

The AR: Household-level affordability measured as the percentage or ratio of basic water and sewer costs to disposable household income for low-income customers. This measure may be calculated for an individual customer or aggregated statistically for any defined group of customers.

$$AR_c = \frac{p_c(W + S)}{I_c - E_c}$$

I is household income

E is essential household expenses (other than water and sewer services)

p is the number of persons in the household

W is the per capita cost of essential water services

S is the per capita cost of essential sewer services

Affordability At The 20th Income Percentile (AR₂₀)

		Source
People Per Household	4	Journal AWWA January 2018 (values from Teodoro article)
Essential Water Volume*	50	Journal AWWA January 2018 (values from Teodoro article)
Typical Monthly Household Essential Volume	6,000	
Water Monthly Consumption		
Tier 1	4,300	
Tier 2	1,700	
Water 3/4" Residential Base Charge	\$ 9.54	
Wastewater Monthly Consumption		
Tier 1	4,300	
Wastewater 3/4" Residential Base Charge	\$ 9.02	
Monthly Household Cost Of Essential Water Services	\$ 31.42	FY 2020 CRW Water Rates
Monthly Household Cost Of Essential Wastewater Services**	\$ 36.51	FY 2020 CRW Wastewater Rates
Monthly Household Cost Of Essential Renewable Water Services	\$ 26.15	FY 2020 CRW Renewal Water Rates
Monthly Household Cost Of Essential Stormwater Services	\$ 7.12	FY 2020 CRW Stormwater Rates
Total Cost of Essential Water and Sewer Services	\$ 101.20	
Annual Household Income (20th Percentile)***	\$ 50,466	American FactFinder: American Community Survey (Castle Rock Town)
Annual Essential Household Expenses****	\$ 26,120	Consumer Expenditure Survey - Table 3133 West Region
Annual Disposable Income	\$ 24,346	
Monthly Disposable Income	\$ 2,029	
AR₂₀	4.99%	Teodoro Study average of 11.4% for 25 largest US cities.

* Essential water volume in gallons per capita per day based upon *Measuring Household Affordability for Water and Sewer Utilities*, M.P. Teodoro, *Journal AWWA*, January 2018, 110:1.

** Wastewater services charged based on average winter monthly consumption of 4,300 gallons.

*** "This focus on the 20th percentile household aligns the analysis of water and sewer affordability with mainstream assessments of welfare economics, which typically identify the 20th percentile as the lower boundary of the middle class." - Teodoro

**** Does not include water and sewer services. Reflects expenses at an income level between \$50,000 and \$69,999 in the western region.

Basic Service Costs As HM: A way to measure affordability is to calculate the HM that would be necessary to pay for basic water and sewer service.

$$HM_c = \frac{p_c(W + S)}{A}$$

p is the number of persons in the household
W is the per capita cost of essential water services
S is the per capita cost of essential sewer services
A is the minimum wage in the labor market

Basic Household Water And Sewer Cost Expressed In Terms Of Hours Of Labor At Minimum Wage (HM)

			Source
People Per Household	4		Journal AWWA January 2018 (values from Teodoro article)
Essential Water Volume*	50		Journal AWWA January 2018 (values from Teodoro article)
Typical Monthly Household Essential Volume	6,000		
Monthly Household Cost Of Essential Water Services	\$ 31.42		FY 2020 CRW Water Rates
Monthly Household Cost Of Essential Wastewater Services**	\$ 36.51		FY 2020 CRW Wastewater Rates
Monthly Household Cost Of Essential Renewable Water Services	\$ 26.15		FY 2020 CRW Renewal Water Rates
Monthly Household Cost Of Essential Stormwater Services	\$ 7.12		FY 2020 CRW Stormwater Rates
Total Cost of Essential Water and Sewer Services	\$ 101.20		
Minimum Wage	\$ 11.10		http://www.ncsl.org/research/labor-and-employment/state-minimum-wage-chart.aspx#Table
HM	9.12		Teodoro Study average of 9.0 for 25 largest US cities.

* Essential water volume in gallons per capita per day based upon *Measuring Household Affordability for Water and Sewer Utilities*, M.P. Teodoro, *Journal AWWA*, January 2018, 110:1.