

Discussion Paper

Process , Criteria, and Methods for Process Water Exclusion

10/25/2010

The Statute

Section 10608.24 (e) “When developing the urban water use target pursuant to Section 10608.20, an urban retail water supplier that has a **substantial percentage** of industrial water use in its service area, may exclude process water from the calculation of gross water use to avoid a **disproportionate burden** on another customer sector.” (Emphasis added)

Background

The Department of Water Resources (DWR) took the following steps for implementing provisions of the SBx7 7 Statute of 2009 regarding the exclusion of process water use from gross water use, including what would constitute a “substantial percentage” of industrial water use to avoid a “disproportionate burden” on non-industrial sectors:

- Consulted a statistician to determine if a definition for substantial percentage according to statistics exists (one did not).
- Conducted a literature search for the use of “substantial percentage” in published work. The smallest figure referred to as representing “substantial percentage” in the reviewed documents was 20% and the largest figure was 65%. DWR was, however, unable to get a clear definition of “substantial percentage” in any of the literature reviewed.
- Analyzed urban water use data obtained from California Urban Water Conservation Council (CUWCC) for years 2005 through 2008 (analysis included only data entries by suppliers of three-thousand connections or greater consistent with SBX7-7 definition of urban water suppliers).
- Convened a work group open to the public and interested stakeholders as well as SBX7-7 Urban Stakeholder Committee (USC) members to obtain input and discussion to advise DWR’s decision making process. This work group has been known as the Process Water Work Group.

Data Analysis

DWR obtained industrial and total water use data from the CUWCC in order to assess the extent of industrial water use throughout the state. Table 1 shows the total number of water suppliers that have complete data sets to calculate the percentage of industrial water use for each year 2005 to 2008.

Table 1. Total number of water suppliers with complete data sets to estimate percentage of industrial water use.

Year	Number of Suppliers
2005	146
2006	147
2007	149
2008	150

The first step in this analysis was to calculate the ratio of industrial water use to the total water use. This ratio was placed in a new data column and sorted from lowest to highest values. Figure 1 shows a histogram of these ratios for the year 2005. Histograms of ratios for years 2006 through 2008 are similar to that of 2005 and therefore are not shown here. What is clear from the histograms is that most retail suppliers have a small fraction of industrial water use. The cumulative percent of a ratio, X, was calculated as the number of data points (retail suppliers) with ratios less than or equal to X to the total number of data points (retail suppliers). This was done to obtain quartile plots of the data to evaluate the “substantial percentage” of industrial to total water use.

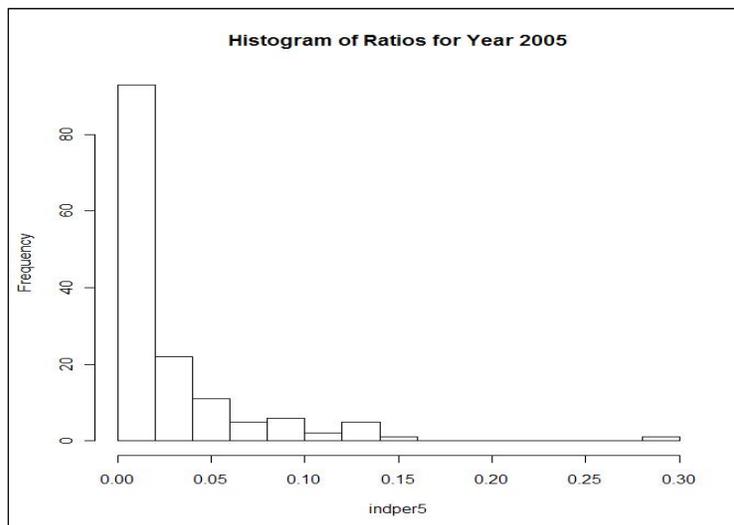


Figure 1. Histogram of ratios of industrial water use to total water use for the year 2005.

Figure 2 shows the cumulative percentage of retail water suppliers versus the ratio of industrial water use to total water use for years 2005 through 2008. For example, Figure 2 indicates that for 80% of urban water suppliers we analyzed, the ratio of industrial water use to total water use is less than 4 percent. It is clear from this figure that there are slight differences from year to year. Therefore, average values were calculated at a given cumulative percentage value. Table 2 shows results of such calculations for cumulative percentage values 60 through 95 in increments of 5.

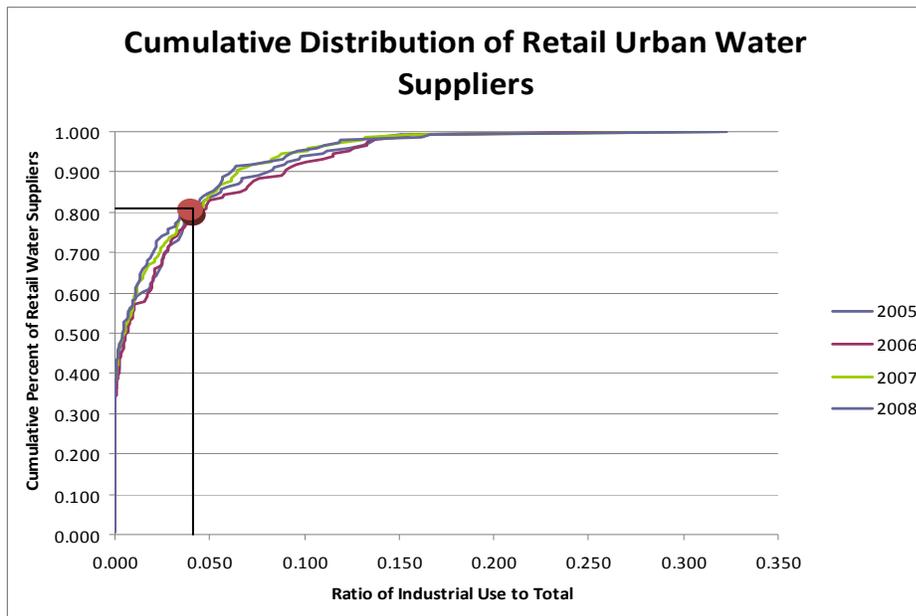


Figure 2. Cumulative distribution of urban retail water suppliers for years 2005 through 2008.

Using Figure 2, the consultant working for DWR initially suggested at the May 2010 USC meeting that 4 percent of industrial water use to gross water use may be considered a substantial percentage, resulting in a cumulative percentage of 80 percent of water suppliers. In other words, 20 percent of the total water suppliers would be eligible to deduct if 4 percent was determined as a substantial percentage.

DWR did further data analysis producing Table 2 and Figure 3 and suggested using the per capita industrial water use as an indicator of disproportionate burden on other sectors because it indicates the amount of additional water from the industrial sector that the other sectors have to conserve if it is not excluded.

Table 2. Percentage industrial water use by years for cumulative percentiles 60 - 95.

Percentile	Percentage Industrial Water Use				
	2005	2006	2007	2008	Average
60	1.5	1.8	1.2	1.1	1.0
65	2.3	2.1	1.5	1.4	1.8
70	2.7	2.7	2.4	2.0	2.0
75	3.6	3.4	3.2	2.8	3.0
80	4.3	4.6	4.0	3.5	4.0
85	5.6	6.6	5.3	5.1	5.7
90	8.1	9.0	6.4	6.2	7.0
95	11.2	12.3	10.1	9.4	10.8

Disproportionate Burden

The statute states an urban retail water supplier that has substantial percentage of industrial water use in its service area may exclude process water from the calculation of gross water use *to avoid a disproportionate burden on another customer sector*. Figure 3 shows a cumulative distribution of urban retail water suppliers versus industrial water use in gallons per capita per day (gpcd). DWR, using Figure 3 and Table 2, determined that the 80 percent cumulative distribution and 4 percent industrial water use to gross water use would result in shifting an average increase of about 7.5 gpcd to other sectors. [Note: 5 outliers that had values over 300 gpcd were removed from Figure 3 for the chart to clearly show the trend where the 80 percent line intersects the curve. Dropping the outliers from the chart does not affect the results or conclusions from the analysis.]

Based on this finding, DWR suggested the threshold ratio to be 10 percent (approximately 6 percent of the water agencies to be eligible), resulting in an average increase of approximately 15 gpcd. This was DWR's **first draft criteria** presented at the second Process Water Work Group meeting held August 3rd (the first meeting of the Process Water Work Group focused on discussing the provisions of the SBx7 7 Statute of 2009 that applied to industrial water use)

DWR then received comments that can be summarized as follows:

- The 10 percent threshold is too low, while others stated it was too high.
- The threshold should be determined locally based on local conditions.
- The criteria should not be prescriptive.
- The suggestion does not account for local conditions such as demand hardening, characteristics of industrial water use, and anticipated cost effective conservation, etc.

Based on these comments, DWR did further data analysis and generated Figure 4 which shows correlations between gpcd of industrial water (gpcd-ind) and the ratio of industrial water use to the gross water use. DWR also generated Table 3 using gpcd of non-industrial water use (gpcd-ni) as an indicator of prior water conservation efforts by other sectors.

Table 3 was prepared by calculating the quartiles of the gpcd of non-industrial water use for all suppliers from the CUWCC data sample. A quartile is a descriptive statistic that is obtained by arranging data samples from the lowest to the highest value and dividing them into four equal groups. Quartiles were used because the data was not normally distributed. Using the average quartiles from Table 3, it indicates that about 25% of the suppliers studied had less than or equal to 143 gpcd, about 50% had less than or equal 195 gpcd, and about 75% had less than or equal to 273 gpcd of non-industrial water use.

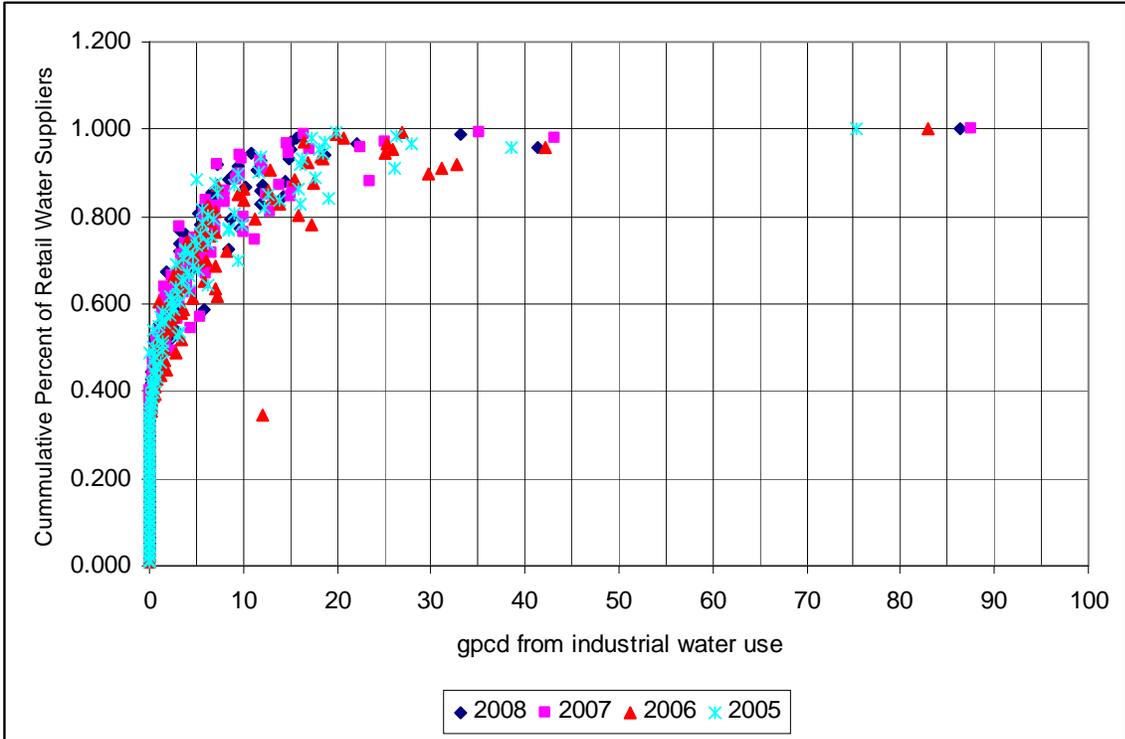


Figure 3. Cumulative distribution of retail urban water suppliers versus gpcd of industrial water use. (Note: 5 outliers have been removed).

Table 3. Quartiles of the gpcd of non-industrial water use for years 2005 through 2008.

year	min	1st	2nd	3 rd	max
2005	15.1	138.1	185.7	262.8	3092.5
2006	55.5	144.3	190.1	268.1	23401.1
2007	49.8	148.6	203.0	280.3	3801.2
2008	71.3	142.2	202.9	282.5	58494.6
Average	47.9	143.3	195.4	273.4	22197.4

At the third Process Water Work Group meeting on August 24, 2010, DWR presented its **second draft criteria** using non-industrial water use efficiency as an indicator for determining eligibility for deducting process water.

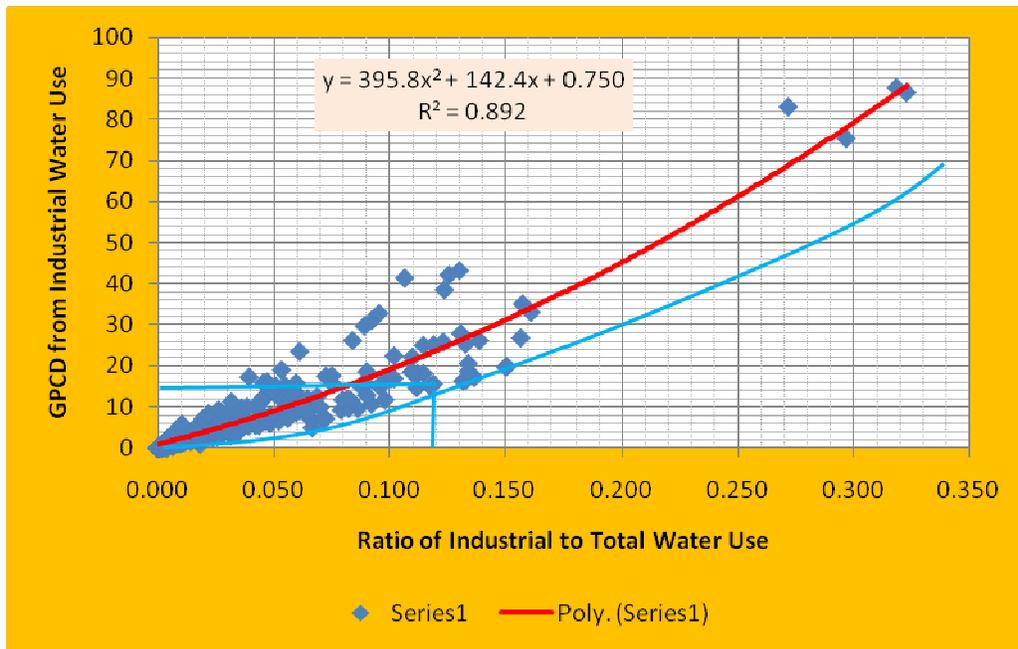


Figure 4. The gpcd of industrial water use versus the ratio of industrial water use to total water use. (Note: 5 outliers have been removed).

Based on comments received during the August 24th meeting, DWR developed its **third draft criteria** as follows:

- Percentage of industrial water use to gross water use as an indicator of a “substantial percentage” of industrial water use,
- Per capita amount of industrial water as an indicator of “disproportionate burden” on non-industrial customers,
- Per capita amount of non-industrial sector as an indicator of past conservation efforts by other sectors,
- Sliding scales (tiers) based on the percentage of industrial water use to gross water use and the per capita amount of non-industrial water use.

Using these criteria, DWR presented its revised draft criteria to the Process Water Work group at the fourth meeting held on September 16th. Stakeholders discussed the strengths of the draft criteria such as the level of technical analysis to back up the criteria and the credit for past conservation. The group also expressed concerns that: (1) a partial deduction of process water requires calculating the whole amount, (2) the quartiles deviated from what some felt constituted a substantial percent of process water use (the method allowed for a partial deduction at 2.5%), as well as (3) concerns that gpcd is not the best measure for industrial water use efficiency.

Based on the comments from the September 16th meeting, DWR adjusted the eligibility criteria for process water exclusion and presented its **fourth draft criteria** at a Process Water Work Group meeting on September 27th. The Criteria included a sliding scale of percentages of the ratio of industrial water to total water use and corresponding partial

deductions, including provisions for disadvantaged communities and demand hardening. This draft criteria had a different method for determining the threshold where partial deduction of process water was permitted, namely if an agency's industrial water use contributed 20 gpcd or more to total water use.

After receiving additional comments and suggestions from the work group, and speaking with water agency and industry representatives, DWR prepared its fifth draft criteria. In developing its **fifth draft criteria**, DWR conducted additional analyses of the CUWCC data to assess the effects of using different criteria ranges mentioned above on the volume of water that would be deducted and the number of water suppliers that would be eligible to deduct.

Fifth Draft criteria

Data analyses completed after the September 27th Process Water Work Group meeting can be summarized as follows:

- This analysis used the same CUWCC data that was used in previous analyses for years 2005 through 2008.
- The volume of water indicated in Table 4 below and the number of suppliers indicated in Table 5 are averages of the 4 years of data (2005-2008) for each scenario.
- Five data outliers were suspected to be erroneous and removed from the analysis.

Results from these analyses are presented in Tables 4 and 5 below. For each year of the data set, the total volume of industrial water that qualifies for exclusion and the total number of suppliers that may exclude were calculated based on the criteria listed under the "Scenario" column. The resulting values were then averaged to get the values shown in columns 2 and 3 of Tables 4 and 5. It should be noted that the values of industrial water use volume and the number of suppliers in Tables 4 and 5 are based on the data set that DWR analyzed. Therefore, statewide figures for these parameters would be higher. The percentages, however, are expected to remain more or less the same since it was assumed that the analyzed data would be representative of statewide water use patterns. Also note that the industrial water use volumes in Table 4 represent process water that is eligible for exclusion. Therefore, the actual volume of process water that may be deducted is less.

Figure 5 shows the distribution of the gpcd of non-industrial water use for all of the CUWCC data analyzed. It is presented to show the proportion of water suppliers that could deduct all of their process water based on one of the criteria, non-industrial water use.

Table 4. Results of analysis based on volume of industrial water use.

Scenario	Total Volume of Industrial Water that is Eligible to Exclude Process Water (AF)	Percentage of Gross Water Use that May be Exclude (%)
Pct Industrial >10%	53,616	1.03
Pct Industrial >12%	27,865	0.54
Pct Industrial >15%	21,100	0.42
Pct Industrial >10% or gpcd-ind>12	78,978	1.54
Pct Industrial >10% or gpcd-ind >20	55,147	1.06
Pct Industrial >12% or gpcd-ind >15	62,534	1.20
Pct Industrial >12% or gpcd-ind >20	31,814	0.62
Pct Industrial >15% or gpcd-ind >20	29,641	0.57
Pct Industrial >15% or gpcd-ind >30	22,584	0.44

Table 5. Results of analysis based on number of urban water suppliers.

Scenario	Number of Suppliers that May Exclude	Percentage of Total Number of Suppliers that May Exclude (%)
Pct Industrial >10%	9	5.97
Pct Industrial >12%	5	3.59
Pct Industrial >15%	2	1.53
Pct Industrial >10% or gpcd-ind>12	18	12.12
Pct Industrial >10% or gpcd-ind >20	10	6.83
Pct Industrial >12% or gpcd-ind >15	13	8.88
Pct Industrial >12% or gpcd-ind >20	8	5.29
Pct Industrial >15% or gpcd-ind >20	7	4.61
Pct Industrial >15% or gpcd-ind >30	4	2.56

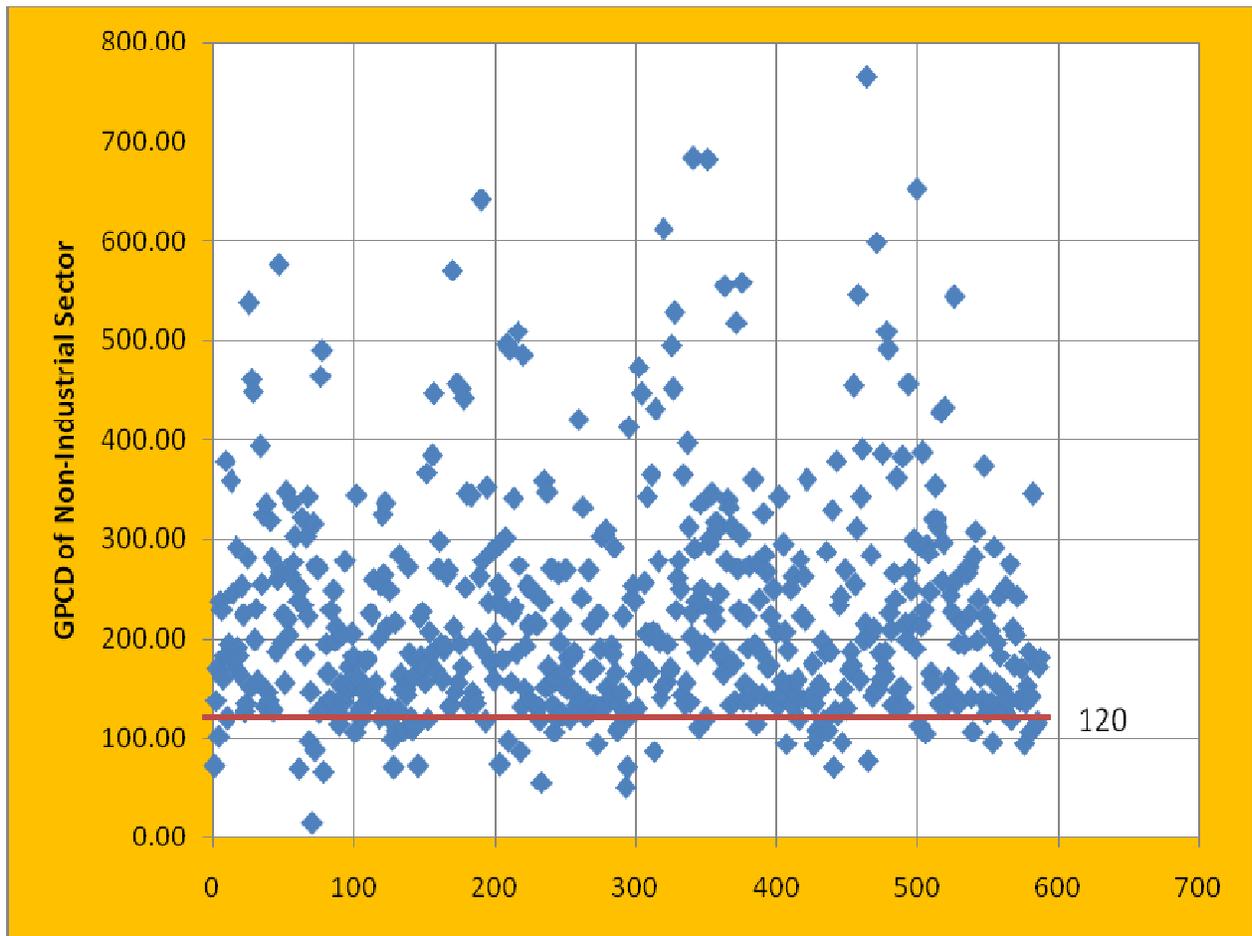


Figure 5. Distribution of gpcd values of non-industrial sectors. Horizontal axis shows number of data points. Some outliers have been deleted from the chart.

Fifth Draft criteria for the Emergency Process Water Regulation

Based on current and prior data analyses and comments received from Process Water Work Group members, DWR developed the **fifth draft criteria** to recognize the variability in local conditions, and to provide urban retail water suppliers flexibility in implementing this regulation. The draft criteria presented below includes criteria for: (1) the percentage of industrial water use, (2) a disproportionate burden on another customer sector using the per capita industrial water use; (3) verified past water conservation by other sectors using per capita water use of the non-industrial sector, and (4) economic burden to disadvantaged communities.

Criteria for Excluding Industrial Process Water Use from Gross Water Use

When calculating its gross water use, an urban retail water supplier may deduct up to 100 percent of process water use if any one of the following criteria is met in its service area:

- (a) Total industrial water use is equal to or greater than 12 percent of gross water use, or
- (b) Total industrial water use is equal to or greater than 15 gallons per capita per day, or
- (c) Non-industrial water use is equal to or less than 120 gallons per capita per day if the water supplier has self-certified the sufficiency of its water conservation program with the Department of Water Resources under the provisions of section 10631.5 of the Water Code, or
- (d) The population within the suppliers' service area meets the criteria for a disadvantaged community.

Explanations for the Criterion

- (a) Total industrial water use is equal to or greater than 12 percent of gross water use,
 - ✓ DWR analyzed the distribution of percentage industrial water use for the 145 – 150 suppliers that submitted their water use data to the CUWCC and presented various threshold values of substantial percentage to the work group. The work group in return suggested a threshold ranging from 5% to 20%. Using its own data analysis, DWR determined that 20% would be restrictive because only a few water suppliers would qualify and numbers less than 12% would be too broad allowing too many suppliers not meeting the criteria to exclude process water. Therefore, DWR decided that 12% would be the threshold for the substantial percentage of industrial water use for all urban water suppliers.
- (b) Total industrial water use is equal to or greater than 15 gallons per capita per day, or
 - ✓ The data that DWR analyzed showed that there could be a “disproportionate burden” on non-industrial water use sectors even when the industrial water use is less than the 12% threshold of gross water use. Per capita industrial water use (gpcd of industrial water use) was therefore used as an indicator of the burden. This is used as a measure of how much additional water the non-industrial sectors need to conserve because of industrial water use. Since the statute states that disproportionate burden needs to be avoided, DWR determined that a threshold for the gpcd of industrial water is necessary. DWR determined that at 12% of industrial water use the threshold for gpcd of industrial water use is 15 (from Figure 4).

(c) Non-industrial water use is equal to or less than 120 gallons per capita per day if the water supplier has self-certified the sufficiency of its water conservation program with DWR under the provisions of section 10631.5 of the Water Code, or

- ✓ Per capita non-industrial water use was used as an indicator of prior conservation efforts in the non-industrial sector because it could potentially show how much conservation the supplier has already done to lower its per capita water use.
- ✓ Not considering demand hardening would put a disproportionate burden on the non-industrial sector that has no room for more conservation. For example, if a residential sector in a given service area has already done significant conservation and does not have much room for more, savings for the industrial water would have to come from the commercial and institutional sectors, disproportionately burdening these sectors.
- ✓ 120 gpcd was determined based on statistical analysis of the non-industrial water use data and its distribution (Figure 5), as well as comments received from the work group stakeholders.

(d) The population within the suppliers' service area meets the criteria for a disadvantaged community.

- ✓ DWR, based on comments received from the work group, decided that disproportionate burden can occur if water supplier's customers are in a disadvantaged community, even if a water supplier's industrial water use is below the 12 percentage.
- ✓ If customers are disadvantaged, the supplier may be forced to shift the burden to its customers, resulting in disproportionate burden.