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**TABLE 7-1****OU5 ROD WF5.5 REMEDIATION LEVELS**

| <i>Parameter</i>               | <i>Remediation Levels at WF5.5 Required to Meet Water Quality Standards at Upstream Boundary of Alamosa River Segment 3c<sup>1</sup></i> |                         |
|--------------------------------|--|-------------------------|
|                                | <i>Low-Flow (µg/L)</i>   | <i>High-Flow (µg/L)</i> |
| Aluminum (total)               | 5,000  | 5,000                   |
| Cadmium (total)                | 2  | 14                      |
| Copper (total)                 | 35 to 400 <sup>2</sup>   | 1,550                   |
| Iron (total)                   | 25,000   | 55,000                  |
| Manganese (total)              | 15,000   | 22,000                  |
| Zinc (total)                   | 2,800  | 2,450                   |
| Minimum pH (s.u.) <sup>3</sup> | 6.6  | 5.1                     |

## Notes:

1. Remediation levels are estimated for times when the SMSS Water Treatment Plant is operating and discharging effluent to Wightman Fork (typically mid-May through October). Remediation levels are based on model predictions when the Alamosa River upstream of Wightman Fork has a low-flow pH of 4.8 and a high-flow pH of 6.9.
2. The model predicts that if the pH of the Alamosa River upstream of Wightman Fork is between 5 and 6 during low flow, which is about one unit higher than the value used to estimate the 35 µg/L remediation level for copper, then the copper remediation level could be in the range of 200 to 400 µg/L. This higher range of remediation levels for copper should be achievable during the majority of the operational year.
3. Minimum pH values could be lower depending on the pH of the Alamosa River upstream of Wightman Fork.

**TABLE 7-2**  
**PERCENTAGE COVER FOR SUMMITVILLE MINE REVEGETATION SAMPLING PLOTS AND SECTIONS IN 2002**

| <i>Section</i>                      | <i>Plot No.</i> | <i>Transect Length (m)</i> | <i>Percent Cover</i> |                    |             |              |             |               |
|-------------------------------------|-----------------|----------------------------|----------------------|--------------------|-------------|--------------|-------------|---------------|
|                                     |                 |                            | <i>Bare</i>          | <i>Total Plant</i> | <i>Forb</i> | <i>Grass</i> | <i>Rock</i> | <i>Litter</i> |
| North Waste Dump                    | 5               | 400                        | 18                   | 74                 | 8           | 66           | 1           | 6             |
|                                     | 6               | 400                        | 20                   | 74                 | 2           | 72           | 1           | 5             |
|                                     | 7               | 400                        | 19                   | 75                 | 2           | 73           | 1           | 6             |
|                                     | 8               | 400                        | 6                    | 83                 | 3           | 80           | 1           | 10            |
| Section Mean (Standard Error)       |                 |                            | 16 (3.3)             | 77 (2.2)           | 4 (1.4)     | 73 (2.8)     | 1 (0.1)     | 7 (1.1)       |
| North Waste Dump w/ Erosion Blanket | 9               | 400                        | 16                   | 73                 | 7           | 66           | 2           | 9             |
|                                     | 10              | 400                        | 27                   | 67                 | 3           | 63           | 3           | 4             |
|                                     | 11              | 400                        | 14                   | 75                 | 4           | 71           | 4           | 7             |
|                                     | 12              | 400                        | 26                   | 72                 | 2           | 69           | 2           | 0             |
| Section Mean (Standard Error)       |                 |                            | 21 (3.2)             | 72 (1.8)           | 4 (1.1)     | 67 (1.7)     | 3 (0.4)     | 5 (2.0)       |
| Chandler Groin                      | 13              | 400                        | 52                   | 44                 | 2           | 42           | 1           | 4             |
|                                     | 14              | 400                        | 51                   | 45                 | 2           | 43           | 2           | 2             |
|                                     | 15              | 400                        | 35                   | 45                 | 4           | 41           | 2           | 18            |
|                                     | 16              | 400                        | 55                   | 19                 | 0           | 19           | 6           | 20            |
| Section Mean (Standard Error)       |                 |                            | 48 (4.4)             | 38 (6.4)           | 2 (0.8)     | 36 (5.8)     | 3 (1.3)     | 11 (4.7)      |
| North Pit                           | 17              | 400                        | 50                   | 45                 | 2           | 43           | 2           | 4             |
|                                     | 18              | 400                        | 51                   | 34                 | 0           | 34           | 4           | 11            |
|                                     | 19              | 400                        | 23                   | 59                 | 5           | 54           | 2           | 16            |
|                                     | 20              | 400                        | 18                   | 80                 | 1           | 79           | 0           | 2             |
|                                     | 21              | 400                        | 68                   | 24                 | 0           | 24           | 4           | 5             |
|                                     | 22              | 400                        | 71                   | 10                 | 0           | 10           | 7           | 12            |
|                                     | 23              | 400                        | 65                   | 20                 | 1           | 19           | 3           | 12            |
|                                     | 24              | 400                        | 45                   | 32                 | 3           | 29           | 2           | 22            |
|                                     | 25              | 250                        | 57                   | 24                 | 3           | 22           | 2           | 16            |
|                                     | 26              | 400                        | 38                   | 53                 | 0           | 53           | 1           | 8             |
| Section Mean (Standard Error)       |                 |                            | 49 (5.7)             | 38 (6.7)           | 1 (0.5)     | 37 (6.6)     | 3 (0.6)     | 11 (2.0)      |

| <i>Section</i>                         | <i>Plot No.</i> | <i>Transect Length (m)</i> | <i>Percent Cover</i> |                    |             |              |             |               |
|--|-----------------|----------------------------|----------------------|--------------------|-------------|--------------|-------------|---------------|
|  |                 |                            | <i>Bare</i>          | <i>Total Plant</i> | <i>Forb</i> | <i>Grass</i> | <i>Rock</i> | <i>Litter</i> |
| <b>South Pit</b>                       | 27              | 425                        | 68                   | 18                 | 0           | 17           | 1           | 13            |
|  | 28              | 400                        | 23                   | 75                 | 1           | 75           | 0           | 1             |
|  | 29              | 400                        | 54                   | 36                 | 2           | 33           | 2           | 9             |
|  | 30              | 400                        | 24                   | 61                 | 1           | 61           | 1           | 13            |
|  | 31              | 400                        | 72                   | 7                  | 0           | 7            | 3           | 19            |
|  | 32              | 400                        | 25                   | 63                 | 10          | 53           | 2           | 10            |
|  | 33              | 400                        | 36                   | 46                 | 5           | 41           | 2           | 16            |
|  | 34              | 400                        | 87                   | 7                  | 0           | 7            | 2           | 4             |
|  | 35              | 325                        | 38                   | 56                 | 10          | 46           | 5           | 1             |
| Section Mean (Standard Error)          |                 |                            | 47 (7.9)             | 41 (8.5)           | 3 (1.4)     | 38 (7.9)     | 2 (0.5)     | 9 (2.1)       |
| <b>Upper Cropsy</b>                    | 36              | 400                        | 35                   | 57                 | 5           | 52           | 2           | 6             |
|  | 37              | 400                        | 29                   | 56                 | 2           | 54           | 3           | 12            |
| Section Mean (Standard Error)          |                 |                            | 32 (3.3)             | 57 (0.4)           | 4 (1.1)     | 53 (0.7)     | 2 (0.6)     | 9 (3.1)       |
| <b>Heap Leach Pad</b>                  | 38              | 400                        | 21                   | 64                 | 5           | 59           | 1           | 14            |
|  | 39              | 400                        | 28                   | 52                 | 5           | 47           | 2           | 19            |
|  | 40              | 400                        | 11                   | 63                 | 3           | 59           | 1           | 26            |
|  | 41              | 400                        | 10                   | 69                 | 1           | 69           | 2           | 18            |
| Section Mean (Standard Error)          |                 |                            | 17 (4.2)             | 62 (3.7)           | 3 (0.9)     | 58 (4.5)     | 1 (0.3)     | 19 (2.5)      |
| <b>Cropsy Waste Pile Footprint</b>     | 42              | 150                        | 25                   | 42                 | 0           | 42           | 3           | 30            |
|  | 43              | 400                        | 20                   | 66                 | 9           | 58           | 1           | 12            |
|  | 44              | 400                        | 11                   | 58                 | 1           | 57           | 1           | 31            |
|  | 45              | 300                        | 19                   | 54                 | 2           | 52           | 3           | 24            |
|  | 46              | 400                        | 4                    | 63                 | 0           | 62           | 1           | 33            |
| Section Mean (Standard Error)          |                 |                            | 16 (3.7)             | 57 (4.2)           | 2 (1.6)     | 54 (3.5)     | 2 (0.5)     | 26 (3.7)      |
| <b>Lower Cropsy</b>                    | 47              | 400                        | 57                   | 38                 | 2           | 36           | 4           | 1             |
|  | 48              | 400                        | 62                   | 13                 | 2           | 11           | 2           | 23            |
|  | 49              | 400                        | 16                   | 64                 | 2           | 62           | 2           | 18            |
|  | 50              | 400                        | 14                   | 55                 | 3           | 52           | 2           | 30            |
|  | 52              | 300                        | 39                   | 44                 | 0           | 44           | 2           | 14            |
|  | 53              | 250                        | 30                   | 49                 | 8           | 41           | 2           | 19            |
|  | 59              | 400                        | 59                   | 22                 | 0           | 22           | 3           | 15            |
|  | 60              | 600                        | 25                   | 64                 | 4           | 60           | 2           | 9             |
| Section Mean (Standard Error)          |                 |                            | 38 (6.9)             | 44 (6.6)           | 2 (0.9)     | 41 (6.3)     | 2 (0.3)     | 16 (3.0)      |
| <b>Lower Cropsy w/ Erosion Blanket</b> | 51              | 350                        | 19                   | 65                 | 4           | 61           | 1           | 15            |
| <b>CDP</b>                             | 54              | 375                        | 52                   | 43                 | 2           | 41           | 1           | 5             |
|  | 55              | 350                        | 56                   | 30                 | 1           | 29           | 4           | 11            |
|  | 56              | 400                        | 69                   | 21                 | 0           | 21           | 1           | 9             |
|  | 57              | 250                        | 48                   | 29                 | 6           | 24           | 1           | 21            |
|  | 58              | 400                        | 42                   | 56                 | 6           | 49           | 2           | 1             |
| Section Mean (Standard Error)          |                 |                            | 53 (4.5)             | 36 (6.1)           | 3 (1.3)     | 33 (5.4)     | 2 (0.5)     | 9 (3.4)       |

| <i>Section</i>                | <i>Plot No.</i> | <i>Transect Length (m)</i> | <i>Percent Cover</i> |                    |             |              |             |               |
|-------------------------------|-----------------|----------------------------|----------------------|--------------------|-------------|--------------|-------------|---------------|
|                               |                 |                            | <i>Bare</i>          | <i>Total Plant</i> | <i>Forb</i> | <i>Grass</i> | <i>Rock</i> | <i>Litter</i> |
| Beaver Mud Dump               | 61              | 400                        | 50                   | 41                 | 0           | 41           | 4           | 6             |
|                               | 62              | 400                        | 71                   | 22                 | 4           | 19           | 2           | 5             |
|                               | 63              | 350                        | 57                   | 36                 | 0           | 35           | 3           | 5             |
|                               | 64              | 100                        | 67                   | 3                  | 0           | 3            | 1           | 29            |
|                               | 65              | 100                        | 59                   | 17                 | 2           | 15           | 1           | 23            |
|                               | 66              | 100                        | 74                   | 4                  | 0           | 4            | 22          | 0             |
|                               | 67              | 130                        | 81                   | 5                  | 1           | 4            | 4           | 11            |
| Section Mean (Standard Error) |                 |                            | 65 (4.0)             | 18 (5.9)           | 1 (0.5)     | 17 (5.9)     | 5 (2.8)     | 11 (4.1)      |
| Water Treatment Plant         | 68              | 300                        | 62                   | 18                 | 0           | 18           | 3           | 16            |
| Missionary Seeps              | 69              | 320                        | 25                   | 63                 | 11          | 52           | 2           | 9             |
|                               | 70              | 475                        | 46                   | 48                 | 6           | 41           | 2           | 4             |
| Section Mean (Standard Error) |                 |                            | 36 (10.9)            | 55 (7.8)           | 9 (2.2)     | 47 (5.6)     | 2 (0.1)     | 7 (2.5)       |

Data from CSU (2003)

**TABLE 7-3**  
**PERCENTAGE COVER FOR SUMMITVILLE MINE REVEGETATION SAMPLING PLOTS AND SECTIONS IN 2004**

| <i>Section</i>                      | <i>Plot No.</i>               | <i>Transect Length (m)</i> | <i>Percent Cover</i> |                    |             |              |             |               |
|-------------------------------------|-------------------------------|----------------------------|----------------------|--------------------|-------------|--------------|-------------|---------------|
|                                     |                               |                            | <i>Bare</i>          | <i>Total Plant</i> | <i>Forb</i> | <i>Grass</i> | <i>Rock</i> | <i>Litter</i> |
| North Waste Dump                    | 5                             | 397                        | 12                   | 51                 | 13          | 39           | 10          | 25            |
|                                     | 6                             | 400                        | 26                   | 66                 | 8           | 59           | 0           | 8             |
|                                     | 7                             | 446                        | 21                   | 62                 | 6           | 56           | 4           | 12            |
|                                     | 8                             | 400                        | 13                   | 46                 | 2           | 44           | 2           | 40            |
|                                     | Section Mean (Standard Error) |                            | 18 (3.4)             | 56 (4.7)           | 7 (2.1)     | 49 (4.8)     | 4 (2.2)     | 21(7.2)       |
| North Waste Dump w/ Erosion Blanket | 9                             | 401                        | 18                   | 78                 | 17          | 61           | 1           | 3             |
|                                     | 10                            | 390                        | 21                   | 77                 | 5           | 72           | 0           | 1             |
|                                     | 11                            | 400                        | 4                    | 94                 | 5           | 90           | 1           | 1             |
|                                     | 12                            | 400                        | 4                    | 96                 | 15          | 81           | 0           | 1             |
|                                     | Section Mean (Standard Error) |                            | 12 (4.5)             | 86 (5.0)           | 11(3.3)     | 76 (6.1)     | 0 (0.2)     | 2 (0.6)       |
| Chandler Groin                      | 13                            | 430                        | 59                   | 19                 | 2           | 17           | 4           | 17            |
|                                     | 14                            | 381                        | 15                   | 69                 | 11          | 58           | 4           | 8             |
|                                     | 15                            | 401                        | 20                   | 78                 | 4           | 74           | 0           | 2             |
|                                     | 16                            | 357                        | 31                   | 62                 | 6           | 57           | 2           | 5             |
|                                     | Section Mean (Standard Error) |                            | 31 (9.7)             | 57 (13.0)          | 6 (1.9)     | 51 (12.1)    | 3 (1.0)     | 8 (3.3)       |
| North Pit                           | 17                            | 399                        | 29                   | 60                 | 4           | 56           | 2           | 4             |
|                                     | 18                            | 399                        | 25                   | 72                 | 3           | 69           | 1           | 3             |
|                                     | 19                            | 395                        | 26                   | 62                 | 11          | 51           | 2           | 11            |
|                                     | 20                            | 399                        | 17                   | 47                 | 3           | 44           | 4           | 22            |
|                                     | 21                            | 457                        | 64                   | 34                 | 1           | 33           | 0           | 2             |
|                                     | 22                            | 391                        | 50                   | 36                 | 7           | 29           | 7           | 7             |
|                                     | 23                            | 398                        | 34                   | 57                 | 3           | 54           | 0           | 9             |
|                                     | 24                            | 409                        | 20                   | 61                 | 8           | 54           | 2           | 17            |
|                                     | 25                            | 252                        | 21                   | 56                 | 7           | 49           | 3           | 21            |
|                                     | 26                            | 369                        | 25                   | 72                 | 1           | 71           | 0           | 2             |
|                                     | Section Mean (Standard Error) |                            | 31 (4.6)             | 56 (4.1)           | 5 (1.0)     | 51 (4.2)     | 2 (0.7)     | 10 (2.4)      |



| <i>Section</i>                         | <i>Plot No.</i>               | <i>Transect Length (m)</i> | <i>Percent Cover</i> |                    |             |              |             |               |
|--|-------------------------------|----------------------------|----------------------|--------------------|-------------|--------------|-------------|---------------|
|  |                               |                            | <i>Bare</i>          | <i>Total Plant</i> | <i>Forb</i> | <i>Grass</i> | <i>Rock</i> | <i>Litter</i> |
| <b>South Pit</b>                       | 27                            | 422                        | 22                   | 54                 | 3           | 51           | 2           | 21            |
|  | 28                            | 201                        | 23                   | 63                 | 3           | 59           | 0           | 14            |
|  | 29                            | 412                        | 21                   | 57                 | 7           | 50           | 2           | 20            |
|  | 30                            | 408                        | 21                   | 70                 | 11          | 58           | 0           | 10            |
|  | 31                            | 396                        | 46                   | 37                 | 4           | 33           | 3           | 13            |
|  | 32                            | 377                        | 14                   | 75                 | 15          | 60           | 0           | 11            |
|  | 33                            | 191                        | 36                   | 50                 | 6           | 44           | 5           | 9             |
|  | 34                            | 300                        | 30                   | 54                 | 8           | 47           | 4           | 11            |
|  | 35                            | 325                        | 22                   | 67                 | 19          | 48           | 4           | 6             |
|  | Section Mean (Standard Error) |                            |                      | 26 (3.3)           | 59 (3.8)    | 9 (1.9)      | 50 (2.9)    | 2 (0.7)       |
| <b>Upper Cropsy</b>                    | 36                            | 403                        | 27                   | 70                 | 11          | 58           | 0           | 3             |
|  | 37                            | 379                        | 43                   | 45                 | 6           | 40           | 2           | 8             |
|  | Section Mean (Standard Error) |                            |                      | 35 (7.7)           | 57 (12.3)   | 8 (2.9)      | 49 (9.4)    | 1 (0.9)       |
| <b>Heap Leach Pad</b>                  | 38                            | 398                        | 26                   | 62                 | 7           | 55           | 1           | 11            |
|  | 39                            | 401                        | 36                   | 53                 | 4           | 49           | 0           | 11            |
|  | 40                            | 401                        | 18                   | 45                 | 4           | 41           | 2           | 33            |
|  | 41                            | 408                        | 24                   | 47                 | 6           | 40           | 2           | 27            |
|  | Section Mean (Standard Error) |                            |                      | 26 (3.7)           | 52 (3.9)    | 5 (0.8)      | 46 (3.5)    | 1 (0.5)       |
| <b>Cropsy Waste Pile Footprint</b>     | 42                            | 150                        | 57                   | 35                 | 7           | 28           | 4           | 5             |
|  | 43                            | 394                        | 32                   | 44                 | 11          | 33           | 1           | 15            |
|  | 44                            | 391                        | 27                   | 33                 | 5           | 29           | 5           | 30            |
|  | 45                            | 394                        | 25                   | 58                 | 1           | 57           | 1           | 15            |
|  | 46                            | 402                        | 8                    | 77                 | 3           | 74           | 1           | 14            |
|  | 71                            | 296                        | 11                   | 60                 | 1           | 59           | 1           | 27            |
|  | 72                            | 207                        | 4                    | 83                 | 2           | 81           | 0           | 10            |
|  | 73                            | 199                        | 10                   | 73                 | 6           | 67           | 2           | 14            |
|  | 74                            | 110                        | 28                   | 65                 | 41          | 24           | 1           | 6             |
|  | Section Mean (Standard Error) |                            |                      | 22 (6.1)           | 58 (6.8)    | 4 (1.2)      | 53 (7.4)    | 2 (0.6)       |
| <b>Lower Cropsy</b>                    | 47                            | 259                        | 72                   | 17                 | 1           | 16           | 6           | 2             |
|  | 48                            | 269                        | 56                   | 35                 | 8           | 28           | 4           | 4             |
|  | 49                            | 383                        | 16                   | 55                 | 12          | 43           | 2           | 26            |
|  | 50                            | 256                        | 49                   | 22                 | 7           | 14           | 11          | 10            |
|  | 52                            | 302                        | 12                   | 81                 | 4           | 77           | 1           | 6             |
|  | 53                            | 246                        | 25                   | 47                 | 2           | 45           | 2           | 26            |
|  | 59                            | 582                        | 32                   | 50                 | 2           | 48           | 3           | 13            |
|  | 60                            | 618                        | 24                   | 64                 | 9           | 55           | 1           | 11            |
|  | Section Mean (Standard Error) |                            |                      | 36 (7.5)           | 46 (7.5)    | 6 (1.4)      | 41 (7.5)    | 4 (1.2)       |
| <b>Lower Cropsy w/ Erosion Blanket</b> | 51                            | 400                        | 15                   | 74                 | 14          | 60           | 1           | 10            |

| <i>Section</i>                | <i>Plot No.</i> | <i>Transect Length (m)</i> | <i>Percent Cover</i> |                    |             |              |             |               |
|-------------------------------|-----------------|----------------------------|----------------------|--------------------|-------------|--------------|-------------|---------------|
|                               |                 |                            | <i>Bare</i>          | <i>Total Plant</i> | <i>Forb</i> | <i>Grass</i> | <i>Rock</i> | <i>Litter</i> |
| CDP                           | 54              | 364                        | 41                   | 45                 | 6           | 39           | 2           | 12            |
|                               | 55              | 349                        | 36                   | 40                 | 3           | 37           | 1           | 23            |
|                               | 56              | 393                        | 49                   | 47                 | 3           | 44           | 3           | 1             |
|                               | 57              | 252                        | 28                   | 57                 | 3           | 54           | 2           | 10            |
|                               | 58              | 396                        | 23                   | 52                 | 12          | 40           | 2           | 21            |
| Section Mean (Standard Error) |                 |                            | 35 (4.6)             | 48 (2.9)           | 5 (1.8)     | 43 (3.0)     | 2 (0.4)     | 13(3.9)       |
| Beaver Mud Dump               | 61              | 375                        | 21                   | 71                 | 3           | 68           | 1           | 7             |
|                               | 62              | 338                        | 48                   | 38                 | 0           | 38           | 1           | 9             |
|                               | 63              | 349                        | 28                   | 50                 | 2           | 48           | 1           | 21            |
|                               | 64              | 101                        | 56                   | 39                 | 11          | 28           | 5           | 0             |
|                               | 65              | 99                         | 60                   | 38                 | 3           | 35           | 2           | 0             |
|                               | 66              | 134                        | 62                   | 19                 | 1           | 19           | 12          | 7             |
|                               | 67              | 153                        | 55                   | 40                 | 12          | 28           | 3           | 3             |
| Section Mean (Standard Error) |                 |                            | 47 (6.1)             | 42 (5.9)           | 4 (1.8)     | 38 (6.2)     | 3 (1.6)     | 7 (2.8)       |
| Water Treatment Plant         | 68              | 299                        | 52                   | 44                 | 6           | 38           | 0           | 3             |
| Missionary Seeps              | 69              | 320                        | 20                   | 57                 | 15          | 42           | 0           | 19            |
|                               | 70              | 592                        | 43                   | 44                 | 16          | 28           | 1           | 11            |
| Section Mean (Standard Error) |                 |                            | 31 (11.4)            | 50 (6.4)           | 15(0.9)     | 35 (7.3)     | 1 (0.5)     | 15(3.6)       |

Data from CSU (2005)

**TABLE 7-4**  
**PERCENT COVER OF PLANT TAXA ENCOUNTERED IN RECLAIMED AREAS AT THE SUMMITVILLE MINE IN 2002 AND 2004**

| Scientific Name                           | Common Name              | Average % Cover on<br>SMSFS Reclaimed Areas |      |
|---|--------------------------|---|------|
|   |                          | 2002  | 2004 |
| <b>Graminoids:</b>                        |                          |   |      |
| <i>Agrostis gigantea</i>                  | redtop                   | 0.1   | 0.1  |
| <i>Agrostis scabra</i>                    | rough bentgrass          |   | 0.1  |
| <i>Agrostis stolonifera</i>               | creeping bentgrass       |   | <0.1 |
| <i>Alopecurus pratensis</i>               | meadow foxtail           | 0.6   | 0.4  |
| <i>Bromus inermis</i>                     | smooth brome             |   | 1.6  |
| <i>Bromus marginatus</i>                  | mountain brome           | 0.2   | 0.2  |
| <i>Calamagrostis canadensis</i>           | bluejoint                | <0.1  | <0.1 |
| <i>Carex microptera</i>                   | smallwing sedge          | <0.1  | 0.3  |
| <i>Carex sp.</i>                          | sedge                    | 0.1   |      |
| <i>Dactylis glomerata</i>                 | orchardgrass             | 0.5   | 0.1  |
| <i>Deschampsia caespitosa</i>             | tufted hairgrass         | 1.9   | 3.6  |
| <i>Elymus trachycaulus</i>                | slender wheatgrass       | 23.0  | 21.2 |
| <i>Festuca brachyphylla</i>               | alpine fescue            |   | 0.1  |
| <i>Festuca ovina</i>                      | sheep fescue             | 1.2   | 3.3  |
| <i>Festuca rubra</i>                      | red fescue               |   | 0.2  |
| <i>Hordeum jubatum L.</i>                 | foxtail barley           | <0.1  |      |
| <i>Hordeum vulgare</i>                    | common barley            | 0.1   |      |
| <i>Pascopyrum smithii</i>                 | western wheatgrass       | <0.1  | 1.4  |
| <i>Phleum alpinum</i>                     | alpine timothy           | <0.1  | <0.1 |
| <i>Phleum pratense</i>                    | timothy                  | 6.5   | 8.8  |
| <i>Poa alpina</i>                         | alpine bluegrass         | 2.0   | 4.9  |
| <i>Poa arctica</i>                        | arctic bluegrass         |   | 0.3  |
| <i>Poa compressa</i>                      | Canada bluegrass         | 0.2   | 0.1  |
| <i>Poa fendleriana</i>                    | muttongrass              | 0.3   | <0.1 |
| <i>Poa secunda</i>                        | Sandberg bluegrass       |   | <0.1 |
| <i>Triticum aestivum</i>                  | common wheat             | 4.4   | 0.3  |
|   | <b>total grass:</b>      | 41.2  | 47.2 |
| <b>Forbs:</b>                             |                          |   |      |
| <i>Achillea millefolium var. alpicola</i> | common yarrow            | 3.2   | 7.3  |
| <i>Androsace septentrionalis</i>          | pygmyflower rockjasmine  |   | <0.1 |
| <i>Chenopodium capitatum</i>              | blite goosefoot          | <0.1  | <0.1 |
| <i>Descurainia pinnata</i>                | western tansymustard     | <0.1  |      |
| <i>Epilobium hornemannii</i>              | Hornemann's willowherb   | <0.1  |      |
| <i>Fragaria virginiana</i>                | Virginia strawberry      | <0.1  |      |
| <i>Kochia scoparia</i>                    | Mexican-fireweed         | <0.1  |      |
| <i>Penstemon strictus</i>                 | Rocky Mountain penstemon | <0.1  | <0.1 |
| <i>Rumex aquaticus var. fenestratus</i>   | western dock             | <0.1  | <0.1 |
| <i>Senecio atratus</i>                    | tall blacktip ragwort    | 0.2   | 0.5  |
| <i>Senecio bigelovii</i>                  | nodding ragwort          | <0.1  | <0.1 |
| <i>Taraxacum sp.</i>                      | dandelion                | <0.1  |      |
| <i>Trifolium pratense</i>                 | red clover               | <0.1  | <0.1 |
|   | <b>total forb:</b>       | 3.5   | 7.9  |
|   | <b>total plant:</b>      | 44.8  | 55.1 |

Data from CSU (2005)

**TABLE 7-5**  
**PERCENT OF SAMPLES ACHIEVING OU5 ROD REMEDIATION LEVELS AT WF5.5**  
**2000 THROUGH JULY 31, 2005**

| <i>Parameter</i> | <i>Low Flow Regime</i>          |                          |                            | <i>High Flow Regime</i>         |                          |                            |
|------------------|---------------------------------|--------------------------|----------------------------|---------------------------------|--------------------------|----------------------------|
|                  | <i>Remediation Level (mg/L)</i> | <i>Number of Samples</i> | <i>Percent Achievement</i> | <i>Remediation Level (mg/L)</i> | <i>Number of Samples</i> | <i>Percent Achievement</i> |
| Aluminum         | 5                               | 46                       | 24%                        | 5                               | 31                       | 71%                        |
| Cadmium          | 0.002                           | 5                        | 0%                         | 0.014                           | 5                        | 100%                       |
| Copper           | 0.035/0.4                       | 135                      | 0% / 4%                    | 1.55                            | 97                       | 92%                        |
| Iron             | 25                              | 132                      | 100%                       | 55                              | 97                       | 100%                       |
| Manganese        | 15                              | 132                      | 100%                       | 22                              | 97                       | 100%                       |
| Zinc             | 2.8                             | 131                      | 100%                       | 2.45                            | 97                       | 100%                       |
| pH (minimum)     | 6.6                             | 128                      | 0%                         | 5.1                             | 83                       | 36%                        |

**NOTES:**

1. Low flow defined as period July through April.
2. High flow defined as months of May and June.
3. Parameters as total or total recoverable form.
4. Remedial levels in mg/L except pH, which is in standard units.
5. As stated in OU5 ROD, remediation levels apply to times when the Water Treatment Plant is operating and discharging effluent to Wightman Fork.
6. Geochemical modeling performed in support of the ROD predicted that if the pH of the Alamosa River upstream of Wightman Fork is between 5 and 6 during low flow, then the copper remediation level could be in the range of 0.2 to 0.4 mg/L. However, if the pH of the Upper Alamosa River is closer to a value of 4, a remediation level of 0.035 mg/L is more appropriate.

TABLE 7-6

SUMMARY OF 2001 STATE OF COLORADO AQUATIC LIFE STANDARD EXCEEDANCES IN THE ALAMOSA RIVER

| ALAMOSA RIVER SEGMENT No.:  |                | 3a      | 3b      | 3c        |           | 8         | 9         | 10        | Comment     |
|-----------------------------|----------------|---------|---------|-----------|-----------|-----------|-----------|-----------|-------------|
| Parameter                   | Date           | AR45.5  | AR43.6  | AR41.2    | AR34.5    | T1A       | AR31.0    | AR21.6    |             |
| Aluminum                    | April 11       |         |         |           |           |           |           |           |             |
|                             | April 19 & 20  | > Acute |         | > Chronic |           |           |           |           |             |
|                             | May 26 & 27    |         |         |           |           | > Chronic | > Chronic | > Chronic |             |
|                             | May 31         |         |         |           |           |           |           |           | SDI Release |
|                             | June 22        |         |         |           |           |           |           |           |             |
|                             | August 28 & 29 |         |         |           |           |           |           |           |             |
| Iron<br>(Total Recoverable) | April 11       |         |         |           |           |           |           |           |             |
|                             | April 19 & 20  |         |         |           | > Chronic |           |           |           |             |
|                             | May 26 & 27    |         |         |           |           | > Chronic | > Chronic | > Chronic |             |
|                             | May 31         |         |         |           |           |           |           |           | SDI Release |
|                             | June 22        |         |         |           |           | > Chronic |           |           |             |
|                             | August 28 & 29 |         |         |           |           | > Chronic |           |           |             |
| pH                          | April 11       |         |         |           |           |           |           |           |             |
|                             | April 19 & 20  |         | < Min   | < Min     |           |           |           | < Min     |             |
|                             | May 26 & 27    |         | < Min   | < Min     |           |           | < Min     |           |             |
|                             | May 31         |         | < Min   | < Min     |           |           |           |           | SDI Release |
|                             | June 22        |         |         |           |           |           |           |           |             |
|                             | August 28 & 29 |         | < Min   | < Min     |           |           |           | < Min     |             |
| Manganese                   | April 11       |         |         |           |           |           |           |           |             |
|                             | April 19 & 20  |         |         |           |           |           |           |           |             |
|                             | May 26 & 27    |         |         |           |           |           |           |           |             |
|                             | May 31         |         |         |           |           |           |           |           | SDI Release |
|                             | June 22        |         |         |           |           |           |           |           |             |
|                             | August 28 & 29 |         |         |           |           |           |           |           |             |
| Zinc                        | April 11       |         |         |           |           |           |           |           |             |
|                             | April 19 & 20  |         |         |           |           |           |           |           |             |
|                             | May 26 & 27    |         | > Acute | > Acute   |           |           |           |           |             |
|                             | May 31         |         | > Acute | > Acute   | > Acute   |           |           |           | SDI Release |
|                             | June 22        |         |         |           |           |           |           |           |             |
|                             | August 28 & 29 |         |         |           |           |           |           |           |             |
| Copper                      | April 11       |         |         |           |           |           |           |           |             |
|                             | April 19 & 20  | > Acute | > Acute | > Acute   |           |           |           |           |             |
|                             | May 26 & 27    |         |         | > Acute   | > Acute   | > Acute   | > Acute   | > Acute   |             |
|                             | May 31         |         | > Acute | > Acute   | > Acute   |           |           |           | SDI Release |
|                             | June 22        |         |         |           |           |           |           |           |             |
|                             | August 28 & 29 |         |         | > Acute   |           |           |           |           |             |

- Notes: 1. "> Acute" indicates that the measured concentration exceeded the State of Colorado's acute water quality standard.  
2. "> Chronic" indicates that the measured concentration exceeded the State of Colorado's chronic water quality standard.  
3. "< Min" indicates that the pH value was below the range of 6.5 to 9.0. Note that the Segment 3a minimum value varies seasonally.  
4. [Greyed out] indicates that the location was not sampled or parameter not analyzed during the particular sampling event.  
5. In 2001, Segment 3d did not exist.

**TABLE 7-7**

**SUMMARY OF 2003 STATE OF COLORADO AQUATIC LIFE STANDARD EXCEEDANCES IN THE ALAMOSA RIVER**

| <b>ALAMOSA RIVER SEGMENT No.:</b>   |                   | <b>3a</b>     | <b>3b</b>     | <b>3c</b>     | <b>3d</b>     |               | <b>8</b>   | <b>9</b>      | <b>10</b>     | <b>Comment</b> |
|-------------------------------------|-------------------|---------------|---------------|---------------|---------------|---------------|------------|---------------|---------------|----------------|
| <b>Parameter</b>                    | <b>Date</b>       | <b>AR45.5</b> | <b>AR43.6</b> | <b>AR41.2</b> | <b>AR37.5</b> | <b>AR34.5</b> | <b>T1A</b> | <b>AR31.0</b> | <b>AR21.6</b> |                |
| <b>Aluminum</b>                     | May 21 & 22       |               |               |               | > Chronic     |               |            |               |               |                |
|                                     | September 17 & 18 |               |               |               |               |               |            | > Chronic     |               |                |
| <b>Iron<br/>(Total Recoverable)</b> | May 21 & 22       |               |               |               |               |               | > Chronic  |               |               |                |
|                                     | September 17 & 18 |               |               |               |               | > Chronic     |            | > Chronic     |               |                |
| <b>pH</b>                           | May 21 & 22       |               |               |               |               |               |            |               |               |                |
|                                     | September 17 & 18 |               |               | < Min         | < Min         |               |            | < Min         |               |                |
| <b>Manganese</b>                    | May 21 & 22       |               |               |               |               |               |            |               |               |                |
|                                     | September 17 & 18 |               |               |               |               |               |            |               |               |                |
| <b>Zinc</b>                         | May 21 & 22       |               |               |               |               |               |            |               |               |                |
|                                     | September 17 & 18 |               |               |               |               |               |            |               |               |                |
| <b>Copper</b>                       | May 21 & 22       |               |               | > Chronic     | > Chronic     |               |            |               |               |                |
|                                     | September 17 & 18 |               |               |               |               |               |            | > Acute       |               |                |

- Notes: 1. "> Acute" indicates that the measured concentration exceeded the State of Colorado's acute water quality standard.  
 2. "> Chronic" indicates that the measured concentration exceeded the State of Colorado's chronic water quality standard.  
 3. "< Min" indicates that the pH value was below the range of 6.5 to 9.0. Note that the Segment 3a minimum value varies seasonally.  
 4. [shaded] indicates that the location was not sampled or parameter not analyzed during the particular sampling event.

**TABLE 7-8**

**SUMMARY OF 2004 STATE OF COLORADO AQUATIC LIFE STANDARD EXCEEDANCES IN THE ALAMOSA RIVER**

| <b>ALAMOSA RIVER SEGMENT No.:</b>   |                   | <b>3a</b>     | <b>3b</b>     | <b>3c</b>     | <b>3d</b>     |               | <b>8</b>   | <b>9</b>      | <b>10</b>     | <b>Comment</b> |
|-------------------------------------|-------------------|---------------|---------------|---------------|---------------|---------------|------------|---------------|---------------|----------------|
| <b>Parameter</b>                    | <b>Date</b>       | <b>AR45.5</b> | <b>AR43.6</b> | <b>AR41.2</b> | <b>AR37.5</b> | <b>AR34.5</b> | <b>T1A</b> | <b>AR31.0</b> | <b>AR21.6</b> |                |
| <b>Aluminum</b>                     | May 25 & 26       |               |               |               |               |               |            |               |               |                |
|                                     | September 21 & 22 |               |               |               |               |               |            |               |               |                |
| <b>Iron<br/>(Total Recoverable)</b> | May 25 & 26       |               |               |               |               |               |            |               |               |                |
|                                     | September 21 & 22 |               |               |               |               |               |            |               |               |                |
| <b>pH</b>                           | May 25 & 26       |               |               |               | < Min         |               |            |               |               |                |
|                                     | September 21 & 22 |               |               | < Min         |               |               | < Min      |               |               |                |
| <b>Manganese</b>                    | May 25 & 26       |               |               |               |               |               |            |               |               |                |
|                                     | September 21 & 22 |               |               |               |               |               |            |               |               |                |
| <b>Zinc</b>                         | May 25 & 26       |               |               |               |               |               |            |               |               |                |
|                                     | September 21 & 22 |               |               |               |               |               |            |               |               |                |
| <b>Copper</b>                       | May 25 & 26       |               |               | > Acute       | > Chronic     |               | > Chronic  |               |               |                |
|                                     | September 21 & 22 |               |               | > Acute       |               |               | > Chronic  |               |               |                |

- Notes: 1. "> Acute" indicates that the measured concentration exceeded the State of Colorado's acute water quality standard.  
 2. "> Chronic" indicates that the measured concentration exceeded the State of Colorado's chronic water quality standard.  
 3. "< Min" indicates that the pH value was below the range of 6.5 to 9.0. Note that the Segment 3a minimum value varies seasonally.  
 4. [shaded box] indicates that the location was not sampled or parameter not analyzed during the particular sampling event.

**TABLE 7-9**

**SUMMARY OF 2005 STATE OF COLORADO AQUATIC LIFE STANDARD EXCEEDANCES IN THE ALAMOSA RIVER**

| <i>ALAMOSA RIVER SEGMENT No.:</i> |             | 3a     | 3b     | 3c        | 3d        |        | 8         | 9      | 10     | Comment |
|-----------------------------------|-------------|--------|--------|-----------|-----------|--------|-----------|--------|--------|---------|
| Parameter                         | Date        | AR45.5 | AR43.6 | AR41.2    | AR37.5    | AR34.5 | T1A       | AR31.0 | AR21.6 |         |
| Aluminum                          | May 25 & 26 |        |        | > Chronic | > Chronic |        | > Chronic |        |        |         |
|                                   |             |        |        |           |           |        |           |        |        |         |
| Iron<br>(Total Recoverable)       | May 25 & 26 |        |        | > Chronic |           |        | > Chronic |        |        |         |
|                                   |             |        |        |           |           |        |           |        |        |         |
| pH                                | May 25 & 26 |        |        | < Min     | < Min     |        |           |        |        |         |
|                                   |             |        |        |           |           |        |           |        |        |         |
| Manganese                         | May 25 & 26 |        |        |           |           |        |           |        |        |         |
|                                   |             |        |        |           |           |        |           |        |        |         |
| Zinc                              | May 25 & 26 |        |        |           |           |        |           |        |        |         |
|                                   |             |        |        |           |           |        |           |        |        |         |
| Copper                            | May 25 & 26 |        |        | > Acute   | > Acute   |        | > Chronic |        |        |         |
|                                   |             |        |        |           |           |        |           |        |        |         |

- Notes: 1. "> Acute" indicates that the measured concentration exceeded the State of Colorado's acute water quality standard.  
 2. "> Chronic" indicates that the measured concentration exceeded the State of Colorado's chronic water quality standard.  
 3. "< Min" indicates that the pH value was below the range of 6.5 to 9.0. Note that the Segment 3a minimum value varies seasonally.  
 4. [shaded box] indicates that the location was not sampled or parameter not analyzed during the particular sampling event.



**Table 8-1**  
**Aluminum, Copper and Zinc Load Allocation for Wightman Fork Basin at WF5.5**

| <b>Aluminum (lbs/Day)</b> |                                   |                            |                              |                         |                              |                 |                 |
|---------------------------|-----------------------------------|----------------------------|------------------------------|-------------------------|------------------------------|-----------------|-----------------|
| <b>Month</b>              | <b>SMSS Background (Measured)</b> | <b>SMSS WTP (Measured)</b> | <b>SMSS NPS (Calculated)</b> | <b>WF5.5 (Measured)</b> | <b>Contribution at WF5.5</b> |                 |                 |
|                           |                                   |                            |                              |                         | <b>Background</b>            | <b>SMSS WTP</b> | <b>SMSS NPS</b> |
| January                   | 0.14                              |                            | 93.7                         | 93.8                    | 0.2%                         | 0.0%            | 99.8%           |
| February                  | 0.02                              |                            | 85.3                         | 85.3                    | 0.0%                         | 0.0%            | 100.0%          |
| March                     |                                   |                            | 77.3                         | 77.3                    | 0.0%                         | 0.0%            | 100.0%          |
| April                     |                                   | 32.4                       | 82.9                         | 115                     | 0.0%                         | 28.1%           | 71.9%           |
| May                       | 3.02                              | 51.1                       | 654                          | 708                     | 0.4%                         | 7.2%            | 92.4%           |
| June                      | 16.8                              | 55.5                       | 646                          | 719                     | 2.3%                         | 7.7%            | 89.9%           |
| July                      | 17.5                              | 36.4                       | 466                          | 520                     | 3.4%                         | 7.0%            | 89.6%           |
| August                    | 6.87                              | 44.2                       | 312                          | 363                     | 1.9%                         | 12.2%           | 85.9%           |
| September                 | 6.83                              | 52.6                       | 230                          | 289                     | 2.4%                         | 18.2%           | 79.4%           |
| October                   | 8.78                              | 47.1                       | 367                          | 423                     | 2.1%                         | 11.1%           | 86.8%           |
| November                  | 3.81                              |                            | 332                          | 336                     | 1.1%                         | 0.0%            | 98.9%           |
| December                  | 2.33                              |                            | 155                          | 158                     | 1.5%                         | 0.0%            | 98.5%           |

| <b>Copper (lbs/Day)</b> |                                   |                            |                              |                         |                              |                 |                 |
|-------------------------|-----------------------------------|----------------------------|------------------------------|-------------------------|------------------------------|-----------------|-----------------|
| <b>Month</b>            | <b>SMSS Background (Measured)</b> | <b>SMSS WTP (Measured)</b> | <b>SMSS NPS (Calculated)</b> | <b>WF5.5 (Measured)</b> | <b>Contribution at WF5.5</b> |                 |                 |
|                         |                                   |                            |                              |                         | <b>Background</b>            | <b>SMSS WTP</b> | <b>SMSS NPS</b> |
| January                 | 0.08                              |                            | 18.4                         | 18.4                    | 0.4%                         | 0.0%            | 99.6%           |
| February                | 0.02                              |                            | 12.4                         | 12.4                    | 0.2%                         | 0.0%            | 99.8%           |
| March                   | 0.08                              |                            | 11.8                         | 11.8                    | 0.7%                         | 0.0%            | 99.3%           |
| April                   | 0.41                              | 0.54                       | 16.8                         | 17.7                    | 2.3%                         | 3.1%            | 94.7%           |
| May                     | 0.57                              | 0.55                       | 67.9                         | 69.0                    | 0.8%                         | 0.8%            | 98.4%           |
| June                    | 0.74                              | 0.50                       | 56.1                         | 57.3                    | 1.3%                         | 0.9%            | 97.8%           |
| July                    | 0.29                              | 0.48                       | 49.1                         | 49.8                    | 0.6%                         | 1.0%            | 98.5%           |
| August                  | 0.29                              | 0.54                       | 40.8                         | 41.6                    | 0.7%                         | 1.3%            | 98.0%           |
| September               | 0.13                              | 0.65                       | 27.6                         | 28.4                    | 0.5%                         | 2.3%            | 97.3%           |
| October                 | 0.38                              | 0.66                       | 32.0                         | 33.0                    | 1.1%                         | 2.0%            | 96.9%           |
| November                | 0.15                              | 0.72                       | 61.4                         | 62.2                    | 0.2%                         | 1.2%            | 98.6%           |
| December                | 0.03                              |                            | 28.4                         | 28.4                    | 0.1%                         | 0.0%            | 99.9%           |

| <b>Zinc (lbs/Day)</b> |                                   |                            |                              |                         |                              |                 |                 |
|-----------------------|-----------------------------------|----------------------------|------------------------------|-------------------------|------------------------------|-----------------|-----------------|
| <b>Month</b>          | <b>SMSS Background (Measured)</b> | <b>SMSS WTP (Measured)</b> | <b>SMSS NPS (Calculated)</b> | <b>WF5.5 (Measured)</b> | <b>Contribution at WF5.5</b> |                 |                 |
|                       |                                   |                            |                              |                         | <b>Background</b>            | <b>SMSS WTP</b> | <b>SMSS NPS</b> |
| January               | 0.65                              |                            | 8.73                         | 9.38                    | 6.9%                         | 0.0%            | 93.1%           |
| February              | 0.57                              |                            | 7.23                         | 7.80                    | 7.3%                         | 0.0%            | 92.7%           |
| March                 | 0.50                              |                            | 7.71                         | 8.22                    | 6.1%                         | 0.0%            | 93.9%           |
| April                 | 0.57                              | 0.30                       | 13.1                         | 14.0                    | 4.1%                         | 2.1%            | 93.8%           |
| May                   | 6.09                              | 0.32                       | 43.2                         | 49.6                    | 12.3%                        | 0.6%            | 87.1%           |
| June                  | 7.00                              | 0.30                       | 39.0                         | 46.3                    | 15.1%                        | 0.7%            | 84.2%           |
| July                  | 3.54                              | 0.28                       | 27.9                         | 31.7                    | 11.2%                        | 0.9%            | 87.9%           |
| August                | 3.16                              | 0.25                       | 22.5                         | 25.9                    | 12.2%                        | 1.0%            | 86.8%           |
| September             | 1.98                              | 0.32                       | 21.2                         | 23.5                    | 8.4%                         | 1.4%            | 90.2%           |
| October               | 1.50                              | 0.28                       | 19.7                         | 21.5                    | 7.0%                         | 1.3%            | 91.8%           |
| November              | 1.18                              | 0.36                       | 27.0                         | 28.5                    | 4.1%                         | 1.3%            | 94.6%           |
| December              | 0.66                              |                            | 18.6                         | 19.3                    | 3.4%                         | 0.0%            | 96.6%           |

Notes: Aluminum, Copper and Zinc values are in the Total and Total Recoverable Form.  
SMSS = Summitville Mine Superfund Site  
NPS = Non-Point Source  
WTP = Water Treatment Plant