May 25, 2012

Colorado River Basin Study Project Team
c/o Pam Adams
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Via email: ColoradoRiverBasinStudy@usbr.gov

Re: *Technical Memorandum C – Quantification of Water Demand Scenarios*

Dear Colorado River Basin Study Project Team:

Western Resource Advocates and the Pacific Institute write to comment on the recent release of *Technical Memorandum C* (Memo), describing the water demand scenarios for the Colorado River Basin Water Supply and Demand Study (Basin Study). The quantification of demands, and the development of various scenarios that reflect a broad range of possible futures, are foundational elements of the Basin Study.

Long-term projections are inherently problematic; this is especially true in Colorado River basin states, where recent and long-term fluctuations in economic and demographic growth rates are especially pronounced. The Basin Study's scenario approach is a reasonable method to reflect the uncertainty about conditions in the year 2060. The concept of the scenario approach is to capture a range of plausible futures. The storylines informing the six different scenarios provide an additional benefit, framing the projections and offering a useful narrative driving the development of future demands.

We want the Basin Study to be credible; it will be used as a tool to support planning and the selection of water project infrastructure and programs by Basin states, the Bureau of Reclamation and water users and providers. We write to alert you that the Memo contains two fundamental problems that undermine the credibility of the Basin Study as a whole and distort the projection of future supply-demand imbalances. These two fundamental problems are:

1. Several scenario demand projections are inconsistent with their scenario storyline, and
2. In some cases, projected demands are based on outdated information, instead of 'best estimates.'

## Projections Inconsistent with Storylines

The storylines were intended to inform quantification of demands within the six different scenarios. In many cases, however, demand projections are not consistent with these storylines. The variability in M&I water use efficiency provides a good example of this lack of adherence to the intent of the storylines. The following table, compiled from summary information within the appendices, shows this variability.

**Table 1. 2060 Change in Per Capita Water Usage (%), from 2015 Scenario A.**

| State | A | B | C1 | C2 | D1 | D2 |
|---|---|---|---|---|---|---|
| **AZ** | -4% | +1% | -5% | -22% | -23% | -23% |
| **CA** | -12% | -9% | -13% | -13% | -18% | -13% |
| **CO** | -9% | -9% | -9% | -20% | -22% | -20% |
| **NM** | -11% | -11% | -11% | -15% | -24% | -22% |
| **NV** | -20% | -20% | -20% | -20% | -20% | -20% |
| **UT** | -14% | -14% | -14% | -21% | -23% | -25% |
| **WY** | +3% | +1% | +4% | +3% | -22% | +3% |

Each storyline projects that, at minimum, "External factors that limit the water use of fixtures and appliances (for example, federal statute) continue, resulting in 'natural' increases in in-home efficiency." The storylines for Scenarios D1 & D2 additionally assume a "substantive increase in water-saving technology." While the states generally project higher efficiency in per capita use under the D scenarios, the 'natural' increase over the 45-year period from 2015 to 2060 (Scenarios A, B, and C1) is exceedingly modest. For example, Arizona projects that efficiency gains over the 45-year period will average less than 0.1% per year under Scenario A, while California projects efficiency improvements will be only half of the gains it achieved from 1990-2008. Note further that most states adjust their water use efficiency rates across the scenarios, as indicated by the storylines. Nevada, however, uses the same rate of change for every scenario. Surprisingly, Wyoming projects that M&I per capita use rates will actually *increase* over time for every scenario (except D1), despite an excess of published literature indicating the opposite. These projections are not consistent with the storylines and are not consistent with historic or recent trends, where almost all of the municipal water agencies within the basin states experienced annual efficiency gains of 0.5% per year or more.

To the extent that these projections over-state the water needs for the municipal sector, they will show up throughout the Basin Study in the form of larger water imbalances in each scenario. Not only is this outcome almost certainly incorrect, publishing it as the "best evidence" is plainly unsupported by the significant data available to the Study authors and in the Study record. In addition, the use of these projections for other parts of the Study will skew the appropriate size of proposed options and strategies, individually or grouped into portfolios, necessary to right the imbalances.

Quantification that is inconsistent with the storylines continues for other parameters, and for the scenarios as a whole. Table 2 shows the 2015 Scenario A demand projection for each basin state and the 2060 projections for each scenario, highlighting that several states are not participating in robust scenario planning.

**Table 2. Total Study Area Demand (KAF).**

| | 2015 | 2060 | | | | | |
|---|---|---|---|---|---|---|---|
| **State** | **A** | **A** | **B** | **C1** | **C2** | **D1** | **D2** |
| **AZ** | 5,318 | 5,953 | 5,769 | 6,753 | 6,004 | 5,390 | 5,970 |
| **CA** | 7,908 | 9,011 | 7,734 | 10,261 | 10,129 | 8,645 | 10,110 |
| **CO** | 7,379 | 7,947 | 7,816 | 6,987 | 7,079 | 7,302 | 8,193 |
| **NM** | 1,330 | 1,551 | 1,490 | 1,777 | 1,627 | 1,480 | 1,581 |
| **NV** | 377 | 541 | 514 | 624 | 624 | 541 | 624 |
| **UT** | 3,136 | 3,460 | 3,176 | 3,784 | 3,307 | 3,226 | 3,287 |
| **WY** | 2,109 | 2,188 | 2,198 | 2,348 | 2,167 | 2,141 | 2,167 |

While the majority of states project different demands for each of the six scenarios, Nevada only offers three different demand scenarios, apparently ignoring differences in the scenario storylines. Similarly, Wyoming not only projects the same demand for two scenarios (C2 and D2), but inexplicably projects that 2060 demand for Scenario B (the Slow Growth storyline) will surpass that of Scenario A (the Current Projected storyline).

By contrast, the states that quantified demands differently, to reflect the differing assumptions between storylines, have provided useful information. Colorado, for example, made a good faith effort to develop plausible projections based on the storylines, creating some unexpected but informative projections. For example, total demand under Colorado's 2060 Scenario C1 ('the Rapid Growth' storyline) projection is more than 300,000 acre-feet less than its Scenario D1 (the 'Enhanced Environment' storyline), largely because urban growth is expected to occur at the expense of irrigated acreage, in spite of the substantive increase in water saving technology described in Scenario D1. Interestingly, Colorado's total study area demand in 2060 would be less than total demand in 2015 under half of the scenarios.

## Outdated Information

Bad data and outdated projections further undermine the credibility of the Basin Study. Nevada, for example, relies on population projections from 2008, even though more recent, better estimates that take into account the growth trends re-set of the recession are readily available. This reliance on outdated information means that the Southern Nevada Water Authority projects its 2015 service area population will increase by almost 660,000 people relative to Clark County's 2011 population estimate of the same service area, a 35% increase in four years. This is absurd. Compare this to the estimated 0.8% population increase from 2010 to 2011. Even Nevada's so-called "Slow Growth" Scenario adds more than 470,000 people from 2011 to 2015 – a 24% increase in four years. These inflated projections are simply not credible, whatever the reason, and should be revised using "best estimate" demographic projections as the storylines indicate.

Arizona's population projections also pose a troubling challenge. By citing a source dated 2011, the Memo suggests population projections are recent; however, a review of that source reveals its reliance on "population figures... developed using 2006 Arizona Department of Economic

Security population projections," themselves based on estimated 2005 populations. Thus, the Memo actually relies on a population estimate seven years out of date. In fact, the Arizona website posting these projections includes the following disclaimer: "**NOTE: These projections were made in 2006 by the Population Statistics Units at the Department of Economic Security. We are keenly aware that they are now outdated."**

This source projects that Arizona's population will "grow 150% by 2030." By contrast, more recent Arizona Department of Economic Security data show that Arizona's population grew by 0.3% from 2008 to 2009, and by only 0.2% from 2009 to 2010, less than 10% of the growth rate projected by the 2006 estimate. The 2006 projection used in the Memo over-estimates Arizona's total 2010 population by 9.5%, suggesting that the Scenario A 2015 population projection is *at least* that inflated. That is, Arizona's Scenario A projection is likely to overestimate the study area population by some 675,000 people. This in turn suggests that Arizona's Scenario A M&I water demand in 2015 is also inflated by some 160,000 acre-feet. This is not a negligible sum, especially as this over-estimate propagates and expands in 2035 and 2060.

These errors in population projections are significant and inflate projected study area demand for water. At minimum, the Memo should note that population projections are outdated; more appropriately, the Memo should adjust these projections to better reflect more recent data.

## Additional Issues

Arizona's projected per capita use rate for the Colorado River mainstem is not consistent with the rate it provides in its 2011 draft Demand Narrative. On p. 4 of the Narrative, Arizona states that, "In the mainstem area, gpcd figures are based upon water use data reported in Reclamation's Water Accounting Reports; the average gpcd was about 240." Yet for Scenario A, the projected GPCD for the mainstem in 2015 & 2035 is 271, rising to 277 in 2060. This inconsistency inflates demand for Colorado River water, without justification.

At a basin-wide level, Footnote 3 to Figure C-5 states that the study's projection of future demand "assumed 1971-2008 average reservoir evaporation of 2.0 maf 2012-2060." Yet Section 6.1 of the Memo states "Average annual evaporative losses between 1971 and 2008 are about 1.8 maf and 1.5 maf[1] between 2000 and 2008. Declining evaporative losses can be attributed to lower average reservoir storage" (p. C-42). Why does the study project that future evaporation will be higher than the long term average, especially when reservoir storage presumably will continue to decline, further reducing evaporative losses? The discussion of climate change impacts on Lake Mead evaporation in Appendix C10 states that, "The median of the projections indicates an increase in net evaporation loss of about 1 percent in 2035 and almost 3 percent by 2060." This projected 3 percent increase in reservoir evaporation by 2060 does not explain the 33% increase in evaporative loss (relative to the recent average) projected for the entire period of 2012-2060, as shown in Figure C-5. Even ignoring the projected impacts of the supply-demand imbalance on reservoir storage and subsequent declines in reservoir evaporation, this

[1] However, Figure C-16 suggests that the 2001-2008 average annual evaporative loss is closer to 1.6 maf, and that the 1971-2008 average may be closer to 2 maf. The text appears to be inconsistent with the values plotted in the graph.

reliance on an inflated evaporation volume overstates demands on the Colorado River system by almost 500,000 acre-feet per year. We understand that Reclamation is aware of this problem and is working to correct the error. Please inform us of how this problem is resolved.

Under "Key Terms" (p. C-1), the definition of "Study Area" should read "the hydrologic boundaries of the Colorado River Basin *within the United States*, plus …." The study area does not include some 2,000 square miles of the Colorado River basin that lie within the Republic of Mexico. This distinction should also be noted on the legend of Figure C-1.

Please do not hesitate to contact either of us if you would like clarification or additional information on any of the above comments and suggestions.

Sincerely,

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