, then it may be necessary to calculate population-weighted average statistics for the LQI. The population-weighted average LQI can be calculated by multiplying the ratio of the population for a given geographic area to the total geographic area by the LQI upper limit for the geographic area before summing these products across geographies, or using a refined approach based on census track matching to respective utility service areas.

5.1.3 Step 3: Calculate the Household Burden Indicator

The next step is to calculate the HBI. The HBI can be calculated by dividing the Total Annual Basic Water Sector Household Cost by the upper boundary of the LQI. Table 5-2 provides a worksheet for calculating the HBI.

Table 5-2 Worksheet 2: Household Burden Indicator

Indicator Calculation	Value	Line Number
• Total Annual Basic Water Sector Household Cost (Line 109)_____		200
• ÷ Upper Boundary of the Lowest Quintile Income _____		201
• = Household Burden Indicator _____		202

Once a permittee’s financial plan forecast has been developed, as described in Section 4, the HBI should be calculated in each year over a long-term forecast period based on the financial plan forecast. This will require a forecast of the Total Water Sector Residential Customer Cost, as well as a forecast of the upper boundary of the LQI. The upper boundary of the LQI can be estimated by applying an annual escalation factor using the long-term historical trend of the upper boundary of the LQI.

5.1.4 Step 4: Calculate the Poverty Prevalence Indicator

The next step is to calculate the PPI. The PPI can be calculated by first obtaining the FPL statistic from the U.S. Census Bureau’s ACS table covering ‘Poverty Status In The Past 12 Months’. The fields of interest within this table are the lines for ‘200 percent of poverty level’ and ‘Population for whom poverty status is determined’. Divide the first by the second to get the % of the population below 200% of the FPL per Worksheet 3. More detailed guidance regarding the steps required to obtain the data required to calculate the PPI on the AFF website can be found in Appendix C. Table 5-3 below details the steps required to calculate the PPI.

Table 5-3 Worksheet 3: Poverty Prevalence Indicator

Indicator Calculation	Value	Line Number
• Service Area Population Below 200% of FPL	_____	300
• ÷ Population for Whom Poverty Status is Determined	_____	301
• = Poverty Prevalence Indicator	_____	302

For the percent of the population below 200% of the FPL statistic the user can sum the population below 200% across geographies and divide that by the sum of the total population across geographies.

5.1.5 Step 5: Analyze the HBI and the PPI

The next step is to analyze the current HBI with the PPI by comparing to the benchmark ranges described in Section 4. This matrix approach is presented in Table 5-2 and reflects a recommended approach for jointly interpreting household affordability burden using both metrics. The horizontal dimension reflects ranges of the percent of households below 200% of FPL, and the vertical dimension reflects ranges for the annual household total water costs as a percent of household income at the community’s LQI.

In Table 5-4, household affordability for the community is deemed high burden if total water costs are a relatively high percentage of household income for the LQI household, *and* a relatively large proportion of the community households are economically challenged (i.e., the northwest portion of the matrix). However, if less than 20% of households are below 200% of FPL, then the community as a whole may be

relatively affluent such that relatively high total water costs may not create a high burden for the community, even if water costs are a relatively high percentage of LQI (although there are probably households that will struggle).

The matrix approach also reflects that water services may be unaffordable if a large proportion of the community’s households are below twice the FPL, even if water bills are a relatively low percent of LQI (the southwest portion of the matrix). However, it is recommended that the benchmarks shown in Table 5-4 be further evaluated by completing an empirical assessment of the HBI and PPI results from a number of diverse communities to determine if the numeric ranges for the combined HBI and PPI metrics adequately capture the relative degree of affordability of water sector services for these communities.

Table 5-4 Benchmarks for Recommended Household Affordability Metrics

HBI - Water Costs as a Percent of Income at LQI	PPI - Percent of Households Below 200% of FPL		
	>=35%	20% to 35%	<20%
>=10%	Very High Burden	High Burden	Moderate-High Burden
7% to 10%	High Burden	Moderate-High Burden	Moderate-Low Burden
< 7%	Moderate-High Burden	Moderate-Low Burden	Low Burden

In order to assess the financial impact that the regulatory requirement may have on the permittee’s residential customers, the HBI should be projected annually into the future using the permittee’s financial plan forecast. By doing so, the future HBI values will include the impact to residential customers of paying a proportionate share of the cost of satisfying the regulatory requirement. The permittee may project the HBI values along with the current PPI percentage, and compare with the benchmark ranges shown in Table 5-4 under various financial plan scenarios. These scenarios will help inform the negotiations between the permittee and EPA regarding an appropriate and affordability implementation timeframe.

5.1.6 Step 6: Prepare Supplemental Household Affordability Information

In in some situations, a permittee may believe that there are particularly unique circumstances that apply to them that would justifiably affect the conclusion of the household affordability assessment described above. In such situations, the permittee is encouraged to provide additional documentation of its unique financial conditions to the appropriate regulatory authorities for consideration. For example, in Section 5.1.1 we note that submitting supplemental information about household consumption or size is

encouraged. Other supplemental household affordability metrics may also be presented, as described in Section 3.3.

If a permittee decides to present the number of low-income households in the community that are paying a disproportionate amount of their income for housing, the following steps can be followed:

- Access Table B25074 from the American Community Survey, Household Income by Gross Rent as a Percentage of Household Income in the Past 12 Months.
- Add the number of households in each of the first three income categories reported by the Census that pay 50% or more of their income for rent. The first three income categories currently include households earning less than \$10,000, \$10,000 to \$19,999, and \$20,000 to \$34,999, respectively.
- Divide the total number of households paying more than 50% of their income for gross rent by the total number of renter households in the three lowest income categories.

Table 5-5 shows this calculation at the national level based on Table B25074 (see Appendix C, Figure 1 snapshot). Table 5-5 indicates that 46% of renter households in the three lowest income categories pay more than 50% of their income for gross rent.

Table 5-5 National Households Paying More than 50% of Income for Rent

Description	Household income category			
	Less than \$10,000	\$10,000 to \$19,999	\$20,000 to 34,999	Total
Number of households paying more than 50% of income for rent	2,980,378	3,705,732	2,446,772	9,132,882
Total renter households in category	5,130,045	6,271,583	8,345,132	19,746,760
Percentage of households paying more than 50% of income for rent	58%	59%	29%	46%

The national statistic of the percentage of renter households in the lowest income ranges that pay more than 50% of income for rent could be used to compare the housing burden across communities. Communities that are significantly higher than the national benchmark might be expected to have a higher affordability burden than others with similar utility rates and income levels.

Communities may find that other measures from federal or more local data sources are relevant to depicting the unique household affordability burdens in their community. For example, large elderly or other fixed income populations, loss of primary employers, or sustained high unemployment rates may put economic pressure on a community that can impact water service affordability even where the primary measures of the HBI do not otherwise suggest a very high burden for the community. This information is recommended to be presented as part of supplemental information submitted in the context of household affordability or financial capability metrics (see section 5.2.3).

5.2 Completing the Financial Capability Assessment

The recommended community FCA methodology focuses on long-term cash-flow modeling for the utility under review as well as supporting metrics that reveal both utility and community financial capability. A step-by-step process for characterizing a utility's and community's financial capability is described below.

5.2.1 Step 1: Develop a Cash Flow Forecast

The first step in the recommended FCA methodology is to develop a long-term cash flow forecast or financial plan. The cash flow forecast or financial plan should include projections of annual revenues, services rates, O&M expenses, capital needs, debt service requirements, and key fiscal policy measures, such as debt service coverage and cash fund balances. A detailed review of the specific components of the cash-flow forecast model are outlined in Appendix B. The steps detailed below provide some guidance on preparing the cash flow forecast:

- 1. General assumptions:** Identify fiscal policies, goals, and other general assumptions.
Establish targets for cash-on-hand that must be maintained in each year of financial planning forecasts to ensure adequate reserves are available for unexpected expenses, to meet operational cash-flow needs, and to comply with the debt service coverage requirements of creditors. These targets drive alternative financial plan scenarios along with other top-line assumptions such as interest earning rates by type, amortization periods, creditor interest rates, issuance fees, and other assumptions by debt type. These assumptions are integrated into the financial model first to drive rate adjustment calculations and can be tracked to identify exceedances and signs of stress.
- 2. Ratepayer Units and Consumption Behaviors:** Prepare customer accounts (# of accounts or equivalent residential units (EDUs)) and consumption projections (water and sewer consumption per account in 1,000 gallons or hundred cubic feet, for example).
The projected number of customer accounts and associated billable volumes are entered into the model to determine the rate-base for revenue forecasts.
- 3. "Test" year inputs:** Evaluate base-year revenues and revenue requirements (including O&M expenses and existing debt service).
Utility operating and maintenance expenses, existing debt (amortized debt service for prior loans taken out for capital financing), and rate (revenues from core business activities), and non-rate (such as grants and other revenue sources not part of regular business activities) revenues for a single year serve as the baseline year of the forecast that projections will be based on. Base-year revenues and expenses are often input as actuals for the most recent full year of data available. In modeling this is known as the "test year". The test-year could also be an average of recent actuals if, for example, the most recent prior year was thought to be anomalous, such as when unusually wet weather drives up sewer operating expenses. Alternatively, the test year might include projected actuals for the year in which the analysis is being done, or a budget. All existing amortized debt service should also be entered.
- 4. O&M expense forecasts:** Prepare cost escalation estimates to generate O&M expense forecasts.

Assumptions regarding the expected rate of change in O&M expenses for each year of the forecast period are entered. These assumptions are related to inflation of key expense items often by category (i.e. inflation of general expenses, labor, benefits, electricity, chemicals, etc.).

5. **Capital expenditure forecast:** Develop capital funding plan including assignment of sources and capital improvement plan (CIP) uses of funds and a forecast of revenue bond, state revolving funds (SRF), and other new debt service requirements.

The CIP is input, the composition of the capital financing strategy, meaning the mix of planned sources of different forms of debt obligations (e.g., revenue bonds, SRF loans), pay-as-you-go (PAYGO) financing, and dedicated funds (e.g., reserves) and uses in the CIP is assigned to further differentiate model outputs. The CIP should be scrutinized particularly if it only includes a 3 to 5-year short term view as is common. While full-scale long-term asset management plans with smoothed investments may not be available to every utility an effort should be made to develop a CIP that is realistic and extends through the period of the forecast regulatory horizon under review. Next debt service requirements are forecast.

6. **Proforma financial plan:** Prepare financial plan including cash flow and revenue sufficiency projections.

The financial plan projection brings together all of the inputs and assumptions to summarize cash flows including costs, revenues, debt service coverage ratios, and fund balance sufficiency in each year of the forecast period.

7. **Rate adjustments:** Estimate rate adjustment needs.

The rate adjustments needed in each forecast year to achieve revenue requirements are calculated as the final piece of the financial plan and applied to the prior year rate to calculate the new rates. Often a typical consumption level for the residential retail customer class is applied to generate average bills in each forecast period for trending. In the context of the FCA the consumption level used to calculate the HBI should be used to estimate bills.

The results of the cash flow forecast and financial plan are typically reported on a cash flow pro forma that summarizes the annual cash flow projections. Iterations of the cash flow forecast are typically prepared to assess the utility rate impacts of implementing a capital program over various timelines.

5.2.2 Step 2: Calculate Key Utility Financial Capability Metrics

The next step is to calculate key utility financial capability metrics. These should include the utility's fiscal policy targets and requirements, as well as the key utility financial capability metrics highlighted below:

- **Cumulative Rate Increase** = $(\text{Rate in Last Year of Forecast Period} - \text{Rate in Test Year}) \div \text{Rate in Test Year}$
 - This metric will determine the percentage increase in rates over the full forecast period. In general, the cumulative rate increase should be benchmarked against 1.0 to 1.5 times the cumulative rate of inflation over the period to understand the extent to which water sector service costs are growing relative to prices in the economy in general. In addition

to a review of the cumulative increase looking at the year-over-year slope of rates or rate increases as a trend compared to inflation can provide a picture of the magnitude of cost growth for households.

- **Forecasted Typical Bills as a Percentage of LQI and Median Income** = Total Water Sector Service Bill Using HBI Consumption in Each Forecast Year ÷ LQI
 - This metric will track HBI throughout the forecast period and can be used as an important check for needed schedule adjustments in the FCA. Any year where the HBI analysis suggests a high household affordability burden should be considered for schedule relief. While trending the PPI metric based on the financial plan outputs is not possible the HBI metric can become an integral and quantifiable signal of household affordability burden within the FCA. Further, this set of measures represents a direct tie back to measures of household affordability as described in Section 3, and as described in that section the relevant threshold values for identification of a high burden HBI as part of FCA may shift downward (from 10% to 7% using the presented matrix in Table 3-1 and 5-4) if the PPI calculation falls in the highest range (>35%).
- **Forecasted Outstanding Debt per Customer Account or Per Capita** = Total Outstanding Debt ÷ Number of Accounts [or Population Served]
 - Medians for debt per customer and per capita are reported by ratings agencies and can be compared to specific utilities to determine if borrowing is reaching unsustainable levels (Scott, 2018).
- **Forecast Capital Structure** = Total Outstanding Debt ÷ Total Equity, or Total Outstanding Debt ÷ Net Plant Assets, or Debt ÷ Funds Available for Debt Service
 - The debt to equity ratio is typically reported by ratings agencies and can be compared to specific utilities to determine if borrowing has reaching levels of concern relative to what is typical (Scott, 2018).
- **Forecast Debt Service Coverage** = Net Operating Income ÷ Total Annual Debt Service
 - Debt service coverage is used to ensure sufficient cash is being generated in any given year to pay for debt service obligations plus a margin. A revenue bond debt service coverage covenant in the range of 1.25x to 1.50x is often pledged.
- **Forecast Days Cash on Hand** = Total Cash and Cash Equivalents on Hand ÷ (Total Annual Operating Expenses ÷ 365 Days Per Year)
 - Days cash on hand is a metric often established as a utility policy to ensure the organization does not run out of cash due to emergencies or other unforeseen expenses. A fiscal target of maintaining 270 to 365 days or more of cash is typical for some utilities.

These four metrics can be reviewed to determine if water sector service costs are leading to a deterioration in financial capability for the utility. Taken together, these metrics serve to summarize the magnitude of requisite water sector service rate increases relative to prices in the economy overall, the

burden those rate increases place on low-income households, the debt requirements per customer (or per capita) that investments for regulatory compliance are driving relative to peers, and how extensively they are relying on debt relative to peers. EPA and the utility should work together to determine how implementation schedules should be adjusted to avoid exceeding benchmarks of financial capability and household affordability through any periods of burden identified. With a good picture of the utility in hand following completion of a financial plan, associated metrics, and scenario iterations, consideration should also be given to the financial capability of the community overall.

5.2.3 Step 3: Calculate Key Community Financial Capability Metrics

Demographic and socioeconomic metrics for the community overall can be presented to help inform the FCA. While the utility financial capability is the focus of cash flow analyses, a healthy utility may be at risk if the community overall is experiencing financial stress. While the permittee should be granted flexibility in determining what additional information they would like to bring forth to help communicate the broader economic context that they operate within, some key community-oriented metrics are suggested below:

- **Local tax revenues as a percent of gross taxable resources** = $\text{Total Community Tax Revenue} \div (\text{Aggregate Residential Household Income} + (\text{Business Income} - \text{Employee Compensation}))$
 - Provides a picture of tax revenue relative to income in recognizing that tax revenues may be generated by sources other than just property values.
- **Overall real revenue growth** = $(\text{Total Community Tax Revenue for Most Recent Prior Year} - \text{Total Community Tax Revenue for Period } n) \div \text{Total Community Tax Revenue for Period } n$
 - Declines in revenue observed through this analysis may be a sign of economic distress. A review of these trends can help enrich the picture of the context of the community and the direction it is headed.
- **Value of unfunded long-term liabilities** = Total value of unfunded pension and any other unfunded long-term liabilities
 - A review of formal debt burden can sometimes exclude other long-term liabilities such as pensions, which can be substantial and should be reviewed as part of an FCA.
- **Unemployment Severity** = Long-Term Trends in Local Unemployment Rate
 - Static views of the unemployment rate do not account for changes overtime and may reflect economic cycles that are likely to change. As such, a longer-term trend of unemployment may be a better indicator of the severity of employment struggles in a given area.
- **Trends in population demographics** = Indicates changes in population, such as whether population is declining or increasing, and whether the age of the population is changing. Declining population trends and changes to other population demographics can make it

more difficult for utilities to pay for capital needs over time. These can be leading indicators of financial capability challenges.

In addition to these metrics EPA should take care to recognize the historical context that the utility is operating within. Additional information regarding the trends in market conditions and socioeconomic factors affecting the community's financial capability, such as trends in population, relative wealth, economic growth, and other economic or structural problems in the community, as well as environmental justice and equity considerations should be compiled under this step of the process.

5.2.4 Step 4: Combine Household Affordability and Utility/Community Financial Capability Into a Financially Viable and Implementable Financial Plan

The cash flow forecast, projected utility financial metrics, and community economic and socioeconomic considerations should be brought together in developing a financially viable and implementable financial plan. This includes assessing how the proposed HBI value will likely change over time as the expenditures necessary to address the regulatory requirement are programmed into the permittee's financial plan. The permittee should consider the projected HBI value, as well as the other socioeconomic information for the community (as described above) in assessing how high and how fast utility rates can increase to accommodate the costs associated with meeting regulatory requirements, as well as the implementation schedule for the capital plan to achieve the regulatory requirements. This inter-play between the financial forecast, the HBI, and the community FCA indicators illustrates how the household affordability and utility financial capability frameworks come together into development of a plan to achieve the regulatory requirements.

6. Opportunities to Address Affordability Challenges

6.1 Introduction

Affordability concerns for essential water sector services occur at both the household level and the community/utility level, and there are some opportunities and strategies that may be able to be deployed to help address these concerns. These options include:

1. using lifeline rates or other forms of rate structures that provide low-level water bills for those who use only basic levels of potable water and related wastewater services,
2. providing utility-funded customer assistance programs (CAPs) that assist those meeting specific requirements reflecting household economic hardship,
3. offering leak detection and water use efficiency programs targeting low income households, to reduce the amount of water used and thus reducing their water and wastewater bills.
4. Securing low cost loans and grants that may be available to lower a utility's overall cost of service.

The extent to which a utility has taken advantage of these opportunities in addressing their affordability challenges could be included as supplemental information that is provided to EPA in an affordability and FCA assessment report. However, while each of these options can help with affordability challenges, there also are several important limitations associated with these options. These limitations are discussed below.

6.2 Constraints on Utility-Based Solutions for Small Rural Systems

Small water systems have very limited opportunities to manage the size of water bills and provide assistance to their economically challenged households. In addition to the same legal and administrative constraints facing larger systems, small systems face challenges including:

- The lack of economies of scale translates into relatively high costs per unit of water provided, which exacerbates challenges households face in affording basic potable and clean water services. There often are very limited (if any) opportunities for small systems to reduce their unit costs, unless they can tap into potential grants or low-cost loan programs, or system partnership and consolidation opportunities. A number of potential partnership options may help reduce costs and address many other small utility challenges, where such options are physically and institutionally suitable. However, for many small rural systems, pragmatic options for physical consolidation or other forms of effective regional partnerships may be very limited due to distance, terrain, and other critical factors.

- With a small customer base, there are more limited opportunities to collect sufficient additional funds from the utility’s more affluent customers to support a viable CAP that can provide meaningful support for the expensive water service costs faced by the economically disadvantaged households.
- Many rural small systems have a customer base of predominantly lower income households, meaning there are few (if any) more affluent households to help cover the costs of water service.
- Few practical options exist for small, rural systems to significantly reduce per unit costs, as many partnership and other options face physical and institutional limitations, especially in rural settings.
- Options to tap outside resources may exist (e.g., access to SRF or other funding sources) to help with some regulation-related capital costs. However, even where the capital outlay for regulatory compliance is covered by grants or low interest loans, the ongoing O&M costs alone may cause affordability issues.

6.3 Constraints on Utility-Based Solutions for Larger systems

Affordability challenges are not limited to small water sector utilities; they have become more prevalent in larger water and wastewater systems as well. This is due to a variety of factors, including regulatory and other drivers that are escalating costs of service, as well as the mounting economic challenges faced by the growing number of income-limited households in communities of all sizes. While mid- and large-sized utilities may have some more opportunities than their smaller counterparts to assist with water sector affordability challenges within the communities they serve, their ability to adequately address the problem remains highly constrained. Some of the key reasons mid- and large-scale utilities are struggling to address water-related affordability challenges in their communities are as follows:

- Utility use of CAPs and “lifeline” rate approaches may be more economically viable in larger systems than in small systems, as there is a larger population base from which to obtain funds that in turn may be directed to reduce the economic burden on low income households and reduce overall utility costs associated with mounting arrearages. However, funding to support CAPs is highly limited in many settings due to state/local laws and policies that may preclude or inhibit using the utility rate base as a revenue source for CAPs. In many locations cost-of-service (COS) requirements and related provisions against discriminatory pricing (i.e., mandating that customers receiving the same level of service be charged the same amounts) may limit the use of lifeline rate structures, and the size of available CAP budgets to what may be collected through voluntary donations (e.g., bill round up options) or other non-rate-base options (UNC EFC, 2017). These legal and policy directives also may limit the ability of many utilities to apply rate structures that provide below-cost or other forms of lifeline rates for those households at the bottom end of the income distribution. Legal constraints can also become challenging when a utility’s service area encompasses multiple jurisdictions or when wholesale water service is delivered to another community.

- Utility-provided CAPs, or discounted rates, do not typically help the “hard-to-reach” households (H2R; e.g., renters), who often make up a large share of the households facing economic hardships within a service area. In many communities, renters and other households that are not direct bill-receiving “customers” of the water sector utilities are not directly eligible for bill discounts or other forms of utility-provided assistance (Clements et al., 2018 WRF report).
- CAPs add to the administrative burden and cost for the utility. Developing eligibility requirements and enrolling eligible households can require considerable staff time that is beyond the scope of normal water sector utility business processes.

6.4 Other Opportunities for Utilities

While the use of CAPs or rate structures that subsidize the water sector costs for lower income households may be constrained, there are some other, albeit limited utility approaches that can help address affordability concerns. These strategies are well described in Cromwell et al. (2010, WRF Report), and include:

- Billing customers on a monthly basis versus billing quarterly can help households get into the routine of paying regular, smaller monthly bills, rather than less frequent, but larger quarterly bills. Using budget-based billing, which is a means to levelized customer bills based on historical or estimated usage may also help low income households as it allows them to receive a regular and consistent monthly bill that is easier to anticipate and plan for. Monthly billing and budget-based billing can help a household avoid the rate shock that may arise when a relatively large quarterly bill arrives.
- Providing opportunities for partial payments, and/or extended payment periods, to help households and utilities reduce the scale of arrearages and avoid potential water service shut offs. Service disconnections that make homes uninhabitable can lead to increased homelessness in the community and add costs not only to the utility but also to the community’s social service network in general.

While these options offer limited assistance to economically challenged households, they do provide some help and also may help avoid some arrearages and related costs that both the impacted households and utilities would otherwise bear.

7. The Recommended Methodology Applies to All Uses of the Current Methodology

As documented and summarized in Appendix D, a number of provisions of the Clean Water Act and Safe Drinking Water Act either directly or indirectly call on EPA to use household affordability measures or assess financial capabilities. To do so, EPA programs and regulatory enforcement protocols, as well as programs administered at the state level, have historically referenced the use of MHI and FCA matrix-based determinations of relative economic burden.³⁴ Given the limitations of these historical measures and methods as discussed in Section 1, EPA has an opportunity to move its programs and initiatives forward with the benefit of more focused and practical measures and methods.

In general, our recommended household affordability measures can be used as a replacement for the percentage of MHI measures used historically. Similarly, most contexts for assessing financial capabilities would benefit from adoption of a cash-flow forecasting paradigm. However, it is important that our recommendations not be viewed as advocating for simply replacing one measure for another, one method for another. Rather, our review of how affordability measures were used historically and how financial capabilities have been assessed in practice has reinforced the notion that measures and methods must be placed in context appropriate for the application at hand. In several cases, our core recommendations can and should be supplemented with additional relevant information.

Because context is important, how the recommended household affordability measures and cash-flow forecast methods are used depends largely on the specific program or initiative, and related legislation, calling for consideration of affordability. Perhaps the most prominent of these applications is in enforcement of Clean Water Act requirements where an FCA is required to be submitted to EPA and may be used to define compliance program scheduling. Projections of recommended household affordability measures may be used here to define annual funding (and household impact) limitations. Yet this pairing of cash-flow projections with references to new measures of household affordability may also be useful for other program applications, at both the state and federal levels. These practices range from prioritizing awards for grants and loans, to determining widespread social and economic impacts as called for in assessing potential water quality variances. Significant uses of the recommended household affordability measures and cash-flow forecasting approach to financial capability assessment include:

Federal Level

- **Water Quality Standards.** “Pursuant to the Water Quality Standards Regulation (40 CFR 131), States must define statewide water quality goals by: 1) designating water uses, and 2) adopting

³⁴ For example, EPA references the use of MHI and FCA matrix-based determinations of relative economic burden in *Information for States on Developing Affordability Criteria for Drinking Water*, EPA 816-R-98-002, February 1998.

water quality criteria that protect the designated uses.”³⁵ Use Attainability Analyses (UAAs) may be used to remove uses based on six factors including.

“Factor 6: States may remove a designated use, which is not an existing use, or establish subcategories of a use if the State can demonstrate that attaining the designated use is not feasible because controls more stringent than those required by Section 301(b) or 306 of the [Clean Water Act] would result in substantial and widespread economic and social impact.”³⁶

EPA’s variance regulations in 40 CFR 131.14 rely on the same six factors when outlining the conditions that must be met to establish a variance from a water quality criterion. The water quality standards regulations, including the variance provisions, provide the framework for the states, who must develop water quality standards and ensure that permits they issue are written to meet those standards. Variances can be issued to a single discharger, such as a clean water utility, in which case an evaluation of economic impact may be based on the ratepayers for the utility. Or variances can be issued for multiple dischargers or even statewide, encompassing a much larger potentially impacted population. While modifications and enhancements may be needed, our recommended measures can be used as the foundation for these applications.

EPA’s workbook³⁷ addressing the measurement of economic impacts³⁸ in the water quality standards context is methodologically consistent with the (later published) FCA guidance for CSO controls.³⁹ Both use a workbook that features a calculation of cost per household as a percentage of MHI, and a description of the socioeconomic health of the community by reference to a composite of financial performance indicators. As such, the prescribed method for determining substantial impacts in EPA’s March 1995 guidance is problematic for many of the same reasons cited in the NAPA report, and would benefit from use of our recommended measures.

As with other applications, by focusing on lowest income quintile ratepayers and the prevalence of poverty in a community, analyses using our recommend approach will better measure the projected impacts of designated use attainability on those most substantially affected if uses are not modified or variances are not granted and additional controls must be put in place.⁴⁰ This also may better allow for the evaluation of one control measure versus investments that may render greater environmental benefit, address historical environmental injustices, and protect

³⁵ EPA Interim Economic Guidance for Water Quality Standards, Workbook, EPA-823-B-95-002, March 1995, p. 1-3

³⁶ Collaborative Water Quality Solutions: Exploring Use Attainability Analyses, National Association of Clean Water Agencies (NACWA) and the Water Environment Research Foundation (WERF), p. 63.

³⁷ Interim Economic Guidance for Water Quality Standard Workbook, EPA-823-B-95-002, (March 1995)

³⁸ This guidance also addresses the evaluation of substantial impacts for private sector dischargers where the relevant metrics of impact relate to firm profitability, liquidity, solvency and leverage. Use of recommended cash flow forecasting tools – in this context associated with projected firm performance – is a logical analog.

³⁹ Combined Sewer Overflows - Guidance of Financial Capability Assessment and Schedule Development, EPA 832-B-97-004, (February 1997)

⁴⁰ If this focus on lowest quintile ratepayers is viewed as non-responsive to the need to consider widespread impacts rather than that imposed on 20% of the population, applicants may still provide estimates of impact as a percentage of MHI for the impacted area.

public health. By requiring projections of these measures in cash flow forecasts demonstrating how the applicant's plan of finance will place prospective burdens via rates, fees, or taxes on the economically disadvantaged in a community (potentially across multiple utility service areas), EPA may more effectively portray the need to address equity and affordability in concert with financing of designated uses.

Neither the current MHI-based methodology nor our recommended measures can provide the complete picture in this particular application. Assessing the extent and significance of economic and social impacts is more involved. As noted in EPA's 1995 guidance, potential impacts on business users and related employment opportunities may come into play, and there is merit in gauging the economic impacts of lower water quality on a community in terms of economic development, recreational values, health effects and other factors. In addition, the value of mitigation and offset⁴¹ measures that may be implemented in conjunction with the grant of a water quality standard variances may not be readily captured by our recommended measures but represent important economic considerations.

- **Setting SDWA Standards.** Section 1412(b)(3)(C) of the SDWA requires that EPA prepare a health risk reduction and cost analysis to inform the Administrator's choice of regulatory options. EPA practice is to evaluate the national average additional annual household cost of rule implementation, and for the average household across a range of water system sizes. Affordability is a key criterion for evaluating technologies for existing and future regulations.⁴² The analysis is not informed by either economic trends or by economic disparities characterizing systems likely to face significant capital costs. While system-specific⁴³ financial capability assessment would require more resources than are available to support SDWA rulemakings, consideration of representative costs relative to the household affordability metrics recommended here would be informative to the EPA. It would also be useful to put rule costs in the context of total ratepayer burden as envisioned here rather than looking solely at the cost of drinking water treatment.

Small System Variances Federal requirements for additional drinking water treatment may impose untenable burdens in terms of costs per household for some small communities. Under the SDWA, when EPA is developing a drinking water standard, the Agency must explicitly consider whether technologies are available to allow states to issue small-system variances.⁴⁴ SDWA's provisions clearly recognize that there are some water systems for which additional regulatory burdens outweigh the benefits of adherence to regulatory provisions required of larger

⁴¹ Collaborative Water Quality Solutions: Exploring Use Attainability Analyses, National Association of Clean Water Agencies (NACWA) and the Water Environment Research Foundation (WERF), p. 68.

⁴² USEPA, National-Level Affordability Criteria under the 1996 Amendments to the Safe Drinking Water Act – Final Draft Report, August 19, 1998.

⁴³ Some system specific contaminant occurrence data is typically available for all systems serving >10,000 persons and generalized occurrence patterns are available for smaller systems.

⁴⁴ SDWA §1415(e)(3)

systems. Reviews by NDWAC and the EPA Science Advisory Board (SAB) have recognized that the current methodology has resulted in some small systems struggling with costs of compliance.^{45, 46} In constructing this list of technologies, EPA must explain any assumptions it is making regarding affordability.

As with its economic guidance for water quality standards, EPA's outline of considerations for States' development of affordability criteria⁴⁷ references largely the same factors and calculations as contained in its FCA guidance for CSO controls, published a year prior. Its "Framework for Affordability Analysis" (Table 3) identifies:

- Household affordability in terms of user charge claims on income, these claims relative to income levels, and potential rate shock – but only indirectly speak to impacts on the economically disadvantaged.
- Financial capacity in terms of a snapshot of the water system and community's financial structure as indicated by various financial performance ratios and metrics – grouped to indicate access to public and private capital, fiscal condition of local government, and socioeconomic conditions.

Though affordability criteria are employed in different ways across federal applications, because the underlying methodology mirrors that advanced in earlier guidance, similar opportunities for improvement apply for these uses as those noted in our measure and methodology recommendations.

State Level

- **EPA Grants to Fund State Revolving Fund Loan Programs (DWSRF, CWSRF).** EPA requires the submission of Intended Use Plans (IUPs) for grants to fund SRF programs. The IUPs are intended, in part, to demonstrate that no assistance will be provided to water systems that do not have adequate technical, managerial, and financial capability to comply with the provisions of the SDWA and CWA, respectively. They also require States to describe their criteria and methods for distribution of funds.

In general, to demonstrate financial capability, States have had systems submit variants of EPA's two-phased screening methodology that develop an estimate of costs as a percentage of MHI, and reference community financial performance indicators. States' criteria and methods for project selection may consider the economic condition of prospective recipients.

⁴⁵USEPA, Affordability Criteria for Small Drinking Water Systems: An EPA Science Advisory Board Report, EPA-SAB-EEAC-03-004, December 2002

⁴⁶Recommendations of the National Drinking Water Advisory Council to U.S. EPA on Its National Small Systems Affordability Criteria, July 2003

⁴⁷ Information for States on Development of Affordability Criteria for Drinking Water, EPA 816-R-98-002, (February 1998)

Should EPA accept the recommended measures of household affordability to supplement (or supplant) references to cost as a percent of MHI, this change could help States direct resources to areas facing acute water affordability challenges. Similarly, by modifying its IUP guidance to call for cash-flow analyses to demonstrate financial capability, States could require more robust demonstrations of systems' financial sustainability while also focusing on how SRF-funded projects may affect low-income customers over the long-term. These uses of recommended measures could also be used in supplemental submittals designed to help ensure SRF funding is leveraged to greatest benefit. For example, analyses of regionalization alternatives may be enhanced through evaluating projected cash flows and prospective impacts on low-income customers.

- As a prerequisite to receipt of annual SRF grant funds, states are required to propose a ranking methodology for project applications, provide a public comment period, and then submit the proposed methodology to EPA for final approval. The ranking methodology is one mechanism for EPA to help ensure that federal dollars supporting state infrastructure development are being used effectively:
 - By using the recommended measures of household affordability in defining priorities and ranking for the distribution of funds, States may advance objectives to help ensure access to and affordability of water services for the most economically disadvantaged.
 - By requiring projections of these measures in cash-flow forecasts demonstrating the borrower's ability to service debt obligations, Pro Forma Fund Summary cash flow forecasts could also speak to the prospective burdens to be borne by borrowers' ratepayers – and thereby daylight needs to address equity and affordability in concert with financing of system improvements.
- **Utility/Community Grants.** Grant programs administered by the States (e.g., Public Water System Supervision (PWSS) grants, Assistance for Small and Disadvantaged Community⁴⁸ grants), as well as State-funded grant programs, may likewise benefit from adoption of the recommended measures for household affordability and use of cash-flow forecasting. In these contexts, the use of the measures and forecasting techniques may differ in some respects from the prioritization and financial feasibility analyses associated with SRF borrowing. Where poverty is a consideration in distributing loans, many grant applicants may be in communities with such high poverty rates that the prevalence of poverty is not as distinguishing a characteristic. Consideration of these approaches is timely given the new requirements in America's Water

⁴⁸ Consideration of these approaches is timely given the new requirements in America's Water Infrastructure Act (AWIA) of 2018 requiring states to ensure that at least 6% of the SRF capitalization grant be used as loan subsidies to disadvantaged communities. The AWIA specifically directed EPA to amend Assistance for Disadvantaged Communities. --Section 1452(d)(2) to provide more preferential loan terms for these communities. <https://www.congress.gov/bill/115th-congress/senate-bill/3021?q=%7B%22search%22%3A%5B%22america%27s+water+infrastructure+act+of+2018%22%5D%7D&s=6&r=2>) - Accessed on February 7, 2019.

Infrastructure Act of 2018⁴⁹ requiring states to ensure that at least 6% of the SRF capitalization grant be used as loan subsidies to disadvantaged communities.

However, the recommended household affordability measures and FCA techniques may still serve to more effectively administer these programs by better helping to target how grant funds are distributed. As with the loan programs, the recommended household affordability measure may help ensure focus on the most economically disadvantaged customers. Yet by also using these measures in concert with a simple cash-flow forecast construct, State administrators may be able to gauge whether the grant awards may help a struggling system achieve financial sustainability (or is fundamentally insolvent).

- **Low Income Customer Assistance Programs.** As concerns grow over low-income water affordability, legislation is being proposed (e.g., United States,⁵⁰ Michigan,⁵¹ California⁵²) to provide federal and statewide programs and/or facilitate local customer assistance programs.⁵³ These proposed programs feature different mechanisms to fund the assistance measures, and contemplate some differences in the forms of assistance (e.g., bill assistance, water use efficiency measures) yet share the common objective of addressing emerging water affordability challenges for low-income customers. Advocacy in support of these initiatives has often referred to rising water bills as a percentage of low-income customers' incomes. EPA's adoption of the recommended measures' focus on lowest quintile customers would help further align how household affordability is measured and considered in the administration of related programs. In addition, consensus around how household affordability is to be measured will undoubtedly help advance consideration of appropriate benchmarks for when water service pricing falls within a range of unaffordability.⁵⁴
- **State Capacity Development Functions.** Beyond State-administered funding programs, the recommended household affordability measures and cash-flow forecasting may also help enhance State permitting processes for water resource systems. Community Water Systems and wastewater permittees must generally be able to demonstrate adequate technical, managerial, and financial capability. Whereas to date, financial capability has largely been gauged in terms of

⁵⁰ US legislation: "Low-Income Water Customer Assistance Programs Act of 2018", S 3015 introduced by Senator Kamala Harris (D-CA) in the 115th Congress, 2nd Session.

⁵¹ Michigan: H05196'17 (H-1) substitute for HB-5898 as passed by the House, Dec 12, 2018 amending the Michigan Safe Drinking Water Act of 1976. PA 399

⁵² Low Income Water Rate Assistance Act, California Assembly Bill No. 401, Chapter 662 (Dodd), October 9, 2015

⁵³ For a review of customer assistance programs, see: *Drinking Water and Wastewater Customer Assistance Programs*, USEPA, April 2016. For a review of the legal frameworks and constraints related to such programs, see: *Navigating Legal Pathways to Rate-Funded Customer Assistance Programs: A Guide for Water and Wastewater Utilities*, University of North Carolina Environmental Finance Center, 2017.

⁵⁴ EPA adoption may also help smooth the process of adjustment from common misuse of 2 – 2.5% percent of MHI as an affordability threshold to the more focused measure of total water costs as a percentage of lowest quintile income. With this adjustment, the applicable range of unaffordability will necessarily be a substantially higher percentage given the use of lowest quintile rather than median income as the measure's denominator.

projected costs, the recommended focus on lowest quintile income users may help ensure that systems utilizing financial forecasting, both evaluate more than a snapshot of financial performance and evaluate the system's ability to provide services to the households in these communities that are most at risk. States may use this approach to ensure systems more strongly demonstrate the financial viability and sustainability of their enterprises and set the stage for serious consideration of economically beneficial partnership solutions.

- **Small System Variances** – As noted above, under the SDWA, when EPA is developing a drinking water standard, the Agency must explicitly consider whether technologies are available to allow states to issue small-system variances.⁵⁵ In constructing this list of technologies, EPA must explain any assumptions it is making regarding affordability. Because EPA's current methodology mirrors that advanced in earlier guidance, the advantages our measure and methodology recommendations apply.

The appropriate metric for analysis of small system variance technologies has been the topic of previous expert commentaries.^{56, 57} In using the recommended measures, some of the same challenges noted for previously discussed applications may be encountered. For example, obtaining representative income data (whether median or lowest quintile) may be problematic for especially small systems. In practice, States' use of household metrics to determine small system variance eligibility is anticipated to continue to be particularly challenging. Data collection challenges to support variance decisions will remain acute. Systems often have limited on-site technical, managerial and financial capacity, can manage only limited face-to-face interaction (due to logistical challenges), and endure a lack of continuity in recordkeeping. Both data collection and subsequent financial capability analysis is thereby complicated even though the number of impacted households is, by definition, limited.

In summary, the recommended pairing of cash-flow forecasts to assess financial capabilities with references to new measures of household affordability will not only better guide enforcement of SDWA and CWA requirements (particularly scheduling of compliance programs), it may also better inform the other applications by which EPA addresses economic considerations. Whether informing prioritization of awards for grants and loans or guiding a determination of widespread social and economic impacts of water quality standards, the recommended measures and methods provide for EPA to apply greater focus on advancing equity and financial sustainability.

⁵⁵ SDWA §1415(e)(3)

⁵⁶ Affordability Criteria for Small Drinking Water Systems: An EPA Science Advisory Board Report - December 2002

⁵⁷ Recommendations of the National Drinking Water Advisory Council to U.S. EPA on Its National Small Systems Affordability Criteria - July 2003

8. Conclusions and Recommendations

8.1 Framework Criteria

Due to the shortcomings of the existing EPA FCA Guidance as cited in the literature and in the NAPA report, a set of criteria for developing a new framework for measuring household affordability and financial capability was developed based on an extensive literature review and stakeholder outreach. Through this outreach and discussion, the following criterial were identified as being important in the development of an alternative household affordability and community financial capability framework:

Criteria Relevant to Both Household Affordability and Community Financial Capability:

1. The framework should have a clear definition of what household affordability and financial capability mean and how they may be measured, as well as provide clear and practical definitions for operative terms (e.g. non-discretionary household expenditures, relative wealth, etc.) as they are used in the criteria listed below.
2. The framework should focus on both household affordability (rate payer burden) as well as the financial capability of the water system providing the services and the community receiving the services.
3. The framework should use valid and defensible measures that rely upon readily available data from relevant verifiable sources.
4. The framework should be straightforward, direct, transparent, and consistently applied by water systems, EPA, and state primacy agencies, while preserving regulatory flexibility.
5. The framework should be applicable for comparative analysis among water systems and across water resource services (water, wastewater, stormwater).
6. The framework should allow for flexibility in defining and identifying a water system's potential financial and economic burdens by allowing for the selection of specific metrics for household affordability and water system financial capability components.
7. The framework should consider the current and future full cost of providing water, wastewater, and stormwater utility services. Full cost reflects that O&M needs are met, an effective asset management plan is in place, and effective plans for sustainability/resiliency.
8. The framework should consider all sources of user charge and tax-derived revenue used to pay for all water costs.
9. The framework should be applicable to a broad range of EPA purposes (e.g., CD negotiations under CWA, approval of WQS variances and use attainability analyses, assessing economic feasibility of rulemakings under the SDWA and CWA, establishing SDWA small system variances, and providing guidance on access to federal funding and financing programs where affordability is a component). However, the framework should allow the level of analytical complexity to vary by application.

Criteria specifically relevant to the household affordability component of the framework:

1. The framework should be defensible in determining relative burdens.
2. The framework should focus on low-income customers and other customers most vulnerable to rate increases.
3. The framework should identify the size and composition of the economically vulnerable customer base (e.g., elderly, low-income, renters) relative to the water system's total rate payer base.
4. The framework should consider the types and level of service provided to customers (e.g., retail vs. wholesale service), appropriate levels of customer water usage (e.g. a level of basic water usage), contractual pricing arrangements, and an allocation of costs among customers served (in proportion to their usage of the system) in estimating a customer's financial burden.
5. The framework should accommodate all current and anticipated future household water costs (drinking water, wastewater, and stormwater, etc.), alternatives to ensure safe drinking water, and other non-discretionary household expenditures.

Criteria specifically relevant to the Community Financial Capability component of the framework:

1. The financial capability component should recognize effective financial planning and management to enable rate stability and access to credit on favorable terms. It should consider and advance the sustainability of the water system's finances and consider the community's ability to support it.
2. The financial capability component should provide for recognition of historic and future trends of a community's economic, demographic, resiliency, and/or social conditions.
3. The financial capability component should consider trends in market conditions and socioeconomic factors affecting the community's financial capability, such as trends in population, relative wealth, economic growth, and other economic and structural problems in the community served by the water system, as well as environmental justice and equity considerations.

8.2 Recommended Household Affordability Assessment Methodology

The following alternatives were considered to achieve the best balance in addressing the most critical criteria and considerations, and it is recommended that the EPA consider the following combination of measures of household affordability as an alternative to EPA's RI and be considered in tandem:

1. The Household Burden Indicator (HBI), defined as basic water service costs (combined) as a percent of the 20th Percentile of Lowest Quintile of Income (LQI) for the Service Area); plus
2. The Poverty Prevalence Indicator (PPI), defined as the percentage of community households at or below 200% of Federal Poverty Level (FPL).

There was no metric that captures the local cost of other essential household needs for low-income households, along with water services costs, that was found to be broadly applicable, and suitably reliable, and based on readily accessible data. While some metrics exist that capture other essential household needs or the local cost of living, these measures were found to have limitations or tradeoffs that prevented them from being included as part of the recommended core household affordability assessment methodology. However, it is strongly recommended that supplemental measures that consider the cost of other essential household needs and the local cost of living be presented as supplemental information, where feasible.

An important consideration in establishing a household affordability assessment methodology is the establishment of a set of benchmarks to be used to differentiate between what policy makers and stakeholders consider to be relatively affordable, as contrasted to water costs that may be considered potentially unaffordable (ambiguous), or clearly unaffordable. Ideally, the threshold of what is clearly unaffordable occurs at the point where households cannot afford essential needs and are forced with having to make choices between paying for food, housing, heat, prescription medications, child care, essential transportation and water sector services. There has been limited research in the water sector attempting to measure when this threshold is reached, and more research is needed in this area. However, a set of benchmarks are suggested for combining the HBR and the PPI and assessing household affordability for a community. These benchmarks are summarized in the following matrix.

Figure 8-1: Benchmarks for Recommended Household Affordability Metrics

HBI - Water Costs as a Percent of Income at LQI	PPI - Percent of Households Below 200% of FPL		
	>=35%	20% to 35%	<20%
>=10%	Very High Burden	High Burden	Moderate-High Burden
7% to 10%	High Burden	Moderate-High Burden	Moderate-Low Burden
< 7%	Moderate-High Burden	Moderate-Low Burden	Low Burden

It is recommended that household affordability for the community be deemed high burden if total basic water costs are a relatively high percentage of household income for the LQI household, *and* a relatively large proportion of the community households are economically challenged (i.e., the upper left portion of the matrix). However, if less than 20% of households are below 200% of FPL, then the community as a whole may be relatively affluent such that relatively high total water costs may not create a high burden for the community, even if water costs are a relatively high percentage of LQI (although there are probably households that will struggle). The matrix approach also reflects that water services may be highly burdensome and unaffordable if a large proportion of the community’s households are below twice the FPL, even if water bills are a relatively low percent of LQI (the lower left portion of the matrix).

Additional Empirical Evaluation Is Next Step

Additional research is needed to establish and confirm appropriate affordability benchmarks based on the recommended affordability metrics. At a minimum, additional empirical evaluation should be conducted to more thoroughly assess how these proposed benchmarks perform when applied across of a broader range of actual utility settings and circumstances. Additional empirical evaluation will support a better-informed policy dialogue for how to interpret and possibly modify the suggested benchmarks.

Similar to the existing EPA FCA, it is strongly recommended that a permittee be allowed and encouraged to provide additional documentation that it believes provides a more complete picture of its unique financial conditions and circumstances. This may include providing supplemental metrics, such as applying a measure of community-specific discretionary income or housing burden, mapping of total water costs as a percentage of U.S. Census Tract income or presenting other additional household affordability measures identified in the literature or in this report.

8.3 Recommended Community Financial Capability Methodology

The recommended FCA methodology consists of using long-term cash-flow modeling to inform how and when capital improvements may be implemented within the financial capability of a utility. It is recommended that cash-flow forecasts be constructed and used as a tool to enable projections of annual utility cash flows under a variety of alternative assumptions (including the specific schedule of capital improvements required to achieve compliance). The cash flow forecast or financial plan should include projections of annual revenues, services rates, O&M expenses, capital needs, debt service requirements, and key fiscal policy measures, such as debt service coverage and cash fund balances.

It is recommended that the financial plan forecast be used iteratively by determining the system-wide rate increases required to finance alternative capital program (and related O&M expense) schedules and configurations and selecting a financially viable financial plan. A viable financial plan includes a projection of utility revenues and rates that do not impose too acute financial burdens (indicated through forecasts of established household affordability metrics) while enabling the cost-effective financing of required system improvements and allowing for a reasonable rate slope that would be negotiated by the EPA and the permittee. This rate increase slope effectively defines annual funding constraints, in the context of the cumulative burden of rates associated with all available water services, within which required system improvements may be funded. Projects and operating initiatives whose funding may exceed annual budget constraints must be deferred and rescheduled to conform to the entity's financing limitations.

As part of the financial capability framework, it is recommended that a number of measures and metrics be calculated and compared across utility entities in order to help identify viable and implementable

financial plans with others that are considered relatively unaffordable. These measures include the following:

- **Cumulative Rate Increase** – Provides a simple measure of the compounding effect of annual rate adjustments over the forecast period.
- **Forecasted Typical Bills as a Percentage of LQI and Median Income** – Service bills may be calculated for each year of the forecast period and compared to current and projected billings of other similarly situated utilities.
- **Forecasted Outstanding Debt per Customer Account or Per Capita** – Cash-flow forecasts may readily be constructed to enable forecasts of these metrics which measure the debt burden placed on a utility and customer base.
- **Forecast Capital Structure** – A related, potentially alternative to forecasting absolute indebtedness per account is to forecast the evolution of the utility's capital structure (e.g. debt/equity ratio) over the forecast – providing an indication of the extent of future leverage and ability to fund new requirements.

These and alternative measures developed through cash flow forecasting inform determination of viable rate slopes and projected levels of utility rates that define the financial capability of a utility. These forecasts also align well with some of the key metrics and ratios used by the municipal bond rating agencies to gauge issuer credit worthiness. Maintaining key financial metrics and ratios at levels that allow utilities to finance capital improvements at reasonable interest rates is an important element of assessing a utility's financial capability through cash flow forecasting.

It is further recommended that a number of common principles be used as benchmarks or guides for the negotiation/determination of viable rate slopes for individual utilities:

- **Inflation / income growth indexing**- Whether in the context of EPA's regulatory enforcement posture, standard setting, or financing programs, requiring utilities to increase utility rates by at least 1.0 to 1.5 times the general inflation rate assumptions used in cash-flow forecasting is suggested to be a reasonable minimum rate slope requirement.
- **Peer utility comparisons** – Comparisons of peer utilities' current and projected utility rate levels may inform judgments about appropriate rate slopes. These judgments must likewise be informed by consideration of local and regional economic circumstances, differences in cost of living, community and utility-specific conditions impacting costs, and other supplemental factors (e.g., other environmental investment needs). For example, if a utility's non-compliance is paired with utility rates markedly lower than peer and neighboring utilities, after local cost of living, household affordability, and other socioeconomic factors are taken into account, a steeper rate slope in the initial years of a capital plan, such as rate increases of 2.0 times the prevailing inflation rate or more may be necessary to more rapidly build financial capacity to fund compliance measures.
- **Ratepayer budgeting** – Determining the extent and pace of rate increase adjustments – the rate slope – must also be gauged by recognition that water services are necessities and

relatively price inelastic such that rate increases are typically absorbed dollar-for-dollar. Sharp rate increases impose acute disruptions in ratepayer budgets; relative rate stability is preferred. Ratepayers in this analysis are not simply residential customers, but also commercial and industrial customers, whose viability is important to the local economy and jobs. In general, single year rate increases that exceed 8-10% (or 2.0 to 4.0 times prevailing inflation) should be avoided if possible. Alternatively, a program of more modest annual adjustment is recommended.

- **Regional Economic Factors** – A program of annual rate increases also should be considered in the context of regional economic conditions that, as much as anything else, may influence the effective burden of program financing. The permittee should be encouraged to present supplemental information to the EPA that provides a more complete characterization of the regional economic conditions and the factors that should be considered in negotiating an appropriate rate slope.

Guided by these basic principles, cash-flow forecasts may be developed that incorporate rate increase programs that appropriately reflect a utility's financial capabilities. Given the limitations of these capabilities, defined by an acceptable rate slope and ultimately affordable utility rates, scheduling of system improvements is largely a matter of determining which projects and programs should be prioritized and sequenced for financing within the defined annual affordability constraints. In doing so, utilities and regulators will be (appropriately) challenged to define the improvement programs that render the greatest benefits soonest, that facilitate efficient and effective project delivery, and that are responsive to utility and more broadly community needs and financial capabilities.

8.4 Combining Household Affordability and Financial Capability

In evaluating household affordability and financial capability for a water utility and its community, it is recommended that EPA consider both aspects together. The household affordability and community financial capability framework proposed in this report can be brought together in an analytical way. The proposed HBI value will likely change over time as the expenditures necessary to address the regulatory requirement are programmed into the permittee's cash flow forecast. This will likely result in the need for the permittee to generate additional revenues through utility rate increases, which affects the projected HBI. However, due to affordability constraints, there are limitations on how high and how fast utility rates can increase to accommodate the costs associated with meeting regulatory requirements. These limitations impact the revenue forecast of the financial plan. This inter-play between the financial forecast and the HBI illustrates how the household affordability and utility financial capability frameworks come together. Through this inter-play, the permittee and EPA can then make better judgments about the limits of financing capacity by ensuring forecasted impacts of water services do not push metrics beyond reasonable tolerances.

It is recommended that each of the metrics presented in this report be compared using a range of utilities of varying sizes, locations, and economic circumstances in order to assess reasonable ranges or benchmarks for each metric where affordability problems are expected. Once these levels are determined through case study comparisons, a better judgement of the benchmark ranges that reflect overall

affordability can be determined. If the metrics tend to exceed tolerances together, then perhaps an appropriate weighting can be placed on each, and an aggregate scoring system may be able to be developed. If, however, the general pattern of metric results obtained from examining utilities with varying household affordability and financial capability are not clear or consistent, then a more qualitative approach to assessing overall household affordability and financial capability may be more appropriate.

The recommended pairing of cash-flow forecasts to assess financial capabilities with references to new measures of household affordability will not only better guide enforcement of SDWA and CWA requirements (particularly scheduling of compliance programs), it may also better inform the other applications by which EPA addresses economic considerations. Whether informing prioritization of awards for grants and loans or guiding a determination of widespread social and economic impacts of water quality standards, the recommended measures and methods provide for EPA to apply greater focus on advancing equity and financial sustainability.

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Appendix A: Evaluation of Household Affordability Alternatives



Customer Affordability Methodology Evaluation Matrix

= Area of Relative Advantage
 = Recommended Metric

A. Water Cost Burden Metrics

Overall Framework Criteria		Criteria Weight	1	2	3	4	5	6
			EPA Residential Indicator (Cost as % of MHI)	Cost as % Lowest Income Quintile	WARi® (Weighted average residential index)	AR20 (Basic cost for service as % of 20th % of Income)	Hours at Min Wage	Households Delinquent in Paying Bills %
General Framework Criteria								
1	Clearly defined terms.	Standard						
2	Customer affordability and financial capability.	Standard						
3	Valid, defensible measures from readily available, verifiable sources.	Higher						
4	Straightforward, direct, and transparent, with consistent yet flexible application.	Standard						
5	Applicable for comparisons among systems and across water services.	Standard						
6	Allows for flexible selection of metrics.	Standard						
7	Consider current and future cost of water, wastewater, and stormwater services.	Higher						
8	Consider all sources of revenue (user charge, tax-derived).	Standard						
9	Applicable to a broad range of EPA purposes but flexible in complexity.	Standard						
Customer Affordability Component Criteria								
1	Defensible in determining relative burdens.	Standard						
2	Focus on low-income and others most vulnerable to rate increases.	Higher						
3	Identify size and composition of the economically vulnerable customer base.	Standard						
4	Consider level of service, water usage, contractual pricing, and allocation of costs.	Standard						
5	Consider current and anticipated water costs, and other non-discretionary costs.	Standard						

Customer Affordability Methodology Evaluation Matrix

 = Area of Relative Advantage
 = Recommended Metric

B. Low Income Prevalence Metrics

Overall Framework Criteria		Criteria Weight	7 Poverty Rate %	8 Living Wage %	9 Shelter Cost %	10 Households Receiving Public Assistance %
General Framework Criteria						
1	Clearly defined terms.	Standard				
2	Customer affordability and financial capability.	Standard				
3	Valid, defensible measures from readily available, verifiable sources.	Higher				
4	Straightforward, direct, and transparent, with consistent yet flexible application.	Standard				
5	Applicable for comparisons among systems and across water services.	Standard				
6	Allows for flexible selection of metrics.	Standard				
7	Consider current and future cost of water, wastewater, and stormwater services.	Higher				
8	Consider all sources of revenue (user charge, tax-derived).	Standard				
9	Applicable to a broad range of EPA purposes but flexible in complexity.	Standard				
Customer Affordability Component Criteria						
1	Defensible in determining relative burdens.	Standard				
2	Focus on low-income and others most vulnerable to rate increases.	Higher				
3	Identify size and composition of the economically vulnerable customer base.	Standard				
4	Consider level of service, water usage, contractual pricing, and allocation of costs.	Standard				
5	Consider current and anticipated water costs, and other non-discretionary costs.					

Appendix B: Cash-Flow Forecasting Procedures

Long-term forecasting of system revenue requirements is particularly useful for placing compliance requirements and associated rate adjustments in appropriate context, whether for compliance scheduling, stakeholder communication or defense of rate challenges. These forecasts can provide a comprehensive portrait of rate increase drivers, demonstrate the rationale for rate adjustments, and help define long-term system financing strategies.

Cash flow forecasting may be used to project financial performance indicators (e.g., debt service coverage, fund balances, debt/equity ratios) given alternative assumptions and inputs. More specifically, such forecasting enables revenue projections under alternative assumptions related to customer accounts, billable volumes, interest earning rates, and other factors. Similarly, O&M expenses may be projected under alternative assumptions related to inflation of key expense items, treatment requirements, and other factors. Forecast modeling may reflect capital financing strategy included planned uses of different forms of debt obligations (e.g., revenue bonds, SRF loans), pay-as-you-go (PAYGO) financing, and dedicated funds (e.g., reserves).

Preparing a cash flow forecast for a single utility and a single type of water service requires a substantial analysis. This task becomes more complicated when evaluating all water service costs, and may require compiling a forecast that reflects multiple utilities or service providers (e.g., a drinking water utility, a wastewater utility, and a stormwater program). The challenges include (1) collecting data to reasonably forecast future costs and revenues, (2) making assumptions regarding rate and customer assistance policies (e.g., will the multiple entities be able to coordinate rate increases; will the multiple entities operate independent CAPs; how are local, state, or federal subsidy programs taken into account, etc.). While more complicated, in most cases this kind of analysis is doable and necessary to plan a sustainable future for water service in a community.

Specific procedures for cash-flow forecasting are outlined below and contemplate use of a basic integrated spreadsheet model to facilitate the development of forecasts and conduct of scenario analyses. The modeling requires a number of general assumptions and is founded on inter-related forecasts of revenues, O&M expenses, and capital financing related expenses (including debt service requirements and PAYGO financing). A typical structure for the model would include separate areas or sheets as follows:

- **General assumptions:** Cash flow projections require a number of general assumptions including beginning fund balances, cost escalation factors, terms for debt financing, and factors impacting rate increase revenue generation. In addition, minimum and target financial performance measures like fund balance and debt service coverage levels are specified. For FCA purposes, assumptions regarding household income growth and prospective changes in costs of living may be employed.

- **Base revenue forecast:** In order to determine system-wide rate increase requirements to finance compliance, projections of revenues under current rates, including other operating and non-operating revenues, is required. Base service revenues are projected using assumed account growth rates that reflect recent and projected near-term economic trends and assumed non-price induced changes in water use patterns. Other sources of revenues, particular to individual entities' system configurations must similarly be forecast. For example, forecasts of Municipal Option Sales Taxes (MOST) used to support the City of Atlanta's Clean Water Atlanta program financing were developed for its Financial Capability-Based Schedule Extension Request.⁵⁸ In general, historical financial statement data may be referenced to identify both sources of non-service rate revenues and some basis for forecasting future values.
- **Rate increase revenues:** Annual system-wide service rate revenues associated with projected rate increases are calculated by determining expected changes in consumption due to the combination of account growth, consumption trends, and assumed sensitivities to changes in rates – the price elasticity of demand. Revenue increases associated with other fees and charges may also be forecast based on projected billing determinants.
- **O&M expense forecasts:** O&M cost projections are typically based on budgeted expenditures for the forthcoming year and assumptions about cost escalation over time. Cost escalation factors may be applied uniformly or on an individual line item basis. O&M expense forecasts should include scheduling of any one-time or recurring expenses occasioned by the operation of projects to be constructed over the forecast period.
- **Capital Improvement Program (CIP) expenditure forecast:** Annual system capital improvement expenditures – specifically including projects required for regulatory compliance - are scheduled over the forecast period. Project costs are typically expressed in current dollars whereupon the model will apply assumed capital cost escalation factors to forecast a schedule of nominal capital expenditures.
- **Forecasted revenue bond, SRF and other debt service requirements:** Existing debt service schedules associated with outstanding indebtedness, by priority of lien, are combined with projections of debt service requirements associated with forecasted debt issues. New debt service requirements for senior lien and subordinate debt obligations may be estimated using standard level payment calculation formulas (e.g., PMT function in Microsoft Excel) or provided by an entity's Financial Advisor. In either event, the debt terms assumptions noted above provide a basis for forecasting future debt service obligations from available debt financing vehicles (e.g., revenue bonds, SRF loans).
- **Financial Plan:** System financing decisions, specifically the strategy to enable funding of capital and O&M expenses required to achieve compliance, may be evaluated through this essential, interactive model component. Typically structured as a modified Pro Forma Fund Summary, its functionality is to help develop decisions about how the system's obligations will be met while

⁵⁸ Atlanta FCA extension request report.

preserving its financial integrity. The simple construct is that the Financial Plan involves determining the system-wide rate increases required to finance forecasted O&M and capital expenditures while continuing to meet or exceed system financial performance targets, most notably debt service coverage and fund balance targets. The user may employ alternative capital financing strategies (e.g. forms of debt, PAYGO amounts) as well as modify year-over-year rate adjustments and draws on fund balances, yet plan viability requires forecasted conformance with specified financial performance targets.

- **Sources and Uses of Funds:** This model component is generally useful to summarize the cash-flow forecast by major revenue and expense category. This is usually helpful to communicate cash-flow forecast results to stakeholders, support debt offerings, and manage compliance with covenants. As a matter of transparency, transfer payments should be clearly identified and reflected, whether the transfer payment represents a subsidy to the utility or a payment from the utility to one or more of its owners or member governments.
- **Forecasted Bill Impacts – Household Affordability Measures:** Using current rate and charge schedules, assumptions about household usage levels, and the forecasted system-wide rate adjustments determined through the Financial Plan component, forecasts of water service bills may be developed for customers at different points in the income distribution function. Conceptually, forecasts of most of the alternative measures of Household Affordability (e.g., percent of median or LQI metrics, bills as a percent of adjusted poverty measures, bills in terms of minimum wage hours) with companion assumptions or forecasts of prospective changes in the components of the measures. For example, several submitted Long-Term Control Plans (LTCPs) have reflected increasing claims on LQI due, in part, to assumptions that recent trends related to income inequality will persist over the employed forecast periods.

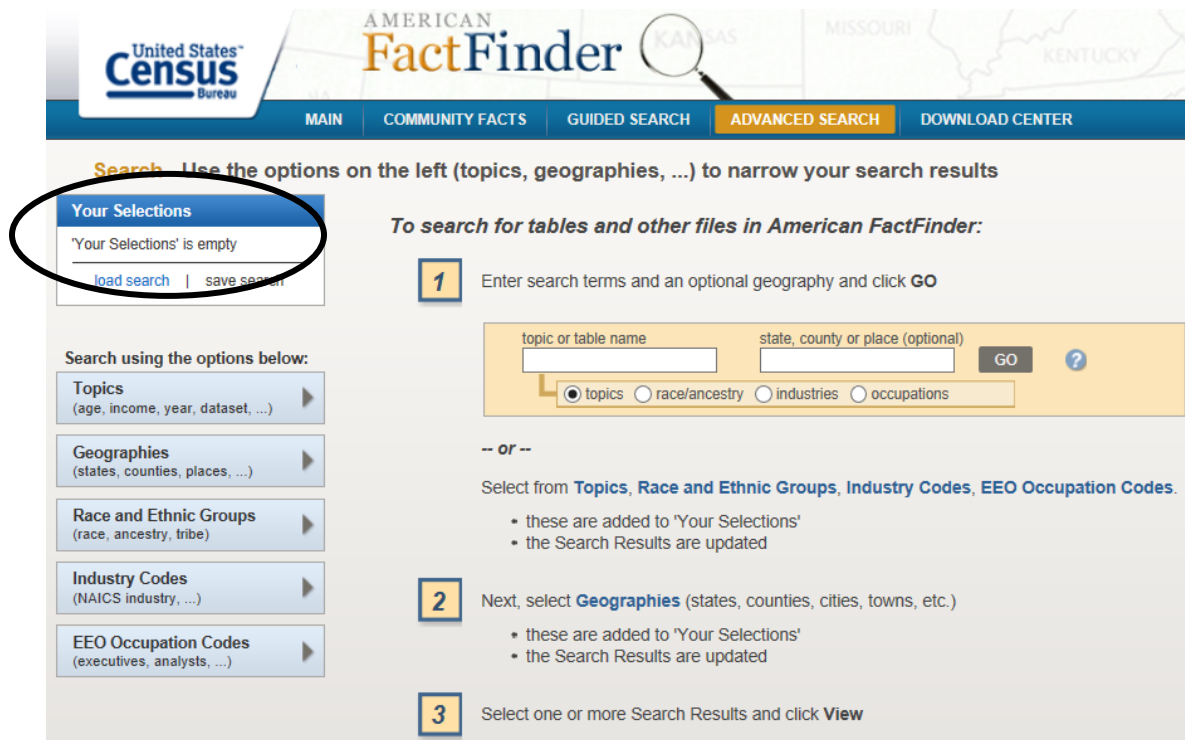
This type of cash-flow forecast modeling is generally familiar for large and mid-size utility systems experienced with accessing credit whether through the municipal debt market or state loan programs. Issuers of credit will typically require some demonstration that the issuer will be able to meet their debt service obligations, and generally will gauge credit worthiness on forecasted performance relative to the metrics used to assure financial integrity. However, the basic cash-flow construct may be applied to exceptionally small systems as well – as it amounts, in essence, to a simple budgeting exercise using different assumptions about future revenues and expenses.

Notably, these cash-flow procedures do not render a single, simple metric defining a specific level of burden imposed by the resultant schedule of capital improvements and O&M expenditures. Rather, they are to be used iteratively – testing alternative CIP schedules and associated rate increase requirements - to develop mutually agreeable compliance schedules that are within an entity's financial capabilities. For EPA and state regulators to ensure equitable, consistent enforcement across entities and geographies, key assumptions and outcomes (e.g., slope of acceptable annual rate adjustments, capital structure changes) may be informed by previously negotiated actions and emerging policies on how impacts on Household Affordability should be considered in EPA enforcement and technical assistance contexts.

Appendix C: Accessing U.S. Census Bureau Information

Access the AFF website: <http://factfinder2.census.gov/> .

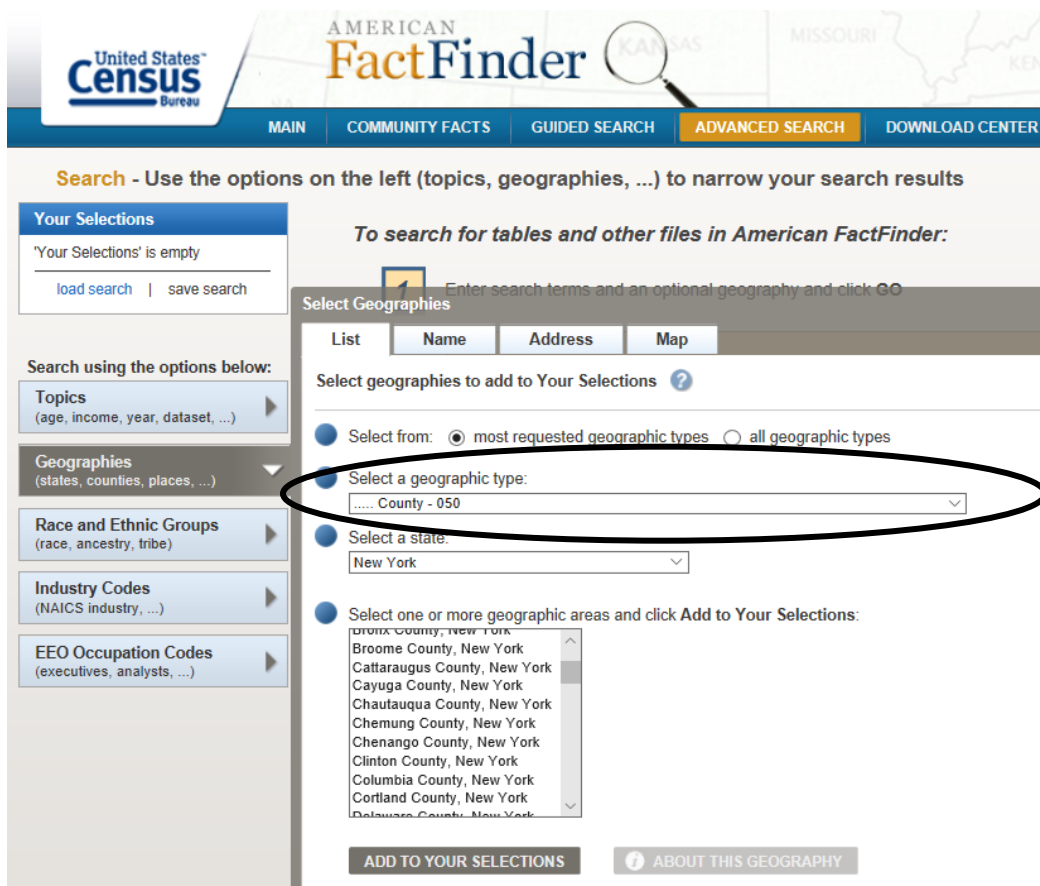
Click the “Advanced Search” tab located on the top ribbon of the page and ensure that the “Your Selections” box is empty. If there are selections inside the box, click “X” to remove them.



1. Select geographic area.

- On the left-hand side of the page, select “Geographies.”
- A pop-up box will appear that allows you to select your desired “geographic type” (e.g., United States, State, County, Place within a State, etc.). The geographic type selected will depend on the service area of your utility. For example, if your utility’s service area roughly follows county boundaries, you will want to select “County” as the geographic type. The geographic type “Place within “State” captures most cities, towns, and villages, while MSAs extend beyond city boundaries, including suburbs and related economic areas. For more information on geographic types, see the Census Bureau’s Geographic Areas Reference Manual (available at <http://www.census.gov/geo/reference/garm.html>).

- After selecting the geographic type, you will be asked to select your specific geographic area. For example, the figure below shows the geographic type of “County”, which requires that you select a “State” first. After this is chosen, a list of counties will appear.
- Once you have selected your geographic area, click “Add to your selections.” You can then add additional geographic areas of interest from this menu. You can also highlight multiple geographies at once (e.g., if your service area encompasses more than one county) by holding down the Ctrl button as you left-click on each geography name.
- When you are finished adding your geographic areas, click “CLOSE X” on the upper right-hand side of the “Select Geographies” pop-up box.



- The process for accessing ACS data at the census-tract level is similar to the process outlined above for community- and national-level data. However, there are several ways to select your geographic area and download the data. The following provides an example of this procedure for Buffalo, New York.
- Within the “Geographies” dialog box, select the “Name” tab on the upper left-hand side.
- In the “Name” tab, under “Geography Filter Options,” select “Census Tract.”

- Type the city name in the geography name box (e.g., Buffalo) and select the area that is the best match, which in this example is “Buffalo-Cheektowaga-Niagara Falls, NY MSA” and then click “GO”.
- A list of options will appear for census tracts within your specified area. Review the results and click the appropriate name where the “Geography Type” is listed as “Census Tract” (do not select any with the type “Census tract within ...”). For example, with the Buffalo-Cheektowaga-Niagara Falls, NY MSA example, you may want to choose all census tracts fully/partially within Buffalo-Cheektowaga-Niagara Falls, NY MSA, or those that are located fully within Buffalo-Cheektowaga-Niagara Falls, NY MSA.
- When working with census-tract data, it is important to evaluate the margin of error (MOE) associated with the data estimates. MOE estimates are typically located in the column immediately to the right of the data estimate. If the MOE for a specific census tract is very large, you will want to exclude that census tract from your analysis. Census tracts with large MOEs typically have very few people in them (e.g., areas with airports, parks, etc.) and are not representative of an actual population/area.
- Your selection will appear in the “Your Selections” box on the main page. You can now click the “CLOSE X” tab to exit the “Geographies” dialog box.

The screenshot displays the American FactFinder interface. On the left sidebar, under 'Geography Filter Options', the 'Block Group (22,088)' option is circled. In the main search area, the 'Enter a geography name or use the Geography Filter Options below:' field contains the text 'Buffalo', which is also circled. Below this field, there are radio buttons for 'Select from: most requested geographic types', 'all geographic types', and 'individual blocks'. To the right, the 'Geography Results' table is visible, showing a list of geographic areas with columns for 'Geography Name', 'Geography Type', and 'About'.

Geography Name	Geography Type	About
<input type="checkbox"/> United States	United States	?
<input type="checkbox"/> All States within United States and Puerto Rico	State	
<input type="checkbox"/> All States within United States, Puerto Rico, and the Island Areas	State	
<input type="checkbox"/> Alabama	State	?
<input type="checkbox"/> Alaska	State	?
<input type="checkbox"/> Arizona	State	?
<input type="checkbox"/> Arkansas	State	?
<input type="checkbox"/> California	State	?
<input type="checkbox"/> Colorado	State	?
<input type="checkbox"/> Connecticut	State	?

The screenshot shows the American FactFinder interface. On the left, there are navigation tabs: MAIN, COMMUNITY FACTS, GUIDED SEARCH, **ADVANCED SEARCH**, and DOWNLOAD CENTER. Below these is a search instruction: "Search - Use the options on the left (topics, geographies, ...) to narrow your search results".

The main content area is titled "To search for tables and other files in American FactFinder:". It includes a search bar with the text "Enter search terms and an optional geography and click GO". Below the search bar is a "Select Geographies" section with tabs for "List", "Name", "Address", and "Map".

Under "Select Geographies", there is a search box containing "Buffalo-Cheektowaga-Niagara Falls, NY Metro Area" and a "GO" button. Below this is a "Your Geography Filters" section with a "clear all filters" link. To the right is a "Select geographies to add to Your Selections" section with radio buttons for "most requested geographic types", "all geographic types", and "individual blocks".

The "Geography Results: 1-20 of 20" section contains a table with the following columns: "Geography Name" and "Geography Type". The table lists various geographic areas, and the "All Census Tracts fully within/partially within Buffalo-Cheektowaga-Niagara Falls, NY Metro Area" row is circled in black.

Geography Name	Geography Type
<input type="checkbox"/> All Counties within Buffalo-Cheektowaga-Niagara Falls, NY Metro Area	County
<input type="checkbox"/> All Places fully within/partially within Buffalo-Cheektowaga-Niagara Falls, NY Metro Area	Place within State
<input type="checkbox"/> All Estimates Universe Places fully within/partially within Buffalo-Cheektowaga-Niagara Falls, NY Metro Area	Estimates Universe Place
<input type="checkbox"/> All Economic Places fully within/partially within Buffalo-Cheektowaga-Niagara Falls, NY Metro Area	Economic Place
<input type="checkbox"/> All County Subdivisions within Buffalo-Cheektowaga-Niagara Falls, NY Metro Area	County Subdivision
<input type="checkbox"/> All Estimates Universe County Subdivisions within Buffalo-Cheektowaga-Niagara Falls, NY Metro Area	Estimates Universe County Subdivision
<input type="checkbox"/> All Census Tracts fully within/partially within Buffalo-Cheektowaga-Niagara Falls, NY Metro Area	Census Tract

2. Select relevant socioeconomic data.

- Once you close the “Geographies” box, search results will be displayed. The search results include the tables, files, or documents available for the selected geographic areas.
- There will likely be a number of files available. To narrow down your options, you can enter the specific ACS table name, number, or topic in which you are interested, or a more local “Place” in the “Refine your search results” box located above the list of available tables. Relevant files will appear, including options for different data sets (e.g., single-year or multi-year average estimates). Specific tables are needed for income and poverty data for the recommended household affordability methodology, they are:
 - Income Quintile Data = B19080: HOUSEHOLD INCOME QUINTILE UPPER LIMITS
 - The field of interest within this table is the ‘Second Quintile’.
 - % of Population Below 200% of the FPL = S1701: POVERTY STATUS IN THE PAST 12 MONTHS

- The fields of interest within this table are ‘ALL INDIVIDUALS WITH INCOME BELOW THE FOLLOWING POVERTY RATIOS: 200 percent of poverty level’ and ‘Population for whom poverty status is determined’. Divide the first by the second to get the % of the population below 200% of the FPL.

The screenshot shows the American FactFinder interface. At the top, there's a navigation bar with 'United States Census Bureau' and 'AMERICAN FactFinder'. Below that, a search bar is highlighted with a red circle, containing the text 'Refine your search results: E19080'. To the left of the search bar, there are several filter categories: 'Your Selections', 'Search using the options below:', 'Topics', 'Geographies', 'Race and Ethnic Groups', 'Industry Codes', and 'EEO Occupation Codes'. Below the search bar, there's a table of search results. The table has columns for 'ID', 'Table, File or Document Title', 'Dataset', and 'About'. The first row is 'S0101 AGE AND SEX' with '2017 ACS 5-year estimates' as the dataset. Other rows include 'S0601 SELECTED CHARACTERISTICS OF THE TOTAL AND NATIVE POPULATIONS IN THE UNITED STATES', 'S0701 GEOGRAPHIC MOBILITY BY SELECTED CHARACTERISTICS IN THE UNITED STATES', 'S0801 COMMUTING CHARACTERISTICS BY SEX', 'S0802 MEANS OF TRANSPORTATION TO WORK BY SELECTED CHARACTERISTICS', 'S1002 GRANDPARENTS', 'S1101 HOUSEHOLDS AND FAMILIES', 'S1201 MARITAL STATUS', 'S1301 FERTILITY', 'S1401 SCHOOL ENROLLMENT', and 'S1501 EDUCATIONAL ATTAINMENT'.

- Alternatively, you can click on the “Topics” box on the left-hand side of the page to narrow your search. A pop-up box will appear that will allow you to select a specific data set (e.g., one-year average estimates from current or previous years, three-year average estimates) or narrow down the field of tables available:
 - To select a specific data set within the “Topics” dialog box, click on the “+” sign next to “Dataset.” This will allow you to select the specific data set(s) from which you wish to collect data. The data set(s) you select will appear in the “Your Selections” box on the upper left-hand side of the screen.
 - You can also narrow down the field of tables based on broad categories (e.g., “People and Housing”) using the “Topics” dialog box. For example, if data on MHI were needed, click on “People,” “Income & Earnings,” then “Income/Earnings (Households).” The selected data set(s) will appear in the “Your Selections” box on the upper left-hand side of the screen.
 - After you make your selections, click on “CLOSE X” located on the upper right-hand side of the “Topics” dialog box.

The screenshot shows the American FactFinder website interface. At the top, there is a navigation bar with links for MAIN, COMMUNITY FACTS, GUIDED SEARCH, ADVANCED SEARCH, and DOWNLOAD CENTER. Below the navigation bar, a search instruction reads: "Search - Use the options on the left (topics, geographies, ...) to narrow your search results".

On the left side, there is a "Your Selections" panel with a search box containing "Census Tract All Census Tracts within Buffalo, NY Urbanized Area; New York". Below this, there are several filter categories: "Topics", "Geographies", "Race and Ethnic Groups", "Industry Codes", and "EEO Occupation Codes". The "Topics" category is highlighted with a red circle.

A "Select Topics" dialog box is open in the center, titled "Select Topics to add to 'Your Selections'". It lists various topics with checkboxes: People, Housing, Year, Product Type, Program, and Dataset. A note at the bottom of the dialog states: "Note: The Race & Ethnicity topic is available under the Race and Ethnic Groups button on the left." There is also an option to "Include archived products in your search".

On the right side, a table of search results is displayed. The table has columns for "Dataset" and "About". The results include various ACS 5-year estimates for different population groups and regions.

Dataset	About
2010 ACS 5-year estimates	?
2010 ACS 5-year estimates	?
2010 ACS 5-year estimates	?
2010 ACS 5-year estimates	?
2010 ACS 5-year estimates	?
2010 ACS 5-year estimates	?
2010 ACS 5-year estimates	?
2010 ACS 5-year estimates	?
2010 ACS 5-year estimates	?
2010 ACS 5-year estimates	?
2010 ACS 5-year estimates	?
2010 ACS 5-year estimates	?

- After narrowing your search using either of these methods, the relevant tables, files, and documents will be displayed. Click on the title of the table, file, or document of interest to view it. You can also click on the box adjacent to the file and then click on “View” or “Download.” The selected table will appear, as shown here.
- You can view the statistics included in the selected table, modify the table, print the table, or download the data using the buttons above the table.

Although the American Community Survey (ACS) produces population, demographic and housing unit estimates, for 2010, the 2010 Census provides the [official counts of the](#) for the nation, states, and counties.

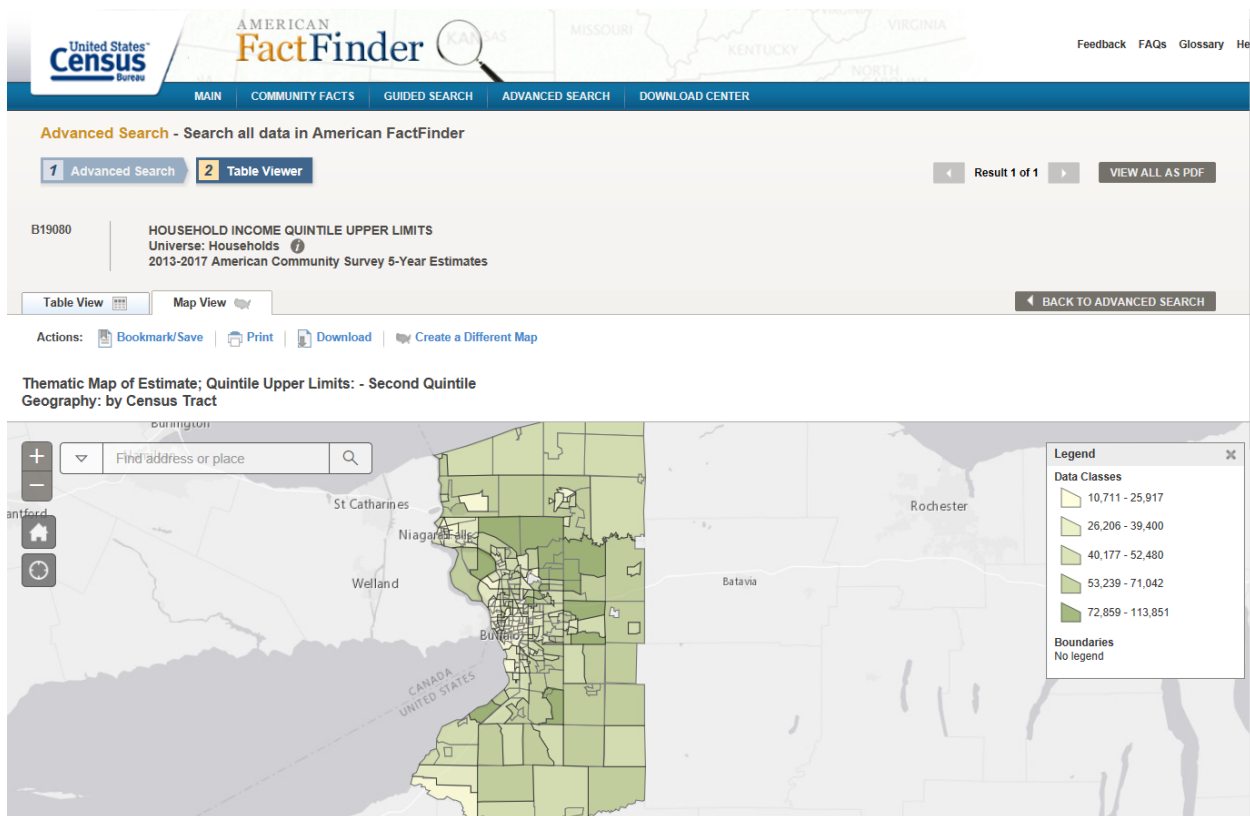
<< 1 - 18 of 396 >>

	Census Tract 2, Erie County, New York		Census Tract 6, Erie County, New York		Census Tract 7, Erie County, New York		Census Tract 8, Erie County, New York	
	Estimate	Margin of Error	Estimate	Margin of Error	Estimate	Margin of Error	Estimate	Margin of Error
Quintile Upper Limits:								
Lowest Quintile	12,658	+/-1,939	20,680	+/-1,196	30,077	+/-13,814	20,878	+/-7,151
Second Quintile	24,722	+/-4,763	33,057	+/-10,966	46,296	+/-4,986	35,922	+/-7,272
Third Quintile	41,311	+/-7,470	57,024	+/-8,422	71,700	+/-10,619	55,053	+/-7,619
Fourth Quintile	70,117	+/-7,879	78,326	+/-14,150	97,559	+/-9,551	84,764	+/-8,779
Lower Limit of Top 5 Percent	113,017	+/-26,976	116,074	+/-40,543	151,234	+/-24,899	118,911	+/-12,396

Source: U.S. Census Bureau, 2006-2010 American Community Survey

3. Verifying your data via mapping.

- Next, you will want to narrow your search results and click on the table in which you are interested, as described above for community-/national-level data.
- Once you select the table in which you are interested, it will be presented in “Table View” mode. Before downloading the data, you can verify visually that the geographic area selected covers the correct region. To do this, click on “Create a Map,” then select a value in the table to create your map per the arrow and circled cell in the figure above.
- If the area selected is not correct, you can download census-tract data by county, as follows:
- Go back to the main page.
- Select geographic region using “Counties” (instead of selecting by “Name”).
- Click the red “X” to remove the previously selected geography.
- On the “List” tab under “Geographic Type,” select “Census Tract.”
- Select “All Census Tracts within...” for the selected state and county.
- Click “Add to Your Selections” and close the “Geographies” window. Create a map as before and confirm that the geographic area is correct.



4. Downloading the data.

- Once you have the correct data file, download it by clicking “Download” on the “Table View” page and selecting the csv file format (which can be opened using Excel). This will download a series of files, including a csv file that contains the actual data and a csv “metadata” file that explains the column headers for the data.
- If you plan to display the data in a geographic information system program, census tract shapefiles are available at <http://www.census.gov/cgi-bin/geo/shapefiles2010/main>.
- A short video tutorial is available on the Census website: http://factfinder2.census.gov/help/en/virtual_tour.htm.

5. Weighting the data to combine geographic areas.

- If the utility service area is comprised of a customized combination of geographies, then it may be necessary to calculate population-weighted average statistics for the lowest income quintile or percent of the population below 200% of the FPL statistics.
- To obtain the population-weighted average lowest income quintile for a customized combination of geographies, the ratio of the population for a given geographic area to the total geographic area should be multiplied by the lowest income quintile upper limit for the geographic area before summing these products across geographies. Note that this is only

possible using this approach if all water sector utility rates are assumed to be the same across each geographic component of the service area. Otherwise the user would need to calculate the HBI for each geographic component before applying the population weight for each geography and then summing across geographies.

- For the percent of the population below 200% of the FPL statistic the user can sum the population below 200% across geographies and divide that by the sum of the total population across geographies.

Appendix D: Applicable Federal Statutes

Below is a summary of the specific clauses from federal statutes and associated guidance documents that relate either directly or indirectly to the findings of this report. Those that are deemed to relate directly include areas of regulatory law and enforcement guidance where EPA could replace existing metrics used to measure water sector service affordability with those proposed in this report. In general, those that are deemed to relate indirectly to the findings of this report are statutes and guidance where EPA could issue unenforceable recommendations to states around any findings from this report that they choose to endorse.

Directly Applicable

- 33 U.S.C. 1342 (s)
 - In this subsection, the term ‘integrated plan’ means a plan developed in accordance with the Integrated Municipal Stormwater and Wastewater Planning Approach Framework, issued by the Environmental Protection Agency and dated June 5, 2012.
 - A permit issued under this section that incorporates an integrated plan may integrate all requirements under this Act addressed in the integrated plan, including requirements relating to: a combined sewer overflow; a capacity, management, operation, and maintenance program for sanitary sewer collection systems; a municipal stormwater discharge; a municipal wastewater discharge; (v) a water quality-based effluent limitation to implement an applicable waste load allocation in a total maximum daily load; implementation of projects, including innovative projects, to reclaim, recycle, or reuse water; and green infrastructure.
- 33 U.S.C. § 1342 (q)(1)
 - Under the NPDES statute “Each permit, order, or decree issued pursuant to this chapter after December 21, 2000, for a discharge from a municipal combined storm and sanitary sewer shall conform to the Combined Sewer Overflow Control Policy signed by the Administrator on April 11, 1994 (in this subsection referred to as the “CSO control policy”).”⁵⁹ The CSO control policy notes that “Schedules for implementation of the long-term CSO control plan may be phased based on the relative importance of adverse impacts upon WQS and designated uses, and on a permittee’s *financial capability*.”⁶⁰ This original 1994 CSO control policy also notes

⁵⁹<http://uscode.house.gov/view.xhtml?req=%22combined+sewer+overflow%22&f=treesort&fq=true&num=3&hl=true&edition=prelim&granuleId=USC-prelim-title33-section1342>

⁶⁰ <https://www.epa.gov/sites/production/files/2015-10/documents/owm0111.pdf>

that specific guidance on financial capability would be subsequently released, which it was in February of 1997. It is the methodology of measuring household affordability and community financial capability from that February 1997 guidance that has been the subject of much of the debate around water service affordability measurement in the United States.⁶¹

- 42 U.S.C. § 300f (1)(C)
 - “(1) The term "primary drinking water regulation" means a regulation which- (C) specifies for each such contaminant either- (i) a MCL, if, in the judgment of the Administrator, it is economically and technologically feasible to ascertain the level of such contaminant in water in public water systems, or (ii) if, in the judgment of the Administrator, it is not *economically or technologically feasible* to so ascertain the level of such contaminant, each treatment technique known to the Administrator which leads to a reduction in the level of such contaminant sufficient to satisfy the requirements of section 300g-1 of this title...”⁶²
- 42 U.S. C. § 300g-1 (b)
- “Health Risk Reduction and Cost Analysis. -- Maximum contaminant levels.-When proposing any national primary drinking water regulation that includes a maximum contaminant level, the Administrator shall, with respect to a maximum contaminant level that is being considered in accordance with paragraph (4) and each alternative maximum contaminant level that is being considered pursuant to paragraph (5) or (6)(A), publish, seek public comment on, and use for the purposes of paragraphs (4), (5), and (6) an analysis ... When proposing a national primary drinking water regulation that includes a treatment technique in accordance with paragraph (7)(A), the Administrator shall publish and seek public comment on an analysis of the health risk reduction benefits and costs likely to be experienced as the result of compliance with the treatment technique and alternative treatment techniques that are being considered ... (4)(C) (C) Determination.-At the time the Administrator proposes a national primary drinking water regulation under this paragraph, the Administrator *shall publish a determination as to whether the benefits of the maximum contaminant level justify, or do not justify, the costs* based on the analysis conducted under paragraph (3)(C) (4)(D) Definition of feasible.-For the purposes of this subsection, the term "feasible" means feasible with the use of the best technology, treatment techniques and other means which the Administrator finds, after examination for efficacy under field conditions and not solely under laboratory conditions, *are available (taking cost into consideration)*.
 -

⁶¹ <https://www.epa.gov/sites/production/files/2015-10/documents/csofc.pdf>

⁶² <http://uscode.house.gov/view.xhtml?req=%22Affordability%22+%22water%22&f=treesort&fq=true&num=6&hl=true&edition=prelim&granuleId=USC-prelim-title42-section300f>

- “(4)(E)(ii) List of technologies for small systems.-The Administrator shall include in the list any technology, treatment technique, or other means that is *affordable*, as determined by the Administrator in consultation with the States, for small public water systems serving- (I) a population of 10,000 or fewer but more than 3,300; (II) a population of 3,300 or fewer but more than 500; and (III) a population of 500 or fewer but more than 25; and that achieves compliance with the MCL or treatment technique...”
- “(7)(A) The Administrator is authorized to promulgate a national primary drinking water regulation that requires the use of a treatment technique in lieu of establishing a MCL, if the Administrator makes a finding that it is not *economically or technologically feasible* to ascertain the level of the contaminant. In such case, the Administrator shall identify those treatment techniques which, in the Administrator's judgment, would prevent known or anticipated adverse effects on the health of persons to the extent feasible. Such regulations shall specify each treatment technique known to the Administrator which meets the requirements of this paragraph, but the Administrator may grant a variance from any specified treatment technique in accordance with section 300g-4(a)(3) of this title.”
- “(15) Variance Technologies (A) In general.-At the same time as the Administrator promulgates a national primary drinking water regulation for a contaminant pursuant to this section, the Administrator shall issue guidance or regulations describing the best treatment technologies, treatment techniques, or other means (referred to in this paragraph as "variance technology") for the contaminant that the Administrator finds, after examination for efficacy under field conditions and not solely under laboratory conditions, are available and *affordable*, as determined by the Administrator in consultation with the States, for public water systems of varying size, considering the quality of the source water to be treated...” “Variance technologies identified by the Administrator pursuant to this paragraph may not achieve compliance with the MCL or treatment technique requirement of such regulation, but shall achieve the maximum reduction or inactivation efficiency that is *affordable* considering the size of the system and the quality of the source water.”
- “(C) Additional Information.-“ “...The Administrator shall provide any assumptions used in determining *affordability*, taking into consideration the number of persons served by such systems.”⁶³
- 42 U.S.C. § 300g-4 (e)
 - “(e) Small system variances” “(3) Conditions for granting variances- A variance under this subsection shall be available only to a system- (A) that cannot *afford* to comply, in accordance with *affordability criteria* established by the Administrator (or

⁶³<http://uscode.house.gov/view.xhtml?req=%22Affordability%22+%22water%22&f=treesort&fq=true&num=7&hl=true&edition=prelim&granuleId=USC-prelim-title42-section300g-1>

the State in the case of a State that has primary enforcement responsibility under section 300g-2 of this title), with a national primary drinking water regulation...”

“(7) Regulations and guidance (A) In general- Not later than 2 years after August 6, 1996, and in consultation with the States, the Administrator shall promulgate regulations for variances to be granted under this subsection. The regulations shall, at a minimum, specify- “... (ii) requirements for the installation and proper operation of variance technology that is identified (pursuant to section 300g-1(b)(15) of this title) for small systems and the *financial and technical capability* to operate the treatment system, including operator training and certification,...” “(B) Affordability criteria- Not later than 18 months after August 6, 1996, the Administrator, in consultation with the States and the Rural Utilities Service of the USDA, shall publish information to assist the States in developing *affordability criteria*. The *affordability criteria* shall be reviewed by the States not less often than every 5 years to determine if changes are needed to the criteria. (8) Review by the Administrator- (A) In general- The Administrator shall periodically review the program of each State that has primary enforcement responsibility for public water systems under section 300g-2 of this title with respect to variances to determine whether the variances granted by the State comply with the requirements of this subsection. With respect to *affordability*, the determination of the Administrator shall be limited to whether the variances granted by the State comply with the *affordability criteria* developed by the State. (B) Notice and publication- If the Administrator determines that variances granted by a State are not in compliance with *affordability criteria* developed by the State and the requirements of this subsection, the Administrator shall notify the State in writing of the deficiencies and make public the determination.”⁶⁴

Indirectly Applicable

- 33 U.S.C. § 1284 (b)(1)(B)
 - The EPA Administrator may not approve grants for the construction of a publicly owned treatment work unless the applicant “has legal, institutional, managerial, and *financial capability* to insure adequate construction, operation, and maintenance of treatment works throughout the applicant's jurisdiction, as determined by the Administrator.”⁶⁵
- 33 U.S.C. § 1301 (c)(3)
 - The EPA Administrator or state grantee when considering applications for sewer overflow control grants may prioritize financially distressed communities, AND

⁶⁴<http://uscode.house.gov/view.xhtml?req=%22Affordability%22+%22water%22&f=treesort&fq=true&num=8&hl=true&edition=prelim&granuleId=USC-prelim-title42-section300g-4>

⁶⁵ <http://uscode.house.gov/view.xhtml?req=granuleid:USC-prelim-title33-section1284&num=0&edition=prelim>

under paragraph (c) part (1), "...the term "financially distressed community" means a community that meets affordability criteria established by the State in which the community is located...", AND under paragraph (c) part (3) "The Administrator may publish information to assist States in establishing *affordability criteria*."⁶⁶

- 33 U.S.C. § 1383 (i)(1)
 - The state grantee when considering applications from municipalities for clean water revolving loan fund grants "(d)...may provide additional subsidization, including forgiveness of principal and negative interest loans..."(A) in assistance to a municipality or intermunicipal, interstate, or State agency to benefit a municipality that- (i) meets the affordability criteria of the State established under paragraph (2)", which under (2)(C) states that "The Administrator may publish information to assist States in establishing *affordability criteria*..."⁶⁷
- 42 U.S.C. §300j-1. Research, technical assistance, information, training of personnel
 - ... the Safe Drinking Water Act Amendments of 1996 (Public Law 104-182) [see Short Title of 1996 Amendments note set out under section 201 of this title] authorized technical assistance for small and rural communities to assist those communities in complying with regulations promulgated pursuant to the Safe Drinking Water Act (42 U.S.C. 300f et seq.); "(2) technical assistance and compliance training—"(A) ensures that Federal regulations *do not overwhelm the resources of small and rural communities*; and "(B) provides small and rural communities lacking technical resources with the necessary skills to improve and protect water resources; "(3) across the United States, more than 90 percent of the community water systems serve a population of less than 10,000 individuals; "(4) *small and rural communities have the greatest difficulty providing safe, affordable public drinking water and wastewater services due to limited economies of scale and lack of technical expertise*; and
- 42 U.S.C. § 300j-12 - State revolving loan funds
 - With respect to intended use plans for grant funds as part of state loan fund programs "(a) General authority..." "(3) Limitation- (A) In general- Except as provided in subparagraph (B), no assistance under this section shall be provided to a public water system that- (i) does not have the technical, managerial, and *financial capability* to ensure compliance with the requirements of this subchapter..." "(B) Restructuring- A public water system described in subparagraph (A) may receive assistance under this section if..."(ii) if subparagraph (A)(i) applies to the system, the owner or operator of the system agrees to undertake feasible and appropriate changes in operations

⁶⁶ <http://uscode.house.gov/view.xhtml?req=granuleid:USC-prelim-title33-section1301&num=0&edition=prelim>

⁶⁷ <http://uscode.house.gov/view.xhtml?req=%22Affordability%22+%22water%22&f=treesort&fq=true&num=5&hl=true&edition=prelim&granuleid=USC-prelim-title33-section1383#>

(including ownership, management, accounting, rates, maintenance, consolidation, alternative water supply, or other procedures) if the State determines that the measures are necessary to ensure that the system has the technical, managerial, and ***financial capability*** to comply with the requirements of this subchapter over the long term.” “(b) Intended use plans...” “(3) Use of funds (A) In general- An intended use plan shall provide, to the maximum extent practicable, that priority for the use of funds be given to projects that-“ “...(iii) assist systems most in need on a ***per household basis according to State affordability criteria***.” “...(d) Assistance for disadvantaged communities...” “(3) "Disadvantaged community" defined- In this subsection, the term "disadvantaged community" means the service area of a public water system that meets ***affordability criteria*** established after public review and comment by the State in which the public water system is located. The Administrator may publish information to assist States in establishing ***affordability criteria***.”⁶⁸

- §300j-16. Assistance to colonias
- Each grant awarded pursuant to subsection (b) shall be used to provide assistance to one or more eligible communities with respect to which the residents are subject to a significant health risk (as determined by the Administrator or the head of the Federal agency making the grant) attributable to the lack of access to an adequate ***and affordable*** drinking water supply system. §300j-19a. Assistance for small and disadvantaged communities
 - The Administrator shall establish a program under which grants are provided to eligible entities for use in carrying out projects and activities the primary purposes of which are to assist public water systems in meeting the requirements of this subchapter. ... An eligible entity under this section— ... (2) serves a community—(A) that, ***under affordability criteria established by the State under section 300j-12(d)(3) of this title***, is determined by the State—(i) to be a disadvantaged community; or (ii) to be a community that may become a disadvantaged community as a result of carrying out a project or activity under subsection (b); or (B) with a population of less than 10,000 individuals that the Administrator determines ***does not have the capacity to incur debt sufficient to finance a project or activity under subsection*** (b).
- §300j-19b. Reducing lead in drinking water
 - The term "lead reduction project" means a project or activity the primary purpose of which is to reduce the concentration of lead in water for human consumption by—(i) replacement of publicly owned lead service lines; (ii) testing, planning, or other relevant activities, as determined by the Administrator, to identify and address conditions (including corrosion control) that contribute to increased concentration of lead in water for human consumption; and (iii) providing assistance to low-income homeowners to replace lead service lines. ... ***The term "low-income", with respect to an***

⁶⁸<http://uscode.house.gov/view.xhtml?req=%22Affordability%22+%22water%22&f=treesort&fq=true&num=9&hl=true&edition=prelim&granuleId=USC-prelim-title42-section300j-12>

individual provided assistance under this section, has such meaning as may be given the term by the Governor of the State in which the eligible entity is located, based upon the affordability criteria established by the State under section 300j-12(d)(3) of this title. ...

In providing grants under this subsection, the Administrator shall give priority to an eligible entity that— (A) the Administrator determines, *based on affordability criteria established by the State under section 300j-12(d)(3) of this title, to be a disadvantaged community*; ... The Administrator may reduce or eliminate the non-Federal share under subparagraph (A) for *reasons of affordability*, as the Administrator determines to be appropriate.