

Lake Havasu City Water Service Area and Water Consumption

Lake Havasu City's Colorado River water contract with Reclamation includes the establishment of a contract water service area operated by the City's Water Division of the Operations Department. The original water service area in 1968 coincided with the Lake Havasu Irrigation and Drainage District (LHIDD) boundaries. Later water entitlement additions and contract amendments extended the water service to its present area to accommodate the Horizon Six area, Lake Havasu State Park and future development (Figure 1). A separate Colorado River water entitlement contract area served by the private water company, EPCOR, delivers water to Desert Hills and an area within the city limits on the northwest side.

To service the City's water contract area, Colorado River designated water is withdrawn by the City primarily through water wells near the lake, although there is one surface water intake used for supplementing irrigation water for a 36-hole golf course (Figure 2). The Horizontal Collector

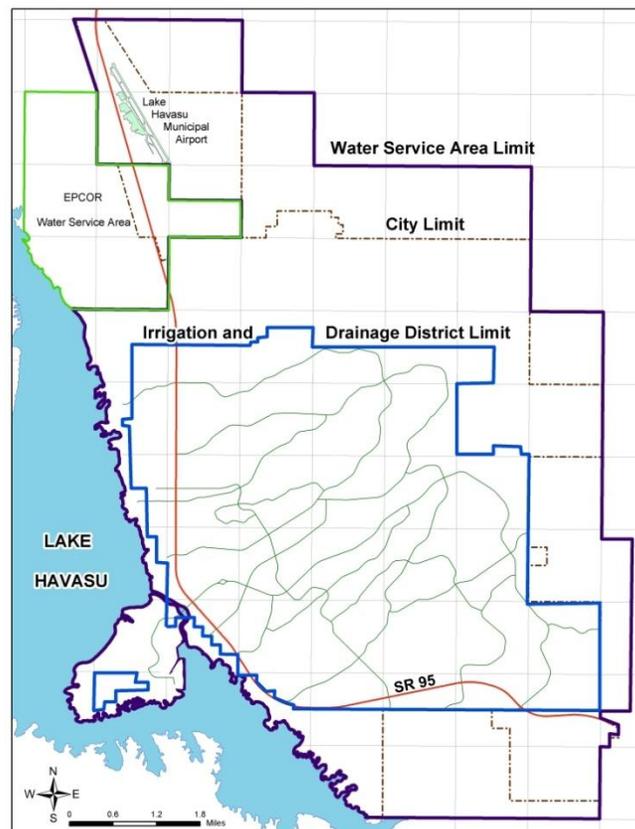


Figure 1: The Lake Havasu City present contract water service area (purple outline) compared to its original size (blue outlines) in 1968 that also represents the LHIDD. The area outlined in green is a water service contract area by a private water company.

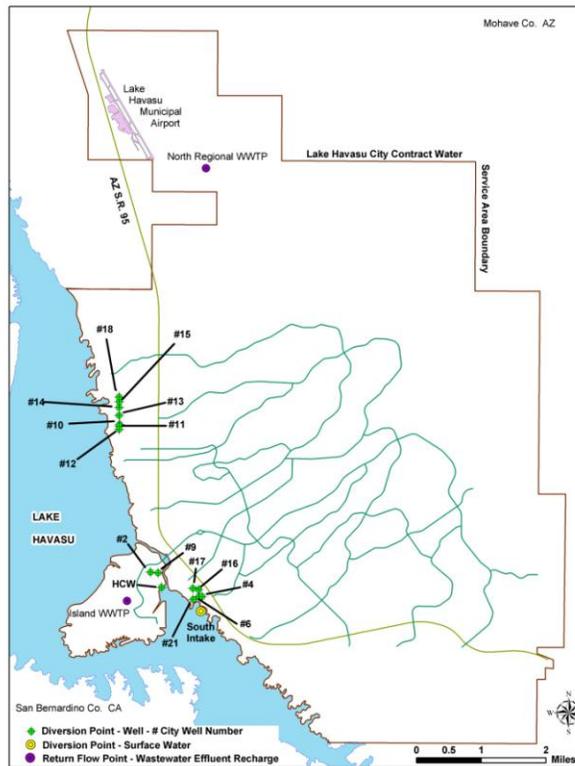


Figure 2: Lake Havasu City Colorado River water contract diversion points that supply the City’s water service area and two permitted treated wastewater effluent disposal sites for return flow to the river system.

Well diverts most of the water (please see “Follow the Water” virtual tour) and the City is actively exploring for a second horizontal collector well site to assure the City has enough water for delivery to its customers.

Historically, the water demand for Lake Havasu City has declined; especially in recent years due to a variety of factors (please see water conservation section). In the 1970’s and early 1980’s large water consumption was encouraged through the then established water rate structure that lowered the per unit rate as larger volumes were used (Figure 3). This is similar to today’s bulk purchases of goods that have lower per item cost than if buying only one of the same product. The City’s per capita water use from 1984 to 1989 ranged between 460 and 435 gallons/person/day. In 1990, this mind set changed and a new scaling water rate structure was established to discourage high water consumption by charging more with increased volume. This is also known as an increasing tier or block water rate structure. Several more adjustments have been made up to the current rate structure set in August 2009 (Table 1). This last rate structure adjustment actually rewards single and multi-family residential customers who use the least amount of water by decreasing the rate of the lowest tier from the previous version. For

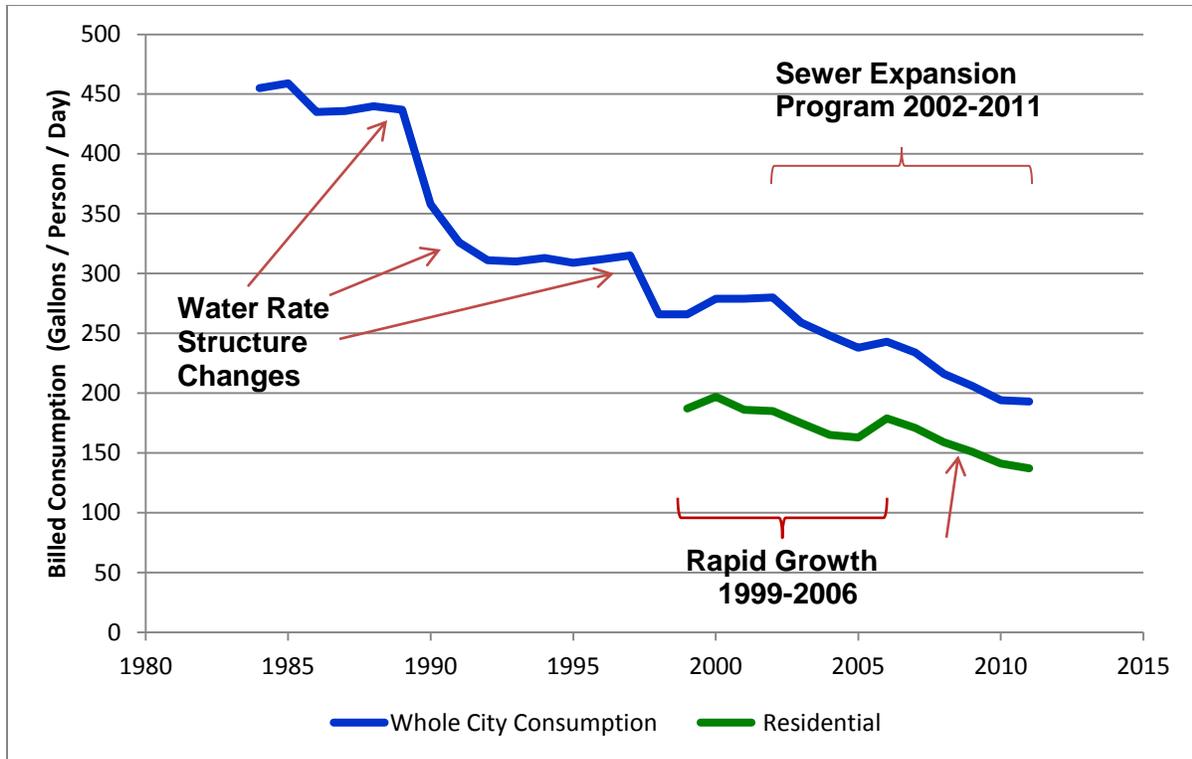


Figure 3: Lake Havasu City historical total city (blue) and residential (green) per capita consumption trend as a result of various water conservation measures instituted.

Table 1: Lake Havasu City current water rate structure for residential domestic consumption.

| Single Family Residential Domestic | | Multi-Family Residential Domestic | |
|---------------------------------------|----------------------|---------------------------------------|----------------------|
| Usage (Cu. Ft.) – In District (LHIDD) | Rate per 100 Cu. Ft. | Usage (Cu. Ft.) – In District (LHIDD) | Rate per 100 Cu. Ft. |
| 0-1,300 | \$1.35 | 0-2,600 | \$1.35 |
| 1,301 – 2,500 | \$1.76 | 2,601 – 55,000 | \$1.76 |
| 2,501 – 5,000 | \$2.16 | 55,001 – 200,000 | \$2.16 |
| Over 5,000 | \$2.30 | Over 200,000 | \$2.30 |
| Out of District (LHIDD) | Rate per 100 Cu. Ft. | Out of District (LHIDD) | Rate per 100 Cu. Ft. |
| 0-1,300 | \$1.69 | 0-2,600 | \$1.69 |
| 1,301 – 2,500 | \$2.20 | 2,601 – 55,000 | \$2.20 |
| 2,501 – 5,000 | \$2.70 | 55,001 – 200,000 | \$2.70 |
| Over 5,000 | \$3.38 | Over 200,000 | \$3.38 |

more a detailed look at the current water rate structure that includes irrigation, commercial/industrial, hydrant, and RV park rates as well as monthly base water meter charges, please see the 2010 Water Conservation Plan on this website (pages 2-10 to 2-12).

In addition to the water rate structure, an unintended water use reduction began in 2002 due to the expansion of the City's sewer collection system, in which monthly sewer charge amounts are based on winter water usage. Residential billed water volumes from November to April are tracked for each customer and the three lowest volumes are averaged together to compare to a monthly sewer rate that is then applied to the water bill for a year. Each winter period water use resets the monthly sewer charge. This way of financing the sewer expansion work has helped to lower water consumption through the construction period which ended in 2011, despite the City experiencing rapid population growth from 2002 to 2006. The great recession of 2008 and beyond also contributed to water use reductions through population losses.

Total acre-feet of water consumed in 2011, at 11,342 ac-ft, was the lowest since 1998. Almost 74% of the city's total usage is from single and multi-family residential consumption (Figure 4) and a large portion of that total (~65%) is for landscape irrigation (included in both residential and irrigation categories in Figure 4). Nonresidential irrigation volumes are included in the irrigation, water wells, commercial, schools and in the South Intake categories in Figure 4. The South Intake is a lake water diversion point exclusively used to supplement the Mulberry Wastewater Treatment Plant effluent pond for golf course irrigation during the warmer months. As a result of the large percentage of irrigation in the city, only 25% of the treated drinking water produced is cycled back through the sewer system.

The treated drinking water irrigation volumes would be even higher if treated wastewater effluent (~2,000 ac-ft) was not used on the area's golf courses. The demand is especially high in the summer, but the arid nature of the Lower Colorado River has inherent high evapotranspiration rates (ET - this term covers both evaporation and transpiration, which is the release of water vapor by plants into the atmosphere) throughout the year. Lake Havasu's annual ET averages between 86" and 89" or a little over 7 feet, as compared to a mean 4.3" / year for the annual rainfall. Annual ET cycles for 2008, 2009 and 2011 shown in Figure 5 are typical over the last 9 years. High ET rates are due to the city's mean annual daily high temperature (86.6°F) and typical summers averaging 125 days and 49 days, at or above 100°F and 110°F, respectively. Even the summer overnight low temperatures (mid 80's to mid 90's) are higher than many place's normal summer high temperature. The relatively high humidity of the monsoon season from July through September actually depresses the rate of ET, so if monsoon were not present, the annual ET would be much higher.

The amount of water diverted from the Colorado River and its aquifer in 2011 was 12,678 ac-ft, about 10.5% more than billed. This discrepancy is due to a combination of unmetered water leaks, water meter inaccuracies and timing of obtaining records between the diversion and consumption volumes. The city is divided into four zones for meter reading that spans over a month's period for recording all water consumption volumes, which usually do not all fall within

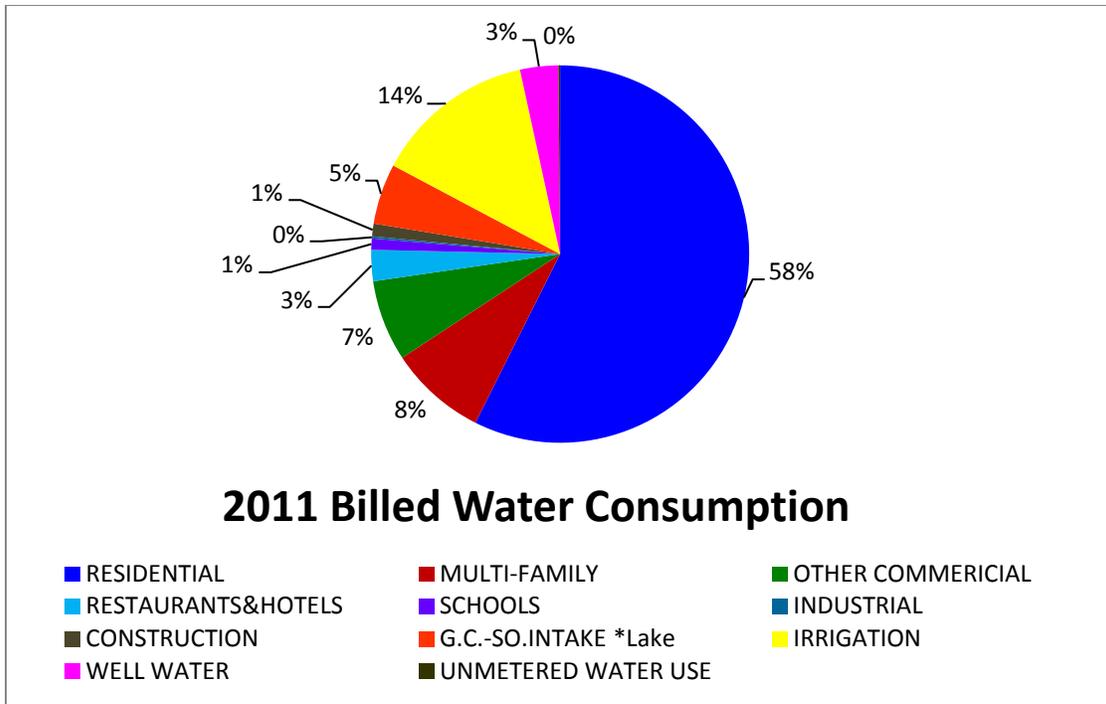


Figure 4: Relative percentage of water category uses for Lake Havasu City’s 2011 billed water consumption. The irrigation section combines non-residential with those residents that have an irrigation meter in addition to their domestic water meter. Irrigation volumes at residences without a separate irrigation meter are included in the blue residential category. 0% on the chart indicates volumes under 1%.

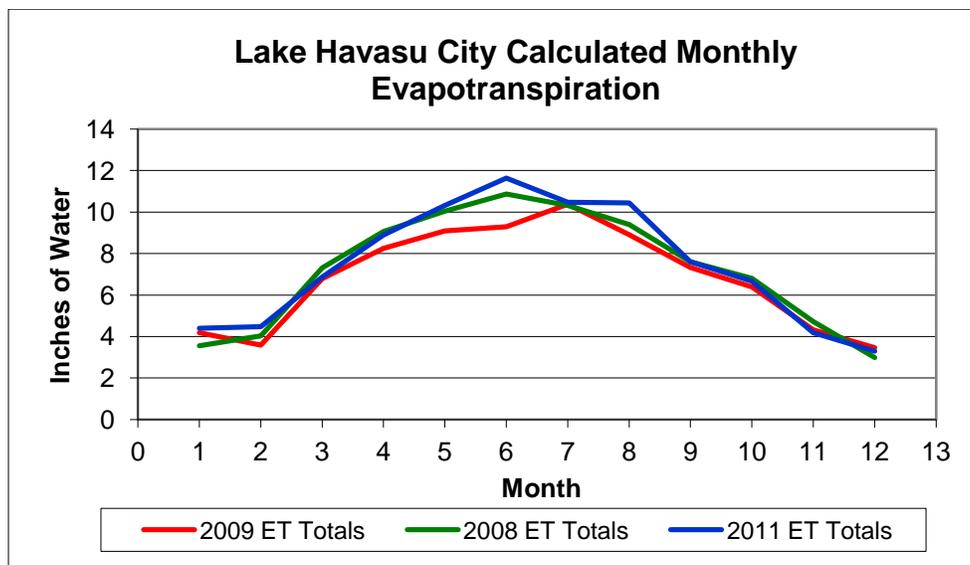


Figure 5: Typical ET annual cycles for Lake Havasu City showing a peak in June or July, depending on when the monsoon moisture moves into the area.

one particular month (i.e. Most customers get a bill that shows water used from a part of one month to the same part of the next month, instead of following a calendar month). Conversely, there is only one diversion point meter to read (at the City's water treatment plant) at the end of each month. The City is working to lower this percentage through a variety of means (please see water conservation section).

Water Consumption Projections

The City's 2010 Water Conservation Plan discusses projected water demands based on the city's expected population growth. Accurate projections of water use are almost impossible, but a general sense of expected demand can be developed through considering current water use practices, anticipated water conservation measures beyond what is currently in place, and projected population growth. The 2008 recession took what certainty there is in predicting growth and through it out the door. Lake Havasu City's population decreased from 2008 to at least 2010 and slow growth is expected for some time, but for how long is anybody's guess. In the case of a 4th priority Colorado River water contract holder, an additional consideration of lowering the annual allocation available needs to be included when Colorado River declared shortages are in play. With this in mind, the following graphs show estimated water demand based on population and time, respectively (Figures 6 and 7). These projections will be refined as new pertinent information is obtained or developed. The figures also show what Lake Havasu City's projected entitlement would be given three scenarios of federally declared Colorado River shortages (the dashed lines), 400,000, 500,000 and 600,000 ac-ft, respectively. These are the volumes of reduced delivery to Nevada (3.3%) and Arizona 4th priority users (with no shortages to Mexico) that are responses to the lowering levels of Lake Mead. The entitlement changes with time to 2031 account for growing water use by water providers and irrigators on the river. At 2031, it is assumed all contracts will be at maximum entitlements and will remain level thereafter. As can be seen in the graphs, Lake Havasu City's demand at some point in time will exceed water supply availability if shortages are declared. As mentioned in the Water Resources discussion on this website, an intrastate shortage agreement is in place until 2026 that provide for taking shortages from our entitlement volume. How shortage volumes are assessed to the City after 2026 is unclear; however, possible scenarios include the status quo or the possibility that shortages will be taken from the City's prior year diversion amount, which is clearly not a favorable situation.

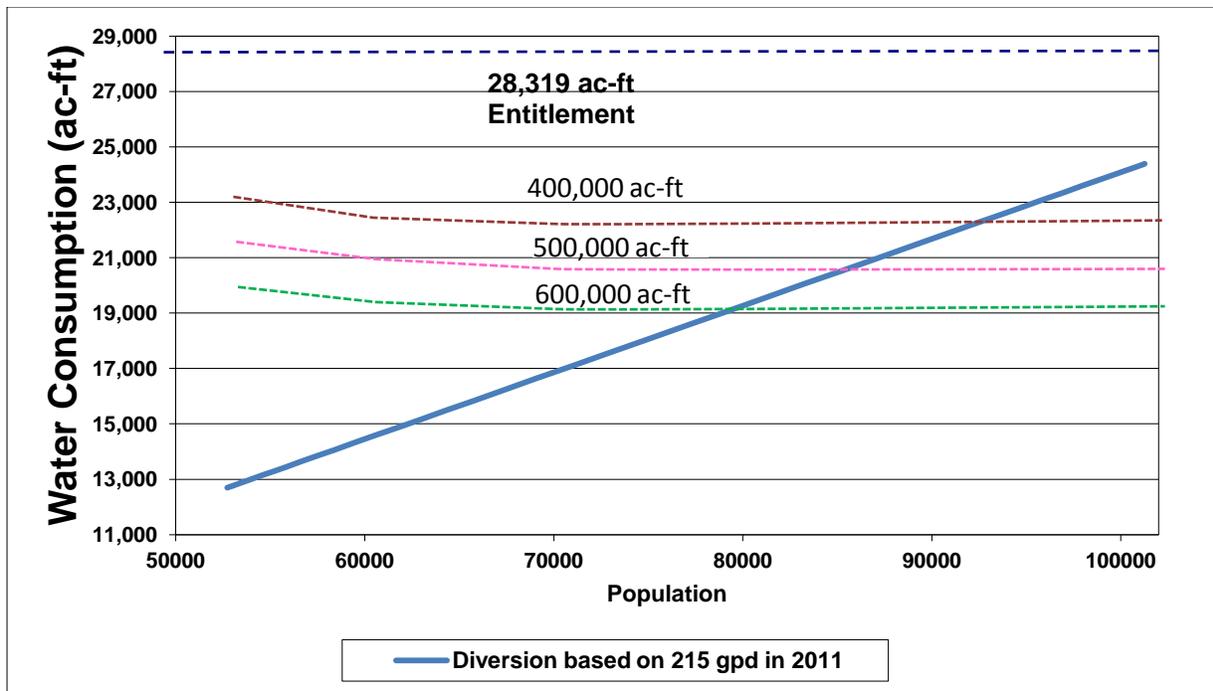


Figure 6: Estimated water demand projection with population growth based on a per capita volume use (gallons/person/day (gpd)). Population estimated are loosely based on the City's growth from 2010 to 2012.

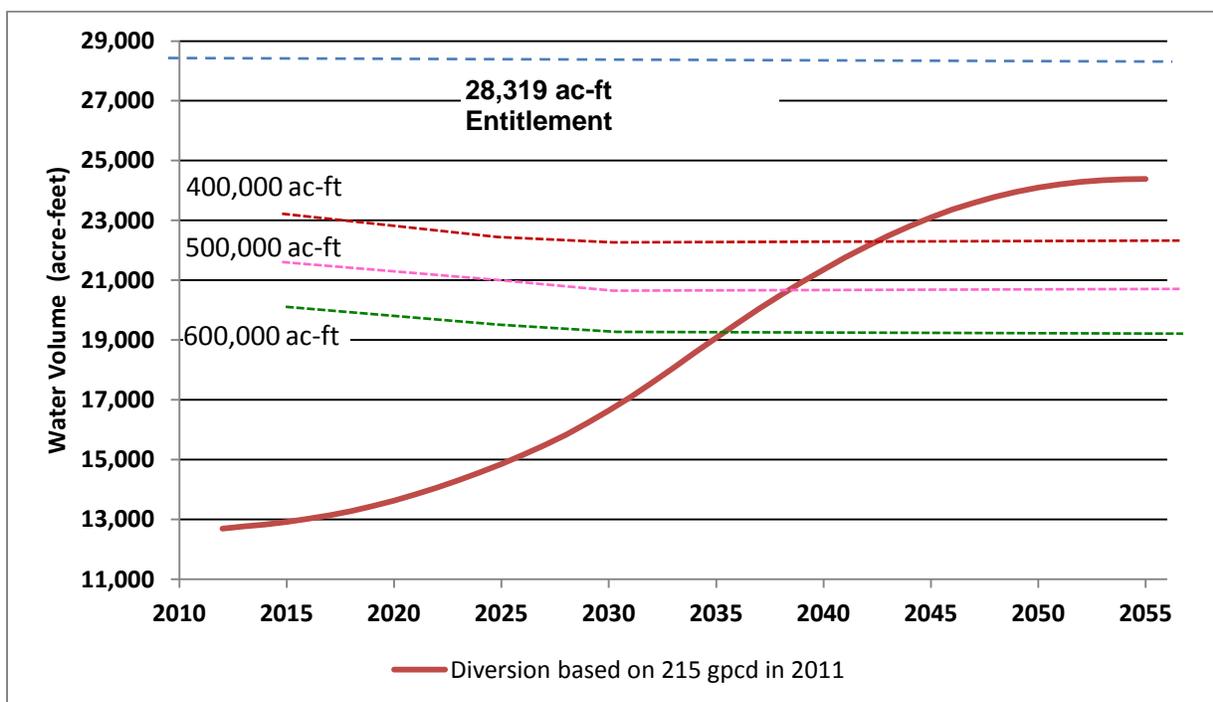


Figure 7: Water demand projection estimate with time based on the same per capita assumption used in Figure 5.