



**ADDENDUM TO**  
**TECHNICAL MEMORANDUM 7-10**

**Instream Flow Downstream of  
Englebright Dam**

**Depth and Velocity Summary Tables for In-  
Channel and for Floodplain**

**Yuba River Development Project  
FERC Project No. 2246**

February 2014

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**Table of Contents**

| <b>Section No.</b> | <b>Description</b>                  | <b>Page No.</b> |
|--------------------|-------------------------------------|-----------------|
| 1.0                | Introduction.....                   | 1               |
| 2.0                | Floodplain Inundation Results ..... | 1               |

**List of Figures**

| <b>Figure No.</b> | <b>Description</b> | <b>Page No.</b> |
|-------------------|--------------------|-----------------|
| None.             |                    |                 |

**List of Tables**

| <b>Table No.</b> | <b>Description</b>  | <b>Page No.</b> |
|------------------|---|-----------------|
| 2.0-1.           | Area (acres) of geomorphic reach with a given range of depths for each flow not including depths for the wetted area of the flow 5,000 cfs. Shaded cells indicate the depths with the greatest area for a given flow.....             | 3               |
| 2.0-2.           | Area (acres) of geomorphic reach with a given range of velocities for each flow not including velocities for the wetted area of the flow 5,000 cfs. Shaded cells indicate the velocities with the greatest area for a given flow..... | 4               |
| 2.0-3.           | Area (acres) of geomorphic reach with a given range of depths for each flow below and including 5,000 cfs. Shaded cells indicate the depths with the greatest area for a given flow.....  | 5               |
| 2.0-4.           | Area (acres) of geomorphic reach with a given range of velocities for each flow for below and including 5,000 cfs. Shaded cells indicate the velocities with the greatest area for a given flow. ....                                 | 6               |

**List of Attachments**

None.

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TECHNICAL MEMORANDUM 7-10

# ADDENDUM TO INSTREAM FLOW DOWNSTREAM OF ENGLEBRIGHT DAM

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## 1.0 Introduction

This addendum consists of additional depth and velocity analysis results based on the same 2D model described in the technical memorandum. Yuba County Water Agency and Relicensing Participants collaboratively agreed to use, for Project modeling, the existing Sedimentation and River Hydraulics two-dimensional Model, Version 2.1 (SRH2D v2.1) model. The model was developed by the Lower Yuba River Accord's River Management Team (RMT)<sup>1</sup> to simulate flow velocities, depths and directions in the river, excluding a 1.16-mile long inaccessible, narrow, bedrock canyon known as the Narrows Reach. The RMT collected field data to develop the model from June 2006 through June 2010. The hydraulic model was developed from October 2010 through June 2012.

There are two sets of tables presented here. The first sets of tables are a supplement to the tables presented in section 3.3 of the technical memorandum and describe the wetted areas outside (not including) the in-channel wetted area which was agreed by the relicensing participants to be 5,000 cubic feet per second (cfs). Modeled wetted areas outside the wetted area for 5,000 cfs are meant to represent the floodplain at each of the modeled flows summarized. Those tables describe areas within each geomorphic reach by binned depths and velocities. The second set of tables describe the same attributes but for several modeled flows below and including 5,000 cfs which represent the agreed to in-channel area.

## 2.0 Floodplain Inundation Results

Floodplain Inundation Results are displayed in Tables 2.0-1 through 2.0-4 below.

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<sup>1</sup> The RMT includes representatives of YCWA; the United States Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service; United States Department of Interior, Fish and Wildlife Service; Cal Fish and Wildlife; Pacific Gas and Electric Company; California Department of Water Resources and the non-governmental organizations that are parties to the Lower Yuba Accord Fisheries Agreement.

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**Table 2.0-1. Area (acres) of geomorphic reach with a given range of depths for each flow not including depths for the wetted area of the flow 5,000 cfs. Shaded cells indicate the depths with the greatest area for a given flow.**

| Flow (cfs)   | Englebright Dam Geomorphic Reach |                |                |                |               |             |             | Timbuctoo Geomorphic Reach |                |                |                |               |             |              | Parks Bar Geomorphic Reach |                |                |                |               |             |            |               |
|--------------|----------------------------------|----------------|----------------|----------------|---------------|-------------|-------------|----------------------------|----------------|----------------|----------------|---------------|-------------|--------------|----------------------------|----------------|----------------|----------------|---------------|-------------|------------|---------------|
|              | 0 - 0.5 (ft)                     | 0.5 - 1.5 (ft) | 1.5 - 3.0 (ft) | 3.0 - 5.0 (ft) | 5.0 - 15 (ft) | >15 (ft)    | Total       | 0 - 0.5 (ft)               | 0.5 - 1.5 (ft) | 1.5 - 3.0 (ft) | 3.0 - 5.0 (ft) | 5.0 - 15 (ft) | >15 (ft)    | Total        | 0 - 0.5 (ft)               | 0.5 - 1.5 (ft) | 1.5 - 3.0 (ft) | 3.0 - 5.0 (ft) | 5.0 - 15 (ft) | >15 (ft)    | Total      |               |
| 7,500        | 0.6                              | 0.6            | 0.1            | 0.0            | 0.0           | 0.0         | 1.3         | 10.0                       | 2.5            | 0.3            | 0.0            | 0.0           | 0.0         | 12.8         | 15.0                       | 11.7           | 1.0            | 0.0            | 0.0           | 0.0         | 0.0        | 27.7          |
| 10,000       | 0.8                              | 0.9            | 0.9            | 0.1            | 0.0           | 0.0         | 2.7         | 13.5                       | 11.4           | 2.3            | 0.2            | 0.0           | 0.0         | 27.4         | 20.7                       | 24.2           | 12.2           | 1.4            | 0.0           | 0.0         | 0.0        | 58.5          |
| 15,000       | 0.9                              | 1.0            | 1.2            | 1.4            | 0.2           | 0.0         | 4.7         | 13.6                       | 15.4           | 16.5           | 3.3            | 0.2           | 0.0         | 49.0         | 29.6                       | 33.3           | 38.2           | 20.1           | 1.7           | 0.0         | 0.0        | 122.9         |
| 21,100       | 0.7                              | 0.7            | 1.3            | 1.6            | 1.7           | 0.0         | 6.0         | 14.2                       | 15.2           | 18.8           | 19.7           | 2.7           | 0.0         | 70.6         | 33.5                       | 39.7           | 48.8           | 49.7           | 19.3          | 0.0         | 0.0        | 191.0         |
| 30,000       | 0.6                              | 0.6            | 0.8            | 1.3            | 4.3           | 0.0         | 7.6         | 9.8                        | 14.9           | 18.4           | 24.0           | 24.4          | 0.0         | 91.5         | 24.6                       | 33.0           | 53.7           | 66.9           | 79.2          | 0.0         | 0.0        | 257.4         |
| 42,200       | 0.6                              | 0.6            | 0.8            | 1.1            | 5.7           | 0.0         | 8.8         | 8.6                        | 9.2            | 15.6           | 25.3           | 53.5          | 0.0         | 112.2        | 22.0                       | 29.4           | 41.8           | 69.6           | 145.0         | 0.0         | 0.0        | 307.8         |
| 84,400       | 0.6                              | 0.6            | 0.7            | 0.9            | 5.2           | 4.1         | 12.1        | 4.0                        | 4.4            | 5.3            | 8.0            | 100.3         | 16.2        | 138.2        | 13.2                       | 17.5           | 31.0           | 52.1           | 299.2         | 17.2        | 0.0        | 430.2         |
| 110,400      | 0.5                              | 0.5            | 0.7            | 0.9            | 4.7           | 5.9         | 13.2        | 3.2                        | 3.5            | 4.6            | 6.1            | 75.6          | 52.6        | 145.6        | 10.1                       | 11.2           | 18.8           | 32.8           | 307.9         | 68.8        | 0.0        | 449.6         |
| <b>Total</b> | <b>5.3</b>                       | <b>5.5</b>     | <b>6.5</b>     | <b>7.3</b>     | <b>21.8</b>   | <b>10.0</b> | <b>56.4</b> | <b>76.9</b>                | <b>76.5</b>    | <b>81.8</b>    | <b>86.6</b>    | <b>256.7</b>  | <b>68.8</b> | <b>647.3</b> | <b>168.7</b>               | <b>200.0</b>   | <b>245.5</b>   | <b>292.6</b>   | <b>852.3</b>  | <b>86.0</b> | <b>0.0</b> | <b>1845.1</b> |

| Flow (cfs)   | Dry Creek Geomorphic Reach |                |                |                |               |             |              | Daguerre Point Dam Geomorphic Reach |                |                |                |               |              |               | Hallwood Geomorphic Reach <sup>1</sup> |                |                |                |               |             |            |              |
|--------------|----------------------------|----------------|----------------|----------------|---------------|-------------|--------------|-------------------------------------|----------------|----------------|----------------|---------------|--------------|---------------|--|----------------|----------------|----------------|---------------|-------------|------------|--------------|
|              | 0 - 0.5 (ft)               | 0.5 - 1.5 (ft) | 1.5 - 3.0 (ft) | 3.0 - 5.0 (ft) | 5.0 - 15 (ft) | >15 (ft)    | Total        | 0 - 0.5 (ft)                        | 0.5 - 1.5 (ft) | 1.5 - 3.0 (ft) | 3.0 - 5.0 (ft) | 5.0 - 15 (ft) | >15 (ft)     | Total         | 0 - 0.5 (ft)                           | 0.5 - 1.5 (ft) | 1.5 - 3.0 (ft) | 3.0 - 5.0 (ft) | 5.0 - 15 (ft) | >15 (ft)    | Total      |              |
| 7,500        | 13.6                       | 10.4           | 1.0            | 0.0            | 0.0           | 0.0         | 25.0         | 14.0                                | 12.8           | 1.0            | 0.0            | 0.0           | 0.0          | 27.8          | 16.3                                   | 19.2           | 3.3            | 0.2            | 0.0           | 0.0         | 0.0        | 39.0         |
| 10,000       | 19.6                       | 21.6           | 9.2            | 3.0            | 0.2           | 0.0         | 53.6         | 17.8                                | 21.5           | 15.3           | 0.4            | 0.0           | 0.0          | 55.0          | 22.5                                   | 29.2           | 26.0           | 3.0            | 0.1           | 0.0         | 0.0        | 80.8         |
| 15,000       | 16.6                       | 28.6           | 32.1           | 12.6           | 3.5           | 0.0         | 93.4         | 33.5                                | 43.3           | 56.3           | 30.4           | 3.9           | 0.0          | 167.4         | 19.4                                   | 30.3           | 45.3           | 42.4           | 10.2          | 0.0         | 0.0        | 147.6        |
| 21,100       | 12.4                       | 17.5           | 36.2           | 39.5           | 13.5          | 0.0         | 119.1        | 29.3                                | 41.6           | 59.4           | 75.5           | 30.7          | 0.0          | 236.5         | 19.9                                   | 28.2           | 40.4           | 56.2           | 55.5          | 0.0         | 0.0        | 200.2        |
| 30,000       | 9.5                        | 13.4           | 22.7           | 44.3           | 50.8          | 0.0         | 140.7        | 19.0                                | 31.3           | 56.2           | 81.2           | 111.4         | 0.0          | 299.1         | 12.0                                   | 14.0           | 22.2           | 48.4           | 144.8         | 1.7         | 0.0        | 243.1        |
| 42,200       | 6.1                        | 8.5            | 15.8           | 28.8           | 93.5          | 0.0         | 152.7        | 13.8                                | 18.1           | 37.4           | 70.5           | 187.9         | 0.0          | 327.7         | 8.3                                    | 11.5           | 26.2           | 31.1           | 184.1         | 22.2        | 0.0        | 283.4        |
| 84,400       | 4.5                        | 4.3            | 5.6            | 10.1           | 141.7         | 6.2         | 172.4        | 8.0                                 | 8.1            | 9.5            | 19.8           | 274.5         | 48.1         | 368.0         | --                                     | --             | --             | --             | --            | --          | --         | --           |
| 110,400      | 5.2                        | 7.6            | 7.3            | 8.0            | 120.0         | 43.9        | 192.0        | 10.0                                | 9.9            | 12.2           | 15.1           | 256.7         | 107.7        | 411.6         | --                                     | --             | --             | --             | --            | --          | --         | --           |
| <b>Total</b> | <b>87.5</b>                | <b>111.9</b>   | <b>129.9</b>   | <b>146.3</b>   | <b>423.2</b>  | <b>50.1</b> | <b>948.9</b> | <b>145.4</b>                        | <b>186.6</b>   | <b>247.3</b>   | <b>292.9</b>   | <b>865.1</b>  | <b>155.8</b> | <b>1893.1</b> | <b>98.4</b>                            | <b>132.4</b>   | <b>163.4</b>   | <b>181.3</b>   | <b>394.7</b>  | <b>23.9</b> | <b>0.0</b> | <b>994.1</b> |

<sup>1</sup> Values for Hallwood Geomorphic Reach at 84,400 cfs and 110,400 cfs do not include the entire reach; therefore those values are not represented.

| Flow (cfs)   | Marysville Geomorphic Reach <sup>2</sup> |                |                |                |               |            |              |
|--------------|--|----------------|----------------|----------------|---------------|------------|--------------|
|              | 0 - 0.5 (ft)                             | 0.5 - 1.5 (ft) | 1.5 - 3.0 (ft) | 3.0 - 5.0 (ft) | 5.0 - 15 (ft) | >15 (ft)   | Total        |
| 7,500        | 3.8                                      | 3.4            | 1.1            | 0.0            | 0.0           | 0.0        | 8.3          |
| 10,000       | 4.5                                      | 4.7            | 4.3            | 0.9            | 0.0           | 0.0        | 14.4         |
| 15,000       | 5.1                                      | 5.5            | 7.5            | 7.4            | 2.6           | 0.0        | 28.1         |
| 21,100       | 8.2                                      | 8.9            | 9.1            | 8.6            | 13.0          | 0.0        | 47.8         |
| 30,000       | 7.7                                      | 9.0            | 14.1           | 18.1           | 27.2          | 0.4        | 76.5         |
| 42,200       | 8.0                                      | 12.6           | 12.0           | 15.4           | 58.3          | 4.2        | 110.5        |
| 84,400       | --                                       | --             | --             | --             | --            | --         | --           |
| 110,400      | --                                       | --             | --             | --             | --            | --         | --           |
| <b>Total</b> | <b>37.3</b>                              | <b>44.1</b>    | <b>48.1</b>    | <b>50.4</b>    | <b>101.1</b>  | <b>4.6</b> | <b>285.6</b> |

<sup>2</sup> Marysville Geomorphic Reach had no measurements at discharges of 84,400 cfs or 110,400 cfs.

**Table 2.0-2. Area (acres) of geomorphic reach with a given range of velocities for each flow not including velocities for the wetted area of the flow 5,000 cfs. Shaded cells indicate the velocities with the greatest area for a given flow.**

| Flow (cfs)   | Englebright Dam Geomorphic Reach |                  |                  |                  |                  |             |             | Timbuctoo Geomorphic Reach |                  |                  |                  |                  |              |              | Parks Bar Geomorphic Reach |                  |                  |                  |                  |              |               |
|--------------|----------------------------------|------------------|------------------|------------------|------------------|-------------|-------------|----------------------------|------------------|------------------|------------------|------------------|--------------|--------------|----------------------------|------------------|------------------|------------------|------------------|--------------|---------------|
|              | 0 - 0.5 (ft/s)                   | 0.5 - 1.0 (ft/s) | 1.0 - 1.5 (ft/s) | 1.5 - 2.0 (ft/s) | 2.0 - 4.0 (ft/s) | >4.0 (ft/s) | Total       | 0 - 0.5 (ft/s)             | 0.5 - 1.0 (ft/s) | 1.0 - 1.5 (ft/s) | 1.5 - 2.0 (ft/s) | 2.0 - 4.0 (ft/s) | >4.0 (ft/s)  | Total        | 0 - 0.5 (ft/s)             | 0.5 - 1.0 (ft/s) | 1.0 - 1.5 (ft/s) | 1.5 - 2.0 (ft/s) | 2.0 - 4.0 (ft/s) | >4.0 (ft/s)  | Total         |
| 7,500        | 0.9                              | 0.2              | 0.1              | 0.1              | 0.1              | 0.0         | 1.4         | 7.2                        | 2.4              | 1.3              | 0.7              | 1.1              | 0.1          | 12.8         | 11.8                       | 5.8              | 4.3              | 2.8              | 2.9              | 0.1          | 27.7          |
| 10,000       | 1.5                              | 0.4              | 0.2              | 0.1              | 0.3              | 0.1         | 2.6         | 11.8                       | 4.6              | 3.0              | 2.2              | 4.6              | 1.3          | 27.5         | 19.0                       | 8.8              | 8.9              | 7.7              | 13.4             | 0.7          | 58.5          |
| 15,000       | 1.6                              | 0.9              | 0.5              | 0.4              | 0.7              | 0.6         | 4.7         | 13.9                       | 6.7              | 5.5              | 4.3              | 12.1             | 6.5          | 49.0         | 41.0                       | 13.0             | 11.7             | 11.9             | 38.1             | 7.3          | 123.0         |
| 21,100       | 1.7                              | 0.9              | 0.6              | 0.5              | 1.2              | 1.1         | 6.0         | 16.4                       | 7.4              | 6.2              | 5.3              | 18.1             | 17.3         | 70.7         | 48.9                       | 18.8             | 20.6             | 21.1             | 60.8             | 20.9         | 191.1         |
| 30,000       | 1.2                              | 0.9              | 0.7              | 0.5              | 1.6              | 2.6         | 7.5         | 8.5                        | 6.7              | 7.2              | 7.0              | 26.6             | 35.5         | 91.5         | 41.9                       | 15.9             | 18.8             | 19.3             | 91.6             | 69.8         | 257.3         |
| 42,200       | 1.9                              | 1.1              | 0.7              | 0.6              | 1.5              | 3.0         | 8.8         | 9.0                        | 6.8              | 6.1              | 5.7              | 25.0             | 59.5         | 112.1        | 45.2                       | 18.9             | 21.8             | 26.0             | 94.7             | 101.3        | 307.9         |
| 84,400       | 2.0                              | 1.4              | 0.9              | 0.7              | 1.7              | 5.4         | 12.1        | 6.3                        | 4.6              | 4.1              | 4.1              | 17.8             | 101.3        | 138.2        | 58.8                       | 24.6             | 18.6             | 19.3             | 88.8             | 220.1        | 430.2         |
| 110,400      | 1.5                              | 1.4              | 1.0              | 0.8              | 2.2              | 6.4         | 13.3        | 5.8                        | 4.7              | 4.1              | 3.7              | 15.9             | 111.4        | 145.6        | 53.7                       | 24.5             | 20.1             | 19.3             | 72.0             | 260.0        | 449.6         |
| <b>Total</b> | <b>12.3</b>                      | <b>7.2</b>       | <b>4.7</b>       | <b>3.7</b>       | <b>9.3</b>       | <b>19.2</b> | <b>56.4</b> | <b>78.9</b>                | <b>43.9</b>      | <b>37.5</b>      | <b>33.0</b>      | <b>121.2</b>     | <b>332.9</b> | <b>647.4</b> | <b>320.3</b>               | <b>130.3</b>     | <b>124.8</b>     | <b>127.4</b>     | <b>462.3</b>     | <b>680.2</b> | <b>1845.3</b> |

| Flow (cfs)   | Dry Creek Geomorphic Reach |                  |                  |                  |                  |              |              | Daguerre Point Dam Geomorphic Reach |                  |                  |                  |                  |              |               | Hallwood Geomorphic Reach <sup>1</sup> |                  |                  |                  |                  |             |              |
|--------------|----------------------------|------------------|------------------|------------------|------------------|--------------|--------------|-------------------------------------|------------------|------------------|------------------|------------------|--------------|---------------|--|------------------|------------------|------------------|------------------|-------------|--------------|
|              | 0 - 0.5 (ft/s)             | 0.5 - 1.0 (ft/s) | 1.0 - 1.5 (ft/s) | 1.5 - 2.0 (ft/s) | 2.0 - 4.0 (ft/s) | >4.0 (ft/s)  | Total        | 0 - 0.5 (ft/s)                      | 0.5 - 1.0 (ft/s) | 1.0 - 1.5 (ft/s) | 1.5 - 2.0 (ft/s) | 2.0 - 4.0 (ft/s) | >4.0 (ft/s)  | Total         | 0 - 0.5 (ft/s)                         | 0.5 - 1.0 (ft/s) | 1.0 - 1.5 (ft/s) | 1.5 - 2.0 (ft/s) | 2.0 - 4.0 (ft/s) | >4.0 (ft/s) | Total        |
| 7,500        | 13.8                       | 4.8              | 3.3              | 1.8              | 1.4              | 0.0          | 25.1         | 13.9                                | 5.5              | 4.6              | 2.3              | 1.5              | 0.0          | 27.8          | 19.1                                   | 7.9              | 6.7              | 3.8              | 1.5              | 0.0         | 39.0         |
| 10,000       | 24.7                       | 9.5              | 6.9              | 5.0              | 7.3              | 0.1          | 53.5         | 24.7                                | 7.9              | 7.6              | 6.1              | 8.7              | 0.1          | 55.1          | 35.4                                   | 14.4             | 13.1             | 9.3              | 8.6              | 0.1         | 80.9         |
| 15,000       | 32.9                       | 9.2              | 12.4             | 11.8             | 25.4             | 1.7          | 93.4         | 53.7                                | 27.1             | 26.9             | 21.0             | 36.7             | 1.9          | 167.3         | 39.8                                   | 22.3             | 23.9             | 22.8             | 37.5             | 1.4         | 147.7        |
| 21,100       | 38.4                       | 12.3             | 12.2             | 10.8             | 38.2             | 7.2          | 119.1        | 45.3                                | 39.5             | 40.9             | 34.2             | 66.7             | 10.0         | 236.6         | 54.6                                   | 24.1             | 26.6             | 24.1             | 63.2             | 7.6         | 200.2        |
| 30,000       | 35.8                       | 5.9              | 7.0              | 10.1             | 51.5             | 30.4         | 140.7        | 36.3                                | 21.7             | 26.9             | 36.9             | 141.0            | 36.3         | 299.1         | 29.6                                   | 28.2             | 31.2             | 35.7             | 100.6            | 17.9        | 243.2        |
| 42,200       | 34.1                       | 8.1              | 12.2             | 13.2             | 41.2             | 43.9         | 152.7        | 36.5                                | 25.0             | 39.6             | 41.3             | 114.8            | 70.6         | 327.8         | 45.6                                   | 35.9             | 29.3             | 23.9             | 100.6            | 48.2        | 283.5        |
| 84,400       | 32.6                       | 7.9              | 7.6              | 8.0              | 38.2             | 78.2         | 172.5        | 41.1                                | 18.4             | 25.3             | 31.0             | 102.0            | 150.1        | 367.9         | --                                     | --               | --               | --               | --               | --          | --           |
| 110,400      | 38.6                       | 10.7             | 9.8              | 8.5              | 32.4             | 91.8         | 191.8        | 68.3                                | 23.3             | 25.6             | 28.5             | 87.6             | 178.3        | 411.6         | --                                     | --               | --               | --               | --               | --          | --           |
| <b>Total</b> | <b>250.9</b>               | <b>68.4</b>      | <b>71.4</b>      | <b>69.2</b>      | <b>235.6</b>     | <b>253.3</b> | <b>948.8</b> | <b>319.8</b>                        | <b>168.4</b>     | <b>197.4</b>     | <b>201.3</b>     | <b>559.0</b>     | <b>447.3</b> | <b>1893.2</b> | <b>224.1</b>                           | <b>132.8</b>     | <b>130.8</b>     | <b>119.6</b>     | <b>312.0</b>     | <b>75.2</b> | <b>994.5</b> |

<sup>1</sup> Values for Hallwood Geomorphic Reach at 84,400 cfs and 110,400 cfs do not include the entire reach, therefore values are not presented.

| Flow (cfs)   | Marysville Geomorphic Reach <sup>2</sup> |                  |                  |                  |                  |             |              |
|--------------|--|------------------|------------------|------------------|------------------|-------------|--------------|
|              | 0 - 0.5 (ft/s)                           | 0.5 - 1.0 (ft/s) | 1.0 - 1.5 (ft/s) | 1.5 - 2.0 (ft/s) | 2.0 - 4.0 (ft/s) | >4.0 (ft/s) | Total        |
| 7,500        | 5.5                                      | 1.3              | 0.8              | 0.5              | 0.4              | 0.0         | 8.5          |
| 10,000       | 6.5                                      | 3.1              | 1.8              | 1.5              | 1.5              | 0.0         | 14.4         |
| 15,000       | 7.9                                      | 4.1              | 3.8              | 4.3              | 7.6              | 0.6         | 28.3         |
| 21,100       | 13.7                                     | 6.7              | 5.2              | 4.9              | 15.0             | 2.4         | 47.9         |
| 30,000       | 21.1                                     | 7.6              | 6.8              | 7.0              | 26.4             | 7.6         | 76.5         |
| 42,200       | 32.2                                     | 12.3             | 11.0             | 9.0              | 28.7             | 17.1        | 110.3        |
| 84,400       | --                                       | --               | --               | --               | --               | --          | --           |
| 110,400      | --                                       | --               | --               | --               | --               | --          | --           |
| <b>Total</b> | <b>86.9</b>                              | <b>35.1</b>      | <b>29.4</b>      | <b>27.2</b>      | <b>79.6</b>      | <b>27.7</b> | <b>285.9</b> |

<sup>2</sup> Marysville Geomorphic Reach had no measurements at discharges of 84,400 cfs or 110,400 cfs.



**Table 2.0-3. Area (acres) of geomorphic reach with a given range of depths for each flow below and including 5,000 cfs. Shaded cells indicate the depths with the greatest area for a given flow.**

| Flow (cfs)   | Englebright Dam Geomorphic Reach |                |                |                |               |            |             | Timbuctoo Geomorphic Reach |                |                |                |               |            |              | Parks Bar Geomorphic Reach |                |                |                |               |            |              |
|--------------|----------------------------------|----------------|----------------|----------------|---------------|------------|-------------|----------------------------|----------------|----------------|----------------|---------------|------------|--------------|----------------------------|----------------|----------------|----------------|---------------|------------|--------------|
|              | 0 - 0.5 (ft)                     | 0.5 - 1.5 (ft) | 1.5 - 3.0 (ft) | 3.0 - 5.0 (ft) | 5.0 - 15 (ft) | >15 (ft)   | Total       | 0 - 0.5 (ft)               | 0.5 - 1.5 (ft) | 1.5 - 3.0 (ft) | 3.0 - 5.0 (ft) | 5.0 - 15 (ft) | >15 (ft)   | Total        | 0 - 0.5 (ft)               | 0.5 - 1.5 (ft) | 1.5 - 3.0 (ft) | 3.0 - 5.0 (ft) | 5.0 - 15 (ft) | >15 (ft)   | Total        |
| 1700         | 0.9                              | 1.0            | 1.6            | 2.2            | 7.4           | 0.1        | 13.2        | 10.9                       | 16.2           | 25.4           | 24.2           | 21.8          | 0.7        | 99.2         | 15.4                       | 19.3           | 32.4           | 40.7           | 14.7          | 0.0        | 122.5        |
| 2000         | 0.9                              | 0.9            | 1.6            | 2.1            | 7.8           | 0.1        | 13.4        | 8.9                        | 14.8           | 24.3           | 26.4           | 23.5          | 0.8        | 98.7         | 16.2                       | 20.3           | 29.0           | 45.2           | 18.1          | 0.1        | 128.9        |
| 2500         | 0.8                              | 0.9            | 1.4            | 2.1            | 8.4           | 0.1        | 13.7        | 10.6                       | 14.5           | 23.2           | 29.3           | 26.5          | 0.8        | 104.9        | 16.2                       | 21.5           | 27.3           | 47.4           | 24.8          | 0.1        | 137.3        |
| 3000         | 0.9                              | 0.9            | 1.3            | 2.1            | 9.0           | 0.1        | 14.3        | 10.7                       | 13.8           | 22.1           | 30.7           | 30.0          | 0.9        | 108.2        | 16.3                       | 21.8           | 27.7           | 46.9           | 31.9          | 0.1        | 144.7        |
| 4000         | 0.8                              | 0.9            | 1.2            | 1.9            | 9.8           | 0.3        | 14.9        | 10.7                       | 13.1           | 21.0           | 31.0           | 36.8          | 1.2        | 113.8        | 14.7                       | 20.4           | 30.5           | 41.9           | 47.6          | 0.2        | 155.3        |
| 5000         | 0.8                              | 0.9            | 1.1            | 1.8            | 10.4          | 0.6        | 15.6        | 10.9                       | 12.7           | 20.0           | 29.9           | 43.6          | 1.6        | 118.7        | 14.1                       | 19.9           | 31.2           | 36.8           | 62.7          | 0.3        | 165.0        |
| <b>Total</b> | <b>5.1</b>                       | <b>5.5</b>     | <b>8.2</b>     | <b>12.2</b>    | <b>52.8</b>   | <b>1.3</b> | <b>85.1</b> | <b>62.7</b>                | <b>85.1</b>    | <b>136.0</b>   | <b>171.5</b>   | <b>182.2</b>  | <b>6.0</b> | <b>643.5</b> | <b>92.9</b>                | <b>123.2</b>   | <b>178.1</b>   | <b>258.9</b>   | <b>199.8</b>  | <b>0.8</b> | <b>853.7</b> |

| Flow (cfs)   | Dry Creek Geomorphic Reach |                |                |                |               |            |              | Daguerre Point Dam Geomorphic Reach |                |                |                |               |            |              | Hallwood Geomorphic Reach |                |                |                |               |            |              |
|--------------|----------------------------|----------------|----------------|----------------|---------------|------------|--------------|-------------------------------------|----------------|----------------|----------------|---------------|------------|--------------|---------------------------|----------------|----------------|----------------|---------------|------------|--------------|
|              | 0 - 0.5 (ft)               | 0.5 - 1.5 (ft) | 1.5 - 3.0 (ft) | 3.0 - 5.0 (ft) | 5.0 - 15 (ft) | >15 (ft)   | Total        | 0 - 0.5 (ft)                        | 0.5 - 1.5 (ft) | 1.5 - 3.0 (ft) | 3.0 - 5.0 (ft) | 5.0 - 15 (ft) | >15 (ft)   | Total        | 0 - 0.5 (ft)              | 0.5 - 1.5 (ft) | 1.5 - 3.0 (ft) | 3.0 - 5.0 (ft) | 5.0 - 15 (ft) | >15 (ft)   | Total        |
| 1700         | 10.1                       | 12.2           | 21.7           | 23.4           | 8.9           | 0.2        | 76.5         | 13.0                                | 15.8           | 23.8           | 33.6           | 11.9          | 0.0        | 98.1         | 12.8                      | 15.0           | 30.7           | 44.8           | 24.5          | 0.0        | 127.8        |
| 2000         | 11.2                       | 12.1           | 21.1           | 24.7           | 11.0          | 0.2        | 80.3         | 13.2                                | 16.1           | 20.6           | 37.0           | 15.2          | 0.0        | 102.1        | 12.6                      | 15.6           | 27.7           | 46.3           | 30.7          | 0.0        | 132.9        |
| 2500         | 11.2                       | 13.1           | 19.5           | 26.2           | 15.4          | 0.2        | 85.6         | 13.8                                | 16.7           | 18.3           | 38.5           | 21.3          | 0.0        | 108.6        | 12.8                      | 16.8           | 24.3           | 46.1           | 41.6          | 0.0        | 141.6        |
| 3000         | 12.7                       | 15.0           | 18.4           | 26.6           | 19.6          | 0.2        | 92.5         | 15.9                                | 18.0           | 18.2           | 36.2           | 28.7          | 0.0        | 117.0        | 13.1                      | 17.1           | 22.8           | 43.9           | 52.5          | 0.0        | 149.4        |
| 4000         | 13.0                       | 17.3           | 20.1           | 26.4           | 26.9          | 0.2        | 103.9        | 16.4                                | 21.7           | 20.2           | 30.3           | 43.2          | 0.0        | 131.8        | 17.3                      | 20.1           | 23.5           | 37.6           | 71.6          | 0.1        | 170.2        |
| 5000         | 12.6                       | 17.6           | 23.3           | 25.9           | 33.9          | 0.2        | 113.5        | 17.4                                | 22.9           | 23.2           | 25.0           | 56.3          | 0.1        | 144.9        | 18.8                      | 24.7           | 25.8           | 32.1           | 88.2          | 0.1        | 189.7        |
| <b>Total</b> | <b>70.8</b>                | <b>87.3</b>    | <b>124.1</b>   | <b>153.2</b>   | <b>115.7</b>  | <b>1.2</b> | <b>552.3</b> | <b>89.7</b>                         | <b>111.2</b>   | <b>124.3</b>   | <b>200.6</b>   | <b>176.6</b>  | <b>0.1</b> | <b>702.5</b> | <b>87.4</b>               | <b>109.3</b>   | <b>154.8</b>   | <b>250.8</b>   | <b>309.1</b>  | <b>0.2</b> | <b>911.6</b> |

| Flow (cfs)   | Marysville Geomorphic Reach |                |                |                |               |             |              |
|--------------|-----------------------------|----------------|----------------|----------------|---------------|-------------|--------------|
|              | 0 - 0.5 (ft)                | 0.5 - 1.5 (ft) | 1.5 - 3.0 (ft) | 3.0 - 5.0 (ft) | 5.0 - 15 (ft) | >15 (ft)    | Total        |
| 1700         | 3.7                         | 5.1            | 7.3            | 12.6           | 39.6          | 1.3         | 69.6         |
| 2000         | 3.6                         | 4.9            | 6.9            | 11.9           | 42.1          | 1.6         | 71.0         |
| 2500         | 3.5                         | 4.3            | 6.9            | 10.0           | 46.4          | 2.1         | 73.2         |
| 3000         | 3.5                         | 4.0            | 6.7            | 9.5            | 48.6          | 2.9         | 75.2         |
| 4000         | 4.1                         | 4.3            | 5.7            | 9.0            | 52.1          | 4.9         | 80.1         |
| 5000         | 3.6                         | 4.9            | 5.5            | 8.6            | 54.2          | 6.5         | 83.3         |
| <b>Total</b> | <b>22.0</b>                 | <b>27.5</b>    | <b>39.0</b>    | <b>61.6</b>    | <b>283.0</b>  | <b>19.3</b> | <b>452.4</b> |

**Table 2.0-4. Area (acres) of geomorphic reach with a given range of velocities for each flow for below and including 5,000 cfs. Shaded cells indicate the velocities with the greatest area for a given flow.**

| Flow (cfs)   | Englebright Dam Geomorphic Reach |                  |                  |                  |                  |             |             | Timbuctoo Geomorphic Reach |                  |                  |                  |                  |              |              | Parks Bar Geomorphic Reach |                  |                  |                  |                  |              |              |
|--------------|----------------------------------|------------------|------------------|------------------|------------------|-------------|-------------|----------------------------|------------------|------------------|------------------|------------------|--------------|--------------|----------------------------|------------------|------------------|------------------|------------------|--------------|--------------|
|              | 0 - 0.5 (ft/s)                   | 0.5 - 1.0 (ft/s) | 1.0 - 1.5 (ft/s) | 1.5 - 2.0 (ft/s) | 2.0 - 4.0 (ft/s) | >4.0 (ft/s) | Total       | 0 - 0.5 (ft/s)             | 0.5 - 1.0 (ft/s) | 1.0 - 1.5 (ft/s) | 1.5 - 2.0 (ft/s) | 2.0 - 4.0 (ft/s) | >4.0 (ft/s)  | Total        | 0 - 0.5 (ft/s)             | 0.5 - 1.0 (ft/s) | 1.0 - 1.5 (ft/s) | 1.5 - 2.0 (ft/s) | 2.0 - 4.0 (ft/s) | >4.0 (ft/s)  | Total        |
| 1700         | 2.7                              | 1.8              | 1.5              | 1.3              | 4.0              | 1.8         | 13.1        | 12.8                       | 9.1              | 12.7             | 16.6             | 33.1             | 15.0         | 99.3         | 16.9                       | 8.9              | 10.5             | 15.9             | 53.5             | 16.8         | 122.5        |
| 2000         | 2.5                              | 1.8              | 1.4              | 1.3              | 4.2              | 2.3         | 13.5        | 10.4                       | 7.6              | 9.9              | 15.0             | 37.6             | 18.2         | 98.7         | 17.8                       | 8.7              | 10.2             | 14.1             | 56.5             | 21.6         | 128.9        |
| 2500         | 2.3                              | 1.7              | 1.3              | 1.1              | 4.3              | 3.1         | 13.8        | 12.0                       | 7.0              | 7.9              | 11.1             | 42.6             | 24.3         | 104.9        | 17.7                       | 8.2              | 9.9              | 12.3             | 58.7             | 30.4         | 137.2        |
| 3000         | 2.1                              | 1.7              | 1.3              | 1.1              | 4.3              | 3.8         | 14.3        | 12.2                       | 6.6              | 6.8              | 8.6              | 43.2             | 30.9         | 108.3        | 17.2                       | 9.0              | 9.3              | 11.6             | 58.4             | 39.4         | 144.9        |
| 4000         | 1.9                              | 1.6              | 1.3              | 1.0              | 4.1              | 5.1         | 15.0        | 11.9                       | 6.6              | 5.8              | 6.4              | 41.4             | 41.6         | 113.7        | 15.7                       | 8.4              | 9.4              | 10.6             | 56.6             | 54.5         | 155.2        |
| 5000         | 1.8                              | 1.6              | 1.2              | 1.0              | 3.8              | 6.2         | 15.6        | 11.9                       | 6.7              | 5.5              | 5.7              | 37.9             | 51.0         | 118.7        | 16.4                       | 9.0              | 9.0              | 9.7              | 54.2             | 66.7         | 165.0        |
| <b>Total</b> | <b>13.3</b>                      | <b>10.2</b>      | <b>8.0</b>       | <b>6.8</b>       | <b>24.7</b>      | <b>22.3</b> | <b>85.3</b> | <b>71.2</b>                | <b>43.6</b>      | <b>48.6</b>      | <b>63.4</b>      | <b>235.8</b>     | <b>181.0</b> | <b>643.6</b> | <b>101.7</b>               | <b>52.2</b>      | <b>58.3</b>      | <b>74.2</b>      | <b>337.9</b>     | <b>229.4</b> | <b>853.7</b> |

| Flow (cfs)   | Dry Creek Geomorphic Reach |                  |                  |                  |                  |             |              | Daguerre Point Dam Geomorphic Reach |                  |                  |                  |                  |              |              | Hallwood Geomorphic Reach <sup>1</sup> |                  |                  |                  |                  |              |              |
|--------------|----------------------------|------------------|------------------|------------------|------------------|-------------|--------------|-------------------------------------|------------------|------------------|------------------|------------------|--------------|--------------|--|------------------|------------------|------------------|------------------|--------------|--------------|
|              | 0 - 0.5 (ft/s)             | 0.5 - 1.0 (ft/s) | 1.0 - 1.5 (ft/s) | 1.5 - 2.0 (ft/s) | 2.0 - 4.0 (ft/s) | >4.0 (ft/s) | Total        | 0 - 0.5 (ft/s)                      | 0.5 - 1.0 (ft/s) | 1.0 - 1.5 (ft/s) | 1.5 - 2.0 (ft/s) | 2.0 - 4.0 (ft/s) | >4.0 (ft/s)  | Total        | 0 - 0.5 (ft/s)                         | 0.5 - 1.0 (ft/s) | 1.0 - 1.5 (ft/s) | 1.5 - 2.0 (ft/s) | 2.0 - 4.0 (ft/s) | >4.0 (ft/s)  | Total        |
| 1700         | 13.6                       | 6.4              | 8.7              | 12.1             | 30.4             | 5.1         | 76.3         | 22.8                                | 5.1              | 5.0              | 6.2              | 51.4             | 7.7          | 98.2         | 16.4                                   | 8.7              | 10.1             | 16.4             | 70.3             | 5.8          | 127.7        |
| 2000         | 14.4                       | 6.5              | 7.1              | 11.5             | 34.2             | 6.7         | 80.4         | 23.4                                | 5.7              | 5.1              | 5.4              | 52.3             | 10.2         | 102.1        | 17.0                                   | 9.2              | 9.3              | 13.3             | 76.0             | 8.1          | 132.9        |
| 2500         | 14.5                       | 6.7              | 6.7              | 8.9              | 39.0             | 9.7         | 85.5         | 24.7                                | 6.7              | 5.7              | 5.0              | 50.4             | 16.0         | 108.5        | 19.2                                   | 10.0             | 9.3              | 10.5             | 78.7             | 13.9         | 141.6        |
| 3000         | 16.8                       | 7.3              | 7.0              | 7.5              | 40.5             | 13.5        | 92.6         | 27.5                                | 8.3              | 6.7              | 5.2              | 45.6             | 23.7         | 117.0        | 20.8                                   | 10.9             | 10.1             | 9.9              | 76.6             | 21.0         | 149.3        |
| 4000         | 18.5                       | 8.7              | 8.6              | 7.6              | 38.6             | 22.0        | 104.0        | 29.6                                | 11.0             | 9.8              | 7.0              | 34.1             | 40.3         | 131.8        | 26.1                                   | 15.4             | 12.4             | 11.0             | 69.8             | 35.4         | 170.1        |
| 5000         | 19.9                       | 9.0              | 9.5              | 8.7              | 36.1             | 30.3        | 113.5        | 31.1                                | 12.6             | 12.0             | 9.0              | 25.7             | 54.5         | 144.9        | 27.8                                   | 19.8             | 16.4             | 13.5             | 60.6             | 51.6         | 189.7        |
| <b>Total</b> | <b>97.7</b>                | <b>44.6</b>      | <b>47.6</b>      | <b>56.3</b>      | <b>218.8</b>     | <b>87.3</b> | <b>552.3</b> | <b>159.1</b>                        | <b>49.4</b>      | <b>44.3</b>      | <b>37.8</b>      | <b>259.5</b>     | <b>152.4</b> | <b>702.5</b> | <b>127.3</b>                           | <b>74.0</b>      | <b>67.6</b>      | <b>74.6</b>      | <b>432.0</b>     | <b>135.8</b> | <b>911.3</b> |

| Flow (cfs)   | Marysville Geomorphic Reach <sup>1</sup> |                  |                  |                  |                  |             |              |
|--------------|--|------------------|------------------|------------------|------------------|-------------|--------------|
|              | 0 - 0.5 (ft/s)                           | 0.5 - 1.0 (ft/s) | 1.0 - 1.5 (ft/s) | 1.5 - 2.0 (ft/s) | 2.0 - 4.0 (ft/s) | >4.0 (ft/s) | Total        |
| 1700         | 10.4                                     | 12.7             | 16.2             | 13.5             | 16.1             | 0.8         | 69.7         |
| 2000         | 9.7                                      | 9.9              | 15.7             | 14.4             | 20.1             | 1.2         | 71.0         |
| 2500         | 8.9                                      | 7.8              | 13.0             | 14.9             | 26.7             | 1.9         | 73.2         |
| 3000         | 8.5                                      | 7.0              | 10.5             | 13.9             | 32.9             | 2.5         | 75.3         |
| 4000         | 9.0                                      | 6.5              | 7.3              | 11.5             | 42.0             | 3.8         | 80.1         |
| 5000         | 8.4                                      | 6.1              | 6.7              | 8.1              | 47.3             | 6.7         | 83.3         |
| <b>Total</b> | <b>54.9</b>                              | <b>50.0</b>      | <b>69.4</b>      | <b>76.3</b>      | <b>185.1</b>     | <b>16.9</b> | <b>452.6</b> |