



## San Miguel River Instream Flow Hearing

Testimony of Don Conklin  
Colorado Water Conservation Board  
Grand Junction, CO  
September 13, 2011



- **Employed by GEI Consultants, formerly Chadwick Ecological Consultants, since 1984**
- **IFIM/PHABSIM Training**
  - IF 201 Introduction Course April 1989
  - IF 305 Field Techniques Course August 1989
  - IF 310 PHABSIM Course November 1989
  - IF 310 PHABSIM Course September 1996

# Basic Points



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3

- **Agencies' ISF recommendations too high**
- **Can't be met a large proportion of the time**
- **Recent flows indicate lower ISF appropriate**
- **GEI recommendations more appropriate**

# Flow Availability



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4

- **Fall/Winter recommendation (9/1-2/29) 80 cfs**
  - Not met during long periods of December through February by historic median (1954 -2011) flows
- **Early spring and mid-to-late summer recommendations (3/1-4/14 and 6/15-8/31) of 115 cfs and 170 cfs**
  - Not met for long periods in each season by historic median flows

# Flow Availability



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5

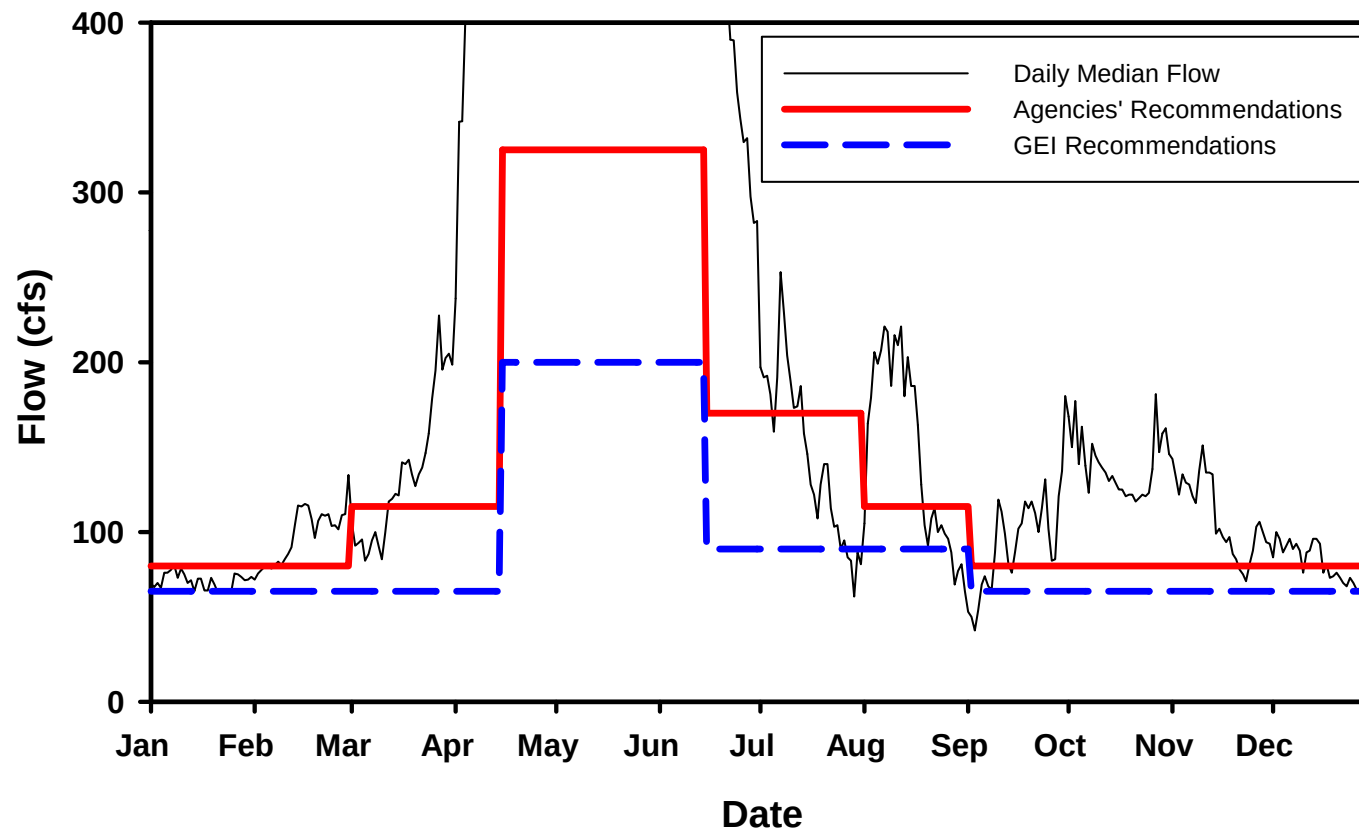


Figure 1 from August 17, 2011 Memo.

# Flow Availability



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6

## ■ Agencies' flows

- Seem to be more “enhancement “ flows
- Flows on paper, won't have real world benefit
- Designed to “protect” habitat levels
  - Can't be done on high flow or low flow end
- Don't take into account other species/life stages



# Habitat Relationships

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7

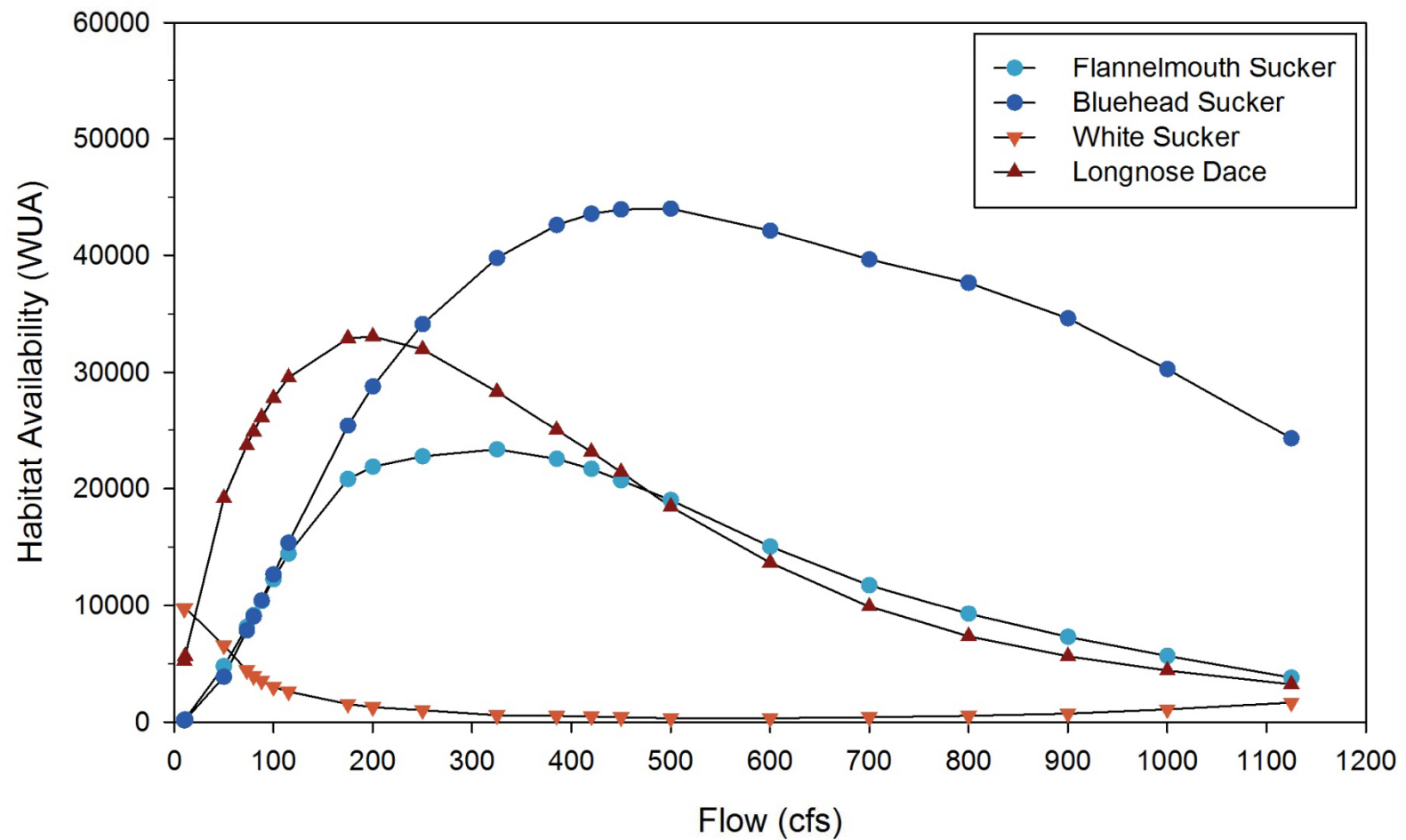


Figure 1 from July 8, 2011 Memo.

# Natural Experiment



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8

- **Assume fish community healthy over recent past**
  - **2008 CDOW data indicate multiple size/age classes**
    - Fish spawned and survived over multiple years
    - Fish healthy through recent drought period
    - Flow data available to describe flow conditions
    - Therefore, use flows to develop ISF Recommendations
    - Probably more useful and a real-world check on PHABSIM



# Flow Comparisons



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9

| Date          | Agencies' ISF | 2001-2008 Minimums |
|---------------|---------------|--------------------|
| Mar 1-Apr 14  | 115 cfs       | 95                 |
| Apr 15-Jun 14 | 325 cfs       | 550-600            |
| Jun 15-Jul 31 | 170 cfs       | 90                 |
| Aug 1-Aug 31  | 115 cfs       | 80-100             |
| Sep 1-Feb 29  | 80 cfs        | 65-70              |

# Flow Comparisons



San Miguel Presentation

10

| Date          | Agencies' ISF | 2001-2008 Minimums | 2002 Minimums |
|---------------|---------------|--------------------|---------------|
| Mar 1-Apr 14  | 115 cfs       | 95                 | 65-70         |
| Apr 15-Jun 14 | 325 cfs       | 550-600            | <75           |
| Jun 15-Jul 31 | 170 cfs       | 90                 | <10           |
| Aug 1-Aug 31  | 115 cfs       | 80-100             | <10           |
| Sep 1-Feb 29  | 80 cfs        | 65-70              | <10 (40)      |

# Flow Comparisons



San Miguel Presentation

11

| Date          | Agencies' ISF | 2001-2008 Minimums | 2002 Minimums | GEI ISF |
|---------------|---------------|--------------------|---------------|---------|
| Mar 1-Apr 14  | 115 cfs       | 95                 | 65-70         | 65      |
| Apr 15-Jun 14 | 325 cfs       | 550-600            | <75           | 200     |
| Jun 15-Jul 31 | 170 cfs       | 90                 | <10           | 90      |
| Aug 1-Aug 31  | 115 cfs       | 80-100             | <10           |         |
| Sep 1-Feb 29  | 80 cfs        | 65-70              | <10 (40)      | 65      |

# Conclusions

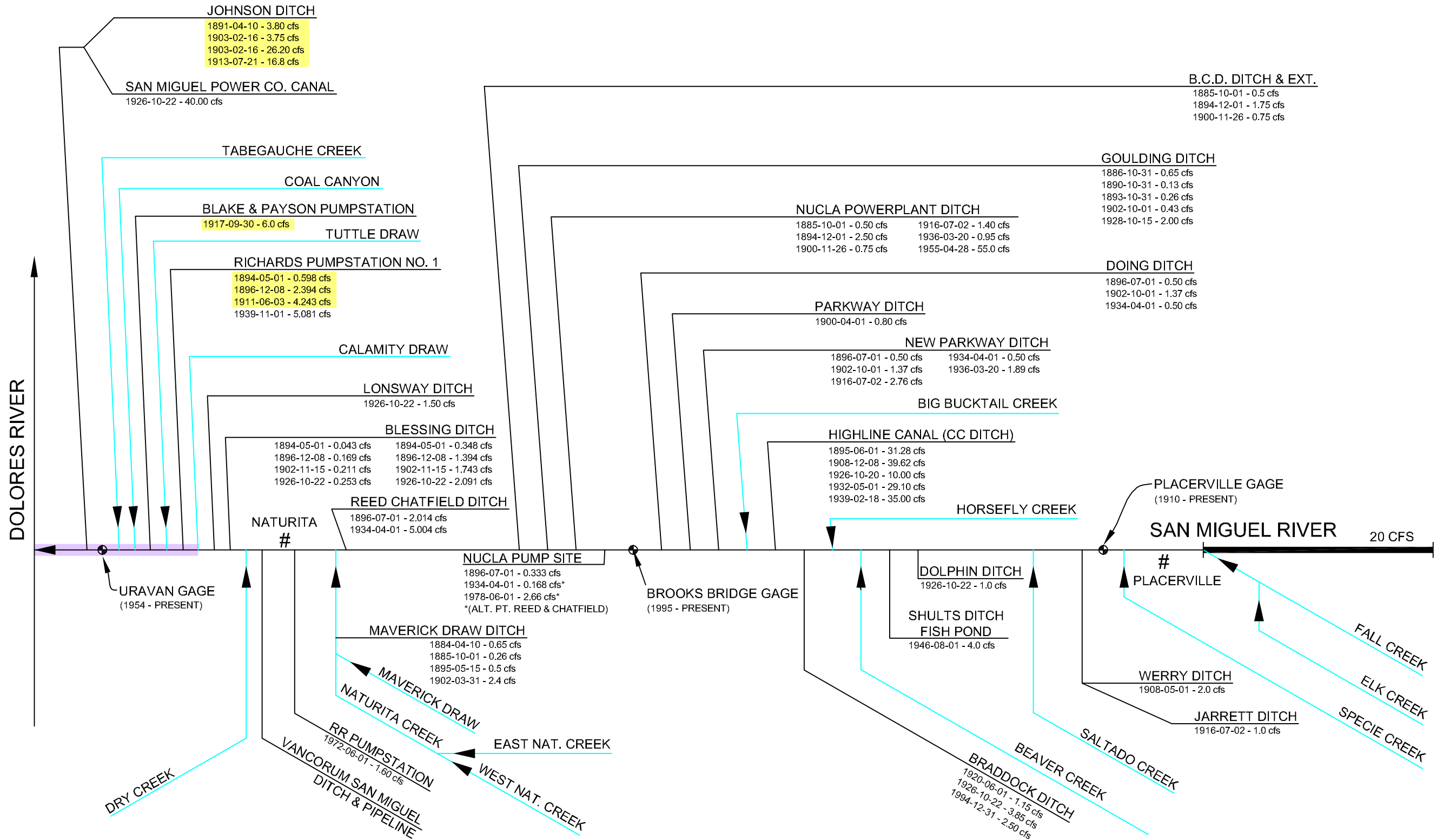


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12

- **“Reasonable preservation of the natural environment to a reasonable degree” can be accomplished with the GEI recommended flows**
  - **Preserves natural flow pattern**
    - Will be variety of wet and dry years, not flatlining
    - Not drought or survival flows
  - **Agencies’ recommendations too high**
    - Represent enhancement flows

Tuesday, July 26, 2011 11:18:48 AM DRAWING: Q:\0410 Montrose County\001 CWCB Review\CAD\Drawings\Water Rights Diagram.DWG



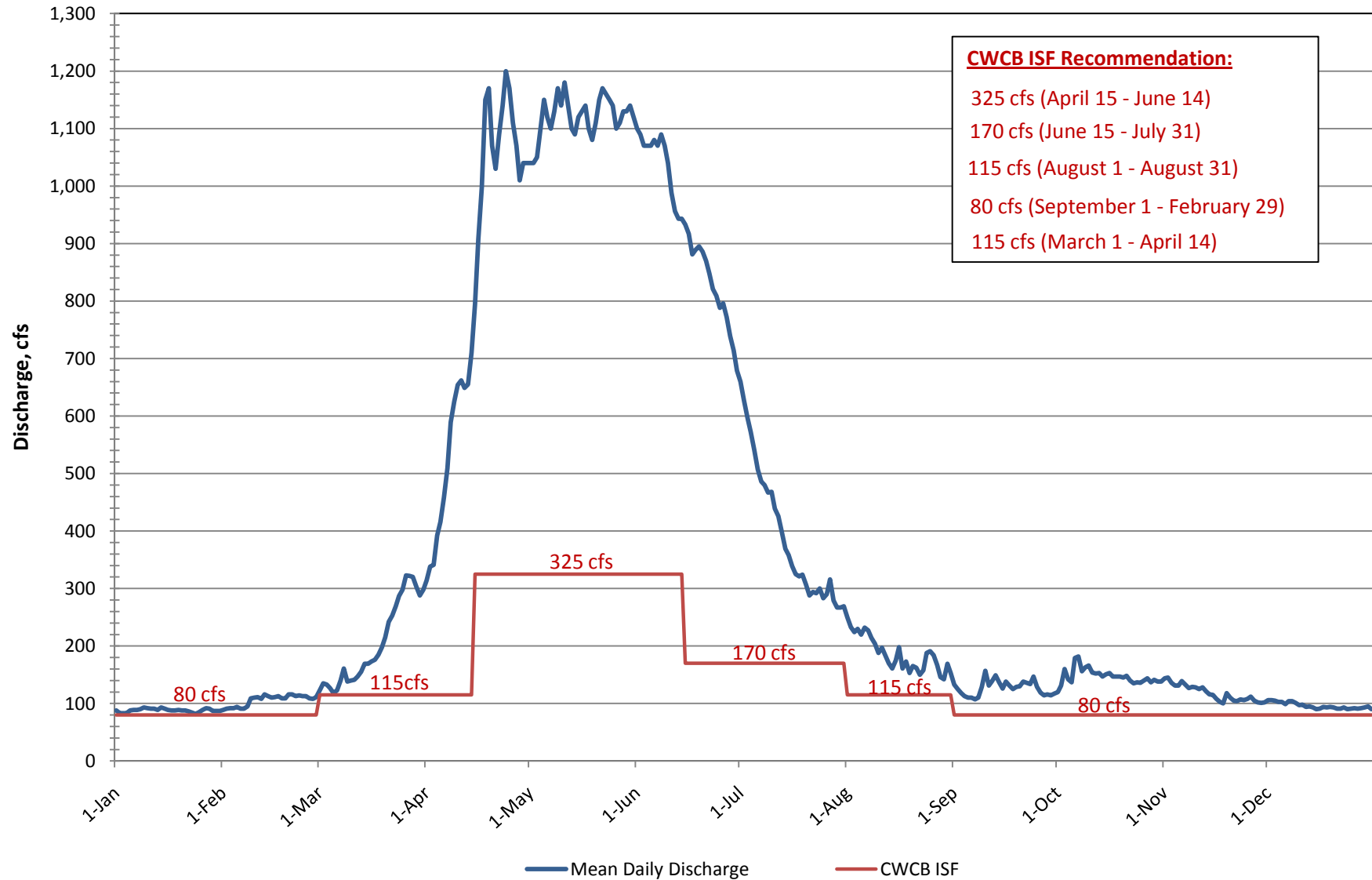
LEGEND

- |  |                                                          |  |                                                    |
|--|----------------------------------------------------------|--|----------------------------------------------------|
|  | Existing (Absolute)                                      |  | GAGING STATION                                     |
|  | Direct Diversion                                         |  | CITIES                                             |
|  | Existing Instream Flow Appropriation ON SAN MIGUEL RIVER |  | INFLOWS                                            |
|  | Proposed Lower San Miguel River ISF Reach                |  | Pre-compact Water Rights within Proposed ISF Reach |

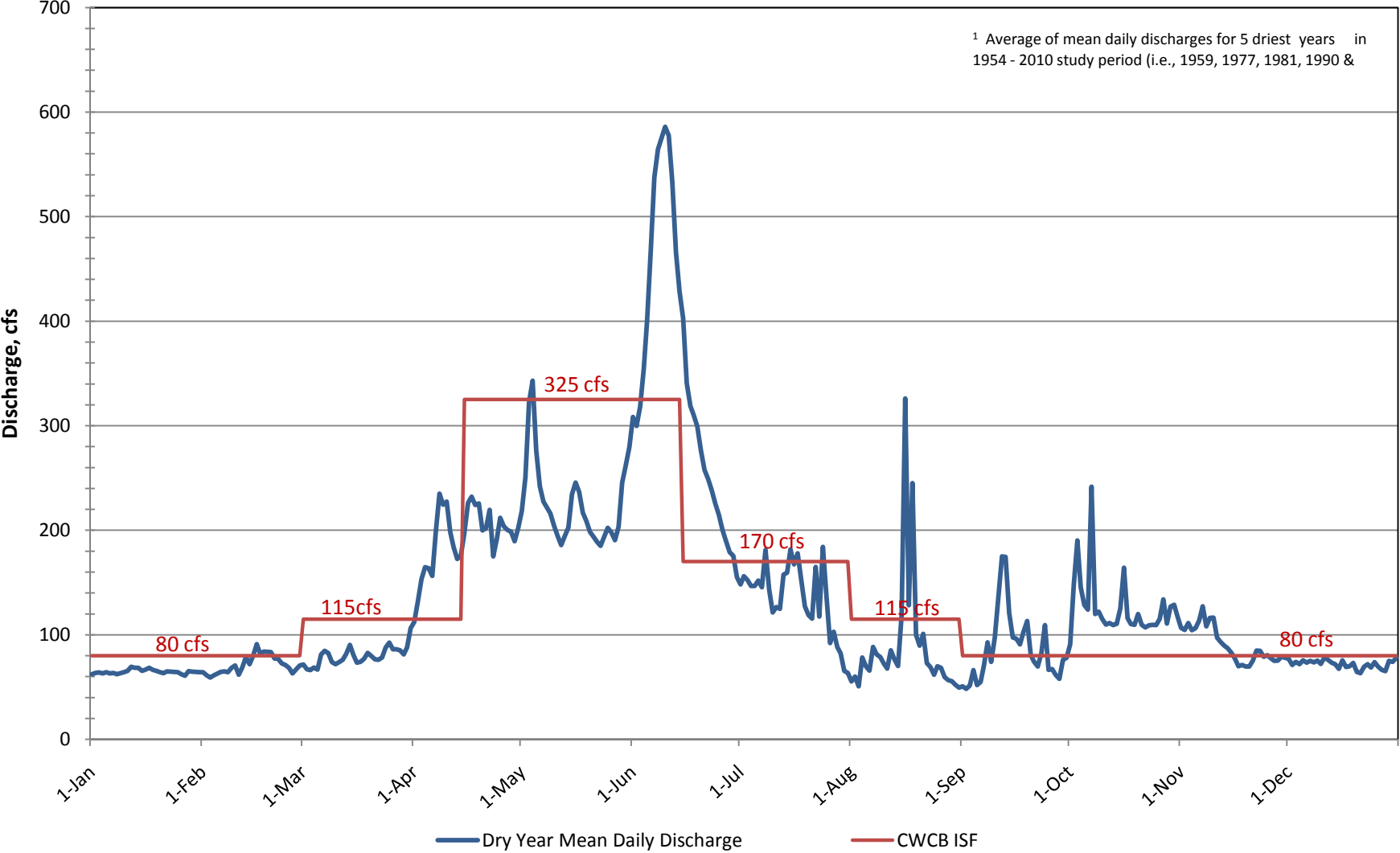
JOB NO. 0410.001.00

| SAN MIGUEL RIVER<br>Water Rights Diagram |                        |
|------------------------------------------|------------------------|
| DEERE & AULT<br>CONSULTANTS, INC.        | FIGURE NO.<br><b>1</b> |
| DATE: <b>REV. 7-26-11</b>                | SCALE: <b>NTS</b>      |

**Figure 1 - San Miguel River at Uravan, CO**  
Average Year Mean Daily Discharge (1954 - 2010)

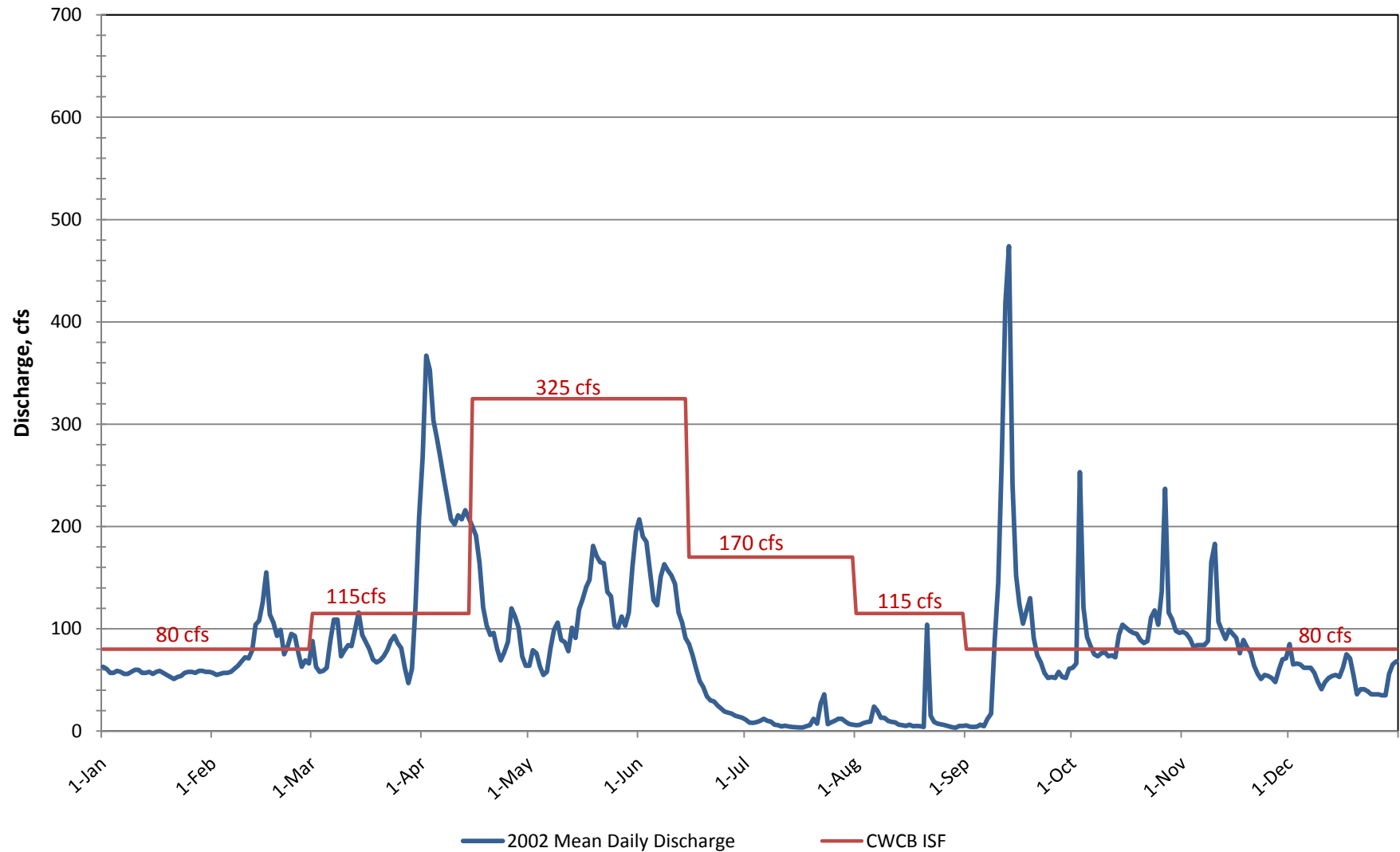


**Figure 2 - San Miguel River at Uravan, CO**  
Dry Year<sup>1</sup> Mean Daily Discharge



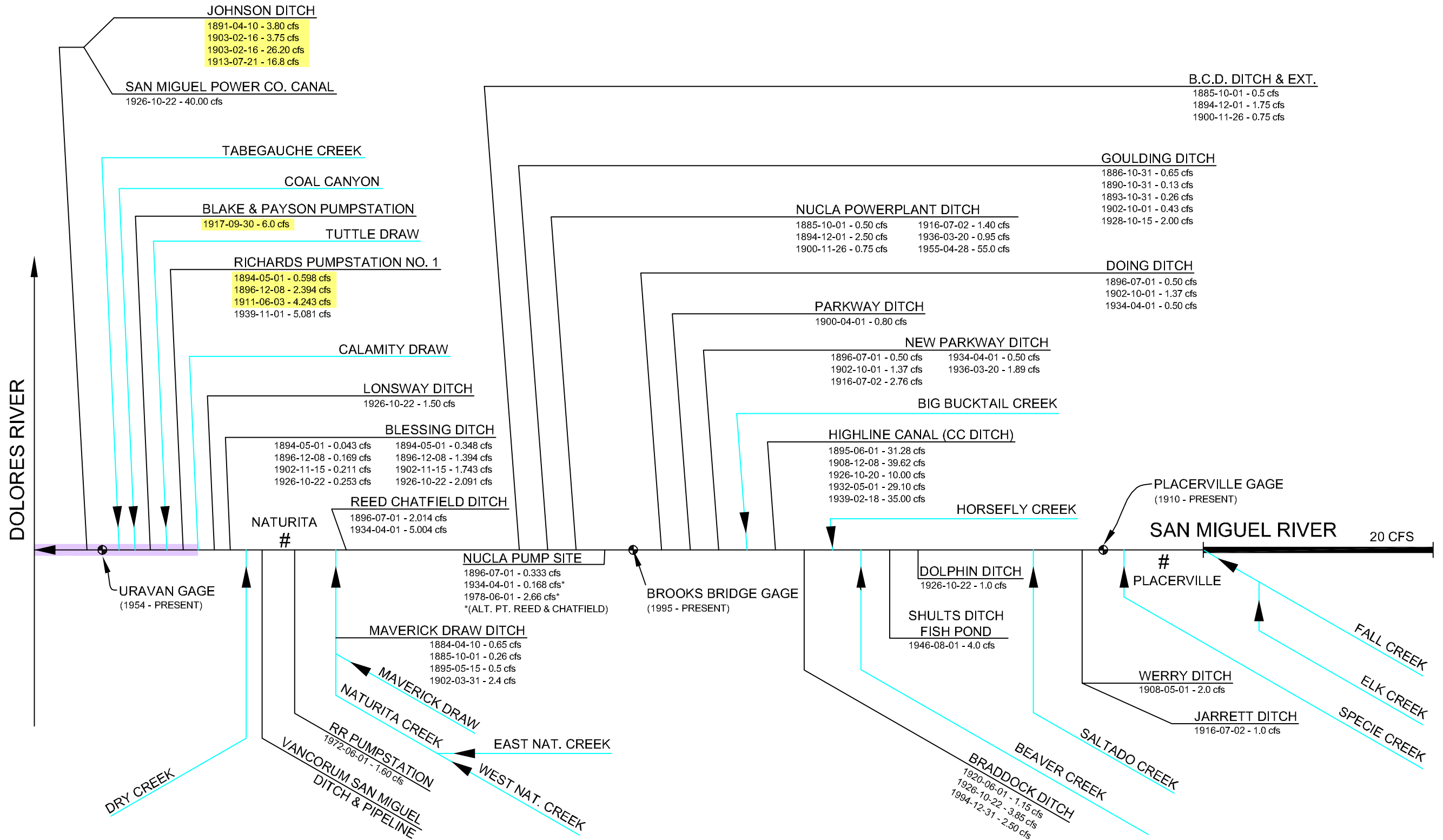
Source: U.S. Geological Survey Gage No. 09177000 (Uravan)

**Figure 3 - San Miguel River at Uravan, CO**  
2002 Mean Daily Discharge





Tuesday, July 26, 2011 11:18:48 AM DRAWING: Q:\0410 Montrose County\001 CWCB Review\CAD\Drawings\Water Rights Diagram.DWG

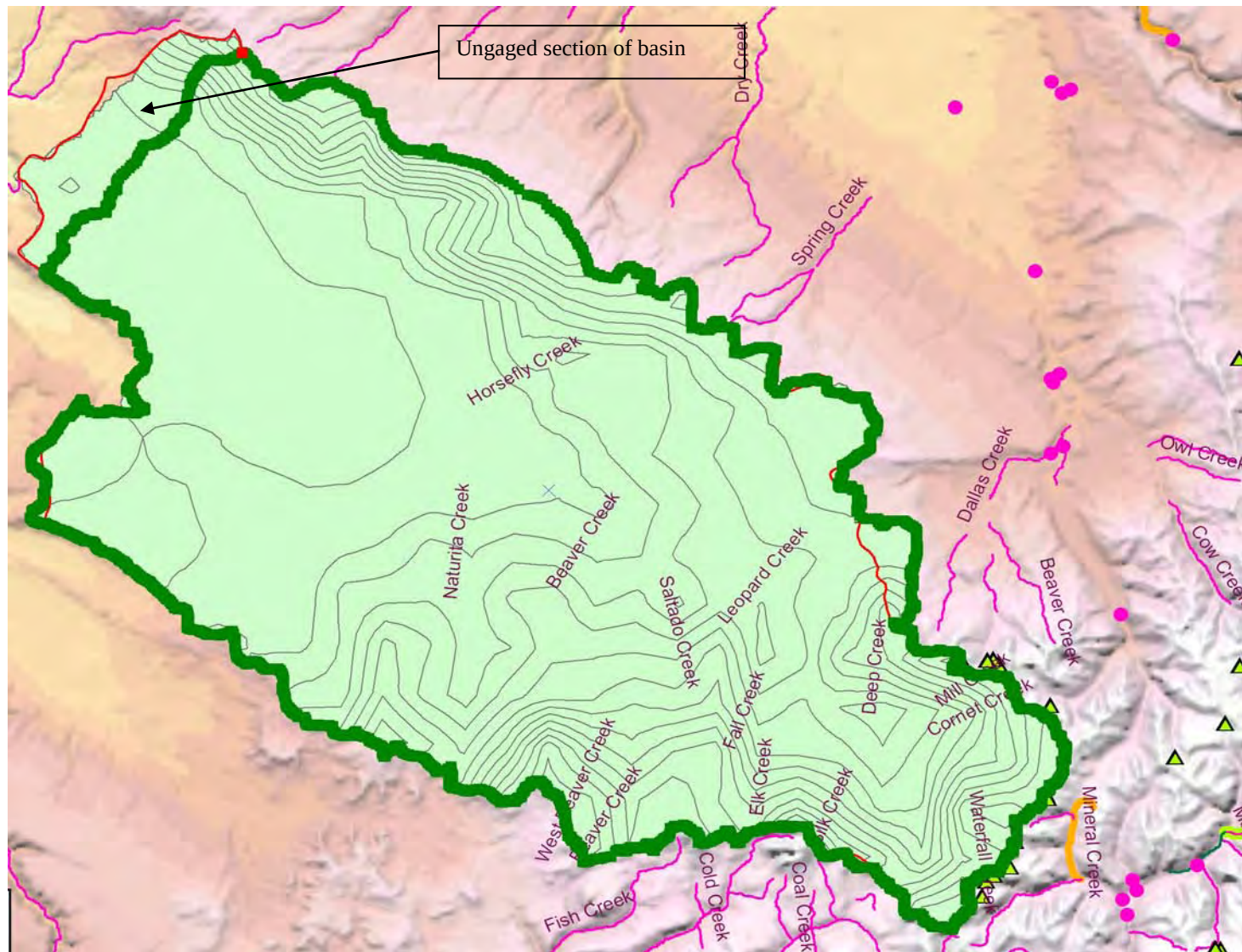


LEGEND

- |  |                                                          |  |                                                    |
|--|----------------------------------------------------------|--|----------------------------------------------------|
|  | Existing (Absolute)                                      |  | GAGING STATION                                     |
|  | Direct Diversion                                         |  | CITIES                                             |
|  | Existing Instream Flow Appropriation ON SAN MIGUEL RIVER |  | INFLOWS                                            |
|  | Proposed Lower San Miguel River ISF Reach                |  | Pre-compact Water Rights within Proposed ISF Reach |

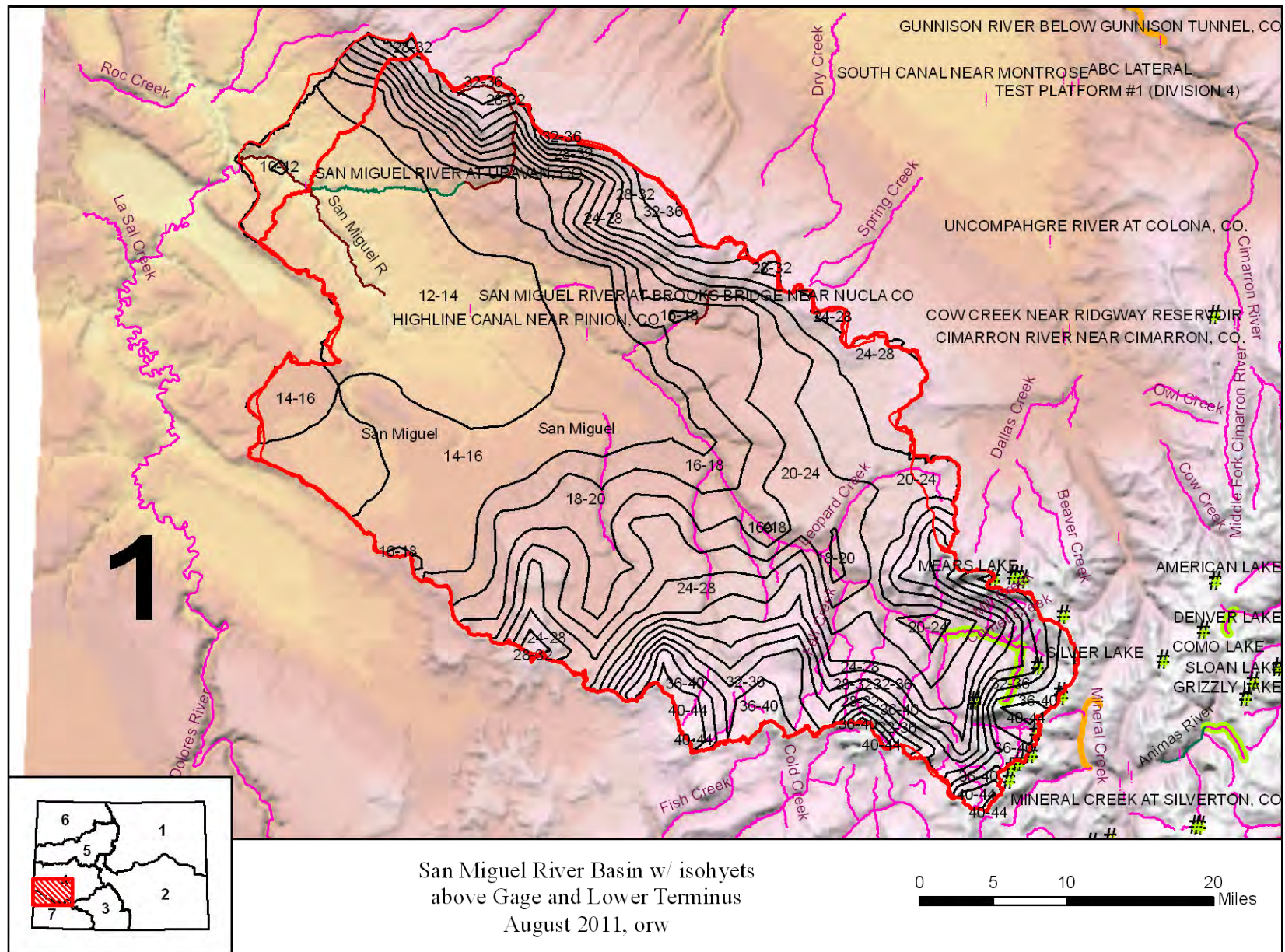
JOB NO. 0410.001.00

| SAN MIGUEL RIVER<br>Water Rights Diagram |                 |
|------------------------------------------|-----------------|
| DEERE & AULT<br>CONSULTANTS, INC.        | FIGURE NO.<br>1 |
| DATE: REV. 7-26-11                       | SCALE: NTS      |



**Figure 2 – Precipitation Similarity**





**Figure 1 - Isohyets San Miguel R. Basin**

**TABLE 1**

**Monthly Summary<sup>1</sup> of CWCB Statistical Hydrograph at Lower Terminus**  
 (Compared to USGS Gage at Uravan, CO)  
 (1954 - 2007)

| <b>Month</b>                    | <b>Mean Daily Discharge at USGS Uravan Gage (cfs)</b> | <b>CWCB Statistical Hydrology at Lower Terminus (cfs)</b> | <b>CWCB's Average Daily Adjustment to Flow (cfs)</b> | <b>Average Monthly Adjustment (ac-ft)</b> | <b>Average Percent Increase (%)</b> | <b>Maximum Daily Adjustment to Flow (cfs)</b> |
|---------------------------------|-------------------------------------------------------|-----------------------------------------------------------|------------------------------------------------------|-------------------------------------------|-------------------------------------|-----------------------------------------------|
| <b>Jan</b>                      | 87.8                                                  | 87.6                                                      | -0.2                                                 | -11.8                                     | -0.2%                               | 1.6                                           |
| <b>Feb</b>                      | 106.0                                                 | 102.4                                                     | -3.6                                                 | -198.2                                    | -3.2%                               | 1.3                                           |
| <b>Mar</b>                      | 203.1                                                 | 157.6                                                     | -45.5                                                | -2,797.1                                  | -19.8%                              | -7.2                                          |
| <b>Apr</b>                      | 809.1                                                 | 662.2                                                     | -146.9                                               | -8,742.1                                  | -17.4%                              | -27.8                                         |
| <b>May</b>                      | 1118.7                                                | 1085.2                                                    | -33.5                                                | -2,058.9                                  | -3.0%                               | 57.8                                          |
| <b>Jun</b>                      | 929.5                                                 | 1020.0                                                    | 90.5                                                 | 5,384.6                                   | 9.6%                                | 145.2                                         |
| <b>Jul</b>                      | 394.5                                                 | 468.7                                                     | 74.2                                                 | 4,564.3                                   | 20.4%                               | 91.9                                          |
| <b>Aug</b>                      | 187.1                                                 | 266.3                                                     | 79.2                                                 | 4,870.7                                   | 43.0%                               | 103.0                                         |
| <b>Sep</b>                      | 130.3                                                 | 192.1                                                     | 61.8                                                 | 3,678.9                                   | 48.6%                               | 78.2                                          |
| <b>Oct</b>                      | 147.8                                                 | 195.5                                                     | 47.7                                                 | 2,933.6                                   | 33.3%                               | 79.9                                          |
| <b>Nov</b>                      | 117.6                                                 | 111.1                                                     | -6.4                                                 | -382.8                                    | -5.6%                               | -1.0                                          |
| <b>Dec</b>                      | 94.4                                                  | 93.4                                                      | -1.0                                                 | -59.7                                     | -1.0%                               | 1.4                                           |
| <b>Annual Totals (in ac-ft)</b> | <b>261,417</b>                                        | <b>268,599</b>                                            |                                                      | <b>7,181</b>                              | <b>8.8%</b>                         |                                               |

<sup>1</sup> See Appendix A for daily values.

## APPENDIX A

Comparison of Mean Daily Discharge at San Miguel River at Uravan Gage with  
CWCB Statistical Estimate of Geometric Mean Discharge at Lower Terminus  
(1954-2007)

|      |                | Mean Daily<br>Discharge San<br>Miguel River @<br>Uravan<br>(cfs) | CWCB<br>Adjusted Flow @<br>LT Gage<br>(cfs) | Adjustment<br>(cfs) | Percent<br>Adjustment |
|------|----------------|------------------------------------------------------------------|---------------------------------------------|---------------------|-----------------------|
| Date |                |                                                                  |                                             |                     |                       |
| Jan  | 1-Jan          | 88                                                               | 87.97                                       | -0.03               | 0.0%                  |
|      | 2-Jan          | 82                                                               | 82.24                                       | 0.24                | 0.3%                  |
|      | 3-Jan          | 81                                                               | 81.55                                       | 0.55                | 0.7%                  |
|      | 4-Jan          | 82                                                               | 80.70                                       | -1.30               | -1.6%                 |
|      | 5-Jan          | 86                                                               | 86.31                                       | 0.31                | 0.4%                  |
|      | 6-Jan          | 87                                                               | 87.50                                       | 0.50                | 0.6%                  |
|      | 7-Jan          | 89                                                               | 89.03                                       | 0.03                | 0.0%                  |
|      | 8-Jan          | 90                                                               | 89.91                                       | -0.09               | -0.1%                 |
|      | 9-Jan          | 93                                                               | 92.51                                       | -0.49               | -0.5%                 |
|      | 10-Jan         | 92                                                               | 91.98                                       | -0.02               | 0.0%                  |
|      | 11-Jan         | 92                                                               | 89.47                                       | -2.53               | -2.7%                 |
|      | 12-Jan         | 91                                                               | 86.78                                       | -4.22               | -4.6%                 |
|      | 13-Jan         | 90                                                               | 89.52                                       | -0.48               | -0.5%                 |
|      | 14-Jan         | 94                                                               | 92.44                                       | -1.56               | -1.7%                 |
|      | 15-Jan         | 92                                                               | 92.12                                       | 0.12                | 0.1%                  |
|      | 16-Jan         | 89                                                               | 90.57                                       | 1.57                | 1.8%                  |
|      | 17-Jan         | 88                                                               | 89.40                                       | 1.40                | 1.6%                  |
|      | 18-Jan         | 88                                                               | 87.85                                       | -0.15               | -0.2%                 |
|      | 19-Jan         | 89                                                               | 87.77                                       | -1.23               | -1.4%                 |
|      | 20-Jan         | 88                                                               | 86.99                                       | -1.01               | -1.1%                 |
|      | 21-Jan         | 88                                                               | 87.65                                       | -0.35               | -0.4%                 |
|      | 22-Jan         | 85                                                               | 85.54                                       | 0.54                | 0.6%                  |
|      | 23-Jan         | 83                                                               | 83.44                                       | 0.44                | 0.5%                  |
|      | 24-Jan         | 81                                                               | 80.21                                       | -0.79               | -1.0%                 |
|      | 25-Jan         | 83                                                               | 81.88                                       | -1.12               | -1.3%                 |
|      | 26-Jan         | 88                                                               | 87.75                                       | -0.25               | -0.3%                 |
|      | 27-Jan         | 92                                                               | 92.12                                       | 0.12                | 0.1%                  |
|      | 28-Jan         | 91                                                               | 91.22                                       | 0.22                | 0.2%                  |
|      | 29-Jan         | 87                                                               | 88.02                                       | 1.02                | 1.2%                  |
|      | 30-Jan         | 87                                                               | 88.23                                       | 1.23                | 1.4%                  |
|      | 31-Jan         | 87                                                               | 88.38                                       | 1.38                | 1.6%                  |
|      | <b>Average</b> | <b>88</b>                                                        | <b>87.65</b>                                | <b>-0.19</b>        | <b>-0.2%</b>          |
|      | <b>Min</b>     | <b>81</b>                                                        | <b>80.21</b>                                | <b>-4.22</b>        | <b>-4.6%</b>          |
|      | <b>Max</b>     | <b>94</b>                                                        | <b>92.51</b>                                | <b>1.57</b>         | <b>1.8%</b>           |

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CWCB Statistical Estimate of Geometric Mean Discharge at Lower Terminus  
(1954-2007)

|     | <b>Date</b>    | <b>Mean Daily<br/>Discharge San<br/>Miguel River @<br/>Uravan<br/>(cfs)</b> | <b>CWCB<br/>Adjusted Flow @<br/>LT Gage<br/>(cfs)</b> | <b>Adjustment<br/>(cfs)</b> | <b>Percent<br/>Adjustment</b> |
|-----|----------------|-----------------------------------------------------------------------------|-------------------------------------------------------|-----------------------------|-------------------------------|
| Feb | 1-Feb          | 89                                                                          | 90.35                                                 | 1.35                        | 1.5%                          |
|     | 2-Feb          | 91                                                                          | 91.46                                                 | 0.46                        | 0.5%                          |
|     | 3-Feb          | 92                                                                          | 91.17                                                 | -0.83                       | -0.9%                         |
|     | 4-Feb          | 91                                                                          | 91.44                                                 | 0.44                        | 0.5%                          |
|     | 5-Feb          | 93                                                                          | 92.01                                                 | -0.99                       | -1.1%                         |
|     | 6-Feb          | 90                                                                          | 90.33                                                 | 0.33                        | 0.4%                          |
|     | 7-Feb          | 91                                                                          | 91.14                                                 | 0.14                        | 0.2%                          |
|     | 8-Feb          | 95                                                                          | 93.06                                                 | -1.94                       | -2.0%                         |
|     | 9-Feb          | 110                                                                         | 102.61                                                | -7.39                       | -6.7%                         |
|     | 10-Feb         | 110                                                                         | 105.57                                                | -4.43                       | -4.0%                         |
|     | 11-Feb         | 112                                                                         | 104.39                                                | -7.61                       | -6.8%                         |
|     | 12-Feb         | 108                                                                         | 102.47                                                | -5.53                       | -5.1%                         |
|     | 13-Feb         | 117                                                                         | 108.34                                                | -8.66                       | -7.4%                         |
|     | 14-Feb         | 113                                                                         | 108.50                                                | -4.50                       | -4.0%                         |
|     | 15-Feb         | 110                                                                         | 109.49                                                | -0.51                       | -0.5%                         |
|     | 16-Feb         | 112                                                                         | 111.47                                                | -0.53                       | -0.5%                         |
|     | 17-Feb         | 113                                                                         | 109.49                                                | -3.51                       | -3.1%                         |
|     | 18-Feb         | 109                                                                         | 106.71                                                | -2.29                       | -2.1%                         |
|     | 19-Feb         | 109                                                                         | 105.66                                                | -3.34                       | -3.1%                         |
|     | 20-Feb         | 116                                                                         | 109.80                                                | -6.20                       | -5.3%                         |
|     | 21-Feb         | 116                                                                         | 110.11                                                | -5.89                       | -5.1%                         |
|     | 22-Feb         | 113                                                                         | 107.38                                                | -5.62                       | -5.0%                         |
|     | 23-Feb         | 114                                                                         | 106.10                                                | -7.90                       | -6.9%                         |
|     | 24-Feb         | 112                                                                         | 104.09                                                | -7.91                       | -7.1%                         |
|     | 25-Feb         | 111                                                                         | 104.18                                                | -6.82                       | -6.1%                         |
|     | 26-Feb         | 107                                                                         | 102.13                                                | -4.87                       | -4.6%                         |
|     | 27-Feb         | 107                                                                         | 105.16                                                | -1.84                       | -1.7%                         |
|     | 28-Feb         | 110                                                                         | 107.91                                                | -2.09                       | -1.9%                         |
|     | 29-Feb         | 112                                                                         | 106.99                                                | -5.01                       | -4.5%                         |
|     | <b>Average</b> | <b>106</b>                                                                  | <b>102.40</b>                                         | <b>-3.57</b>                | <b>-3.2%</b>                  |
|     | <b>Min</b>     | <b>89</b>                                                                   | <b>90.33</b>                                          | <b>-8.66</b>                | <b>-7.4%</b>                  |
|     | <b>Max</b>     | <b>117</b>                                                                  | <b>111.47</b>                                         | <b>1.35</b>                 | <b>1.5%</b>                   |

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|     | Date           | Mean Daily<br>Discharge San<br>Miguel River @<br>Uravan<br>(cfs) | CWCB<br>Adjusted Flow @<br>LT Gage<br>(cfs) | Adjustment<br>(cfs) | Percent<br>Adjustment |
|-----|----------------|------------------------------------------------------------------|---------------------------------------------|---------------------|-----------------------|
| Mar | 1-Mar          | 122                                                              | 114.28                                      | -7.72               | -6.3%                 |
|     | 2-Mar          | 134                                                              | 115.30                                      | -18.70              | -14.0%                |
|     | 3-Mar          | 133                                                              | 117.78                                      | -15.22              | -11.4%                |
|     | 4-Mar          | 127                                                              | 115.30                                      | -11.70              | -9.2%                 |
|     | 5-Mar          | 118                                                              | 110.33                                      | -7.67               | -6.5%                 |
|     | 6-Mar          | 123                                                              | 115.84                                      | -7.16               | -5.8%                 |
|     | 7-Mar          | 141                                                              | 122.01                                      | -18.99              | -13.5%                |
|     | 8-Mar          | 163                                                              | 123.44                                      | -39.56              | -24.3%                |
|     | 9-Mar          | 139                                                              | 119.83                                      | -19.17              | -13.8%                |
|     | 10-Mar         | 141                                                              | 120.33                                      | -20.67              | -14.7%                |
|     | 11-Mar         | 143                                                              | 125.23                                      | -17.77              | -12.4%                |
|     | 12-Mar         | 149                                                              | 129.24                                      | -19.76              | -13.3%                |
|     | 13-Mar         | 157                                                              | 134.05                                      | -22.95              | -14.6%                |
|     | 14-Mar         | 171                                                              | 143.00                                      | -28.00              | -16.4%                |
|     | 15-Mar         | 171                                                              | 144.23                                      | -26.77              | -15.7%                |
|     | 16-Mar         | 177                                                              | 148.65                                      | -28.35              | -16.0%                |
|     | 17-Mar         | 180                                                              | 149.08                                      | -30.92              | -17.2%                |
|     | 18-Mar         | 189                                                              | 150.93                                      | -38.07              | -20.1%                |
|     | 19-Mar         | 202                                                              | 153.80                                      | -48.20              | -23.9%                |
|     | 20-Mar         | 218                                                              | 163.25                                      | -54.75              | -25.1%                |
|     | 21-Mar         | 245                                                              | 168.56                                      | -76.44              | -31.2%                |
|     | 22-Mar         | 254                                                              | 177.12                                      | -76.88              | -30.3%                |
|     | 23-Mar         | 269                                                              | 185.50                                      | -83.50              | -31.0%                |
|     | 24-Mar         | 289                                                              | 196.50                                      | -92.50              | -32.0%                |
|     | 25-Mar         | 301                                                              | 207.59                                      | -93.41              | -31.0%                |
|     | 26-Mar         | 326                                                              | 219.32                                      | -106.68             | -32.7%                |
|     | 27-Mar         | 323                                                              | 224.59                                      | -98.41              | -30.5%                |
|     | 28-Mar         | 319                                                              | 225.41                                      | -93.59              | -29.3%                |
|     | 29-Mar         | 301                                                              | 221.34                                      | -79.66              | -26.5%                |
|     | 30-Mar         | 282                                                              | 219.54                                      | -62.46              | -22.1%                |
|     | 31-Mar         | 290                                                              | 225.43                                      | -64.57              | -22.3%                |
|     | <b>Average</b> | <b>203</b>                                                       | <b>157.64</b>                               | <b>-45.49</b>       | <b>-19.8%</b>         |
|     | <b>Min</b>     | <b>118</b>                                                       | <b>110.33</b>                               | <b>-106.68</b>      | <b>-32.7%</b>         |
|     | <b>Max</b>     | <b>326</b>                                                       | <b>225.43</b>                               | <b>-7.16</b>        | <b>-5.8%</b>          |

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|     | Date           | Mean Daily<br>Discharge San<br>Miguel River @<br>Uravan<br>(cfs) | CWCB<br>Adjusted Flow @<br>LT Gage<br>(cfs) | Adjustment<br>(cfs) | Percent<br>Adjustment |
|-----|----------------|------------------------------------------------------------------|---------------------------------------------|---------------------|-----------------------|
| Apr | 1-Apr          | 312                                                              | 279.77                                      | -32.23              | -10.3%                |
|     | 2-Apr          | 338                                                              | 296.76                                      | -41.24              | -12.2%                |
|     | 3-Apr          | 336                                                              | 308.17                                      | -27.83              | -8.3%                 |
|     | 4-Apr          | 391                                                              | 338.18                                      | -52.82              | -13.5%                |
|     | 5-Apr          | 413                                                              | 361.20                                      | -51.80              | -12.5%                |
|     | 6-Apr          | 461                                                              | 390.62                                      | -70.38              | -15.3%                |
|     | 7-Apr          | 515                                                              | 421.47                                      | -93.53              | -18.2%                |
|     | 8-Apr          | 595                                                              | 469.05                                      | -125.95             | -21.2%                |
|     | 9-Apr          | 621                                                              | 482.28                                      | -138.72             | -22.3%                |
|     | 10-Apr         | 657                                                              | 521.75                                      | -135.25             | -20.6%                |
|     | 11-Apr         | 666                                                              | 542.95                                      | -123.05             | -18.5%                |
|     | 12-Apr         | 659                                                              | 539.90                                      | -119.10             | -18.1%                |
|     | 13-Apr         | 664                                                              | 546.39                                      | -117.61             | -17.7%                |
|     | 14-Apr         | 708                                                              | 580.85                                      | -127.15             | -18.0%                |
|     | 15-Apr         | 792                                                              | 636.27                                      | -155.73             | -19.7%                |
|     | 16-Apr         | 895                                                              | 700.78                                      | -194.22             | -21.7%                |
|     | 17-Apr         | 1010                                                             | 779.55                                      | -230.45             | -22.8%                |
|     | 18-Apr         | 1170                                                             | 869.21                                      | -300.79             | -25.7%                |
|     | 19-Apr         | 1180                                                             | 883.86                                      | -296.14             | -25.1%                |
|     | 20-Apr         | 1060                                                             | 824.45                                      | -235.55             | -22.2%                |
|     | 21-Apr         | 1010                                                             | 841.64                                      | -168.36             | -16.7%                |
|     | 22-Apr         | 1070                                                             | 913.09                                      | -156.91             | -14.7%                |
|     | 23-Apr         | 1120                                                             | 922.13                                      | -197.87             | -17.7%                |
|     | 24-Apr         | 1190                                                             | 950.52                                      | -239.48             | -20.1%                |
|     | 25-Apr         | 1160                                                             | 946.98                                      | -213.02             | -18.4%                |
|     | 26-Apr         | 1120                                                             | 934.34                                      | -185.66             | -16.6%                |
|     | 27-Apr         | 1070                                                             | 913.57                                      | -156.43             | -14.6%                |
|     | 28-Apr         | 1020                                                             | 884.23                                      | -135.77             | -13.3%                |
|     | 29-Apr         | 1040                                                             | 892.50                                      | -147.50             | -14.2%                |
|     | 30-Apr         | 1030                                                             | 893.13                                      | -136.87             | -13.3%                |
|     | <b>Average</b> | <b>809</b>                                                       | <b>662.19</b>                               | <b>-146.91</b>      | <b>-17.4%</b>         |
|     | <b>Min</b>     | <b>312</b>                                                       | <b>279.77</b>                               | <b>-300.79</b>      | <b>-25.7%</b>         |
|     | <b>Max</b>     | <b>1190</b>                                                      | <b>950.52</b>                               | <b>-27.83</b>       | <b>-8.3%</b>          |



## APPENDIX A

**Comparison of Mean Daily Discharge at San Miguel River at Uravan Gage with  
CWCB Statistical Estimate of Geometric Mean Discharge at Lower Terminus  
(1954-2007)**

|     | <b>Date</b>    | <b>Mean Daily<br/>Discharge San<br/>Miguel River @<br/>Uravan<br/>(cfs)</b> | <b>CWCB<br/>Adjusted Flow @<br/>LT Gage<br/>(cfs)</b> | <b>Adjustment<br/>(cfs)</b> | <b>Percent<br/>Adjustment</b> |
|-----|----------------|-----------------------------------------------------------------------------|-------------------------------------------------------|-----------------------------|-------------------------------|
| May | 1-May          | 1,030                                                                       | 947.30                                                | -82.70                      | -8.0%                         |
|     | 2-May          | 1,040                                                                       | 976.21                                                | -63.79                      | -6.1%                         |
|     | 3-May          | 1,040                                                                       | 978.86                                                | -61.14                      | -5.9%                         |
|     | 4-May          | 1,110                                                                       | 1014.32                                               | -95.68                      | -8.6%                         |
|     | 5-May          | 1,160                                                                       | 1025.55                                               | -134.45                     | -11.6%                        |
|     | 6-May          | 1,130                                                                       | 1014.95                                               | -115.05                     | -10.2%                        |
|     | 7-May          | 1,110                                                                       | 1020.25                                               | -89.75                      | -8.1%                         |
|     | 8-May          | 1,130                                                                       | 1039.98                                               | -90.02                      | -8.0%                         |
|     | 9-May          | 1,170                                                                       | 1075.89                                               | -94.11                      | -8.0%                         |
|     | 10-May         | 1,140                                                                       | 1054.45                                               | -85.55                      | -7.5%                         |
|     | 11-May         | 1,170                                                                       | 1059.09                                               | -110.91                     | -9.5%                         |
|     | 12-May         | 1,120                                                                       | 1054.00                                               | -66.00                      | -5.9%                         |
|     | 13-May         | 1,090                                                                       | 1067.24                                               | -22.76                      | -2.1%                         |
|     | 14-May         | 1,080                                                                       | 1072.69                                               | -7.31                       | -0.7%                         |
|     | 15-May         | 1,120                                                                       | 1108.12                                               | -11.88                      | -1.1%                         |
|     | 16-May         | 1,130                                                                       | 1131.70                                               | 1.70                        | 0.2%                          |
|     | 17-May         | 1,140                                                                       | 1130.14                                               | -9.86                       | -0.9%                         |
|     | 18-May         | 1,090                                                                       | 1104.80                                               | 14.80                       | 1.4%                          |
|     | 19-May         | 1,060                                                                       | 1117.81                                               | 57.81                       | 5.5%                          |
|     | 20-May         | 1,090                                                                       | 1127.25                                               | 37.25                       | 3.4%                          |
|     | 21-May         | 1,130                                                                       | 1140.65                                               | 10.65                       | 0.9%                          |
|     | 22-May         | 1,150                                                                       | 1151.65                                               | 1.65                        | 0.1%                          |
|     | 23-May         | 1,150                                                                       | 1144.75                                               | -5.25                       | -0.5%                         |
|     | 24-May         | 1,150                                                                       | 1131.89                                               | -18.11                      | -1.6%                         |
|     | 25-May         | 1,140                                                                       | 1121.88                                               | -18.12                      | -1.6%                         |
|     | 26-May         | 1,110                                                                       | 1094.81                                               | -15.19                      | -1.4%                         |
|     | 27-May         | 1,130                                                                       | 1110.28                                               | -19.72                      | -1.7%                         |
|     | 28-May         | 1,150                                                                       | 1135.45                                               | -14.55                      | -1.3%                         |
|     | 29-May         | 1,150                                                                       | 1161.10                                               | 11.10                       | 1.0%                          |
|     | 30-May         | 1,150                                                                       | 1171.50                                               | 21.50                       | 1.9%                          |
|     | 31-May         | 1120                                                                        | 1157.40                                               | 37.40                       | 3.3%                          |
|     | <b>Average</b> | <b>1119</b>                                                                 | <b>1085.22</b>                                        | <b>-33.48</b>               | <b>-3.0%</b>                  |
|     | <b>Min</b>     | <b>1030</b>                                                                 | <b>947.30</b>                                         | <b>-134.45</b>              | <b>-11.6%</b>                 |
|     | <b>Max</b>     | <b>1170</b>                                                                 | <b>1171.50</b>                                        | <b>57.81</b>                | <b>5.5%</b>                   |

## APPENDIX A

Comparison of Mean Daily Discharge at San Miguel River at Uravan Gage with  
CWCB Statistical Estimate of Geometric Mean Discharge at Lower Terminus  
(1954-2007)

|     | <b>Date</b>    | <b>Mean Daily<br/>Discharge San<br/>Miguel River @<br/>Uravan<br/>(cfs)</b> | <b>CWCB<br/>Adjusted Flow @<br/>LT Gage<br/>(cfs)</b> | <b>Adjustment<br/>(cfs)</b> | <b>Percent<br/>Adjustment</b> |
|-----|----------------|-----------------------------------------------------------------------------|-------------------------------------------------------|-----------------------------|-------------------------------|
| Jun | 1-Jun          | 1,100                                                                       | 1156.98                                               | 56.98                       | 5.2%                          |
|     | 2-Jun          | 1,090                                                                       | 1149.25                                               | 59.25                       | 5.4%                          |
|     | 3-Jun          | 1,060                                                                       | 1145.33                                               | 85.33                       | 8.1%                          |
|     | 4-Jun          | 1,060                                                                       | 1152.22                                               | 92.22                       | 8.7%                          |
|     | 5-Jun          | 1,070                                                                       | 1167.55                                               | 97.55                       | 9.1%                          |
|     | 6-Jun          | 1,090                                                                       | 1190.12                                               | 100.12                      | 9.2%                          |
|     | 7-Jun          | 1,090                                                                       | 1197.89                                               | 107.89                      | 9.9%                          |
|     | 8-Jun          | 1,100                                                                       | 1203.36                                               | 103.36                      | 9.4%                          |
|     | 9-Jun          | 1,090                                                                       | 1210.41                                               | 120.41                      | 11.0%                         |
|     | 10-Jun         | 1,050                                                                       | 1187.73                                               | 137.73                      | 13.1%                         |
|     | 11-Jun         | 995                                                                         | 1140.20                                               | 145.20                      | 14.6%                         |
|     | 12-Jun         | 967                                                                         | 1105.17                                               | 138.17                      | 14.3%                         |
|     | 13-Jun         | 958                                                                         | 1091.40                                               | 133.40                      | 13.9%                         |
|     | 14-Jun         | 957                                                                         | 1082.83                                               | 125.83                      | 13.1%                         |
|     | 15-Jun         | 944                                                                         | 1086.42                                               | 142.42                      | 15.1%                         |
|     | 16-Jun         | 924                                                                         | 1022.90                                               | 98.90                       | 10.7%                         |
|     | 17-Jun         | 882                                                                         | 993.25                                                | 111.25                      | 12.6%                         |
|     | 18-Jun         | 887                                                                         | 983.51                                                | 96.51                       | 10.9%                         |
|     | 19-Jun         | 890                                                                         | 973.14                                                | 83.14                       | 9.3%                          |
|     | 20-Jun         | 881                                                                         | 965.45                                                | 84.45                       | 9.6%                          |
|     | 21-Jun         | 869                                                                         | 948.41                                                | 79.41                       | 9.1%                          |
|     | 22-Jun         | 848                                                                         | 933.04                                                | 85.04                       | 10.0%                         |
|     | 23-Jun         | 821                                                                         | 902.94                                                | 81.94                       | 10.0%                         |
|     | 24-Jun         | 812                                                                         | 875.01                                                | 63.01                       | 7.8%                          |
|     | 25-Jun         | 789                                                                         | 849.31                                                | 60.31                       | 7.6%                          |
|     | 26-Jun         | 786                                                                         | 826.59                                                | 40.59                       | 5.2%                          |
|     | 27-Jun         | 757                                                                         | 797.78                                                | 40.78                       | 5.4%                          |
|     | 28-Jun         | 732                                                                         | 772.49                                                | 40.49                       | 5.5%                          |
|     | 29-Jun         | 710                                                                         | 758.92                                                | 48.92                       | 6.9%                          |
|     | 30-Jun         | 677                                                                         | 731.14                                                | 54.14                       | 8.0%                          |
|     | <b>Average</b> | <b>930</b>                                                                  | <b>1020.02</b>                                        | <b>90.49</b>                | <b>9.6%</b>                   |
|     | <b>Min</b>     | <b>677</b>                                                                  | <b>731.14</b>                                         | <b>40.49</b>                | <b>5.2%</b>                   |
|     | <b>Max</b>     | <b>1100</b>                                                                 | <b>1210.41</b>                                        | <b>145.20</b>               | <b>15.1%</b>                  |

## APPENDIX A

Comparison of Mean Daily Discharge at San Miguel River at Uravan Gage with  
CWCB Statistical Estimate of Geometric Mean Discharge at Lower Terminus  
(1954-2007)

|     | Date           | Mean Daily<br>Discharge San<br>Miguel River @<br>Uravan<br>(cfs) | CWCB<br>Adjusted Flow @<br>LT Gage<br>(cfs) | Adjustment<br>(cfs) | Percent<br>Adjustment |
|-----|----------------|------------------------------------------------------------------|---------------------------------------------|---------------------|-----------------------|
| Jul | 1-Jul          | 659                                                              | 712.55                                      | 53.55               | 8.1%                  |
|     | 2-Jul          | 628                                                              | 684.12                                      | 56.12               | 8.9%                  |
|     | 3-Jul          | 597                                                              | 660.57                                      | 63.57               | 10.6%                 |
|     | 4-Jul          | 572                                                              | 635.30                                      | 63.30               | 11.1%                 |
|     | 5-Jul          | 540                                                              | 613.45                                      | 73.45               | 13.6%                 |
|     | 6-Jul          | 508                                                              | 593.59                                      | 85.59               | 16.8%                 |
|     | 7-Jul          | 487                                                              | 575.66                                      | 88.66               | 18.2%                 |
|     | 8-Jul          | 482                                                              | 560.80                                      | 78.80               | 16.3%                 |
|     | 9-Jul          | 470                                                              | 546.35                                      | 76.35               | 16.2%                 |
|     | 10-Jul         | 473                                                              | 539.38                                      | 66.38               | 14.0%                 |
|     | 11-Jul         | 444                                                              | 519.92                                      | 75.92               | 17.1%                 |
|     | 12-Jul         | 430                                                              | 508.90                                      | 78.90               | 18.3%                 |
|     | 13-Jul         | 401                                                              | 490.76                                      | 89.76               | 22.4%                 |
|     | 14-Jul         | 372                                                              | 463.87                                      | 91.87               | 24.7%                 |
|     | 15-Jul         | 362                                                              | 447.31                                      | 85.31               | 23.6%                 |
|     | 16-Jul         | 343                                                              | 428.72                                      | 85.72               | 25.0%                 |
|     | 17-Jul         | 328                                                              | 409.42                                      | 81.42               | 24.8%                 |
|     | 18-Jul         | 324                                                              | 404.75                                      | 80.75               | 24.9%                 |
|     | 19-Jul         | 328                                                              | 401.78                                      | 73.78               | 22.5%                 |
|     | 20-Jul         | 311                                                              | 398.60                                      | 87.60               | 28.2%                 |
|     | 21-Jul         | 292                                                              | 382.39                                      | 90.39               | 31.0%                 |
|     | 22-Jul         | 298                                                              | 381.37                                      | 83.37               | 28.0%                 |
|     | 23-Jul         | 295                                                              | 369.73                                      | 74.73               | 25.3%                 |
|     | 24-Jul         | 302                                                              | 367.72                                      | 65.72               | 21.8%                 |
|     | 25-Jul         | 287                                                              | 354.27                                      | 67.27               | 23.4%                 |
|     | 26-Jul         | 292                                                              | 354.84                                      | 62.84               | 21.5%                 |
|     | 27-Jul         | 313                                                              | 360.83                                      | 47.83               | 15.3%                 |
|     | 28-Jul         | 278                                                              | 350.13                                      | 72.13               | 25.9%                 |
|     | 29-Jul         | 268                                                              | 337.86                                      | 69.86               | 26.1%                 |
|     | 30-Jul         | 270                                                              | 334.63                                      | 64.63               | 23.9%                 |
|     | 31-Jul         | 274                                                              | 339.55                                      | 65.55               | 23.9%                 |
|     | <b>Average</b> | <b>394</b>                                                       | <b>468.68</b>                               | <b>74.23</b>        | <b>20.4%</b>          |
|     | <b>Min</b>     | <b>268</b>                                                       | <b>334.63</b>                               | <b>47.83</b>        | <b>8.1%</b>           |
|     | <b>Max</b>     | <b>659</b>                                                       | <b>712.55</b>                               | <b>91.87</b>        | <b>31.0%</b>          |

## APPENDIX A

Comparison of Mean Daily Discharge at San Miguel River at Uravan Gage with  
CWCB Statistical Estimate of Geometric Mean Discharge at Lower Terminus  
(1954-2007)

|     | <b>Date</b>    | <b>Mean Daily<br/>Discharge San<br/>Miguel River @<br/>Uravan<br/>(cfs)</b> | <b>CWCB<br/>Adjusted Flow @<br/>LT Gage<br/>(cfs)</b> | <b>Adjustment<br/>(cfs)</b> | <b>Percent<br/>Adjustment</b> |
|-----|----------------|-----------------------------------------------------------------------------|-------------------------------------------------------|-----------------------------|-------------------------------|
| Aug | 1-Aug          | 251                                                                         | 332.86                                                | 81.86                       | 32.6%                         |
|     | 2-Aug          | 233                                                                         | 335.24                                                | 102.24                      | 43.9%                         |
|     | 3-Aug          | 224                                                                         | 327.02                                                | 103.02                      | 46.0%                         |
|     | 4-Aug          | 230                                                                         | 328.17                                                | 98.17                       | 42.7%                         |
|     | 5-Aug          | 221                                                                         | 311.19                                                | 90.19                       | 40.8%                         |
|     | 6-Aug          | 232                                                                         | 313.29                                                | 81.29                       | 35.0%                         |
|     | 7-Aug          | 226                                                                         | 308.31                                                | 82.31                       | 36.4%                         |
|     | 8-Aug          | 211                                                                         | 293.69                                                | 82.69                       | 39.2%                         |
|     | 9-Aug          | 198                                                                         | 283.72                                                | 85.72                       | 43.3%                         |
|     | 10-Aug         | 182                                                                         | 273.76                                                | 91.76                       | 50.4%                         |
|     | 11-Aug         | 196                                                                         | 269.96                                                | 73.96                       | 37.7%                         |
|     | 12-Aug         | 185                                                                         | 266.04                                                | 81.04                       | 43.8%                         |
|     | 13-Aug         | 171                                                                         | 255.58                                                | 84.58                       | 49.5%                         |
|     | 14-Aug         | 164                                                                         | 254.47                                                | 90.47                       | 55.2%                         |
|     | 15-Aug         | 177                                                                         | 277.09                                                | 100.09                      | 56.5%                         |
|     | 16-Aug         | 200                                                                         | 282.45                                                | 82.45                       | 41.2%                         |
|     | 17-Aug         | 162                                                                         | 263.60                                                | 101.60                      | 62.7%                         |
|     | 18-Aug         | 175                                                                         | 260.85                                                | 85.85                       | 49.1%                         |
|     | 19-Aug         | 155                                                                         | 250.37                                                | 95.37                       | 61.5%                         |
|     | 20-Aug         | 167                                                                         | 249.72                                                | 82.72                       | 49.5%                         |
|     | 21-Aug         | 164                                                                         | 251.65                                                | 87.65                       | 53.4%                         |
|     | 22-Aug         | 153                                                                         | 237.79                                                | 84.79                       | 55.4%                         |
|     | 23-Aug         | 162                                                                         | 244.45                                                | 82.45                       | 50.9%                         |
|     | 24-Aug         | 191                                                                         | 238.03                                                | 47.03                       | 24.6%                         |
|     | 25-Aug         | 192                                                                         | 238.49                                                | 46.49                       | 24.2%                         |
|     | 26-Aug         | 187                                                                         | 239.07                                                | 52.07                       | 27.8%                         |
|     | 27-Aug         | 169                                                                         | 230.65                                                | 61.65                       | 36.5%                         |
|     | 28-Aug         | 149                                                                         | 216.13                                                | 67.13                       | 45.1%                         |
|     | 29-Aug         | 145                                                                         | 211.57                                                | 66.57                       | 45.9%                         |
|     | 30-Aug         | 172                                                                         | 208.78                                                | 36.78                       | 21.4%                         |
|     | 31-Aug         | 155                                                                         | 200.62                                                | 45.62                       | 29.4%                         |
|     | <b>Average</b> | <b>187</b>                                                                  | <b>266.28</b>                                         | <b>79.21</b>                | <b>43.0%</b>                  |
|     | <b>Min</b>     | <b>145</b>                                                                  | <b>200.62</b>                                         | <b>36.78</b>                | <b>21.4%</b>                  |
|     | <b>Max</b>     | <b>251</b>                                                                  | <b>335.24</b>                                         | <b>103.02</b>               | <b>62.7%</b>                  |

## APPENDIX A

Comparison of Mean Daily Discharge at San Miguel River at Uravan Gage with  
CWCB Statistical Estimate of Geometric Mean Discharge at Lower Terminus  
(1954-2007)

|     | Date           | Mean Daily<br>Discharge San<br>Miguel River @<br>Uravan<br>(cfs) | CWCB<br>Adjusted Flow @<br>LT Gage<br>(cfs) | Adjustment<br>(cfs) | Percent<br>Adjustment |
|-----|----------------|------------------------------------------------------------------|---------------------------------------------|---------------------|-----------------------|
| Sep | 1-Sep          | 135                                                              | 200.12                                      | 65.12               | 48.2%                 |
|     | 2-Sep          | 125                                                              | 192.16                                      | 67.16               | 53.7%                 |
|     | 3-Sep          | 119                                                              | 186.68                                      | 67.68               | 56.9%                 |
|     | 4-Sep          | 114                                                              | 187.03                                      | 73.03               | 64.1%                 |
|     | 5-Sep          | 112                                                              | 186.23                                      | 74.23               | 66.3%                 |
|     | 6-Sep          | 112                                                              | 186.26                                      | 74.26               | 66.3%                 |
|     | 7-Sep          | 109                                                              | 187.17                                      | 78.17               | 71.7%                 |
|     | 8-Sep          | 112                                                              | 190.08                                      | 78.08               | 69.7%                 |
|     | 9-Sep          | 132                                                              | 197.28                                      | 65.28               | 49.5%                 |
|     | 10-Sep         | 160                                                              | 199.42                                      | 39.42               | 24.6%                 |
|     | 11-Sep         | 134                                                              | 194.11                                      | 60.11               | 44.9%                 |
|     | 12-Sep         | 144                                                              | 199.26                                      | 55.26               | 38.4%                 |
|     | 13-Sep         | 157                                                              | 197.34                                      | 40.34               | 25.7%                 |
|     | 14-Sep         | 143                                                              | 190.06                                      | 47.06               | 32.9%                 |
|     | 15-Sep         | 131                                                              | 182.34                                      | 51.34               | 39.2%                 |
|     | 16-Sep         | 143                                                              | 206.28                                      | 63.28               | 44.3%                 |
|     | 17-Sep         | 135                                                              | 201.04                                      | 66.04               | 48.9%                 |
|     | 18-Sep         | 128                                                              | 197.59                                      | 69.59               | 54.4%                 |
|     | 19-Sep         | 129                                                              | 197.95                                      | 68.95               | 53.5%                 |
|     | 20-Sep         | 131                                                              | 194.13                                      | 63.13               | 48.2%                 |
|     | 21-Sep         | 139                                                              | 196.20                                      | 57.20               | 41.1%                 |
|     | 22-Sep         | 137                                                              | 194.71                                      | 57.71               | 42.1%                 |
|     | 23-Sep         | 136                                                              | 193.90                                      | 57.90               | 42.6%                 |
|     | 24-Sep         | 150                                                              | 196.40                                      | 46.40               | 30.9%                 |
|     | 25-Sep         | 140                                                              | 190.77                                      | 50.77               | 36.3%                 |
|     | 26-Sep         | 126                                                              | 183.99                                      | 57.99               | 46.0%                 |
|     | 27-Sep         | 118                                                              | 178.95                                      | 60.95               | 51.7%                 |
|     | 28-Sep         | 120                                                              | 180.44                                      | 60.44               | 50.4%                 |
|     | 29-Sep         | 117                                                              | 185.96                                      | 68.96               | 58.9%                 |
|     | 30-Sep         | 120                                                              | 188.90                                      | 68.90               | 57.4%                 |
|     | <b>Average</b> | <b>130</b>                                                       | <b>192.09</b>                               | <b>61.83</b>        | <b>48.6%</b>          |
|     | <b>Min</b>     | <b>109</b>                                                       | <b>178.95</b>                               | <b>39.42</b>        | <b>24.6%</b>          |
|     | <b>Max</b>     | <b>160</b>                                                       | <b>206.28</b>                               | <b>78.17</b>        | <b>71.7%</b>          |

## APPENDIX A

Comparison of Mean Daily Discharge at San Miguel River at Uravan Gage with  
CWCB Statistical Estimate of Geometric Mean Discharge at Lower Terminus  
(1954-2007)

|     | Date           | Mean Daily<br>Discharge San<br>Miguel River @<br>Uravan<br>(cfs) | CWCB<br>Adjusted Flow @<br>LT Gage<br>(cfs) | Adjustment<br>(cfs) | Percent<br>Adjustment |
|-----|----------------|------------------------------------------------------------------|---------------------------------------------|---------------------|-----------------------|
| Oct | 1-Oct          | 120                                                              | 172.33                                      | 52.33               | 43.6%                 |
|     | 2-Oct          | 127                                                              | 177.40                                      | 50.40               | 39.7%                 |
|     | 3-Oct          | 159                                                              | 184.85                                      | 25.85               | 16.3%                 |
|     | 4-Oct          | 143                                                              | 183.44                                      | 40.44               | 28.3%                 |
|     | 5-Oct          | 135                                                              | 183.06                                      | 48.06               | 35.6%                 |
|     | 6-Oct          | 177                                                              | 186.96                                      | 9.96                | 5.6%                  |
|     | 7-Oct          | 182                                                              | 196.42                                      | 14.42               | 7.9%                  |
|     | 8-Oct          | 164                                                              | 193.86                                      | 29.86               | 18.2%                 |
|     | 9-Oct          | 172                                                              | 202.21                                      | 30.21               | 17.6%                 |
|     | 10-Oct         | 170                                                              | 198.02                                      | 28.02               | 16.5%                 |
|     | 11-Oct         | 158                                                              | 197.11                                      | 39.11               | 24.8%                 |
|     | 12-Oct         | 154                                                              | 195.39                                      | 41.39               | 26.9%                 |
|     | 13-Oct         | 155                                                              | 197.67                                      | 42.67               | 27.5%                 |
|     | 14-Oct         | 149                                                              | 196.87                                      | 47.87               | 32.1%                 |
|     | 15-Oct         | 152                                                              | 197.70                                      | 45.70               | 30.1%                 |
|     | 16-Oct         | 153                                                              | 200.92                                      | 47.92               | 31.3%                 |
|     | 17-Oct         | 147                                                              | 200.24                                      | 53.24               | 36.2%                 |
|     | 18-Oct         | 148                                                              | 200.95                                      | 52.95               | 35.8%                 |
|     | 19-Oct         | 148                                                              | 201.91                                      | 53.91               | 36.4%                 |
|     | 20-Oct         | 145                                                              | 199.54                                      | 54.54               | 37.6%                 |
|     | 21-Oct         | 148                                                              | 195.64                                      | 47.64               | 32.2%                 |
|     | 22-Oct         | 139                                                              | 194.48                                      | 55.48               | 39.9%                 |
|     | 23-Oct         | 135                                                              | 192.98                                      | 57.98               | 42.9%                 |
|     | 24-Oct         | 136                                                              | 194.42                                      | 58.42               | 43.0%                 |
|     | 25-Oct         | 135                                                              | 191.65                                      | 56.65               | 42.0%                 |
|     | 26-Oct         | 139                                                              | 197.87                                      | 58.87               | 42.4%                 |
|     | 27-Oct         | 143                                                              | 207.89                                      | 64.89               | 45.4%                 |
|     | 28-Oct         | 136                                                              | 207.07                                      | 71.07               | 52.3%                 |
|     | 29-Oct         | 140                                                              | 215.07                                      | 75.07               | 53.6%                 |
|     | 30-Oct         | 137                                                              | 216.86                                      | 79.86               | 58.3%                 |
|     | 31-Oct         | 137                                                              | 181.24                                      | 44.24               | 32.3%                 |
|     | <b>Average</b> | <b>148</b>                                                       | <b>195.55</b>                               | <b>47.71</b>        | <b>33.3%</b>          |
|     | <b>Min</b>     | <b>120</b>                                                       | <b>172.33</b>                               | <b>9.96</b>         | <b>5.6%</b>           |
|     | <b>Max</b>     | <b>182</b>                                                       | <b>216.86</b>                               | <b>79.86</b>        | <b>58.3%</b>          |

## APPENDIX A

Comparison of Mean Daily Discharge at San Miguel River at Uravan Gage with  
CWCB Statistical Estimate of Geometric Mean Discharge at Lower Terminus  
(1954-2007)

|     | <b>Date</b>    | <b>Mean Daily<br/>Discharge San<br/>Miguel River @<br/>Uravan<br/>(cfs)</b> | <b>CWCB<br/>Adjusted Flow @<br/>LT Gage<br/>(cfs)</b> | <b>Adjustment<br/>(cfs)</b> | <b>Percent<br/>Adjustment</b> |
|-----|----------------|-----------------------------------------------------------------------------|-------------------------------------------------------|-----------------------------|-------------------------------|
| Nov | 1-Nov          | 143                                                                         | 133.24                                                | -9.76                       | -6.8%                         |
|     | 2-Nov          | 144                                                                         | 134.23                                                | -9.77                       | -6.8%                         |
|     | 3-Nov          | 135                                                                         | 131.41                                                | -3.59                       | -2.7%                         |
|     | 4-Nov          | 130                                                                         | 125.92                                                | -4.08                       | -3.1%                         |
|     | 5-Nov          | 130                                                                         | 125.08                                                | -4.92                       | -3.8%                         |
|     | 6-Nov          | 138                                                                         | 128.24                                                | -9.76                       | -7.1%                         |
|     | 7-Nov          | 132                                                                         | 127.60                                                | -4.40                       | -3.3%                         |
|     | 8-Nov          | 127                                                                         | 123.85                                                | -3.15                       | -2.5%                         |
|     | 9-Nov          | 128                                                                         | 125.58                                                | -2.42                       | -1.9%                         |
|     | 10-Nov         | 126                                                                         | 124.95                                                | -1.05                       | -0.8%                         |
|     | 11-Nov         | 123                                                                         | 121.82                                                | -1.18                       | -1.0%                         |
|     | 12-Nov         | 127                                                                         | 123.70                                                | -3.30                       | -2.6%                         |
|     | 13-Nov         | 121                                                                         | 117.18                                                | -3.82                       | -3.2%                         |
|     | 14-Nov         | 116                                                                         | 112.07                                                | -3.93                       | -3.4%                         |
|     | 15-Nov         | 116                                                                         | 111.98                                                | -4.02                       | -3.5%                         |
|     | 16-Nov         | 108                                                                         | 105.18                                                | -2.82                       | -2.6%                         |
|     | 17-Nov         | 103                                                                         | 98.28                                                 | -4.72                       | -4.6%                         |
|     | 18-Nov         | 101                                                                         | 94.97                                                 | -6.03                       | -6.0%                         |
|     | 19-Nov         | 118                                                                         | 94.30                                                 | -23.70                      | -20.1%                        |
|     | 20-Nov         | 111                                                                         | 93.36                                                 | -17.64                      | -15.9%                        |
|     | 21-Nov         | 106                                                                         | 96.70                                                 | -9.30                       | -8.8%                         |
|     | 22-Nov         | 105                                                                         | 97.72                                                 | -7.28                       | -6.9%                         |
|     | 23-Nov         | 108                                                                         | 100.85                                                | -7.15                       | -6.6%                         |
|     | 24-Nov         | 106                                                                         | 103.03                                                | -2.97                       | -2.8%                         |
|     | 25-Nov         | 109                                                                         | 103.50                                                | -5.50                       | -5.0%                         |
|     | 26-Nov         | 111                                                                         | 103.81                                                | -7.19                       | -6.5%                         |
|     | 27-Nov         | 104                                                                         | 97.41                                                 | -6.59                       | -6.3%                         |
|     | 28-Nov         | 100                                                                         | 94.12                                                 | -5.88                       | -5.9%                         |
|     | 29-Nov         | 100                                                                         | 91.55                                                 | -8.45                       | -8.4%                         |
|     | 30-Nov         | 101                                                                         | 92.36                                                 | -8.64                       | -8.6%                         |
|     | <b>Average</b> | <b>118</b>                                                                  | <b>111.13</b>                                         | <b>-6.43</b>                | <b>-5.6%</b>                  |
|     | <b>Min</b>     | <b>100</b>                                                                  | <b>91.55</b>                                          | <b>-23.70</b>               | <b>-20.1%</b>                 |
|     | <b>Max</b>     | <b>144</b>                                                                  | <b>134.23</b>                                         | <b>-1.05</b>                | <b>-0.8%</b>                  |

## APPENDIX A

Comparison of Mean Daily Discharge at San Miguel River at Uravan Gage with  
CWCB Statistical Estimate of Geometric Mean Discharge at Lower Terminus  
(1954-2007)

|     | <b>Date</b>    | <b>Mean Daily<br/>Discharge San<br/>Miguel River @<br/>Uravan<br/>(cfs)</b> | <b>CWCB<br/>Adjusted Flow @<br/>LT Gage<br/>(cfs)</b> | <b>Adjustment<br/>(cfs)</b> | <b>Percent<br/>Adjustment</b> |
|-----|----------------|-----------------------------------------------------------------------------|-------------------------------------------------------|-----------------------------|-------------------------------|
| Dec | 1-Dec          | 101                                                                         | 98.72                                                 | -2.28                       | -2.3%                         |
|     | 2-Dec          | 101                                                                         | 100.86                                                | -0.14                       | -0.1%                         |
|     | 3-Dec          | 103                                                                         | 102.72                                                | -0.28                       | -0.3%                         |
|     | 4-Dec          | 102                                                                         | 100.97                                                | -1.03                       | -1.0%                         |
|     | 5-Dec          | 101                                                                         | 101.19                                                | 0.19                        | 0.2%                          |
|     | 6-Dec          | 98                                                                          | 97.63                                                 | -0.37                       | -0.4%                         |
|     | 7-Dec          | 100                                                                         | 101.18                                                | 1.18                        | 1.2%                          |
|     | 8-Dec          | 100                                                                         | 101.39                                                | 1.39                        | 1.4%                          |
|     | 9-Dec          | 98                                                                          | 96.57                                                 | -1.43                       | -1.5%                         |
|     | 10-Dec         | 95                                                                          | 93.26                                                 | -1.74                       | -1.8%                         |
|     | 11-Dec         | 97                                                                          | 96.86                                                 | -0.14                       | -0.1%                         |
|     | 12-Dec         | 93                                                                          | 93.28                                                 | 0.28                        | 0.3%                          |
|     | 13-Dec         | 92                                                                          | 92.05                                                 | 0.05                        | 0.1%                          |
|     | 14-Dec         | 90                                                                          | 88.93                                                 | -1.07                       | -1.2%                         |
|     | 15-Dec         | 89                                                                          | 89.18                                                 | 0.18                        | 0.2%                          |
|     | 16-Dec         | 91                                                                          | 91.22                                                 | 0.22                        | 0.2%                          |
|     | 17-Dec         | 93                                                                          | 91.75                                                 | -1.25                       | -1.3%                         |
|     | 18-Dec         | 91                                                                          | 90.25                                                 | -0.75                       | -0.8%                         |
|     | 19-Dec         | 93                                                                          | 91.60                                                 | -1.40                       | -1.5%                         |
|     | 20-Dec         | 92                                                                          | 90.02                                                 | -1.98                       | -2.2%                         |
|     | 21-Dec         | 91                                                                          | 88.57                                                 | -2.43                       | -2.7%                         |
|     | 22-Dec         | 90                                                                          | 89.28                                                 | -0.72                       | -0.8%                         |
|     | 23-Dec         | 92                                                                          | 91.43                                                 | -0.57                       | -0.6%                         |
|     | 24-Dec         | 90                                                                          | 89.49                                                 | -0.51                       | -0.6%                         |
|     | 25-Dec         | 91                                                                          | 90.04                                                 | -0.96                       | -1.1%                         |
|     | 26-Dec         | 92                                                                          | 90.36                                                 | -1.64                       | -1.8%                         |
|     | 27-Dec         | 91                                                                          | 88.60                                                 | -2.40                       | -2.6%                         |
|     | 28-Dec         | 92                                                                          | 89.97                                                 | -2.03                       | -2.2%                         |
|     | 29-Dec         | 93                                                                          | 90.77                                                 | -2.23                       | -2.4%                         |
|     | 30-Dec         | 94                                                                          | 88.63                                                 | -5.37                       | -5.7%                         |
|     | 31-Dec         | 89                                                                          | 88.15                                                 | -0.85                       | -1.0%                         |
|     | <b>Average</b> | <b>94</b>                                                                   | <b>93.38</b>                                          | <b>-0.97</b>                | <b>-1.0%</b>                  |
|     | <b>Min</b>     | <b>89</b>                                                                   | <b>88.15</b>                                          | <b>-5.37</b>                | <b>-5.7%</b>                  |
|     | <b>Max</b>     | <b>103</b>                                                                  | <b>102.72</b>                                         | <b>1.39</b>                 | <b>1.4%</b>                   |



## **Annual Availability of San Miguel Flows in Excess of CWCB ISF Recommendations**

- Flows in excess of recommended ISF average **167,183** acre-feet per year (43 year study period using flows at Uravan Gage (USGS gage #0917700)).
- **75** percent of the average annual excess flow occurs in only 3 months (i.e., April, May, & June).
- Average monthly flows in excess of the ISF in months of April, May and June are **597** cfs, **804** cfs, and **687** cfs, respectively.
- Flow rates and volumes of this magnitude are difficult for most water users to divert, store or use due to practical infrastructure constraints (i.e., total ditch capacity, ditch capacity in excess of existing water rights being diverted, well capacity and available storage capacity).
- Without large diversion capacities and storage reservoirs, a large portion of peak runoff flows, such as those experienced in the months of April, May and June, cannot be put to beneficial use.

### **Conclusion**

**The annual availability of flows in excess of the CWCB ISF recommendations is a poor indication of the amount of water available for diversion and beneficial use using conventional means of diversion and/or storage. Availability based on an annual time step does reflect the practical physical constraints of water use and storage.**

**TABLE 3**  
**Average Monthly Flows at Uravan Gage**  
**in Excess of Recommended ISF**

| <b>Month</b> | <b>Average Daily Flow<br/>at Uravan Gage<br/>in Excess of ISF<br/>(cfs)</b> | <b>Average Monthly Flow<br/>at Uravan Gage<br/>in Excess of ISF<br/>(AF)</b> | <b>Monthly Percentage<br/>of Annual Flow</b> |
|--------------|-----------------------------------------------------------------------------|------------------------------------------------------------------------------|----------------------------------------------|
| <b>Oct</b>   | 71                                                                          | 4,428                                                                        | 2.6%                                         |
| <b>Nov</b>   | 40                                                                          | 2,433                                                                        | 1.5%                                         |
| <b>Dec</b>   | 22                                                                          | 1,320                                                                        | 0.8%                                         |
| <b>Jan</b>   | 15                                                                          | 946                                                                          | 0.6%                                         |
| <b>Feb</b>   | 31                                                                          | 1,700                                                                        | 1.0%                                         |
| <b>Mar</b>   | 97                                                                          | 5,987                                                                        | 3.6%                                         |
| <b>Apr</b>   | 597                                                                         | 35,536                                                                       | 21.3%                                        |
| <b>May</b>   | 807                                                                         | 49,407                                                                       | 29.6%                                        |
| <b>Jun</b>   | 687                                                                         | 40,850                                                                       | 24.4%                                        |
| <b>Jul</b>   | 242                                                                         | 14,868                                                                       | 8.9%                                         |
| <b>Aug</b>   | 97                                                                          | 5,946                                                                        | 3.6%                                         |
| <b>Sep</b>   | 63                                                                          | 3,762                                                                        | 2.3%                                         |
| <b>Total</b> |                                                                             | <b>167,183</b>                                                               |                                              |