# Appendix A
# Program Summary Data

**Table A-1.** 2019 Canopy Densities of SMP Creeks

| Zone | Town | Creek Name | Reach | Channel type | Canopy Density % |
|---|---|---|---|---|---|
| 1A | Santa Rosa | Abramson Creek | Abramson 1 | Owned-in-Fee, Engineered | 33 |
| 1A | Santa Rosa | Abramson Creek | Abramson 2 | Owned-in-Fee, Engineered | 42 |
| 1A | Windsor | Airport Creek | Airport 1 | Engineered | 9 |
| 1A | Windsor | Airport Creek | Airport 2 | Engineered | 19 |
| 1A | Santa Rosa | Austin Creek | Austin 1 | Owned-in-Fee, Engineered | 41 |
| 1A | Santa Rosa | Austin Creek | Austin 2 | Owned-in-Fee, Engineered | 53 |
| 1A | Santa Rosa | Austin Creek | Austin 3 | Owned-in-Fee, Engineered | 70 |
| 1A | Santa Rosa | Bellevue Wilfred Channel | BellWil 1 | Owned-in-Fee, Engineered | 1 |
| 1A | Santa Rosa | Bellevue Wilfred Channel | BellWil 2 | Owned-in-Fee, Engineered | 3 |
| 1A | Santa Rosa | Bellevue Wilfred Channel | BellWil 3 | Owned-in-Fee, Engineered | 5 |
| 1A | Santa Rosa | Bellevue Wilfred Channel | BellWil 4 | Owned-in-Fee, Engineered | 19 |
| 1A | Santa Rosa | Blucher Creek | Blucher 1 | Natural-Excluded | 98 |
| 1A | Santa Rosa | Blucher Creek | Blucher 2 | Natural-Excluded | 93 |
| 1A | Santa Rosa | Blucher Creek | Blucher 3 | Natural-Excluded | 95 |
| 1A | Santa Rosa | Blucher Creek | Blucher 4 | Natural-Excluded | 82 |
| 1A | Santa Rosa | Brush Creek | Brush 1 | Owned-in-Fee, Engineered | 71 |
| 1A | Santa Rosa | Brush Creek | Brush 2A | Owned-in-Fee, Engineered | 58 |
| 1A | Santa Rosa | Brush Creek | Brush 2B | Owned-in-Fee, Engineered | 54 |
| 1A | Santa Rosa | Brush Creek Tributary 10 | Brush Creek Tributary 10 | Owned-in-Fee, Engineered | 65 |
| 1A | Santa Rosa | Brush Creek Tributary 10 | Brush Creek Tributary 10A | No Easement/Title | 61 |
| 1A | Sebastopol | Calder Creek | Calder 1 | Modified | 95 |
| 1A | Santa Rosa | Coffey Creek | Coffey 1 | Owned-in-Fee, Engineered | 35 |
| 1A | Rohnert Park | Coleman Creek | Coleman 2 | Conduit | 61 |
| 1A | Rohnert Park | Coleman/Cook Creek | Coleman 1 | Engineered | 35 |
| 1A | Rohnert Park | Coleman/Cook Creek | Cook 1 | Conduit | 62 |
| 1A | Santa Rosa | Colgan Creek | Colgan 1 | Owned-in-Fee, Engineered | 13 |
| 1A | Santa Rosa | Colgan Creek | Colgan 2 | Owned-in-Fee, Engineered | 24 |
| 1A | Santa Rosa | Colgan Creek | Colgan 3 | Owned-in-Fee, Engineered | 17 |
| 1A | Santa Rosa | Colgan Creek | Colgan 4 | Owned-in-Fee, Engineered | 19 |
| 1A | Santa Rosa | Colgan Creek | Colgan 5A | Owned-in-Fee, Engineered | 27 |
| 1A | Santa Rosa | Colgan Creek | Colgan 5B | Owned-in-Fee, Engineered | 53 |
| 1A | Santa Rosa | Colgan Creek | Colgan 5C | Owned-in-Fee, Engineered | 39 |
| 1A | Santa Rosa | Colgan Creek | Colgan 6 | Owned-in-Fee, Engineered | 64 |
| 1A | Santa Rosa | Colgan Creek | Colgan 7 | Owned-in-Fee, Engineered | 37 |
| 1A | Santa Rosa | Colgan Creek | Colgan 8 | Conduit | 26 |
| 1A | Santa Rosa | Colgan Creek | Colgan9 | No Easement/Title | 24 |
| 1A | Santa Rosa | College Creek | College 1 | Owned-in-Fee, Engineered | 72 |
| 1A | Santa Rosa | College Creek | College 2 | Owned-in-Fee, Engineered | 80 |
| 1A | Santa Rosa | College Creek | College 3 | Owned-in-Fee, Engineered | 61 |
| 1A | Rohnert Park | Cook Creek | Cook 2 | Owned-in-Fee, Engineered | 36 |
| 1A | Rohnert Park | Cook Creek | Cook 3 | No Easement/Title | 52 |
| 1A | Rohnert Park | Copeland Creek | Copeland 1 | Owned-in-Fee, Engineered | 58 |
| 1A | Rohnert Park | Copeland Creek | Copeland 2 | Engineered | 63 |
| 1A | Rohnert Park | Copeland Creek | Copeland 3 | Engineered | 63 |
| 1A | Rohnert Park | Copeland Creek | Copeland 4 | Engineered | 68 |
| 1A | Rohnert Park | Copeland Creek | Copeland 5 | Engineered | 91 |
| 1A | Rohnert Park | Copeland Creek | Copeland 6 | Modified | 92 |
| 1A | Cotati | Cotati Creek | Cotati 1 | Owned-in-Fee, Engineered | 34 |
| 1A | Cotati | Cotati Creek | Cotati 2A | Owned-in-Fee, Engineered | 41 |
| 1A | Cotati | Cotati Creek | Cotati 2B | Owned-in-Fee, Engineered | 72 |
| 1A | Cotati | Cotati Creek | Cotati 3 | No Easement/Title | 93 |
| 1A | Cotati | Cotati Creek | Cotati 4 | No Easement/Title | 99 |
| 1A | Rohnert Park | Crane Creek | Crane 1 | Owned-in-Fee, Engineered | 54 |
| 1A | Rohnert Park | Crane Creek | Crane 2 | Owned-in-Fee, Engineered | 66 |
| 1A | Rohnert Park | Crane Creek | Crane 3 | Modified | 81 |
| 1A | Santa Rosa | Ducker Creek | Ducker 1 | Owned-in-Fee, Engineered | 57 |
| 1A | Santa Rosa | Ducker Creek | Ducker 2 | Owned-in-Fee, Engineered | 74 |

| Zone | Town | Creek Name | Reach | Channel type | Canopy Density % |
|---|---|---|---|---|---|
| 1A | Santa Rosa | Ducker Creek | Ducker 3 | No Easement/Title | 40 |
| 1A | Santa Rosa | Ducker Creek | Ducker 4 | No Easement/Title | 24 |
| 1A | Santa Rosa | Ducker Creek | Ducker 5 | No Easement/Title | 37 |
| 1A | Windsor | East Windsor Creek | East Windsor 1 | Modified | 93 |
| 1A | Windsor | East Windsor Creek | East Windsor 2 | Modified | 95 |
| 1A | Windsor | Faught Creek | Faught 1 | Owned-in-Fee, Engineered | 92 |
| 1A | Rohnert Park | Five Creek | Five 1 | Owned-in-Fee, Engineered | 54 |
| 1A | Santa Rosa | Forestview Creek | Forestview 1 | Owned-in-Fee, Engineered | 69 |
| 1A | Santa Rosa | Forestview Creek | Forestview 2 | Owned-in-Fee, Engineered | 58 |
| 1A | Santa Rosa | Forestview Creek | Forestview 3 | Owned-in-Fee, Engineered | 55 |
| 1A | Santa Rosa | Fountain Grove Creek | Fountain Grove 1 | Owned-in-Fee, Engineered | 87 |
| 1A | Santa Rosa | Fountain Grove Creek | Fountain Grove 2 | Engineered | 95 |
| 1A | Santa Rosa | Fountain Grove Creek | Fountain Grove 3 | Modified | 84 |
| 1A | Santa Rosa | Fountain Grove Creek | Fountain Grove 4 | Engineered | 97 |
| 1A | Santa Rosa | Fountain Grove Creek | Fountain Grove 5 | Engineered | 19 |
| 1A | Windsor | Fulton Creek | Fulton 0 | Modified | 58 |
| 1A | Windsor | Fulton Creek | Fulton 0A | Modified | 71 |
| 1A | Windsor | Fulton Creek | Fulton 0B | Owned-in-Fee, Engineered | 70 |
| 1A | Windsor | Fulton Creek | Fulton 1 | Owned-in-Fee, Engineered | 87 |
| 1A | Windsor | Fulton Creek | Fulton 2 | Modified | 61 |
| 1A | Windsor | Fulton Creek | Fulton 3 | Modified | 14 |
| 1A | Windsor | Fulton Creek | Fulton 4 | Modified | 26 |
| 1A | Rohnert Park | Gossage Creek | Gossage 1 | Owned-in-Fee, Engineered | 20 |
| 1A | Rohnert Park | Gossage Creek | Gossage 2A | Owned-in-Fee, Engineered | 20 |
| 1A | Rohnert Park | Gossage Creek | Gossage 2B | Owned-in-Fee, Engineered | 28 |
| 1A | Rohnert Park | Gossage Creek | Gossage 3 | Owned-in-Fee, Engineered | 20 |
| 1A | Windsor | Hartman Creek | Hartman 1 | Modified | 28 |
| 1A | Cotati | Hessel Creek | Hessel 1 | Modified | 88 |
| 1A | Cotati | Hessel Creek | Hessel 2 | Modified | 92 |
| 1A | Cotati | Hessel Creek | Hessel 3 | Modified | 86 |
| 1A | Cotati | Hessel Creek | Hessel 4 | Modified | 81 |
| 1A | Rohnert Park | Hinebaugh Creek | Hinebaugh 1 | Owned-in-Fee, Engineered | 50 |
| 1A | Rohnert Park | Hinebaugh Creek | Hinebaugh 2 | Owned-in-Fee, Engineered | 62 |
| 1A | Rohnert Park | Hinebaugh Creek | Hinebaugh 3A | Owned-in-Fee, Engineered | 13 |
| 1A | Rohnert Park | Hinebaugh Creek | Hinebaugh 3B | Owned-in-Fee, Engineered | 39 |
| 1A | Rohnert Park | Hinebaugh Creek | Hinebaugh 4 | Engineered | 38 |
| 1A | Rohnert Park | Hinebaugh Creek | Hinebaugh 5A | Owned-in-Fee, Engineered | 36 |
| 1A | Rohnert Park | Hinebaugh Creek | Hinebaugh 5B | Owned-in-Fee, Engineered | 15 |
| 1A | Rohnert Park | Hinebaugh Creek | Hinebaugh 5C | Owned-in-Fee, Engineered | 60 |
| 1A | Rohnert Park | Hinebaugh Creek | Hinebaugh 6 | Owned-in-Fee, Engineered | 68 |
| 1A | Rohnert Park | Hinebaugh Creek | Hinebaugh 7A | Owned-in-Fee, Engineered | 53 |
| 1A | Rohnert Park | Hinebaugh Creek | Hinebaugh 7B | Owned-in-Fee, Engineered | 75 |
| 1A | Rohnert Park | Hinebaugh Creek | Hinebaugh 8 | Owned-in-Fee, Engineered | 85 |
| 1A | Santa Rosa | Hunter Lane Channel | Hunter 1 | Owned-in-Fee, Engineered | 26 |
| 1A | Santa Rosa | Hunter Lane Channel | Hunter 2 | Owned-in-Fee, Engineered | 52 |
| 1A | Santa Rosa | Hunter Lane Channel | Hunter 3 | Owned-in-Fee, Engineered | 60 |
| 1A | Santa Rosa | Indian Creek | Indian 1 | Engineered | 52 |
| 1A | Santa Rosa | Irwin Creek | Irwin 1 | Modified | 21 |
| 1A | Santa Rosa | Irwin Creek | Irwin 2 | Modified | 26 |
| 1A | Windsor | Jensen Creek | Jensen 1 | Modified | 83 |
| 1A | Santa Rosa | Kawana Springs Creek | Kawana 1A | Owned-in-Fee, Engineered | 23 |
| 1A | Santa Rosa | Kawana Springs Creek | Kawana 1B | Owned-in-Fee, Engineered | 29 |
| 1A | Rohnert Park | Labath Creek | Labath 1 | Owned-in-Fee, Engineered | 56 |
| 1A | Santa Rosa | Labath Creek | Labath 2 | Owned-in-Fee, Engineered | 34 |
| 1A | Sebastopol | Laguna De Santa Rosa | Laguna 0 | Modified | 88 |
| 1A | Windsor | Laguna De Santa Rosa | Laguna 0A | Modified | 61 |
| 1A | Cotati | Laguna de Santa Rosa | Laguna 1 | Owned-in-Fee, Engineered | 48 |
| 1A | Cotati | Laguna de Santa Rosa | Laguna 2 | Owned-in-Fee, Engineered | 55 |

| Zone | Town | Creek Name | Reach | Channel type | Canopy Density % |
|---|---|---|---|---|---|
| 1A | Cotati | Laguna de Santa Rosa | Laguna 3 | Owned-in-Fee, Engineered | 18 |
| 1A | Windsor | Laguna De Santa Rosa | Laguna 3A | Engineered | 61 |
| 1A | Rohnert Park | Laguna de Santa Rosa | Laguna 4 | Owned-in-Fee, Engineered | 31 |
| 1A | Cotati | Laguna de Santa Rosa | Laguna 5 | Owned-in-Fee, Engineered | 32 |
| 1A | Cotati | Laguna de Santa Rosa | Laguna 6 | Owned-in-Fee, Engineered | 47 |
| 1A | Cotati | Laguna de Santa Rosa | Laguna 7 | Engineered | 34 |
| 1A | Santa Rosa | Lorna Dell Creek | Lorna Dell 1 | Owned-in-Fee, Engineered | 40 |
| 1A | Santa Rosa | Lorna Dell Creek | Lorna Dell 2 | Engineered | 84 |
| 1A | Santa Rosa | Lorna Dell Creek | Lorna Dell 3 | Engineered | 81 |
| 1A | Windsor | Mark West Creek | Mark West 1 | Natural-Excluded | 50 |
| 1A | Windsor | Mark West Creek | Mark West 10 | Natural-Excluded | 84 |
| 1A | Windsor | Mark West Creek | Mark West 11 | Natural-Excluded | 72 |
| 1A | Windsor | Mark West Creek | Mark West 12 | Natural-Excluded | 79 |
| 1A | Windsor | Mark West Creek | Mark West 2 | Natural-Excluded | 81 |
| 1A | Windsor | Mark West Creek | Mark West 3 | Natural-Excluded | 80 |
| 1A | Windsor | Mark West Creek | Mark West 4 | Natural-Excluded | 68 |
| 1A | Windsor | Mark West Creek | Mark West 5 | Natural-Excluded | 80 |
| 1A | Windsor | Mark West Creek | Mark West 6 | Natural-Excluded | 92 |
| 1A | Windsor | Mark West Creek | Mark West 7 | Natural-Excluded | 92 |
| 1A | Windsor | Mark West Creek | Mark West 8 | Natural-Excluded | 88 |
| 1A | Windsor | Mark West Creek | Mark West9 | Natural-Excluded | 81 |
| 1A | Santa Rosa | Matanzas Creek | Matanzas 1 | Owned-in-Fee, Engineered | 27 |
| 1A | Santa Rosa | Matanzas Creek | Matanzas 2 | No Easement/Title | 98 |
| 1A | Santa Rosa | Middle Fork Brush Creek | MiddleBrush 1 | Owned-in-Fee, Engineered | 97 |
| 1A | Santa Rosa | Middle Fork Brush Creek | MiddleBrush 2 | Engineered | 97 |
| 1A | Santa Rosa | Moorland Creek | Moorland 1A | Owned-in-Fee, Engineered | 38 |
| 1A | Santa Rosa | Moorland Creek | Moorland 1B | Owned-in-Fee, Engineered | 42 |
| 1A | Santa Rosa | Moorland Creek | Moorland 1C | Owned-in-Fee, Engineered | 90 |
| 1A | Santa Rosa | Moorland Creek | Moorland 2 | Owned-in-Fee, Engineered | 39 |
| 1A | Santa Rosa | Oakmont Creek | Oakmont 1 | Natural | 57 |
| 1A | Oakmont | Oakmont Creek | Oakmont 2 | Natural | 96 |
| 1A | Oakmont | Oakmont Creek | Oakmont 3 | Modified | 91 |
| 1A | Oakmont | Oakmont Creek | Oakmont 4 | Engineered | 61 |
| 1A | Oakmont | Oakmont Creek | Oakmont 5 | Engineered | 81 |
| 1A | Windsor | Olivet Creek | Olivet 1 | Modified | 34 |
| 1A | Windsor | Olivet Creek | Olivet 2 | Modified | 32 |
| 1A | Windsor | Olivet Creek | Olivet 3 | Modified | 32 |
| 1A | Santa Rosa | Paulin Creek | Paulin 1 | Owned-in-Fee, Engineered | 86 |
| 1A | Santa Rosa | Paulin Creek | Paulin 10 | Modified | 96 |
| 1A | Santa Rosa | Paulin Creek | Paulin 11 | Modified | 89 |
| 1A | Santa Rosa | Paulin Creek | Paulin 2 | Owned-in-Fee, Engineered | 79 |
| 1A | Santa Rosa | Paulin Creek | Paulin 3 | Owned-in-Fee, Engineered | 52 |
| 1A | Santa Rosa | Paulin Creek | Paulin 4 | Owned-in-Fee, Engineered | 54 |
| 1A | Santa Rosa | Paulin Creek | Paulin 5 | Owned-in-Fee, Engineered | 78 |
| 1A | Santa Rosa | Paulin Creek | Paulin 6A | Owned-in-Fee, Engineered | 49 |
| 1A | Santa Rosa | Paulin Creek | Paulin 6B | Owned-in-Fee, Engineered | 77 |
| 1A | Santa Rosa | Paulin Creek | Paulin 7 | Owned-in-Fee, Engineered | 96 |
| 1A | Santa Rosa | Paulin Creek | Paulin 8 | Modified | 70 |
| 1A | Santa Rosa | Paulin Creek | Paulin9 | Modified | 56 |
| 1A | Santa Rosa | Peterson Creek | Peterson 1 | Owned-in-Fee, Engineered | 58 |
| 1A | Santa Rosa | Peterson Creek | Peterson 2 | Owned-in-Fee, Engineered | 52 |
| 1A | Santa Rosa | Piner Creek | Piner 1 | Owned-in-Fee, Engineered | 34 |
| 1A | Santa Rosa | Piner Creek | Piner 2 | Owned-in-Fee, Engineered | 46 |
| 1A | Santa Rosa | Piner Creek | Piner 3A | Owned-in-Fee, Engineered | 63 |
| 1A | Santa Rosa | Piner Creek | Piner 3B | Owned-in-Fee, Engineered | 79 |
| 1A | Santa Rosa | Piner Creek | Piner 4 | Owned-in-Fee, Engineered | 64 |
| 1A | Santa Rosa | Piner Creek | Piner 5 | Owned-in-Fee, Engineered | 48 |
| 1A | Santa Rosa | Piner Creek | Piner 6 | Owned-in-Fee, Engineered | 60 |

| Zone | Town | Creek Name | Reach | Channel type | Canopy Density % |
|---|---|---|---|---|---|
| 1A | Santa Rosa | Piner Creek | Piner 7 | Owned-in-Fee, Engineered | 54 |
| 1A | Santa Rosa | Piner Creek | Piner 8 | Owned-in-Fee, Engineered | 71 |
| 1A | Windsor | Pool Creek | Pool 1 | Modified | 67 |
| 1A | Windsor | Pruit Creek | Pruit 1 | Engineered | 84 |
| 1A | Windsor | Redwood Creek | Redwood 1 | Modified | 67 |
| 1A | Windsor | Redwood Creek | Redwood 2 | Modified | 78 |
| 1A | Windsor | Redwood Creek | Redwood 3 | Modified | 57 |
| 1A | Windsor | Redwood Creek | Redwood 4 | Modified | 66 |
| 1A | Santa Rosa | Rincon Creek | Rincon 1 | Modified | 96 |
| 1A | Santa Rosa | Rincon Creek | Rincon 2 | Modified | 93 |
| 1A | Santa Rosa | Rincon Creek | Rincon 3 | Modified | 92 |
| 1A | Santa Rosa | Roseland Creek | Roseland 1 | Owned-in-Fee, Engineered | 35 |
| 1A | Santa Rosa | Roseland Creek | Roseland 1A | Owned-in-Fee, Engineered | 46 |
| 1A | Santa Rosa | Roseland Creek | Roseland 2 | Owned-in-Fee, Engineered | 9 |
| 1A | Santa Rosa | Roseland Creek | Roseland 3 | Owned-in-Fee, Engineered | 10 |
| 1A | Santa Rosa | Roseland Creek | Roseland 4 | Owned-in-Fee, Engineered | 24 |
| 1A | Santa Rosa | Roseland Creek | Roseland 5 | Owned-in-Fee, Engineered | 73 |
| 1A | Santa Rosa | Roseland Creek | Roseland 6 | Modified | 84 |
| 1A | Santa Rosa | Russell Creek | Russell 1A | Owned-in-Fee, Engineered | 68 |
| 1A | Santa Rosa | Russell Creek | Russell 1B | Owned-in-Fee, Engineered | 52 |
| 1A | Santa Rosa | Russell Creek | Russell 2 | Owned-in-Fee, Engineered | 46 |
| 1A | Santa Rosa | Santa Rosa Creek | Santa Rosa 0 | Owned-in-Fee, Engineered | 96 |
| 1A | Santa Rosa | Santa Rosa Creek | Santa Rosa 1 | Owned-in-Fee, Engineered | 68 |
| 1A | Santa Rosa | Santa Rosa Creek | Santa Rosa 10 | Natural | 92 |
| 1A | Santa Rosa | Santa Rosa Creek | Santa Rosa 11 | Natural | 96 |
| 1A | Santa Rosa | Santa Rosa Creek | Santa Rosa 12 | Natural | 99 |
| 1A | Santa Rosa | Santa Rosa Creek | Santa Rosa 13 | Owned-in-Fee, Engineered | 81 |
| 1A | Santa Rosa | Santa Rosa Creek | Santa Rosa 14 | Engineered | 97 |
| 1A | Santa Rosa | Santa Rosa Creek | Santa Rosa 2 | Owned-in-Fee, Engineered | 45 |
| 1A | Santa Rosa | Santa Rosa Creek | Santa Rosa 3 | Owned-in-Fee, Engineered | 58 |
| 1A | Santa Rosa | Santa Rosa Creek | Santa Rosa 4 | Owned-in-Fee, Engineered | 56 |
| 1A | Santa Rosa | Santa Rosa Creek | Santa Rosa 5 | Owned-in-Fee, Engineered | 45 |
| 1A | Santa Rosa | Santa Rosa Creek | Santa Rosa 6 | Owned-in-Fee, Engineered | 53 |
| 1A | Santa Rosa | Santa Rosa Creek | Santa Rosa 7 | Conduit | 33 |
| 1A | Santa Rosa | Santa Rosa Creek | Santa Rosa 8 | Owned-in-Fee, Engineered | 93 |
| 1A | Santa Rosa | Santa Rosa Creek | Santa Rosa9 | Natural | 88 |
| 1A | Santa Rosa | Santa Rosa Creek Diversion | Santa Rosa Div. 1 | Owned-in-Fee, Engineered | 72 |
| 1A | Santa Rosa | Sierra Park Creek | Sierra Park 1 | Owned-in-Fee, Engineered | 12 |
| 1A | Santa Rosa | Sierra Park Creek | Sierra Park 2 | Owned-in-Fee, Engineered | 39 |
| 1A | Santa Rosa | Sierra Park Creek | Sierra Park 3 | Owned-in-Fee, Engineered | 73 |
| 1A | Rohnert Park | South Fork Copeland Creek | SFCope 1 | Engineered | 12 |
| 1A | Rohnert Park | South Fork Copeland Creek | SFCope 2 | Engineered | 28 |
| 1A | Rohnert Park | South Fork Matanzas Creek | SF Matanzas 1 | Natural | 76 |
| 1A | Santa Rosa | Spring Creek | Spring 1 | Owned-in-Fee, Engineered | 96 |
| 1A | Santa Rosa | Spring Creek | Spring 1A | Modified | 95 |
| 1A | Santa Rosa | Spring Creek | Spring 1B | Conduit | 89 |
| 1A | Santa Rosa | Spring Creek | Spring 2 | Modified | 82 |
| 1A | Santa Rosa | Spring Creek | Spring 3 | Owned-in-Fee, Engineered | 72 |
| 1A | Windsor | Starr Creek | Starr 0 | Modified | 94 |
| 1A | Windsor | Starr Creek | Starr 1 | Engineered | 54 |
| 1A | Windsor | Starr Creek | Starr 2 | Owned-in-Fee, Engineered | 64 |
| 1A | Windsor | Starr Creek | Starr 3 | Conduit | 54 |
| 1A | Windsor | Starr Creek Tributary | Starr Creek Trib 1 | Engineered | 71 |
| 1A | Santa Rosa | Steele Creek | Steele 1A | Owned-in-Fee, Engineered | 44 |
| 1A | Santa Rosa | Steele Creek | Steele 1B | Owned-in-Fee, Engineered | 47 |
| 1A | Santa Rosa | Steele Creek | Steele 2 | Owned-in-Fee, Engineered | 73 |
| 1A | Santa Rosa | Steele Creek | Steele 3 | Owned-in-Fee, Engineered | 26 |
| 1A | Santa Rosa | Steele Creek | Steele 4 | Owned-in-Fee, Engineered | 55 |

| Zone | Town | Creek Name | Reach | Channel type | Canopy Density % |
|---|---|---|---|---|---|
| 1A | Santa Rosa | Steele Creek | Steele 5 | Owned-in-Fee, Engineered | 41 |
| 1A | Santa Rosa | Todd Creek | Todd 1 | Owned-in-Fee, Engineered | 27 |
| 1A | Santa Rosa | Todd Creek | Todd 2 | Owned-in-Fee, Engineered | 18 |
| 1A | Santa Rosa | Todd Creek | Todd 3 | Owned-in-Fee, Engineered | 50 |
| 1A | Santa Rosa | Todd Creek | Todd 4A | Owned-in-Fee, Engineered | 29 |
| 1A | Santa Rosa | Todd Creek | Todd 4B | Owned-in-Fee, Engineered | 9 |
| 1A | Santa Rosa | Todd Creek | Todd 5A | Owned-in-Fee, Engineered | 22 |
| 1A | Santa Rosa | Todd Creek | Todd 5B | Owned-in-Fee, Engineered | 33 |
| 1A | Cotati | Washoe Creek | Washoe 1 | Owned-in-Fee, Engineered | 2 |
| 1A | Windsor | Wikiup Creek | Wikiup 0 | Modified | 100 |
| 1A | Larkfield | Wikiup Creek | Wikiup 1 | Owned-in-Fee, Engineered | 96 |
| 1A | Windsor | Wikiup Creek | Wikiup 2 | No Easement/Title | 95 |
| 1A | Rohnert Park | Wilfred Creek | Wilfred 1A | Owned-in-Fee, Engineered | 24 |
| 1A | Rohnert Park | Wilfred Creek | Wilfred 1B | Owned-in-Fee, Engineered | 22 |
| 1A | Rohnert Park | Wilfred Creek | Wilfred 1C | Owned-in-Fee, Engineered | 37 |
| 1A | Rohnert Park | Wilfred Extension | Wilfred Ext. 1 | Owned-in-Fee, Engineered | 39 |
| 1A | Windsor | Windsor Creek | Windsor 1A | Owned-in-Fee, Engineered | 74 |
| 1A | Windsor | Windsor Creek | Windsor 1B | Owned-in-Fee, Engineered | 70 |
| 1A | Windsor | Windsor Creek | Windsor 2 | Natural | 95 |
| 1A | Windsor | Windsor Creek | Windsor 2A | Drainage Easement | 98 |
| 1A | Windsor | Windsor Creek | Windsor 3 | Owned-in-Fee, Engineered | 85 |
| 1A | Windsor | Windsor Creek | Windsor 4 | Owned-in-Fee, Engineered | 66 |
| 1A | Windsor | Windsor Creek Tributary | Windsor Creek Trib 1 | Modified | 59 |
| 1A | Windsor | Woolsey Creek | Woolsey 1 | Modified | 63 |
| 1A | Windsor | Woolsey Creek | Woolsey 2 | Modified | 92 |
| 2A | Petaluma | Adobe Creek | Adobe 1 | Engineered | 94 |
| 2A | Petaluma | Adobe Creek | Adobe 2 | Engineered | 62 |
| 2A | Petaluma | Adobe Creek | Adobe 3 | Engineered | 88 |
| 2A | Petaluma | Adobe Creek | Adobe 4 | Engineered | 95 |
| 2A | Petaluma | Capri Creek | Capri 1 | Owned-in-Fee, Engineered | 56 |
| 2A | Petaluma | Capri Creek | Capri 2 | Owned-in-Fee, Engineered | 47 |
| 2A | Petaluma | Capri Creek | Capri 3 | Engineered | 11 |
| 2A | Petaluma | Capri Creek | Capri 4 | Engineered | 44 |
| 2A | Petaluma | Corona Creek | Corona 1 | Engineered | 40 |
| 2A | Petaluma | Corona Creek | Corona 2 | Engineered | 86 |
| 2A | Petaluma | Corona Creek | Corona 3 | Engineered | 35 |
| 2A | Petaluma | Corona Creek | Corona 4 | Engineered | 68 |
| 2A | Petaluma | Corona Creek | Corona 5 | Engineered | 78 |
| 2A | Petaluma | Corona Creek | Corona 6 | Engineered | 44 |
| 2A | Petaluma | Corona Creek | Corona 7 | Engineered | 38 |
| 2A | Petaluma | Corona Creek Tributary | Corona Creek Trib 1 | Engineered | 8 |
| 2A | Petaluma | Corona Creek Tributary | Corona Creek Trib 2 | Engineered | 27 |
| 2A | Petaluma | Corona Creek Tributary | Corona Creek Trib 3 | Engineered | 36 |
| 2A | Petaluma | East Fork McDowell Creek | East Fork McDowell 1 | Owned-in-Fee, Engineered | 79 |
| 2A | Petaluma | East Washington Creek | East Washington 1 | Engineered | 18 |
| 2A | Petaluma | East Washington Creek | East Washington 2 | Owned-in-Fee, Engineered | 19 |
| 2A | Petaluma | East Washington Creek | East Washington 3 | Owned-in-Fee, Engineered | 44 |
| 2A | Petaluma | East Washington Creek | East Washington 4 | Engineered | 59 |
| 2A | Petaluma | East Washington Creek | East Washington 5 | Engineered | 71 |
| 2A | Petaluma | Ellis Creek | Ellis 1 | Modified | 47 |
| 2A | Petaluma | Jessie Lane Creek | Jessie Lane 1 | Owned-in-Fee, Engineered | 47 |
| 2A | Petaluma | Lichau Creek | Lichau 1 | Engineered | 52 |
| 2A | Petaluma | Lichau Creek | Lichau 2 | Engineered | 59 |
| 2A | Petaluma | Lichau Creek | Lichau 3 | Engineered | 63 |
| 2A | Penngrove | Lichau Creek | Lichau 3A | Modified | 93 |
| 2A | Penngrove | Lichau Creek | Lichau 3B | Modified | 92 |
| 2A | Penngrove | Lichau Creek | Lichau 3C | Modified | 85 |
| 2A | Penngrove | Lichau Creek | Lichau 3D | Modified | 94 |

| Zone | Town | Creek Name | Reach | Channel type | Canopy Density % |
|---|---|---|---|---|---|
| 2A | Petaluma | Lichau Creek | Lichau 4 | Modified | 74 |
| 2A | Penngrove | Lichau Creek | Lichau 5 | Modified | 89 |
| 2A | Penngrove | Lichau Creek | Lichau 6 | Modified | 81 |
| 2A | Penngrove | Lichau Creek | Lichau 7 | Natural | 100 |
| 2A | Santa Rosa | Lichau Creek | Lichau 8 | Natural | 95 |
| 2A | Petaluma | Lynch Creek | Lynch 0A | Modified | 68 |
| 2A | Petaluma | Lynch Creek | Lynch 0B | Engineered | 99 |
| 2A | Petaluma | Lynch Creek | Lynch 1A | Owned-in-Fee, Engineered | 35 |
| 2A | Petaluma | Lynch Creek | Lynch 1B | Owned-in-Fee, Engineered | 19 |
| 2A | Petaluma | McDowell Creek | McDowell 1 | Owned-in-Fee, Engineered | 2 |
| 2A | Petaluma | McDowell Creek | McDowell 2A | Owned-in-Fee, Engineered | 2 |
| 2A | Petaluma | McDowell Creek | McDowell 2B | Owned-in-Fee, Engineered | 3 |
| 2A | Petaluma | McDowell Creek | McDowell 3 | Conduit | 61 |
| 2A | Penngrove | Owens Creek | Owens 1 | Modified | 46 |
| 2A | Petaluma | Petaluma River | Petaluma 0A | Modified | 47 |
| 2A | Petaluma | Petaluma River | Petaluma 0B | Modified | 85 |
| 2A | Petaluma | Petaluma River | Petaluma 0C | Modified | 97 |
| 2A | Petaluma | Petaluma River | Petaluma 1 | Owned-in-Fee, Engineered | 100 |
| 2A | Petaluma | Petaluma River | Petaluma 2 | Modified | 86 |
| 2A | Petaluma | Petaluma River | Petaluma 3 | Modified | 99 |
| 2A | Petaluma | Petaluma River | Petaluma 4 | Modified | 91 |
| 2A | Petaluma | San Antonio Creek | San Antonio 0A | Modified | 100 |
| 2A | Petaluma | San Antonio Creek | San Antonio 0B | Modified | 98 |
| 2A | Petaluma (south of town) | San Antonio Creek | San Antonio 1 | Owned-in-Fee, Engineered | 100 |
| 2A | Petaluma | San Antonio Creek | San Antonio 2 | Modified | 16 |
| 2A | Petaluma | Thompson Creek | Thompson 1 | Engineered | 72 |
| 2A | Petaluma | Washington Creek | Washington 1 | Owned-in-Fee, Engineered | 35 |
| 2A | Petaluma | Washington Creek | Washington 2 | Owned-in-Fee, Engineered | 62 |
| 2A | Petaluma | Washington Creek | Washington 3 | Owned-in-Fee, Engineered | 38 |
| 2A | Petaluma | Washington Creek | Washington 4 | Engineered | 63 |
| 2A | Petaluma | Washington Creek | Washington 5 | Owned-in-Fee, Engineered | 54 |
| 2A | Petaluma | Washington Creek | Washington 6 | Owned-in-Fee, Engineered | 49 |
| 2A | Petaluma | Washington Creek | Washington 7 | Engineered | 56 |
| 2A | Petaluma | Wiggins Hill Creek | Wiggins Hill 1 | Modified | 43 |
| 2A | Petaluma | Wiggins Hill Creek | Wiggins Hill 2 | Modified | 47 |
| 2A | Petaluma | Wilson Creek | Wilson 1 | Modified | 88 |
| 2A | Petaluma | Wilson Creek | Wilson 2 | Modified | 93 |
| 3A | Sonoma | Agua Caliente | Agua Caliente 1 | Construction Easement | 81 |
| 3A | Sonoma | Arroyo Seco Creek | Arroyo Seco 1 | Natural | 97 |
| 3A | Sonoma | Arroyo Seco Creek | Arroyo Seco 2 | Natural | 96 |
| 3A | Sonoma | Arroyo Seco Creek | Arroyo Seco 3 | Modified | 76 |
| 3A | Sonoma | Calabazas Creek | Calabazas 1 | Natural | 97 |
| 3A | Sonoma | Calabazas Creek | Calabazas 2 | Natural | 94 |
| 3A | Sonoma | Dowdall Creek | Dowdall 0 | Modified | 88 |
| 3A | Sonoma | Dowdall Creek | Dowdall 1 | Conduit | 49 |
| 3A | Sonoma | Engler Creek | Engler 1 | No Easement/Title | 74 |
| 3A | Kenwood | Fisher Creek | Fisher 1 | Modified | 72 |
| 3A | Kenwood | Fisher Creek | Fisher 2 | Modified | 85 |
| 3A | Kenwood | Fisher Creek | Fisher 3 | Modified | 96 |
| 3A | Kenwood | Fisher Creek | Fisher 4 | Modified | 98 |
| 3A | Kenwood | Fisher Creek | Fisher 5 | Modified | 56 |
| 3A | Sonoma | Fowler Creek | Fowler 1 | Modified | 70 |
| 3A | Sonoma | Fryer Creek | Fryer 0 | Modified | 99 |
| 3A | Sonoma | Fryer Creek | Fryer 0A | Modified | 87 |
| 3A | Sonoma | Fryer Creek | Fryer 0B | Modified | 37 |
| 3A | Sonoma | Fryer Creek | Fryer 0C | Modified | 92 |
| 3A | Sonoma | Fryer Creek | Fryer 1 | Owned-in-Fee, Engineered | 85 |
| 3A | Sonoma | Fryer Creek | Fryer 2 | Owned-in-Fee, Engineered | 37 |

| Zone | Town | Creek Name | Reach | Channel type | Canopy Density % |
|---|---|---|---|---|---|
| 3A | Sonoma | Fryer Creek | Fryer 3 | Owned-in-Fee, Engineered | 40 |
| 3A | Sonoma | Fryer Creek | Fryer 4 | Owned-in-Fee, Engineered | 72 |
| 3A | Sonoma | Fryer Creek | Fryer 5 | Conduit | 40 |
| 3A | Kenwood | Holly Creek | Holly 1 | Modified | 99 |
| 3A | Sonoma | Hooker Creek | Hooker 1 | Modified | 90 |
| 3A | Kenwood | Kenwood Creek | Kenwood 1 | Modified | 47 |
| 3A | Kenwood | Kenwood Creek | Kenwood 2 | Modified | 65 |
| 3A | Kenwood | Kenwood Creek | Kenwood 3 | Modified | 44 |
| 3A | Kenwood | Lawndale Creek | Lawndale 0 | Natural | 94 |
| 3A | Kenwood | Lawndale Creek | Lawndale 1 | Modified | 68 |
| 3A | Kenwood | Lawndale Creek | Lawndale 2 | Modified | 32 |
| 3A | Sonoma | Lilley Creek | Lilley 1 | Conduit | 90 |
| 3A | Sonoma | Lilley Creek | Lilley 2 | Modified | 67 |
| 3A | Sonoma | Lower East Fork Fryer Creek | Lower East Fork Fryer 1 | Owned-in-Fee, Engineered | 28 |
| 3A | Sonoma | Lower East Fork Fryer Creek | Lower East Fork Fryer 1A | Owned-in-Fee, Engineered | 7 |
| 3A | Sonoma | Lower East Fork Fryer Creek | Lower East Fork Fryer 2 | Owned-in-Fee, Engineered | 38 |
| 3A | Kenwood | Mount Hood Creek | Mount Hood 1 | Natural | 86 |
| 3A | | Mount Hood Creek | Mount Hood 2 | Modified | 67 |
| 3A | Sonoma | Nathanson Creek | Nathanson 0 | Modified | 51 |
| 3A | Sonoma | Nathanson Creek | Nathanson 0A | Modified | 96 |
| 3A | Sonoma | Nathanson Creek | Nathanson 0B | Modified | 94 |
| 3A | Sonoma | Nathanson Creek | Nathanson 1 | Modified | 96 |
| 3A | Sonoma | Nathanson Creek | Nathanson 2 | Modified | 95 |
| 3A | Sonoma | Nathanson Creek | Nathanson 3 | Modified | 98 |
| 3A | Sonoma | Nathanson Creek | Nathanson 4 | Modified | 94 |
| 3A | Sonoma | Nathanson Creek | Nathanson 5 | Modified | 83 |
| 3A | Sonoma | Nathanson Creek | Nathanson 6 | Modified | 88 |
| 3A | Sonoma | Nathanson Creek | Nathanson 7 | Modified | 94 |
| 3A | Sonoma | Nathanson Creek | Nathanson 8 | Modified | 73 |
| 3A | Sonoma | Nathanson Creek | Nathanson9 | Modified | 69 |
| 3A | Sonoma | O'Brien Creek | O'Brien 1 | Modified | 61 |
| 3A | Sonoma | Rodgers Creek | Rodgers 0 | Modified | 76 |
| 3A | Sonoma | Rodgers Creek | Rodgers 0A | Modified | 49 |
| 3A | Sonoma | Rodgers Creek | Rodgers 1 | Modified | 82 |
| 3A | Sonoma | Rodgers Creek | Rodgers 1A | Modified | 88 |
| 3A | Sonoma | Rodgers Creek | Rodgers 1B | Natural | 96 |
| 3A | Sonoma | Rodgers Creek | Rodgers 2 | Modified | 87 |
| 3A | Sonoma | Schell Creek | Schell 1 | Modified | 7 |
| 3A | Sonoma | Schell Creek | Schell 2 | Conduit | 67 |
| 3A | Sonoma | Schell Creek | Schell 3 | Modified | 49 |
| 3A | Sonoma | Schell Creek | Schell 4 | Modified | 24 |
| 3A | Sonoma | Sonoma Creek | Sonoma 0B | Natural | 43 |
| 3A | Sonoma | Sonoma Creek | Sonoma 0C | Natural | 71 |
| 3A | Sonoma | Sonoma Creek | Sonoma 0D | Natural | 58 |
| 3A | Sonoma | Sonoma Creek | Sonoma 0E | Natural | 57 |
| 3A | Sonoma | Sonoma Creek | Sonoma 1 | Owned-in-Fee, Engineered | 70 |
| 3A | Sonoma | Sonoma Creek | Sonoma 10 | Natural | 75 |
| 3A | Sonoma | Sonoma Creek | Sonoma 11 | Natural | 80 |
| 3A | Sonoma | Sonoma Creek | Sonoma 12 | Natural | 81 |
| 3A | Sonoma | Sonoma Creek | Sonoma 13 | Natural | 88 |
| 3A | Sonoma | Sonoma Creek | Sonoma 14 | Natural | 93 |
| 3A | Sonoma | Sonoma Creek | Sonoma 15 | Natural | 89 |
| 3A | Kenwood | Sonoma Creek | Sonoma 16 | Natural | 98 |
| 3A | Kenwood | Sonoma Creek | Sonoma 17 | Natural | 98 |
| 3A | Sonoma | Sonoma Creek | Sonoma 2 | Natural | 73 |
| 3A | Sonoma | Sonoma Creek | Sonoma 3 | Conduit | 80 |
| 3A | Sonoma | Sonoma Creek | Sonoma 4 | Natural | 46 |
| 3A | Sonoma | Sonoma Creek | Sonoma 5 | Natural | 54 |

| Zone | Town | Creek Name | Reach | Channel type | Canopy Density % |
|---|---|---|---|---|---|
| 3A | Sonoma | Sonoma Creek | Sonoma 6 | Natural | 73 |
| 3A | Sonoma | Sonoma Creek | Sonoma 7 | Modified | 63 |
| 3A | Sonoma | Sonoma Creek | Sonoma 8 | Natural | 65 |
| 3A | Sonoma | Sonoma Creek | Sonoma9 | Natural | 77 |
| 3A | Sonoma | Verano Creek | Verano 1 | Modified | 99 |
| 3A | Sonoma | Verano Creek | Verano 2 | Modified | 73 |
| 3A | Sonoma | Verano Creek | Verano 3 | Modified | 43 |

**Table A-2.** Sediment Removal Activities Completed in 2008-2018

| Zone | Year | Type | Project Site | Completed/Estimated Length (linear feet) | Completed/Estimated Volume (cubic yards) | Acres Disturbed: Waters of the U.S. (below OHWM) | Acres Disturbed: Waters of the State (Below Top of Bank) | Acres Disturbed: Total |
|---|---|---|---|---|---|---|---|---|
| **2008** | | | | | | | | |
| 1A | 2008 | Bank Repair | Gossage 2 Bank Repair | 60/60 | / | / | / | 0.000/0.000 |
| 1A | 2008 | Reach | Coleman 2 Reach Scale | 1337/1337 | 2990/1432 | 0.730/0.730 | 0.000/0.000 | 0.730/0.730 |
| 1A | 2008 | Reach | Copeland 4 & 5 Reach Scale | 1270/3050 | 8142/3275 | 0.880/0.880 | 0.000/0.000 | 0.880/0.880 |
| 1A | 2008 | Reach | Hinebaugh 1 Reach Scale | 6932/6932 | 7350/12135 | 5.890/5.890 | 0.000/0.000 | 5.890/5.890 |
| 1A | 2008 | Reach | Roseland Creek Culvert Repairs | / | 1120/168 | /0.170 | / | 0.000/0.170 |
| 1A | 2008 | Reach | Todd 5 Reach Scale | 1270/1270 | 2570/3275 | 0.880/0.880 | 0.000/0.000 | 0.880/0.880 |
| 1A | 2008 | Sediment Basin | Cook 2 Instream Sediment Basin Clearing | / | / | / | / | 0.000/0.000 |
| | | | **1A Total** | **10869.00/12649.00** | **22172.00/20285.00** | **8.380/8.550** | **0.000/0.000** | **8.380/8.550** |
| 2A | 2008 | Localized | Washington 2, 3 Localized Sediment Removal | /197 | 240/145 | /0.090 | / | 0.000/0.090 |
| 2A | 2008 | Reach | Adobe 1 and 2 Reach Scale | / | 930/ | / | / | 0.000/0.000 |
| | | | **2A Total** | **0.00/197.00** | **1170.00/145.00** | **0.000/0.090** | **0.000/0.000** | **0.000/0.090** |
| | | | ***2008 Overall Total*** | ***10869.00/12846.00*** | ***23342.00/20430.00*** | ***8.380/8.640*** | ***0.000/0.000*** | ***8.380/8.640*** |
| **2009** | | | | | | | | |
| 1A | 2009 | Reach | Cotati 1 & 2 | 1122/1122 | 500/416 | 0.510/0.510 | 0.000/0.000 | 0.510/0.510 |
| 1A | 2009 | Reach | Crane 1/Five 1 Reach Scale | 300/3248 | 450/5213 | 0.210/2.690 | 0.000/0.000 | 0.210/2.690 |
| 1A | 2009 | Reach | Wilfred 1 Reach Scale | | 2720/3250 | 1.000/1.000 | 0.000/0.000 | 1.000/1.000 |
| 1A | 2009 | Sediment Basin | Copeland 4 at Country Club Dr. | 200/200 | 168/168 | 0.210/0.210 | 0.000/0.000 | 0.210/0.210 |
| 1A | 2009 | Sediment Basin | Copeland 4 at Snyder Lane | 250/250 | 240/240 | 0.260/0.260 | 0.000/0.000 | 0.260/0.260 |
| | | | **1A Total** | **4374.00/7322.00** | **4078.00/9287.00** | **2.190/4.670** | **0.000/0.000** | **2.190/4.670** |
| 2A | 2009 | Sediment Basin | Adobe 2 Localized | 150/150 | 256/256 | 0.150/0.150 | 0.000/0.000 | 0.150/0.150 |
| | | | **2A Total** | **150.00/150.00** | **256.00/256.00** | **0.150/0.150** | **0.000/0.000** | **0.150/0.150** |
| | | | ***2009 Overall Total*** | ***4524.00/7472.00*** | ***4334.00/9543.00*** | ***2.340/4.820*** | ***0.000/0.000*** | ***2.340/4.820*** |

| Zone | Year | Type | Project Site | Completed/Estimated Length (linear feet) | Volume (cubic yards) | Acres Disturbed: Waters of the U.S. (below OHWM) | Waters of the State (Below Top of Bank) | Total |
|---|---|---|---|---|---|---|---|---|
| **2010** | | | | | | | | |
| 1A | 2010 | Bank Repair | College 3 Bank Stabilization | 122/122 | / | / | / | 0.000/0.000 |
| 1A | 2010 | Bank Repair | Hinebaugh 5 Bank Repair | 120/120 | 120/78 | 0.000/0.020 | 0.030/0.030 | 0.030/0.050 |
| 1A | 2010 | Bank Repair | Hunter 2 Bank Stabilization | 10/10 | /10 | /0.000 | 0.000/0.000 | 0.000/0.000 |
| 1A | 2010 | Bank Repair | Moorland 1 Bank Stabilization | 35/35 | /14 | /0.000 | 0.000/0.000 | 0.000/0.000 |
| 1A | 2010 | Bank Repair | Peterson 2 Bank Stabilization | 86/86 | / | / | / | 0.000/0.000 |
| 1A | 2010 | Bank Repair | Piner 6 Bank Stabilization | 40/40 | / | / | / | 0.000/0.000 |
| 1A | 2010 | Bank Repair | Santa Rosa 1 Bank Stabilization | 73/30 | /20 | /0.010 | /0.000 | 0.000/0.010 |
| 1A | 2010 | Localized | Colgan 5 | 200/200 | 200/200 | 0.090/0.090 | / | 0.090/0.090 |
| 1A | 2010 | Reach | Crane 1/Five 1 Reach Scale | 3000/3000 | 4500/5213 | 1.600/1.600 | 0.000/0.000 | 1.600/1.600 |
| 1A | 2010 | Reach | Kawana 1 Reach Scale | 855/855 | 625/1059 | 0.270/0.270 | 0.000/0.000 | 0.270/0.270 |
| 1A | 2010 | Reach | Laguna 1 Phase I | 2400/2400 | 11000/14485 | 3.470/3.400 | 0.020/0.090 | 3.490/3.490 |
| 1A | 2010 | Reach | Lorna Dell 1 Reach Scale | 1260/1260 | 175/186 | 0.920/0.470 | 0.000/0.450 | 0.920/0.920 |
| 1A | 2010 | Reservoir Inlet Clearing | Brush Creek Reservoir Inlet Clearing | / | 500/40 | 0.030/0.030 | / | 0.030/0.030 |
| 1A | 2010 | Reservoir Inlet Clearing | Matanzas Creek Reservoir Inlet Clearing | / | 500/50 | 0.060/0.060 | / | 0.060/0.060 |
| 1A | 2010 | Reservoir Inlet Clearing | Piner Creek Reservoir Inlet Clearing | / | 450/40 | 0.060/0.060 | / | 0.060/0.060 |
| 1A | 2010 | Reservoir Inlet Clearing | Santa Rosa Creek (Spring Lake) Reservoir Inlet Clearing | / | 110/100 | 0.060/0.060 | / | 0.060/0.060 |
| 1A | 2010 | Sediment Basin | Copeland 3 & 4 | 200/200 | 100/333 | 0.210/0.210 | 0.000/0.000 | 0.210/0.210 |
| 1A | 2010 | Sediment Basin | Copeland 4 & 5 Instream Sediment Basin | 205/205 | 200/683 | 0.210/0.210 | 0.000/0.000 | 0.210/0.210 |
| 1A | 2010 | Sediment Basin | Ducker 2 Instream Sediment Basin | 90/90 | 56/56 | 0.020/0.020 | 0.000/0.000 | 0.020/0.020 |
| 1A | 2010 | Sediment Basin | Paulin 2, 3, 4 Instream Sediment Basins | 600/1141 | 362/805 | 0.200/0.410 | 0.000/0.010 | 0.200/0.420 |
| 1A | 2010 | Sediment Basin | Russell 1 Instream Sediment Basin | 100/100 | 96/74 | 0.030/0.030 | 0.000/0.000 | 0.030/0.030 |
| 1A | 2010 | Sediment Basin | Santa Rosa Div. 1 Instream Sediment Basin | 200/200 | 20/300 | 0.140/0.140 | 0.000/0.000 | 0.140/0.140 |
| 1A | 2010 | Sediment Basin | Starr Creek Trib 1 Instream Sediment Basin | 291/291 | 200/215 | 0.130/ | 0.000/ | 0.130/0.000 |
| 1A | 2010 | Sediment Basin | Wilfred 1 Instream Sediment Basin | 200/200 | 100/104 | 0.060/0.060 | 0.000/0.000 | 0.060/0.060 |
| | | | **1A Total** | **10087.00/10585.00** | **19314.00/24065.00** | **7.560/7.150** | **0.050/0.580** | **7.610/7.730** |
| 2A | 2010 | Sediment Basin | Adobe 2 Instream Sediment Basin | 276/276 | 480/500 | 0.080/0.080 | 0.000/0.000 | 0.080/0.080 |
| | | | **2A Total** | **276.00/276.00** | **480.00/500.00** | **0.080/0.080** | **0.000/0.000** | **0.080/0.080** |
| | | | ***2010 Overall Total*** | ***10363.00/10861.00*** | ***19794.00/24565.00*** | ***7.640/7.230*** | ***0.050/0.580*** | ***7.690/7.810*** |

| Zone | Year | Type | Project Site | Completed/Estimated | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Acres Disturbed | | |
| | | | | Length (linear feet) | Volume (cubic yards) | Waters of the U.S. (below OHWM) | Waters of the State (Below Top of Bank) | Total |
| **2011** | | | | | | | | |
| 1A | 2011 | Reach | Laguna 1 Phase II | 2400/2400 | 5000/12418 | 2.420/2.420 | 0.000/0.000 | 2.420/2.420 |
| 1A | 2011 | Reach | Santa Rosa 2 Phase I | 3494/3494 | 4000/3835 | 3.000/3.000 | 0.000/0.000 | 3.000/3.000 |
| 1A | 2011 | Reach | Todd 3 & 4 Reach Scale | 3300/1913 | 3744/2441 | 1.070/0.970 | 0.030/0.030 | 1.100/1.000 |
| 1A | 2011 | Sediment Basin | Cook 2 Instream Sediment Basin | 200/200 | 721/150 | 0.180/0.180 | 0.000/0.000 | 0.180/0.180 |
| 1A | 2011 | Sediment Basin | Copeland 3 & 4 Instream Sediment Basin | 200/200 | 250/333 | 0.210/0.210 | 0.000/0.000 | 0.210/0.210 |
| 1A | 2011 | Sediment Basin | Copeland 4 & 5 Instream Sediment Basin | 205/205 | 760/683 | 0.210/0.210 | 0.000/0.000 | 0.210/0.210 |
| 1A | 2011 | Sediment Basin | Five 1 Instream Sediment Basin | 120/120 | 150/200 | 0.110/0.110 | 0.000/0.000 | 0.110/0.110 |
| 1A | 2011 | Sediment Basin | Laguna 6 Instream Sediment Basin | 125/391 | 176/183 | 0.040/0.110 | 0.000/0.000 | 0.040/0.110 |
| 1A | 2011 | Sediment Basin | Wilfred 1 Instream Sediment Basin | 200/200 | 200/110 | 0.060/0.050 | 0.000/0.000 | 0.060/0.050 |
| | | | **1A Total** | **10244.00/9123.00** | **15001.00/20353.00** | **7.300/7.260** | **0.030/0.030** | **7.330/7.290** |
| 2A | 2011 | Reach | Corona 1 Reach Scale | 2260/2260 | 1224/421 | 0.520/0.520 | 0.000/0.000 | 0.520/0.520 |
| 2A | 2011 | Reach | Washington 3 Reach Scale | 610/260 | 608/296 | 0.080/0.090 | 0.090/0.090 | 0.170/0.180 |
| 2A | 2011 | Sediment Basin | Adobe 2 Instream Sediment Basin | 350/80 | 2020/500 | 0.080/0.080 | 0.000/0.000 | 0.080/0.080 |
| | | | **2A Total** | **3220.00/2600.00** | **3852.00/1217.00** | **0.680/0.690** | **0.090/0.090** | **0.770/0.780** |
| 3A | 2011 | Bank Repair | Fryer 4 Bank Stabilization | 20/20 | 10/10 | 0.000/0.000 | 0.000/0.000 | 0.000/0.000 |
| 3A | 2011 | Reach | Fryer 2 & 3 Reach Scale | 480/470 | 160/189 | 0.210/0.220 | 0.000/0.000 | 0.210/0.220 |
| | | | **3A Total** | **500.00/490.00** | **170.00/199.00** | **0.210/0.220** | **0.000/0.000** | **0.210/0.220** |
| 8A | 2011 | Sediment Basin | Bloomfield 1 Instream Sediment Basin | 197/197 | 340/242 | 0.100/0.100 | 0.000/0.000 | 0.100/0.100 |
| | | | **8A Total** | **197.00/197.00** | **340.00/242.00** | **0.100/0.100** | **0.000/0.000** | **0.100/0.100** |
| | | | ***2011 Overall Total*** | ***14161.00/12410.00*** | ***19363.00/22011.00*** | ***8.290/8.270*** | ***0.120/0.120*** | ***8.410/8.390*** |
| **2012** | | | | | | | | |
| 1A | 2012 | Bank Repair | Russell 1 Bank Stabilization | 30/15 | 10/10 | 0.000/0.000 | 0.000/0.000 | 0.000/0.000 |
| 1A | 2012 | Localized | Russell 1 Localized | 116/80 | 48/30 | 0.020/0.020 | 0.000/0.000 | 0.020/0.020 |
| 1A | 2012 | Reach | Coleman 1 Reach Scale | 900/903 | 312/913 | 0.290/0.290 | 0.100/0.100 | 0.390/0.390 |
| 1A | 2012 | Reach | Gossage 1, 2, 3 Reach Scale | 7600/7600 | 17944/5270 | 2.680/2.680 | 0.000/0.000 | 2.680/2.680 |
| 1A | 2012 | Reach | Laguna 1 Phase III Reach Scale | 1800/1800 | 4870/4533 | 0.090/0.090 | 0.010/0.010 | 0.100/0.100 |
| 1A | 2012 | Reach | Santa Rosa 1 Reach Scale | 1200/1200 | 1731/3439 | 0.690/0.690 | 0.000/0.000 | 0.690/0.690 |
| 1A | 2012 | Reach | Santa Rosa 2 Phase II Reach Scale | 4143/4143 | 6139/6716 | 4.550/4.550 | 0.000/0.000 | 4.550/4.550 |

| Zone | Year | Type | Project Site | Completed/Estimated: Length (linear feet) | Completed/Estimated: Volume (cubic yards) | Acres Disturbed: Waters of the U.S. (below OHWM) | Acres Disturbed: Waters of the State (Below Top of Bank) | Acres Disturbed: Total |
|---|---|---|---|---|---|---|---|---|
| 1A | 2012 | Reservoir Inlet Clearing | Brush Creek Reservoir Inlet Clearing | / | 100/250 | 0.050/0.050 | 0.000/0.000 | 0.050/0.050 |
| 1A | 2012 | Reservoir Inlet Clearing | Fish Ladder in Santa Rosa Div. 1 | 40/40 | 18/18 | 0.010/0.010 | 0.000/0.000 | 0.010/0.010 |
| 1A | 2012 | Reservoir Inlet Clearing | Matanzas Creek Reservoir Inlet Clearing | / | 216/250 | 0.050/0.050 | 0.000/0.000 | 0.050/0.050 |
| 1A | 2012 | Reservoir Inlet Clearing | Piner Creek Reservoir Inlet Clearing | / | 216/250 | 0.050/0.050 | 0.000/0.000 | 0.050/0.050 |
| 1A | 2012 | Reservoir Inlet Clearing | Santa Rosa Creek (Spring Lake) Reservoir Inlet Clearing | / | 320/100 | 0.060/0.060 | 0.000/0.000 | 0.060/0.060 |
| 1A | 2012 | Sediment Basin | Colgan 3 & 4 Instream Sediment Basin | 180/90 | 785/100 | 0.030/0.030 | 0.000/0.000 | 0.030/0.030 |
| 1A | 2012 | Sediment Basin | Copeland 4 & 5 Instream Sediment Basin | 205/205 | 488/683 | 0.210/0.210 | 0.000/0.000 | 0.210/0.210 |
| 1A | 2012 | Sediment Basin | Laguna 4 & 5 Instream Sediment Basin | 100/391 | 264/183 | 0.110/0.110 | 0.000/0.000 | 0.110/0.110 |
| 1A | 2012 | Sediment Basin | Piner 4 & 5 Instream Sediment Basin | 250/145 | 204/108 | 0.030/0.030 | 0.000/0.000 | 0.030/0.030 |
| 1A | 2012 | Sediment Basin | Piner 6 Instream Sediment Basin | 75/50 | 60/11 | 0.010/0.010 | 0.000/0.000 | 0.010/0.010 |
| 1A | 2012 | Sediment Basin | Wilfred Creek 1 | 60/200 | 16/110 | 0.050/0.050 | 0.000/0.000 | 0.050/0.050 |
| 1A | 2012 | Sediment Basin | Windsor 1B Instream Sediment Basin | 455/226 | 1090/129 | 0.210/0.110 | 0.000/0.000 | 0.210/0.110 |
| | | | **1A Total** | **17154.00/17088.00** | **34831.00/23103.00** | **9.190/9.090** | **0.110/0.110** | **9.300/9.200** |
| 2A | 2012 | Reach | East Washington 1 & 2 Reach Scale | 1820/1820 | 2908/831 | 0.270/0.270 | 0.000/0.000 | 0.270/0.270 |
| 2A | 2012 | Reach | Lichau 2 & 3 Reach Scale | 2000/2000 | 2688/740 | 0.460/0.460 | 0.000/0.000 | 0.460/0.460 |
| 2A | 2012 | Sediment Basin | Adobe 2 Instream Sediment Basin | 100/80 | 464/500 | 0.080/0.080 | 0.000/0.000 | 0.080/0.080 |
| 2A | 2012 | Sediment Basin | Washington 4 & 5 Instream Sediment Basin | 418/418 | 300/301 | 0.120/0.120 | 0.000/0.000 | 0.120/0.120 |
| | | | **2A Total** | **4338.00/4318.00** | **6360.00/2372.00** | **0.930/0.930** | **0.000/0.000** | **0.930/0.930** |
| 3A | 2012 | Reach | Lower East Fork Fryer 1 Reach Scale | 900/900 | 300/765 | 0.060/0.050 | 0.000/0.000 | 0.060/0.050 |
| | | | **3A Total** | **900.00/900.00** | **300.00/765.00** | **0.060/0.050** | **0.000/0.000** | **0.060/0.050** |
| | | | ***2012 Overall Total*** | ***22392.00/22306.00*** | ***41491.00/26240.00*** | ***10.180/10.070*** | ***0.110/0.110*** | ***10.290/10.180*** |

**2013**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1A | 2013 | Localized | Brush 2 and Austin 1 | 550/278 | 1440/819 | 0.250/0.130 | /0.000 | 0.250/0.130 |
| 1A | 2013 | Localized | Fountaingrove 2 Modified Easement | 50/100 | 48/140 | /0.030 | / | 0.000/0.030 |
| 1A | 2013 | Reach | Colgan 2, 3, 4 Reach Scale | 6538/6494 | 12584/5881 | 12.360/2.060 | 0.120/0.000 | 12.480/2.060 |
| 1A | 2013 | Reach | Hinebaugh 3A Reach Scale | 900/5160 | 4560/4639 | /2.380 | 0.090/0.050 | 0.090/2.430 |
| 1A | 2013 | Reach | Todd 1, 2 Reach Scale | 2925/4050 | 7936/1727 | 1.000/1.330 | 0.100/0.000 | 1.100/1.330 |
| 1A | 2013 | Reservoir Inlet Clearing | Brush Creek Reservoir Inlet Clearing | / | 222/250 | 0.050/0.050 | /0.000 | 0.050/0.050 |
| 1A | 2013 | Reservoir Inlet Clearing | Matanzas Creek Reservoir Inlet Clearing | / | 544/250 | 0.050/0.050 | /0.000 | 0.050/0.050 |
| 1A | 2013 | Reservoir Inlet Clearing | Piner Creek Reservoir Inlet Clearing | / | 528/250 | 0.050/0.050 | /0.000 | 0.050/0.050 |

| Zone | Year | Type | Project Site | Completed/Estimated Length (linear feet) | Volume (cubic yards) | Acres Disturbed: Waters of the U.S. (below OHWM) | Waters of the State (Below Top of Bank) | Total |
|---|---|---|---|---|---|---|---|---|
| 1A | 2013 | Sediment Basin | Copeland 4 and 5 Instream Sediment Basin | 283/205 | 688/750 | 0.290/0.210 | 0.000/0.000 | 0.290/0.210 |
| 1A | 2013 | Sediment Basin | Five 1 Instream Sediment Basin | 50/120 | 104/100 | /0.050 | 0.050/0.000 | 0.050/0.050 |
| 1A | 2013 | Sediment Basin | Roseland 1 Sediment Basin Clearing | 360/910 | 144/1241 | 0.170/0.590 | 0.000/0.000 | 0.170/0.590 |
| 1A | 2013 | Sediment Basin | Wilfred 1 Instream Sediment Basin | 50/200 | 40/100 | 0.010/0.050 | 0.000/0.000 | 0.010/0.050 |
| 1A | 2013 | Sediment Basin | Windsor 3 and 4 Instream Sediment Basin | 90/134 | 96/175 | 0.050/0.070 | 0.000/0.000 | 0.050/0.070 |
| | | | **1A Total** | **11796.00/17651.00** | **28934.00/16322.00** | **14.280/7.050** | **0.360/0.050** | **14.640/7.100** |
| 2A | 2013 | Localized | Ellis 1 Modified Easement Sediment Removal | 175/110 | 280/122 | /0.070 | /0.010 | 0.000/0.080 |
| 2A | 2013 | Localized | Lichau 4, 5 Modified Easement Sediment Removal | 210/210 | 616/394 | /0.050 | / | 0.000/0.050 |
| 2A | 2013 | Reach | Corona Trib 1 Reach Scale | 3100/3100 | 1705/1860 | 0.960/0.960 | /0.000 | 0.960/0.960 |
| 2A | 2013 | Reach | East Washington 3, 4, 5 Reach Scale Sediment Removal | 1579/3500 | 728/2473 | 0.250/0.770 | /0.000 | 0.250/0.770 |
| 2A | 2013 | Reach | Lichau 1 Reach Scale Sediment Removal | 775/775 | 808/254 | 0.310/0.310 | /0.000 | 0.310/0.310 |
| 2A | 2013 | Reach | Lynch 1 Reach Scale Sediment Removal | 1290/1090 | 3060/2826 | 1.230/0.880 | /0.000 | 1.230/0.880 |
| 2A | 2013 | Reach | Washington 6 Reach Scale Sediment Removal | 1780/1780 | 1666/1607 | 0.430/0.430 | 0.000/0.000 | 0.430/0.430 |
| 2A | 2013 | Sediment Basin | Adobe 1 and 2 | 281/80 | 1024/750 | 0.290/0.080 | 0.000/0.000 | 0.290/0.080 |
| 2A | 2013 | Sediment Basin | Jessie Lane 1 Instream Sediment Basin | 100/25 | 40/15 | 0.010/0.010 | /0.000 | 0.010/0.010 |
| | | | **2A Total** | **9290.00/10670.00** | **9927.00/10301.50** | **3.480/3.560** | **0.000/0.010** | **3.480/3.570** |
| | | | ***2013 Overall Total*** | ***21086.00/28321.00*** | ***38861.00/26623.50*** | ***17.760/10.610*** | ***0.360/0.060*** | ***18.120/10.670*** |

**2014**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1A | 2014 | Localized | Colgan 5 Localized | 450/170 | 432/101 | 0.040/0.030 | 0.070/ | 0.110/0.030 |
| 1A | 2014 | Reach | Forestview 2 and 3 | 3243/3243 | 2000/901 | 0.140/0.930 | 0.220/ | 0.360/0.930 |
| 1A | 2014 | Reach | Hinebaugh 3B, 4 5A and 5C | 2890/4260 | 4864/2303 | 0.740/1.520 | 0.190/ | 0.930/1.520 |
| 1A | 2014 | Reach | South Fork Copeland 1 Reach Scale Sediment Removal Project | 2805/ | 2296/ | 0.210/ | 0.190/ | 0.400/0.000 |
| 1A | 2014 | Reach | Starr 2 Reach Scale Sediment Removal Project | 800/800 | 800/444 | 0.040/0.280 | 0.000/ | 0.040/0.280 |
| 1A | 2014 | Reach | Steele 1B and 2 Reach Scale Sediment Removal Project | 2342/1542 | 1120/171 | 0.550/0.030 | 0.000/ | 0.550/0.030 |
| 1A | 2014 | Reservoir Inlet Clearing | Brush Creek Reservoir Inlet Clearing | / | 264/250 | 0.050/0.060 | 0.000/ | 0.050/0.060 |
| 1A | 2014 | Reservoir Inlet Clearing | Fish Ladder in Santa Rosa Diversion Structure Inlet Clearing Project | 38/40 | 36/18 | 0.010/0.010 | 0.000/ | 0.010/0.010 |
| 1A | 2014 | Reservoir Inlet Clearing | Matanzas Creek Reservoir Inlet Clearing | / | 1136/250 | 0.100/0.060 | 0.000/ | 0.100/0.060 |
| 1A | 2014 | Reservoir Inlet Clearing | Santa Rosa Creek Reservoir Inlet Clearing Project | / | 128/250 | 0.060/0.060 | 0.000/ | 0.060/0.060 |

| Zone | Year | Type | Project Site | Completed/Estimated Length (linear feet) | Volume (cubic yards) | Acres Disturbed: Waters of the U.S. (below OHWM) | Waters of the State (Below Top of Bank) | Total |
|---|---|---|---|---|---|---|---|---|
| 1A | 2014 | Reservoir Inlet Clearing | Santa Rosa Diversion Structure Inlet Clearing | 250/200 | 576/300 | 0.660/0.140 | 0.000/ | 0.660/0.140 |
| 1A | 2014 | Sediment Basin | Cook 2 In-stream Sediment Basin Clearing Project | 192/200 | 896/200 | 0.180/0.090 | 0.020/ | 0.200/0.090 |
| 1A | 2014 | Sediment Basin | Copeland 2 Instream Sediment Basin Clearing Project | 141/ | 1336/ | 0.100/ | 0.010/ | 0.110/0.000 |
| 1A | 2014 | Sediment Basin | Copeland 3 & 4 In-stream Sediment Basin Clearing Project | 189/200 | 488/400 | 0.140/0.210 | 0.010/ | 0.150/0.210 |
| 1A | 2014 | Sediment Basin | Copeland 4 & 5 In-stream Sediment Basin Clearing Project | 230/283 | 768/750 | 0.310/0.290 | 0.020/ | 0.330/0.290 |
| | | | **1A Total** | **13570.00/10938.00** | **17140.00/6338.00** | **3.330/3.710** | **0.730/0.000** | **4.060/3.710** |
| 2A | 2014 | Bank Repair | E. Washington 3 Bank Repair | 77/53 | 120/67 | 0.010/0.020 | 0.000/0.010 | 0.010/0.030 |
| 2A | 2014 | Reach | McDowell 2B Reach Scale Sediment Removal Project | 1473/ | 600/ | 0.140/ | 0.000/ | 0.140/0.000 |
| 2A | 2014 | Sediment Basin | Adobe 1 & 2 In-stream Sediment Basin Clearing Project | 375/281 | 1136/1024 | 0.370/0.290 | 0.000/ | 0.370/0.290 |
| 2A | 2014 | Sediment Basin | Washington 2 In-stream Sediment Basin | 120/ | 210/ | 0.010/ | 0.000/ | 0.010/0.000 |
| 2A | 2014 | Sediment Basin | Washington 3 In-stream Sediment Basin Clearing Project | 100/ | 150/ | 0.000/ | 0.000/ | 0.000/0.000 |
| | | | **2A Total** | **2145.00/334.00** | **2216.00/1091.00** | **0.530/0.310** | **0.000/0.010** | **0.530/0.320** |
| 3A | 2014 | Reach | Nathanson Bypass 1 Reach Scale Sediment Removal Project | 775/695 | 1104/720 | 0.180/0.210 | 0.000/ | 0.180/0.210 |
| | | | **3A Total** | **775.00/695.00** | **1104.00/720.00** | **0.180/0.210** | **0.000/0.000** | **0.180/0.210** |
| | | | ***2014 Overall Total*** | ***16490.00/11967.00*** | ***20460.00/8149.00*** | ***4.040/4.230*** | ***0.730/0.010*** | ***4.770/4.240*** |
| **2015** | | | | | | | | |
| 1A | 2015 | Bank Repair | Peterson 1 Bank Repair | 40/43 | 16/43 | 0.008/0.008 | 0.012/0.012 | 0.020/0.020 |
| 1A | 2015 | Localized | Coleman 2-Culvert Cleaning | 64/64 | 32/300 | 0.002/0.002 | 0.001/0.001 | 0.003/0.003 |
| 1A | 2015 | Localized | Colgan 7 | 389/389 | 92/136 | 0.179/0.090 | /0.000 | 0.179/0.090 |
| 1A | 2015 | Localized | Kawana 1A | 182/222 | 85/39 | 0.042/0.020 | 0.000/0.000 | 0.042/0.020 |
| 1A | 2015 | Localized | Laguna 2 @ confluence of Hinebaugh and Gossage | 184/600 | 1912/3433 | 0.380/0.710 | 0.211/ | 0.591/0.710 |
| 1A | 2015 | Localized | Peterson 1 | 375/466 | 329/487 | 0.112/0.230 | 0.000/ | 0.112/0.230 |
| 1A | 2015 | Reach | Peterson 2 | 3550/3510 | 3127/1373 | 0.967/1.060 | / | 0.967/1.060 |
| 1A | 2015 | Reservoir Inlet Clearing | Brush Creek Reservoir Inlet Clearing | 0/ | 152/250 | 0.052/0.050 | 0.000/0.000 | 0.052/0.050 |
| 1A | 2015 | Reservoir Inlet Clearing | Fish Ladder in Santa Rosa Div 1 | 40/40 | 15/18 | 0.006/0.010 | /0.000 | 0.006/0.010 |
| 1A | 2015 | Reservoir Inlet Clearing | Matanzas Creek Reservoir Inlet Clearing | 0/ | 856/250 | 0.103/0.050 | / | 0.103/0.050 |
| 1A | 2015 | Sediment Basin | College 2 Sediment Basin | 70/200 | 40/129 | 0.032/0.090 | 0.000/ | 0.032/0.090 |

| Zone | Year | Type | Project Site | Completed/Estimated<br>Length<br>(linear feet) | Volume<br>(cubic yards) | Acres Disturbed<br>Waters of the U.S.<br>(below OHWM) | Waters of the State<br>(Below Top of Bank) | Total |
|---|---|---|---|---|---|---|---|---|
| 1A | 2015 | Sediment Basin | Copeland 4&5 Sediment Basin | 230/205 | 856/750 | 0.210/0.210 | 0.000/0.000 | 0.210/0.210 |
| 1A | 2015 | Sediment Basin | Santa Rosa 1&2 Sediment Basins | 650/1990 | 1432/3713 | 0.049/1.280 | / | 0.049/1.280 |
| 1A | 2015 | Sediment Basin | Todd 5B Sediment Basin | 260/50 | 320/60 | 0.072/0.020 | 0.006/ | 0.078/0.020 |
| | | | **1A Total** | **6034.00/7779.00** | **9264.00/10981.00** | **2.214/3.830** | **0.230/0.013** | **2.444/3.843** |
| 2A | 2015 | Reach | Adobe 1&2 Sediment Removal | 2086/2373 | 4800/5488 | 0.681/1.380 | 0.447/0.460 | 1.128/1.840 |
| 2A | 2015 | Reach | East Fork McDowell 1 | 50/130 | 56/46 | 0.011/0.040 | 0.000/ | 0.011/0.040 |
| | | | **2A Total** | **2136.00/2503.00** | **4856.00/5534.00** | **0.692/1.420** | **0.447/0.460** | **1.139/1.880** |
| 4A | 2015 | Localized | Wood 1 @ Railroad Tracks | 200/200 | 136/196 | 0.184/0.100 | /0.005 | 0.184/0.105 |
| | | | **4A Total** | **200.00/200.00** | **136.00/196.00** | **0.184/0.100** | **0.000/0.005** | **0.184/0.105** |
| 8A | 2015 | Reach | Bloomfield 1 | 1220/1245 | 1768/1252 | 0.364/0.550 | / | 0.364/0.550 |
| | | | **8A Total** | **1220.00/1245.00** | **1768.00/1252.00** | **0.364/0.550** | **0.000/0.000** | **0.364/0.550** |
| | | | ***2015 Overall Total*** | ***9590.00/11727.00*** | ***16024.00/17963.00*** | ***3.454/5.900*** | ***0.677/0.478*** | ***4.131/6.378*** |
| **2016** | | | | | | | | |
| 1A | 2016 | Bank Repair | Russell 1A Bank Repair | 75/100 | 48/50 | 0.005/0.005 | 0.026/0.026 | 0.031/0.031 |
| 1A | 2016 | Localized | Cook Creek Reach 1 | 165/65 | 88/54 | 0.052/0.001 | 0.015/0.000 | 0.067/0.001 |
| 1A | 2016 | Localized | Ducker Reach 1 | 911/1445 | 800/1495 | 0.589/0.741 | 0.277/ | 0.866/0.741 |
| 1A | 2016 | Localized | Laguna de Santa Rosa 2/3 and Copeland 1 | 660/1452 | 2152/560 | 0.378/0.867 | 0.338/ | 0.716/0.867 |
| 1A | 2016 | Reach | Laguna de Santa Rosa Reach 4 | 1959/1969 | 4040/1149 | 1.670/0.322 | 0.151/0.085 | 1.821/0.407 |
| 1A | 2016 | Reach | Santa Rosa Diversion Structure 1 | 254/254 | 448/500 | 0.420/0.420 | 0.000/0.000 | 0.420/0.420 |
| 1A | 2016 | Reservoir Inlet Clearing | Brush Creek Reservior Clearing | / | 104/ | / | / | 0.000/0.000 |
| 1A | 2016 | Reservoir Inlet Clearing | Matanzas Creek Reservoir Clearing | / | 1520/ | / | / | 0.000/0.000 |
| 1A | 2016 | Sediment Basin | Brush 2B/Austin 1 Sediment Basin | 185/200 | 104/200 | 0.178/ | 0.000/0.000 | 0.178/0.000 |
| 1A | 2016 | Sediment Basin | Cook Creek Reach 2 | 203/200 | 1144/150 | 0.184/0.184 | 0.000/ | 0.184/0.184 |
| 1A | 2016 | Sediment Basin | Copeland Creek Reach 3&4 | 310/200 | 432/400 | 0.207/0.207 | 0.000/ | 0.207/0.207 |
| 1A | 2016 | Sediment Basin | Copeland Creek Reach 4&5 | 350/205 | 1200/750 | 0.288/0.212 | 0.006/ | 0.294/0.212 |
| 1A | 2016 | Sediment Basin | Ducker Creek Reach 2A | 40/50 | 40/36 | 0.013/0.013 | 0.000/ | 0.013/0.013 |
| 1A | 2016 | Sediment Basin | Five Creek | 164/120 | 232/100 | 0.110/0.110 | 0.000/ | 0.110/0.110 |
| 1A | 2016 | Sediment Basin | Santa Rosa Creek Reach 2 | 727/2050 | 3096/10412 | 0.668/2.581 | 0.000/ | 0.668/2.581 |

| | | | | Completed/Estimated | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Acres Disturbed | | |
| Zone | Year | Type | Project Site | Length (linear feet) | Volume (cubic yards) | Waters of the U.S. (below OHWM) | Waters of the State (Below Top of Bank) | Total |
| 1A | 2016 | Sediment Basin | Santa Rosa Diversion 1 (Voretx Tube) | 155/200 | 448/500 | 0.219/0.219 | 0.000/0.000 | 0.219/0.219 |
| 1A | 2016 | Sediment Basin | Wilfred Creek Reach 1C | 70/200 | 72/100 | 0.046/0.046 | 0.000/ | 0.046/0.046 |
| | | | **1A Total** | **6228.00/8710.00** | **15968.00/16456.00** | **5.027/5.928** | **0.813/0.111** | **5.840/6.039** |
| 2A | 2016 | Reach | Corona Creek Reach 1 | 981/3167 | 520/939 | 0.360/1.163 | 0.000/ | 0.360/1.163 |
| 2A | 2016 | Sediment Basin | Adobe Creek Sediment Basin | 431/309 | 904/1052 | 0.390/0.293 | 0.002/ | 0.392/0.293 |
| | | | **2A Total** | **1412.00/3476.00** | **1424.00/1991.00** | **0.750/1.456** | **0.002/0.000** | **0.752/1.456** |
| 5A | 2016 | Sediment Basin | Fife Creek Sediment Basins | 779/1380 | 664/1667 | 0.479/0.479 | 0.000/ | 0.479/0.479 |
| | | | **5A Total** | **779.00/1380.00** | **664.00/1667.00** | **0.479/0.479** | **0.000/0.000** | **0.479/0.479** |
| | | | ***2016 Overall Total*** | ***8419.00/13566.00*** | ***18056.00/20114.00*** | ***6.256/7.863*** | ***0.815/0.111*** | ***7.071/7.974*** |
| **2017** | | | | | | | | |
| 1A | 2017 | Bank Repair | Gossage 2A Bank Repair | 20/20 | 44/44 | 0.000/0.000 | 0.009/0.010 | 0.009/0.010 |
| 1A | 2017 | Bank Repair | Laguna 5 Bank Repair | 120/40 | 80/80 | 0.003/0.000 | 0.016/0.020 | 0.019/0.020 |
| 1A | 2017 | Localized | Indian 1 Localized | 186/265 | 72/196 | 0.043/0.060 | 0.000/0.000 | 0.043/0.060 |
| 1A | 2017 | Localized | Matanzas Creek Reservoir inlet and outlet clearing | 300/50 | 7476/580 | 0.238/0.120 | 0.004/0.020 | 0.242/0.140 |
| 1A | 2017 | Localized | Wilfred Ext 2 Localized | 344/690 | 304/196 | 0.119/0.240 | 0.000/0.000 | 0.119/0.240 |
| 1A | 2017 | Reach | Copeland 2 Reach Scale | 3771/3850 | 5288/7372 | 1.090/3.000 | 0.055/0.100 | 1.145/3.100 |
| 1A | 2017 | Reach | Hinebaugh 2 Reach Scale | 1238/1310 | 2872/3779 | 0.853/1.080 | 0.018/0.150 | 0.871/1.230 |
| 1A | 2017 | Reach | Santa Rosa Diversion 1 | 400/305 | 1808/500 | 0.459/0.420 | 0.000/0.000 | 0.459/0.420 |
| 1A | 2017 | Reservoir Inlet Clearing | Brush Creek Reservoir inlet clearing | 50/ | 16/250 | 0.050/0.050 | 0.000/0.000 | 0.050/0.050 |
| 1A | 2017 | Sediment Basin | Cook 2 Sediment Basin | 248/203 | 1176/ | 0.285/0.140 | 0.000/0.000 | 0.285/0.140 |
| 1A | 2017 | Sediment Basin | Copeland 1 & 2 Sediment Basin | 250/250 | 416/416 | 0.143/0.143 | 0.057/0.057 | 0.200/0.200 |
| 1A | 2017 | Sediment Basin | Copeland 4 & 5 Sediment Basin | 370/400 | 3006/1555 | 0.273/0.320 | 0.000/0.000 | 0.273/0.320 |
| 1A | 2017 | Sediment Basin | Copeland 5 Sediment Basin | 377/400 | 1440/465 | 0.155/0.170 | 0.000/0.000 | 0.155/0.170 |
| 1A | 2017 | Sediment Basin | Santa Rosa Div 2 (Vortex Tube) | 138/172 | 832/816 | 0.203/0.021 | 0.000/0.231 | 0.203/0.252 |
| 1A | 2017 | Sediment Basin | Starr Creek Trib 1 | 280/200 | 144/370 | 0.064/0.115 | 0.000/0.000 | 0.064/0.115 |
| 1A | 2017 | Sediment Basin | Wilfred 1C Sediment Basin | 120/70 | 240/72 | 0.027/0.050 | 0.000/0.000 | 0.027/0.050 |
| | | | **1A Total** | **8212.00/8225.00** | **25214.00/16691.00** | **4.005/5.929** | **0.159/0.588** | **4.164/6.517** |
| 2A | 2017 | Sediment Basin | Lichau 3 Sediment Basin | 100/100 | 1400/1111 | 0.172/0.230 | 0.000/0.000 | 0.172/0.230 |
| | | | **2A Total** | **100.00/100.00** | **1400.00/1111.00** | **0.172/0.230** | **0.000/0.000** | **0.172/0.230** |

| Zone | Year | Type | Project Site | Completed/Estimated Length (linear feet) | Completed/Estimated Volume (cubic yards) | Acres Disturbed: Waters of the U.S. (below OHWM) | Acres Disturbed: Waters of the State (Below Top of Bank) | Acres Disturbed: Total |
|---|---|---|---|---|---|---|---|---|
| 3A | 2017 | Sediment Basin | Rodgers 0A/1 Sediment Basin | 350/400 | 1224/2408 | 0.285/0.230 | 0.000/0.000 | 0.285/0.230 |
| | | | **3A Total** | **350.00/400.00** | **1224.00/2408.00** | **0.285/0.230** | **0.000/0.000** | **0.285/0.230** |
| 4A | 2017 | Sediment Basin | Wood 1 Sediment Basin | 350/183 | 680/143 | 0.120/0.100 | 0.000/0.000 | 0.120/0.100 |
| | | | **4A Total** | **350.00/183.00** | **680.00/143.00** | **0.120/0.100** | **0.000/0.000** | **0.120/0.100** |
| 6A | 2017 | Bank Repair | West (Norton) Slough 0 | 75/75 | 500/500 | 0.009/0.009 | 0.034/0.034 | 0.043/0.043 |
| | | | **6A Total** | **75.00/75.00** | **500.00/500.00** | **0.009/0.009** | **0.034/0.034** | **0.043/0.043** |
| | | | ***2017 Overall Total*** | ***9087.00/8983.00*** | ***29018.00/20853.00*** | ***4.591/6.498*** | ***0.193/0.622*** | ***4.784/7.120*** |

**2018**

| Zone | Year | Type | Project Site | Length (linear feet) | Volume (cubic yards) | Waters of the U.S. (below OHWM) | Waters of the State (Below Top of Bank) | Total |
|---|---|---|---|---|---|---|---|---|
| 1A | 2018 | Bank Repair | Austin 1 Bank Repair | 10/20 | 2/10 | 0.000/0.003 | 0.001/0.001 | 0.001/0.004 |
| 1A | 2018 | Bank Repair | Austin 2 Bank Repairs | /310 | 820/97 | /0.007 | /0.036 | 0.000/0.043 |
| 1A | 2018 | Localized | Paulin 8 Localized Sediment Removal | 251/300 | 176/194 | 0.040/0.048 | 0.000/0.000 | 0.040/0.048 |
| 1A | 2018 | Localized | Santa Rosa 2 Localized | 873/650 | 3608/2166 | 0.670/0.445 | 0.000/0.000 | 0.670/0.445 |
| 1A | 2018 | Reach | Copeland 3 Reach Scale | 896/896 | 3560/2509 | 0.684/0.679 | 0.390/0.617 | 1.074/1.296 |
| 1A | 2018 | Reach | Lorna Dell 1 Reach Scale | 911/911 | 408/75 | 0.209/0.209 | 0.000/0.000 | 0.209/0.209 |
| 1A | 2018 | Reservoir Inlet Clearing | Brush Creek Reservoir Inlet Clearing | 100/100 | 680/150 | 0.075/0.075 | 0.000/0.000 | 0.075/0.075 |
| 1A | 2018 | Reservoir Inlet Clearing | Matanzas Creek Reservoir Inlet Clearing | 740/740 | 4408/10054 | 1.864/2.047 | 0.000/0.000 | 1.864/2.047 |
| 1A | 2018 | Reservoir Inlet Clearing | Santa Rosa Creek Reservoir Inlet Clearing | 525/240 | 2704/150 | 0.908/0.331 | 0.000/0.000 | 0.908/0.331 |
| 1A | 2018 | Sediment Basin | Five 1 Sediment Basin | 400/250 | 936/462 | 0.229/0.143 | 0.000/0.000 | 0.229/0.143 |
| 1A | 2018 | Sediment Basin | Paulin 6A Sediment Basin | 350/200 | 312/222 | 0.120/0.069 | 0.000/0.000 | 0.120/0.069 |
| 1A | 2018 | Sediment Basin | Santa Rosa Creek Div 1 | 261/305 | 600/340 | 0.420/0.420 | 0.000/0.000 | 0.420/0.420 |
| | | | **1A Total** | **5317.00/4922.00** | **18214.00/16429.00** | **5.219/4.476** | **0.391/0.654** | **5.610/5.130** |
| 2A | 2018 | Sediment Basin | East Washignton 4&5 Sediment Basin | 160/300 | 312/333 | 0.073/0.138 | 0.000/0.000 | 0.073/0.138 |
| 2A | 2018 | Sediment Basin | Washington 5&6 Sediment Basin | 350/300 | 992/250 | 0.137/0.103 | 0.000/0.000 | 0.137/0.103 |
| | | | **2A Total** | **510.00/600.00** | **1304.00/583.00** | **0.210/0.241** | **0.000/0.000** | **0.210/0.241** |
| 3A | 2018 | Sediment Basin | Rodgers 1A/0 Sediment Basin | 328/400 | 1112/740 | 0.188/0.230 | 0.000/0.000 | 0.188/0.230 |
| | | | **3A Total** | **328.00/400.00** | **1112.00/740.00** | **0.188/0.230** | **0.000/0.000** | **0.188/0.230** |
| 4A | 2018 | Reach | Wood 1 Reach Scale | 1840/1840 | 3256/1985 | 0.854/0.946 | 0.180/0.000 | 1.034/0.946 |
| | | | **4A Total** | **1840.00/1840.00** | **3256.00/1985.00** | **0.854/0.946** | **0.180/0.000** | **1.034/0.946** |

| Zone | Year | Type | Project Site | Completed/Estimated Length (linear feet) | Volume (cubic yards) | Acres Disturbed: Waters of the U.S. (below OHWM) | Waters of the State (Below Top of Bank) | Total |
|---|---|---|---|---|---|---|---|---|
| 5A | 2018 | Sediment Basin | Fife 2/3 Sediment Basin | 871/400 | 1488/444 | 0.299/0.138 | 0.000/0.000 | 0.299/0.138 |
| | | | **5A Total** | **871.00/400.00** | **1488.00/444.00** | **0.299/0.138** | **0.000/0.000** | **0.299/0.138** |
| 6A | 2018 | Sediment Basin | West Slough 1 Sediment Basin | 400/331 | 1232/895 | 0.237/0.190 | 0.122/0.080 | 0.359/0.270 |
| | | | **6A Total** | **400.00/331.00** | **1232.00/895.00** | **0.237/0.190** | **0.122/0.080** | **0.359/0.270** |
| 8A | 2018 | Sediment Basin | Bloomfield 1 Sediment Basin | 150/360 | 856/400 | 0.051/0.124 | 0.000/0.000 | 0.051/0.124 |
| | | | ***8A Total*** | **150.00/360.00** | **856.00/400.00** | **0.051/0.124** | **0.000/0.000** | **0.051/0.124** |
| | | | ***2018 Overall Total*** | ***9416.00/8853.00*** | ***27462.00/21476.00*** | ***7.058/6.345*** | ***0.693/0.734*** | ***7.751/7.079*** |

**Table A-3.** Sediment Removal Activities Completed in Cook Creek and Adobe Basin (2008-2017)

| | | | | Completed/Estimated | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Acres Disturbed | | |
| **Zone** | **Year** | **Type** | **Project Site** | **Length (linear feet)** | **Volume (cubic yards)** | **Waters of the U.S. (below OHWM)** | **Waters of the State (Below Top of Bank)** | **Total** |
| 1A | 2011 | Sediment Basin | Cook 2 Instream Sediment Basin | 200/200 | 721/150 | 0.180/0.180 | 0.000/0.000 | 0.180/0.180 |
| 1A | 2008 | Sediment Basin | Cook 2 Instream Sediment Basin Clearing | / | / | / | / | 0.000/0.000 |
| 1A | 2014 | Sediment Basin | Cook 2 In-stream Sediment Basin Clearing Project | 192/200 | 896/200 | 0.180/0.090 | 0.020/ | 0.200/0.090 |
| 1A | 2016 | Sediment Basin | Cook 2 Sediment Basin | 248/203 | 1176/ | 0.285/0.140 | 0.000/0.000 | 0.285/0.140 |
| 1A | 2017 | Sediment Basin | Cook Creek Reach 2 | 203/200 | 1,144/150 | 0.184/0.184 | 0.000/ | 0.184/0.184 |
| | | | ***Zone 1A Overall Total*** | ***843.00/803.00*** | ***3,937.00/500.00*** | ***0.829/0.594*** | ***0.020/0.000*** | ***0.849/0.594*** |
| 2A | 2015 | Reach | Adobe 1&2 Sediment Removal | 2,086/2373 | 4,800/5,488 | 0.681/1.380 | 0.447/0.460 | 1.128/1.840 |
| 2A | 2008 | Reach | Adobe 1, 2 | /4007 | 930/1,800 | /0.310 | / | 0.000/0.310 |
| 2A | 2014 | Sediment Basin | Adobe 1 & 2 In-stream Sediment Basin Clearing Project | 375/281 | 1,136/1,024 | 0.370/0.290 | 0.000/ | 0.370/0.290 |
| 2A | 2013 | Sediment Basin | Adobe 1 and 2 | 281/80 | 1,024/750 | 0.290/0.080 | 0.000/0.000 | 0.290/0.080 |
| 2A | 2012 | Sediment Basin | Adobe 2 Instream Sediment Basin | 100/80 | 464/500 | 0.080/0.080 | 0.000/0.000 | 0.080/0.080 |
| 2A | 2010 | Sediment Basin | Adobe 2 Instream Sediment Basin | 276/276 | 480/500 | 0.080/0.080 | 0.000/0.000 | 0.080/0.080 |
| 2A | 2011 | Sediment Basin | Adobe 2 Instream Sediment Basin | 350/80 | 2,020/500 | 0.080/0.080 | 0.000/0.000 | 0.080/0.080 |
| 2A | 2009 | Sediment Basin | Adobe 2 Localized | 150/150 | 256/256 | 0.150/0.150 | 0.000/0.000 | 0.150/0.150 |
| 2A | 2016 | Sediment Basin | Adobe Creek Sediment Basin | 431/309 | 904/1052 | 0.390/0.293 | 0.002/ | 0.392/0.293 |
| | | | ***Zone 2A Overall Total*** | ***4,049.00/7636.00*** | ***12,944.00/11,870.00*** | ***2.121/2.743*** | ***0.449/0.460*** | ***2.570/3.203*** |

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**Table A-4.** SMP Creeks and Reaches where Sediment Testing has Occurred within North Coast RWQCB's Jurisdiction

| Zone | Subbasin Name | Creek Name | Reach Name | Year of Sediment Testing |
|---|---|---|---|---|
| 1A | Laguna de Santa Rosa | Cook Creek | Cook 2 | 2016, 2019 |
| 1A | Laguna de Santa Rosa | LaBath Creek | LaBath 1 | 2015 |
| 1A | Laguna de Santa Rosa | Laguna de Santa Rosa | Laguna 2 | 2015 |
| 1A | Laguna de Santa Rosa | Wilfred Creek | Wilfred 1 | 2016, 2018 |
| 1A | Mark West Creek | Santa Rosa Creek | Santa Rosa Division 1 | 2019 |
| 1A | Mark West Creek | Santa Rosa Creek | Santa Rosa Division 2 | 2019 |
| 1A | Mark West Creek | Santa Rosa Creek | Spring Lake Reservoir | 2019 |
| 1A | Roseland and Colgan | Colgan Creek | Colgan 3 | 2013 |
| 1A | Roseland and Colgan | Colgan Creek | Colgan 4 | 2012, 2013 |
| 1A | Roseland and Colgan | Colgan Creek | Colgan 5 | 2010, 2013 |
| 1A | Roseland and Colgan | Colgan Creek | Colgan 6 | 2011 |
| 1A | Roseland and Colgan | Colgan Creek | Colgan 7 | 2010, 2015 |
| 1A | Roseland and Colgan | Kawana Springs Creek | Kawana 1A | 2010, 2015 |
| 1A | Roseland and Colgan | Roseland Creek | Roseland 1 | 2013 |
| 1A | Russian River | Laguna de Santa Rosa | Laguna 1 | 2019 |
| 1A | Russian River | Laguna de Santa Rosa | Laguna 2 | 2019 |
| 1A | Russian River | Laguna de Santa Rosa | Laguna 3 | 2019 |
| 1A | Santa Rosa | Austin Creek | Austin 3 | 2011 |
| 1A | Santa Rosa | Brush Creek | Brush 2 | 2013, 2017 |
| 1A | Santa Rosa | College Creek | College 2 | 2015 |
| 1A | Santa Rosa | College Creek | College 3 | 2010 |
| 1A | Santa Rosa | Ducker Creek | Ducker 2 | 2010 |
| 1A | Santa Rosa | Forestview Creek | Forestview 2 | 2013 |
| 1A | Santa Rosa | Forestview Creek | Forestview 3 | 2013 |
| 1A | Santa Rosa | Green Valley Creek | Green Valley Creek | 2018 |
| 1A | Santa Rosa | Lorna Dell Creek | Lorna Dell 1 | 2010 |

| Zone | Subbasin Name | Creek Name | Reach Name | Year of Sediment Testing |
|---|---|---|---|---|
| 1A | Santa Rosa | Paulin Creek | Paulin 2 | 2010, 2018 |
| 1A | Santa Rosa | Paulin Creek | Paulin 3 | 2010, 2018 |
| 1A | Santa Rosa | Paulin Creek | Paulin 4 | 2010, 2018 |
| 1A | Santa Rosa | Paulin Creek | Paulin 5 | 2013 |
| 1A | Santa Rosa | Paulin Creek | Paulin 6 | 2010, 2013,2018 |
| 1A | Santa Rosa | Paulin Creek | Paulin 8 | 2018 |
| 1A | Santa Rosa | Peterson Creek | Peterson 1 | 2015 |
| 1A | Santa Rosa | Peterson Creek | Peterson 2 | 2010, 2015 |
| 1A | Santa Rosa | Piner Creek | Piner 6 | 2012 |
| 1A | Santa Rosa | Russell Creek | Russell 1 | 2010 |
| 1A | Santa Rosa | Santa Rosa Creek | Santa Rosa 1 | 2010, 2017 |
| 1A | Santa Rosa | Santa Rosa Creek | Santa Rosa 2 | 2011 |
| 1A | Santa Rosa | Steele Creek | Steele 1 | 2014 |
| 1A | Santa Rosa | Steele Creek | Steele 2 | 2013 |
| 1A | Santa Rosa Creek | Austin Creek | Austin 2 | 2019 |
| 1A | Santa Rosa Creek | Brush Creek | Brush Creek Reservoir | 2018, 2019 |
| 1A | Santa Rosa Creek | College Creek | College 1 | 2019 |
| 1A | Santa Rosa Creek | College Creek | College 2 | 2019 |
| 1A | Santa Rosa Creek | Matanzas Creek | Matanzas Reservoir | 2018, 2019 |
| 1A | Santa Rosa Creek | Paulin Creek | Piner Creek Reservoir | 2019 |
| 1A | Upper Laguna | Coleman Creek | Coleman 2 | 2011 |
| 1A | Upper Laguna | Cook Creek | Cook 2 | 2011 |
| 1A | Upper Laguna | Copeland Creek | Copeland 2 | 2014, 2017 |
| 1A | Upper Laguna | Copeland Creek | Copeland 4 | 2011, 2017 |
| 1A | Upper Laguna | Copeland Creek | Copeland 5 | 2017 |
| 1A | Upper Laguna | Crane Creek | Crane 1 | 2010, 2018 |
| 1A | Upper Laguna | Five Creek | Five 1 | 2010, 2018 |
| 1A | Upper Laguna | Gossage Creek | Gossage 1 | 2011 |

| Zone | Subbasin Name | Creek Name | Reach Name | Year of Sediment Testing |
|---|---|---|---|---|
| 1A | Upper Laguna | Gossage Creek | Gossage 2 | 2012 |
| 1A | Upper Laguna | Gossage Creek | Gossage 3 | 2012 |
| 1A | Upper Laguna | Hinebaugh Creek | Hinebaugh 1 | 2012 |
| 1A | Upper Laguna | Hinebaugh Creek | Hinebaugh 3 | 2013 |
| 1A | Upper Laguna | Hinebaugh Creek | Hinebaugh 4 | 2012, 2013 |
| 1A | Upper Laguna | Hinebaugh Creek | Hinebaugh 5 | 2010, 2013 |
| 1A | Upper Laguna | Laguna de Santa Rosa | Laguna 1 | 2010, 2012 |
| 1A | Upper Laguna | Laguna de Santa Rosa | Laguna 4 | 2011 |
| 1A | Upper Laguna | Laguna de Santa Rosa | Laguna 5 | 2011 |
| 1A | Upper Laguna | South Fork Copeland Creek | South Fork Copeland 1 | 2014 |
| 1A | Upper Laguna | Todd Creek | Todd 1 | 2013 |
| 1A | Upper Laguna | Todd Creek | Todd 2 | 2013 |
| 1A | Upper Laguna | Todd Creek | Todd 3 | 2011 |
| 1A | Upper Laguna | Todd Creek | Todd 4 | 2010 |
| 1A | Upper Laguna | Todd Creek | Todd 5 | 2013 |
| 1A | Upper Santa Rosa | Ducker Creek | Ducker 1 | 2016 |
| 1A | Upper Santa Rosa | Ducker Creek | Ducker 2 | 2016 |
| 1A | Upper Santa Rosa | Indian Creek | Indian 1 | 2017 |
| 1A | Upper Santa Rosa | Paulin Creek | Paulin 2 | 2018 |
| 1A | Upper Santa Rosa | Paulin Creek | Paulin 3 | 2018 |
| 1A | Upper Santa Rosa | Paulin Creek | Paulin 4 | 2018 |
| 1A | Upper Santa Rosa | Paulin Creek | Paulin 6 | 2018 |
| 1A | Windsor | Starr Creek | Starr 1 | 2010 |
| 1A | Windsor | Starr Creek | Starr 2 | 2013 |
| 1A | Windsor | Windsor Creek | Windsor 1 | 2011 |
| 1A | Windsor | Windsor Creek | Windsor 3 | 2013 |
| 1A | Windsor | Windsor Creek | Windsor 4 | 2013 |
| 4A | Dry Creek | West Slough | West Slough 1 | 2018, 2019 |

| Zone | Subbasin Name | Creek Name | Reach Name | Year of Sediment Testing |
|---|---|---|---|---|
| 4A | Upper Russian River | Wood Creek | Wood 1 | 2015, 2018 |
| 5A | Ataseadero Creek | Green Valley Creek | Green Valley | 2019 |
| 5A | Russian River | Fife Creek | Fife 2 | 2015, 2016, 2018, 2019 |
| 5A | Russian River | Fife Creek | Fife 3 | 2015, 2016, 2018, 2019 |
| 5A | Russian River | Fife Creek | Fife 4 | 2015, 2016, 2018, 2019 |
| 8A | Estero Americano | Bloomfield Creek | Bloomfield 1 | 2011, 2015 |

**Table A-5.** SMP Creeks and Reaches where Sediment Testing has Occurred within San Francisco Bay RWQCB's Jurisdiction

| Zone | Subbasin Name | Creek Name | Reach Name | Year of Sediment Testing |
|---|---|---|---|---|
| 2A | Petaluma | Adobe Creek | Adobe 1 | 2013, 2015 |
| 2A | Petaluma | Adobe Creek | Adobe 2 | 2013, 2014 |
| 2A | Petaluma | Adobe Creek | Adobe 3 | 2013 |
| 2A | Petaluma | Adobe Creek | Adobe 4 | 2013, 2014 |
| 2A | Petaluma | Corona Creek | Corona 1 | 2011 , 2013 |
| 2A | Petaluma | East Washington Creek | E Washington 2 | 2012 |
| 2A | Petaluma | East Washington Creek | E Washington 3 | 2013 |
| 2A | Petaluma | East Washington Creek | E Washington 4 | 2013, 2018 |
| 2A | Petaluma | East Washington Creek | E Washington 5 | 2013, 2018 |
| 2A | Petaluma | Ellis Creek | Ellis 2 | 2012 |
| 2A | Petaluma | Lichau Creek | Lichau 1 | 2013 |
| 2A | Petaluma | Lichau Creek | Lichau 2 | 2012 |
| 2A | Petaluma | Lichau Creek | Lichau 3 | 2012 , 2017 |
| 2A | Petaluma | Lichau Creek | Lichau 4 | 2012 |
| 2A | Petaluma | Lynch Creek | Lynch 1 | 2013 |
| 2A | Petaluma | McDowell Creek | East Fork McDowell 1 | 2015 |
| 2A | Petaluma | McDowell Creek | McDowell 2 | 2014 |
| 2A | Petaluma | Washington Creek | Washington 1 | 2014 |
| 2A | Petaluma | Washington Creek | Washington 2 | 2014 |
| 2A | Petaluma | Washington Creek | Washington 3 | 2011, 2014 |
| 2A | Petaluma | Washington Creek | Washington 6 | 2013 |
| 3A | Sonoma | Fryer Creek | Fryer 1 | 2011 , 2012 |
| 3A | Sonoma | Nathanson Creek | Nathanson 1 | 2013 |
| 3A | Sonoma | Rodgers Creek | Rodgers 0A | 2019 |
| 3A | Sonoma | Rodgers Creek | Rodgers Creek 1 | 2017, 2019 |

**Table A-6**. SMP Creeks and Reaches Where Trash Removal has Occurred (2010-2019)

| Year | Date | Creek | Reach | Quantity removed (lbs) |
|---|---|---|---|---|
| 2010 | 10/11/2010 | Laguna De Santa Rosa | Laguna1 | 5.00 |
| 2010 | 9/13/2010 | Santa Rosa Creek | SantaRosa5 | 2.00 |
| 2010 | 9/2/2010 | Colgan Creek | Colgan1 | 2.00 |
| 2010 | 8/10/2010 | Colgan Creek | Colgan2 | 10.00 |
| 2010 | 7/20/2010 | Laguna De Santa Rosa | Laguna2 | 10.00 |
| 2010 | 7/20/2010 | Fryer Creek | Fryer1 | 1.50 |
| 2010 | 7/20/2010 | Fryer Creek | Fryer3 | 1.50 |
| 2010 | 7/8/2010 | Copeland Creek | Copeland2 | 1.00 |
| 2010 | 6/15/2010 | Cook Creek | Cook1 | 3.00 |
| 2011 | 10/12/2011 | Santa Rosa Creek | SantaRosa3 | 18.00 |
| 2011 | 10/12/2011 | Spring Creek | Spring1 | 5.00 |
| 2011 | 10/11/2011 | Todd Creek | Todd3 | 38.00 |
| 2011 | 9/21/2011 | Laguna De Santa Rosa | Laguna7 | 2.00 |
| 2011 | 9/19/2011 | Gossage Creek | Gossage1 | 10.00 |
| 2011 | 9/7/2011 | Laguna De Santa Rosa | Laguna3 | 8.00 |
| 2011 | 8/23/2011 | Windsor Creek | Windsor4 | 5.00 |
| 2011 | 8/18/2011 | Santa Rosa Creek | SantaRosa1 | 42.20 |
| 2011 | 8/9/2011 | Laguna De Santa Rosa | Laguna1 | 24.00 |
| 2011 | 8/2/2011 | Laguna De Santa Rosa | Laguna2 | 28.00 |
| 2011 | 6/22/2011 | Hinebaugh Creek | Hinebaugh4 | 4.00 |
| 2011 | 6/21/2011 | Hinebaugh Creek | Hinebaugh5 | 2.00 |
| 2011 | 6/14/2011 | Hinebaugh Creek | Hinebaugh5 | 5.00 |
| 2012 | 10/29/2012 | Petaluma River | Petaluma0B | 400.00 |
| 2012 | 10/15/2012 | West Slough | WestSlough1 | 500.00 |
| 2012 | 10/9/2012 | Austin Creek | Austin2 | 20.00 |
| 2012 | 10/9/2012 | Peterson Creek | Peterson2 | 500.00 |
| 2012 | 10/8/2012 | Ducker Creek | Ducker5 | 15.00 |
| 2012 | 10/4/2012 | Abramson Creek | Abramson2 | 10.00 |
| 2012 | 10/1/2012 | Capri Creek | Capri4 | 15.00 |
| 2012 | 9/26/2012 | Ellis Creek | Ellis1 | 10.00 |

| Year | Date | Creek | Reach | Quantity removed (lbs) |
|---|---|---|---|---|
| 2012 | 9/25/2012 | Hunter Lane Channel | Hunter2 | 75.00 |
| 2012 | 9/24/2012 | Colgan Creek | Colgan5 | 560.00 |
| 2012 | 9/20/2012 | Hunter Lane Channel | Hunter3 | 20.00 |
| 2012 | 9/19/2012 | Colgan Creek | Colgan5 | 20.00 |
| 2012 | 9/18/2012 | Lichau Creek | Lichau3D | 200.00 |
| 2012 | 9/18/2012 | Spring Creek | Spring2 | 50.00 |
| 2012 | 9/18/2012 | Colgan Creek | Colgan5 | 60.00 |
| 2012 | 9/17/2012 | Spring Creek | Spring2 | 325.00 |
| 2012 | 9/17/2012 | Colgan Creek | Colgan5 | 50.00 |
| 2012 | 9/17/2012 | Lichau Creek | Lichau3 | 620.00 |
| 2012 | 9/13/2012 | Spring Creek | Spring2 | 200.00 |
| 2012 | 9/13/2012 | Washington Creek | Washington6 | 40.00 |
| 2012 | 9/12/2012 | Airport Creek | Airport2 | 3,420.00 |
| 2012 | 9/11/2012 | Airport Creek | Airport2 | 1.00 |
| 2012 | 9/11/2012 | Fryer Creek | Fryer1 | 15.00 |
| 2012 | 9/6/2012 | Fryer Creek | Fryer3 | 100.00 |
| 2012 | 8/30/2012 | Jensen Creek | Jensen1 | 80.00 |
| 2012 | 8/28/2012 | College Creek | College3 | 50.00 |
| 2012 | 8/27/2012 | College Creek | College3 | 25.00 |
| 2012 | 8/23/2012 | Santa Rosa Creek | SantaRosa2 | 10.00 |
| 2012 | 8/22/2012 | Santa Rosa Creek | SantaRosa2 | 120.00 |
| 2012 | 8/21/2012 | Coffey Creek | Coffey1 | 60.00 |
| 2012 | 8/20/2012 | Coffey Creek | Coffey1 | 20.00 |
| 2012 | 8/16/2012 | Coffey Creek | Coffey1 | 40.00 |
| 2012 | 8/16/2012 | Lynch Creek | Lynch1 | 20.00 |
| 2012 | 8/15/2012 | Coffey Creek | Coffey1 | 50.00 |
| 2012 | 8/15/2012 | Lynch Creek | Lynch1 | 15.00 |
| 2012 | 8/9/2012 | Hinebaugh Creek | Hinebaugh5 | 15.00 |
| 2012 | 8/8/2012 | Santa Rosa Creek | SantaRosa3 | 2.00 |
| 2012 | 8/8/2012 | Santa Rosa Creek | SantaRosa2 | 500.00 |
| 2012 | 8/8/2012 | Hinebaugh Creek | Hinebaugh5 | 10.00 |
| 2012 | 8/7/2012 | Santa Rosa Creek | SantaRosa3 | 5.00 |

| Year | Date | Creek | Reach | Quantity removed (lbs) |
|---|---|---|---|---|
| 2012 | 8/7/2012 | Hinebaugh Creek | Hinebaugh5 | 10.00 |
| 2012 | 8/6/2012 | Santa Rosa Creek | SantaRosa3 | 10.00 |
| 2012 | 8/6/2012 | East Washington Creek | EastWashington2 | 100.00 |
| 2012 | 8/2/2012 | East Washington Creek | EastWashington1 | 200.00 |
| 2012 | 8/1/2012 | Santa Rosa Creek | SantaRosa3 | 7.00 |
| 2012 | 8/1/2012 | Copeland Creek | Copeland1 | 10.00 |
| 2012 | 7/31/2012 | Santa Rosa Creek | SantaRosa3 | 5.00 |
| 2012 | 7/31/2012 | Santa Rosa Creek | SantaRosa2 | 30.00 |
| 2012 | 7/31/2012 | Hinebaugh Creek | Hinebaugh5 | 13.00 |
| 2012 | 7/30/2012 | Santa Rosa Creek | SantaRosa3 | 30.00 |
| 2012 | 7/30/2012 | Santa Rosa Creek | SantaRosa2 | 40.00 |
| 2012 | 7/30/2012 | Hinebaugh Creek | Hinebaugh5 | 3.00 |
| 2012 | 7/25/2012 | East Washington Creek | EastWashington5 | 15.00 |
| 2012 | 7/25/2012 | Santa Rosa Creek | SantaRosa3 | 40.00 |
| 2012 | 7/24/2012 | East Washington Creek | EastWashington5 | 15.00 |
| 2012 | 7/24/2012 | Santa Rosa Creek | SantaRosa3 | 10.00 |
| 2012 | 7/23/2012 | East Washington Creek | EastWashington5 | 10.00 |
| 2012 | 7/23/2012 | Santa Rosa Creek | SantaRosa4 | 100.00 |
| 2012 | 7/23/2012 | Santa Rosa Creek | SantaRosa2 | 10.00 |
| 2012 | 7/23/2012 | Hinebaugh Creek | Hinebaugh5 | 8.00 |
| 2012 | 7/19/2012 | Adobe Creek | Adobe1 | 35.00 |
| 2012 | 7/19/2012 | Santa Rosa Creek | SantaRosa4 | 20.00 |
| 2012 | 7/19/2012 | Hinebaugh Creek | Hinebaugh5 | 10.00 |
| 2012 | 7/18/2012 | Santa Rosa Creek | SantaRosa4 | 20.00 |
| 2012 | 7/18/2012 | Hinebaugh Creek | Hinebaugh5 | 3.00 |
| 2012 | 7/18/2012 | Hinebaugh Creek | Hinebaugh4 | 15.00 |
| 2012 | 7/17/2012 | Adobe Creek | Adobe1 | 10.00 |
| 2012 | 7/17/2012 | Hinebaugh Creek | Hinebaugh5 | 3.00 |
| 2012 | 7/17/2012 | Hinebaugh Creek | Hinebaugh4 | 15.00 |
| 2012 | 7/16/2012 | Santa Rosa Creek | SantaRosa4 | 50.00 |
| 2012 | 7/16/2012 | Santa Rosa Creek | SantaRosa2 | 40.00 |
| 2012 | 7/12/2012 | Santa Rosa Creek | SantaRosa4 | 7.00 |

| Year | Date | Creek | Reach | Quantity removed (lbs) |
|---|---|---|---|---|
| 2012 | 7/11/2012 | Santa Rosa Creek | SantaRosa4 | 12.00 |
| 2012 | 7/10/2012 | Santa Rosa Creek | SantaRosa4 | 12.00 |
| 2012 | 7/10/2012 | Hinebaugh Creek | Hinebaugh3 | 10.00 |
| 2012 | 7/9/2012 | Santa Rosa Creek | SantaRosa4 | 100.00 |
| 2012 | 7/9/2012 | Corona Creek | Corona1 | 15.00 |
| 2012 | 7/5/2012 | Santa Rosa Creek | SantaRosa4 | 10.00 |
| 2012 | 7/5/2012 | Corona Creek | Corona1 | 10.00 |
| 2012 | 7/3/2012 | Santa Rosa Creek | SantaRosa4 | 5.00 |
| 2012 | 7/3/2012 | Corona Creek | Corona4 | 8.00 |
| 2012 | 7/2/2012 | Santa Rosa Creek | SantaRosa4 | 5.00 |
| 2012 | 6/28/2012 | Santa Rosa Creek | SantaRosa5 | 4.00 |
| 2012 | 6/28/2012 | Corona Creek | Corona5 | 5.00 |
| 2012 | 6/27/2012 | Santa Rosa Creek | SantaRosa6 | 5.00 |
| 2012 | 6/26/2012 | Corona Creek | Corona6 | 5.00 |
| 2012 | 6/26/2012 | Santa Rosa Creek | SantaRosa6 | 6.00 |
| 2012 | 6/20/2012 | Santa Rosa Creek | SantaRosa6 | 14.00 |
| 2013 | 11/7/2013 | Copeland Creek | Copeland2 | 920.00 |
| 2013 | 10/15/2013 | Roseland Creek | Roseland4 | 520.00 |
| 2013 | 10/15/2013 | Spring Creek | Spring3 | 546.00 |
| 2013 | 10/9/2013 | Petaluma River | Petaluma4 | 15.00 |
| 2013 | 9/16/2013 | Laguna De Santa Rosa | Laguna5 | 50.00 |
| 2013 | 8/27/2013 | Forestview Creek | Forestview2 | 75.00 |
| 2013 | 8/27/2013 | Forestview Creek | Forestview1 | 75.00 |
| 2013 | 8/20/2013 | Hinebaugh Creek | Hinebaugh4 | 80.00 |
| 2013 | 8/15/2013 | Laguna De Santa Rosa | Laguna6 | 10.00 |
| 2013 | 8/8/2013 | Laguna De Santa Rosa | Laguna4 | 300.00 |
| 2013 | 8/5/2013 | Paulin Creek | Paulin3 | 500.00 |
| 2013 | 8/2/2013 | Paulin Creek | Paulin6 | 18.00 |
| 2013 | 7/17/2013 | Copeland Creek | Copeland2 | 35.00 |
| 2013 | 7/9/2013 | Copeland Creek | Copeland2 | 900.00 |
| 2013 | 7/9/2013 | Steele Creek | Steele1 | 300.00 |
| 2013 | 7/3/2013 | Copeland Creek | Copeland2 | 20.00 |

| Year | Date | Creek | Reach | Quantity removed (lbs) |
|---|---|---|---|---|
| 2013 | 7/1/2013 | Paulin Creek | Paulin6 | 102.00 |
| 2013 | 7/1/2013 | Copeland Creek | Copeland2 | 20.00 |
| 2013 | 6/17/2013 | Copeland Creek | Copeland1 | 20.00 |
| 2014 | 10/27/2014 | College Creek | College3 | 30.00 |
| 2014 | 10/21/2014 | West Slough | WestSlough1 | 100.00 |
| 2014 | 10/20/2014 | West Slough | WestSlough1 | 200.00 |
| 2014 | 10/14/2014 | South Fork Copeland Creek | SFCope1 | 2,800.00 |
| 2014 | 9/22/2014 | Irwin Creek | Irwin2 | 20.00 |
| 2014 | 9/17/2014 | Colgan Creek | Colgan5B | 500.00 |
| 2014 | 8/11/2014 | Adobe Creek | Adobe1 | 50.00 |
| 2014 | 8/11/2014 | Adobe Creek | Adobe2 | 50.00 |
| 2014 | 7/14/2014 | Steele Creek | Steele5 | 300.00 |
| 2014 | 7/9/2014 | Steele Creek | Steele5 | 20.00 |
| 2014 | 7/7/2014 | Roseland Creek | Roseland4 | 900.00 |
| 2014 | 7/7/2014 | South Fork Copeland Creek | SFCope1 | 6.00 |
| 2014 | 7/4/2014 | South Fork Copeland Creek | SFCope1 | 5.00 |
| 2014 | 7/3/2014 | Paulin Creek | Paulin2 | 20.00 |
| 2014 | 7/2/2014 | Copeland Creek | Copeland2 | 160.00 |
| 2014 | 7/1/2014 | South Fork Copeland Creek | SFCope1 | 10.00 |
| 2014 | 6/26/2014 | Hinebaugh Creek | Hinebaugh1 | 2.50 |
| 2014 | 6/25/2014 | Hinebaugh Creek | Hinebaugh2 | 2.50 |
| 2014 | 6/24/2014 | Hinebaugh Creek | Hinebaugh3B | 15.00 |
| 2014 | 6/24/2014 | Hinebaugh Creek | Hinebaugh4 | 15.00 |
| 2014 | 6/19/2014 | South Fork Copeland Creek | SFCope1 | 20.00 |
| 2015 | 10/27/2015 | San Antonio Creek | SanAntonio1 | 200.00 |
| 2015 | 10/13/2015 | Schell Creek | Schell3 | 75.00 |
| 2015 | 10/12/2015 | Santa Rosa Creek | SantaRosa1 | 10.50 |
| 2015 | 10/6/2015 | Nathanson Creek | Nathanson0 | 100.00 |
| 2015 | 9/22/2015 | East Fork Fryer Creek | LowerEastforkFryer1 | 50.00 |
| 2015 | 9/14/2015 | Wiggins Hill Creek | WigginsHill2 | 100.00 |
| 2015 | 9/8/2015 | Fryer Creek | Fryer1 | 25.00 |
| 2015 | 8/31/2015 | Starr Creek Tributary | StarrTrib1 | 8.00 |

| Year | Date | Creek | Reach | Quantity removed (lbs) |
|---|---|---|---|---|
| 2015 | 8/13/2015 | Lichau Creek | Lichau3A | 500.00 |
| 2015 | 8/11/2015 | Petaluma River | Petaluma2 | 500.00 |
| 2015 | 8/5/2015 | Laguna De Santa Rosa | Laguna3 | 12.00 |
| 2015 | 8/4/2015 | Fryer Creek | Fryer2 | 5.00 |
| 2016 | 12/21/2016 | Copeland Creek | Copeland1 | 55.00 |
| 2016 | 12/20/2016 | Bellevue Wilfred Channel | BellWil3 | 480.00 |
| 2016 | 12/6/2016 | Todd Creek | Todd5A | 560.00 |
| 2016 | 12/6/2016 | Hinebaugh Creek | Hinebaugh1 | 1,200.00 |
| 2016 | 11/7/2016 | Paulin Creek | PinerReservoir | 100.00 |
| 2016 | 11/3/2016 | Todd Creek | Todd5A | 1,260.00 |
| 2016 | 10/24/2016 | Copeland Creek | Copeland5 | 24.00 |
| 2016 | 10/13/2016 | Copeland Creek | Copeland1 | 310.00 |
| 2016 | 10/13/2016 | Laguna De Santa Rosa | Laguna2 | 310.00 |
| 2016 | 10/6/2016 | Bellevue Wilfred Channel | BellWil3 | 374.00 |
| 2016 | 9/29/2016 | East Washington Creek | EastWashington1 | 4,180.00 |
| 2016 | 9/26/2016 | Peterson Creek | Peterson1 | 320.00 |
| 2016 | 8/16/2016 | Laguna De Santa Rosa | Laguna4 | 16.00 |
| 2016 | 8/15/2016 | Todd Creek | Todd4A | 50.00 |
| 2016 | 7/25/2016 | Santa Rosa Creek Diversion | SantaRosaDiv1 | 50.00 |
| 2016 | 6/30/2016 | Hinebaugh Creek | Hinebaugh1 | 100.00 |
| 2016 | 6/27/2016 | Moorland Creek | Moorland2 | 2,000.00 |
| 2016 | 6/15/2016 | Moorland Creek | Moorland2 | 250.00 |
| 2017 | 12/1/2017 | Laguna De Santa Rosa | Laguna2 | 1,980.00 |
| 2017 | 11/27/2017 | Todd Creek | Todd4A | 1,280.00 |
| 2017 | 11/1/2017 | Laguna De Santa Rosa | Laguna2 | 1,040.00 |
| 2017 | 10/23/2017 | Bellevue Wilfred Channel | BellWil1 | 420.00 |
| 2017 | 10/23/2017 | Laguna De Santa Rosa | Laguna1 | 200.00 |
| 2017 | 10/23/2017 | Hinebaugh Creek | Hinebaugh1 | 1,000.00 |
| 2017 | 10/19/2017 | Copeland Creek | Copeland1 | 1,020.00 |
| 2017 | 10/18/2017 | Hinebaugh Creek | Hinebaugh3B | 980.00 |
| 2017 | 10/6/2017 | Roseland Creek | Roseland5 | 260.00 |
| 2017 | 10/4/2017 | Kawana Springs Creek | Kawana1A | 300.00 |

| Year | Date | Creek | Reach | Quantity removed (lbs) |
|---|---|---|---|---|
| 2017 | 10/4/2017 | Colgan Creek | Colgan7 | 2,060.00 |
| 2017 | 10/3/2017 | Santa Rosa Creek | SantaRosa3 | 580.00 |
| 2017 | 10/3/2017 | Laguna De Santa Rosa | Laguna2 | 600.00 |
| 2017 | 10/3/2017 | Todd Creek | Todd3 | 580.00 |
| 2017 | 10/2/2017 | Wilfred Creek | Wilfred1A | 60.00 |
| 2017 | 10/2/2017 | Todd Creek | Todd5A | 1,180.00 |
| 2017 | 10/2/2017 | Hinebaugh Creek | Hinebaugh3B | 2,180.00 |
| 2017 | 10/2/2017 | Russell Creek | Russell1B | 280.00 |
| 2017 | 9/28/2017 | East Washington Creek | EastWashington2 | 40.00 |
| 2017 | 9/26/2017 | Copeland Creek | Copeland1 | 180.00 |
| 2017 | 9/25/2017 | Santa Rosa Creek | SantaRosa1 | 1,300.00 |
| 2017 | 9/25/2017 | Laguna De Santa Rosa | Laguna2 | 480.00 |
| 2017 | 9/25/2017 | Windsor Creek | Windsor4 | 12.00 |
| 2017 | 9/19/2017 | Copeland Creek | Copeland1 | 720.00 |
| 2017 | 9/18/2017 | Laguna De Santa Rosa | Laguna2 | 2,040.00 |
| 2017 | 9/7/2017 | Todd Creek | Todd5A | 1,860.00 |
| 2017 | 9/6/2017 | Copeland Creek | Copeland2 | 100.00 |
| 2017 | 8/31/2017 | Todd Creek | Todd5A | 40.00 |
| 2017 | 8/22/2017 | Lynch Creek | Lynch1B | 400.00 |
| 2017 | 8/22/2017 | Washington Creek | Washington4 | 1,140.00 |
| 2017 | 8/18/2017 | Hinebaugh Creek | Hinebaugh1 | 1,120.00 |
| 2017 | 6/29/2017 | Piner Creek | Piner6 | 1,240.00 |
| 2017 | 6/19/2017 | Santa Rosa Creek | SantaRosa1 | 300.00 |
| 2017 | 6/19/2017 | Laguna De Santa Rosa | Laguna1 | 16.00 |
| 2017 | 6/12/2017 | Laguna De Santa Rosa | Laguna2 | 2,140.00 |
| 2017 | 6/5/2017 | Santa Rosa Creek | SantaRosa1 | 1,560.00 |
| 2017 | 6/5/2017 | Hinebaugh Creek | Hinebaugh1 | 160.00 |
| 2017 | 5/30/2017 | Laguna De Santa Rosa | Laguna2 | 280.00 |
| 2017 | 4/21/2017 | Laguna De Santa Rosa | Laguna2 | 1,760.00 |
| 2017 | 4/7/2017 | Bellevue Wilfred Channel | BellWil1 | 1,780.00 |
| 2017 | 4/6/2017 | Starr Creek Tributary | StarrTrib1 | 10.00 |
| 2017 | 4/3/2017 | Todd Creek | Todd5A | 900.00 |

| Year | Date | Creek | Reach | Quantity removed (lbs) |
|---|---|---|---|---|
| 2017 | 4/3/2017 | Hinebaugh Creek | Hinebaugh1 | 2,040.00 |
| 2017 | 4/2/2017 | Washoe Creek | Washoe1 | 480.00 |
| 2017 | 3/30/2017 | Santa Rosa Creek | SantaRosa1 | 2,700.00 |
| 2017 | 3/29/2017 | Santa Rosa Creek | SantaRosa1 | 1,400.00 |
| 2017 | 3/21/2017 | Santa Rosa Creek | SantaRosa1 | 2,300.00 |
| 2017 | 3/9/2017 | Bellevue Wilfred Channel | BellWil4 | 2,860.00 |
| 2017 | 2/23/2017 | Copeland Creek | Copeland1 | 1,980.00 |
| 2017 | 2/22/2017 | Kawana Springs Creek | Kawana1A | 740.00 |
| 2017 | 2/2/2017 | Nathanson Creek | Nathanson3 | 70.00 |
| 2017 | 1/27/2017 | Paulin Creek | Paulin6A | 400.00 |
| 2017 | 1/20/2017 | Todd Creek | Todd5A | 880.00 |
| 2018 | 12/14/2018 | Lynch Creek | Lynch1A | 1,660.00 |
| 2018 | 12/10/2018 | Bellevue Wilfred Channel | BellWil4 | 1,735.00 |
| 2018 | 12/10/2018 | Hinebaugh Creek | Hinebaugh1 | 660.00 |
| 2018 | 12/7/2018 | Todd Creek | Todd4B | 920.00 |
| 2018 | 12/7/2018 | Hinebaugh Creek | Hinebaugh1 | 1,020.00 |
| 2018 | 12/4/2018 | Colgan Creek | Colgan6 | 100.00 |
| 2018 | 11/27/2018 | Paulin Creek | PinerReservoir | 50.00 |
| 2018 | 11/21/2018 | Copeland Creek | Copeland1 | 1,500.00 |
| 2018 | 11/21/2018 | Laguna De Santa Rosa | Laguna2 | 1,040.00 |
| 2018 | 11/9/2018 | Todd Creek | Todd4A | 740.00 |
| 2018 | 10/29/2018 | Laguna De Santa Rosa | Laguna2 | 1,680.00 |
| 2018 | 10/16/2018 | Lichau Creek | Lichau3A | 1,300.00 |
| 2018 | 10/12/2018 | Roseland Creek | Roseland4 | 1,600.00 |
| 2018 | 10/12/2018 | Colgan Creek | Colgan4 | 1,280.00 |
| 2018 | 10/8/2018 | Laguna De Santa Rosa | Laguna2 | 1,300.00 |
| 2018 | 9/26/2018 | Laguna De Santa Rosa | Laguna2 | 1,900.00 |
| 2018 | 9/19/2018 | Wilfred Creek | Wilfred1A | 1,460.00 |
| 2018 | 9/19/2018 | Copeland Creek | Copeland1 | 1,280.00 |
| 2018 | 9/7/2018 | Colgan Creek | Colgan5A | 860.00 |
| 2018 | 9/7/2018 | Todd Creek | Todd5A | 1,380.00 |
| 2018 | 9/7/2018 | Todd Creek | Todd4B | 1,340.00 |

| Year | Date | Creek | Reach | Quantity removed (lbs) |
|---|---|---|---|---|
| 2018 | 8/31/2018 | Piner Creek | Piner5 | 1,660.00 |
| 2018 | 8/22/2018 | Roseland Creek | Roseland4 | 580.00 |
| 2018 | 8/22/2018 | Laguna De Santa Rosa | Laguna2 | 1,340.00 |
| 2018 | 7/27/2018 | Laguna De Santa Rosa | Laguna2 | 820.00 |
| 2018 | 7/27/2018 | Hinebaugh Creek | Hinebaugh1 | 1,840.00 |
| 2018 | 7/20/2018 | Todd Creek | Todd4A | 3,020.00 |
| 2018 | 7/20/2018 | Laguna De Santa Rosa | Laguna2 | 1,740.00 |
| 2018 | 7/19/2018 | Santa Rosa Creek | SantaRosa1 | 1,240.00 |
| 2018 | 7/19/2018 | Peterson Creek | Peterson2 | 260.00 |
| 2018 | 7/13/2018 | Todd Creek | Todd4A | 2,020.00 |
| 2018 | 7/13/2018 | Piner Creek | Piner6 | 1,640.00 |
| 2018 | 7/12/2018 | Piner Creek | Piner4 | 30.00 |
| 2018 | 7/9/2018 | Piner Creek | Piner5 | 50.00 |
| 2018 | 7/5/2018 | Santa Rosa Creek | SantaRosa1 | 1,080.00 |
| 2018 | 6/29/2018 | College Creek | College1 | 620.00 |
| 2018 | 6/29/2018 | Laguna De Santa Rosa | Laguna2 | 1,340.00 |
| 2018 | 6/15/2018 | Todd Creek | Todd4B | 1,280.00 |
| 2018 | 6/12/2018 | Santa Rosa Creek | SantaRosa2 | 1,240.00 |
| 2018 | 6/11/2018 | Laguna De Santa Rosa | Laguna2 | 1,720.00 |
| 2018 | 6/8/2018 | Moorland Creek | Moorland1A | 1,760.00 |
| 2018 | 6/8/2018 | Todd Creek | Todd4A | 1,620.00 |
| 2018 | 6/8/2018 | Laguna De Santa Rosa | Laguna2 | 800.00 |
| 2018 | 6/1/2018 | Laguna De Santa Rosa | Laguna2 | 1,630.00 |
| 2018 | 6/1/2018 | Hinebaugh Creek | Hinebaugh1 | 720.00 |
| 2018 | 5/30/2018 | Kawana Springs Creek | Kawana1A | 1,680.00 |
| 2018 | 5/29/2018 | Paulin Creek | Paulin5 | 100.00 |
| 2018 | 5/18/2018 | Todd Creek | Todd4A | 650.00 |
| 2018 | 5/18/2018 | Santa Rosa Creek | SantaRosa3 | 600.00 |
| 2018 | 5/11/2018 | Todd Creek | Todd4A | 1,320.00 |
| 2018 | 5/2/2018 | Matanzas Creek | Matanzas1 | 1,240.00 |
| 2018 | 5/1/2018 | Todd Creek | Todd4A | 1,880.00 |
| 2018 | 4/20/2018 | Todd Creek | Todd4A | 1,040.00 |

| Year | Date | Creek | Reach | Quantity removed (lbs) |
|---|---|---|---|---|
| 2018 | 4/20/2018 | West Slough | WestSlough1 | 240.00 |
| 2018 | 4/13/2018 | Laguna De Santa Rosa | Laguna2 | 1,180.00 |
| 2018 | 3/28/2018 | Laguna De Santa Rosa | Laguna2 | 680.00 |
| 2018 | 3/22/2018 | Piner Creek | Piner6 | 640.00 |
| 2018 | 3/2/2018 | Todd Creek | Todd4B | 1,700.00 |
| 2018 | 3/2/2018 | Steele Creek | Steele4 | 1,220.00 |
| 2018 | 3/1/2018 | Hinebaugh Creek | Hinebaugh1 | 500.00 |
| 2018 | 3/1/2018 | Paulin Creek | PinerReservoir | 820.00 |
| 2018 | 2/15/2018 | Laguna De Santa Rosa | Laguna2 | 1,260.00 |
| 2018 | 2/14/2018 | Paulin Creek | PinerReservoir | 2,840.00 |
| 2018 | 2/2/2018 | Hinebaugh Creek | Hinebaugh3A | 780.00 |
| 2018 | 2/2/2018 | Santa Rosa Creek | SantaRosa1 | 2,000.00 |
| 2018 | 2/2/2018 | Todd Creek | Todd2 | 600.00 |
| 2018 | 2/1/2018 | Todd Creek | Todd5A | 1,120.00 |
| 2018 | 2/1/2018 | Paulin Creek | PinerReservoir | 2,460.00 |
| 2018 | 1/18/2018 | NOT APPLICABLE | OceanviewReservoir1 | 400.00 |
| 2018 | 1/18/2018 | Piner Creek | Piner2 | 1,440.00 |
| 2018 | 1/18/2018 | Piner Creek | Piner6 | 980.00 |
| 2018 | 1/17/2018 | Paulin Creek | Paulin6A | 1,320.00 |
| 2018 | 1/17/2018 | Laguna De Santa Rosa | Laguna3 | 2,700.00 |
| 2018 | 1/3/2018 | Laguna De Santa Rosa | Laguna2 | 1,060.00 |
| 2019 | 10/19/2019 | Todd Creek | Todd5B | 2,990.00 |
| 2019 | 10/18/2019 | Hinebaugh Creek | Hinebaugh1 | 1,180.00 |
| 2019 | 10/12/2019 | Copeland Creek | Copeland1 | 1,080.00 |
| 2019 | 10/11/2019 | Russell Creek | Russell1A | 900.00 |
| 2019 | 10/5/2019 | Lynch Creek | Lynch1A | 960.00 |
| 2019 | 10/4/2019 | Colgan Creek | Colgan5A | 1,190.00 |
| 2019 | 9/28/2019 | Todd Creek | Todd5B | 200.00 |
| 2019 | 9/28/2019 | Santa Rosa Creek | SantaRosa1 | 500.00 |
| 2019 | 9/28/2019 | Roseland Creek | Roseland4 | 960.00 |
| 2019 | 9/27/2019 | Paulin Creek | Paulin5 | 1,520.00 |
| 2019 | 9/21/2019 | Lynch Creek | Lynch1A | 700.00 |

| Year | Date | Creek | Reach | Quantity removed (lbs) |
|---|---|---|---|---|
| 2019 | 9/21/2019 | Copeland Creek | Copeland1 | 340.00 |
| 2019 | 9/14/2019 | Russell Creek | Russell1A | 960.00 |
| 2019 | 9/13/2019 | Hinebaugh Creek | Hinebaugh1 | 1,480.00 |
| 2019 | 8/30/2019 | Roseland Creek | Roseland4 | 1,100.00 |
| 2019 | 8/30/2019 | Copeland Creek | Copeland1 | 220.00 |
| 2019 | 8/30/2019 | Hinebaugh Creek | Hinebaugh1 | 1,140.00 |
| 2019 | 8/23/2019 | Todd Creek | Todd5A | 4,320.00 |
| 2019 | 8/16/2019 | Todd Creek | Todd5A | 1,410.00 |
| 2019 | 8/16/2019 | Roseland Creek | Roseland4 | 940.00 |
| 2019 | 8/9/2019 | Five Creek | Five1 | 500.00 |
| 2019 | 8/9/2019 | Santa Rosa Creek | SantaRosa3 | 780.00 |
| 2019 | 8/9/2019 | Bellevue Wilfred Channel | BellWil3 | 360.00 |
| 2019 | 8/9/2019 | Steele Creek | Steele5 | 1,000.00 |
| 2019 | 8/2/2019 | Colgan Creek | Colgan2 | 900.00 |
| 2019 | 8/2/2019 | Warrington Creek | Warrington1 | 1,500.00 |
| 2019 | 7/26/2019 | Todd Creek | Todd5A | 1,720.00 |
| 2019 | 7/26/2019 | Piner Creek | Piner5 | 1,580.00 |
| 2019 | 7/19/2019 | Hinebaugh Creek | Hinebaugh1 | 760.00 |
| 2019 | 7/12/2019 | Lynch Creek | Lynch1A | 340.00 |
| 2019 | 7/12/2019 | Washington Creek | Washington3 | 300.00 |
| 2019 | 7/3/2019 | Paulin Creek | PinerReservoir1 | 240.00 |
| 2019 | 7/3/2019 | Todd Creek | Todd1 | 1,040.00 |
| 2019 | 6/28/2019 | Todd Creek | Todd5A | 1,000.00 |
| 2019 | 6/28/2019 | Copeland Creek | Copeland1 | 240.00 |
| 2019 | 6/21/2019 | Todd Creek | Todd5A | 2,480.00 |
| 2019 | 6/21/2019 | Laguna De Santa Rosa | Laguna2 | 1,520.00 |
| 2019 | 6/14/2019 | Todd Creek | Todd5A | 3,840.00 |
| 2019 | 6/13/2019 | Washington Creek | Washington3 | 1,480.00 |
| 2019 | 5/31/2019 | Todd Creek | Todd5A | 560.00 |
| 2019 | 5/31/2019 | Laguna De Santa Rosa | Laguna1 | 1,050.00 |
| 2019 | 5/24/2019 | Russell Creek | Russell1A | 1,100.00 |
| 2019 | 5/10/2019 | Hinebaugh Creek | Hinebaugh1 | 1,580.00 |

| Year | Date | Creek | Reach | Quantity removed (lbs) |
|---|---|---|---|---|
| 2019 | 5/3/2019 | Hinebaugh Creek | Hinebaugh1 | 1,520.00 |
| 2019 | 4/19/2019 | Lynch Creek | Lynch1A | 1,580.00 |
| 2019 | 4/12/2019 | Hinebaugh Creek | Hinebaugh3A | 1,420.00 |
| 2019 | 4/12/2019 | Todd Creek | Todd4A | 1,460.00 |
| 2019 | 3/29/2019 | Washington Creek | Washington3 | 2,480.00 |
| 2019 | 3/21/2019 | Russell Creek | Russell1A | 1,740.00 |
| 2019 | 3/12/2019 | Nathanson Creek | Nathanson0 | 1,840.00 |
| 2019 | 3/8/2019 | Hinebaugh Creek | Hinebaugh1 | 1,660.00 |
| 2019 | 2/15/2019 | Steele Creek | Steele5 | 1,640.00 |
| 2019 | 2/8/2019 | Russell Creek | Russell1A | 460.00 |
| 2019 | 2/8/2019 | Piner Creek | Piner5 | 1,920.00 |
| 2019 | 2/1/2019 | Bellevue Wilfred Channel | BellWil2 | 2,120.00 |
| 2019 | 1/25/2019 | College Creek | College1 | 380.00 |
| 2019 | 1/25/2019 | Hinebaugh Creek | Hinebaugh1 | 940.00 |
| 2019 | 1/18/2019 | Todd Creek | Todd4A | 1,980.00 |
| 2019 | 1/11/2019 | Russell Creek | Russell1B | 1,060.00 |
| 2019 | 1/11/2019 | Copeland Creek | Copeland1 | 1,720.00 |
| 2019 | 1/4/2019 | Santa Rosa Creek | SantaRosa3 | 660.00 |
| 2019 | 1/4/2019 | Hinebaugh Creek | Hinebaugh1 | 820.00 |
| | | | ***Total*** | ***250,644.70*** |

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# Appendix B
# Outlines for Annual Reports

## Appendix B-1
# OUTLINE FOR ANNUAL NOTIFICATION REPORT

## Introduction / Cover Letter

- Purpose and need for this year's projects.
- Permitting coordination – reference program permit numbers, agency compliance, etc.
- Reference programmatic guidance provided by SMP Manual (BMPs and impact avoidance measures).
- Schedule field visit.

## 1. Proposed Project Lists, Locations, and General Information

### 1.1 Ground Disturbing Projects

| Project Name | Partner Organization | Location | Description | Restoration/ Enhancement Area (acres) | Sonoma Water funding provided |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| **Total Tier 3 Mitigation (Watershed Partnership Program) Provided:** | | | | **XX acres** | **$XXX,XXX** |
| **Tier 3 Mitigation Required:** | | | | **X acres** | **$XXX,XXX** |

Insert a table listing the following standard information for each project:

- Project name (SMP Reach[es])
- Project Type (e.g. reach scale sediment removal, localized sediment removal, etc.)
- Tributary to
- Latitude/Longitude
- Sediment management trigger(s)
- Deviations from Manual activity descriptions or BMPs
- Other project notes

## 1.2 Vegetation Management Projects

Insert a table with the following information:

- SMP Reach
- Total length of reach
- Vegetation management activities (e.g. exotics removal, blackberry removal, in-stream willow, debris removal)
- Vegetation management triggers

## 1.3 Reach Classification and Characterization

- Description of any new reaches currently not described in the SMP Manual or previous notification reports or annual reports.
- Refer to appended reach sheets.

## 1.4 Cumulative Activities on Restriction-Imposed Creeks

- Include table(s) summarizing proposed maintenance activities with maintenance limits (e.g. Laguna de Santa Rosa, Copeland Creek, Santa Rosa Creek, etc.)
- Describe any variances from permitting conditions.

# 2. Project Specifications, Designs, Locations Maps and Photographs

## 2.1 Ground Disturbing Project Specifications

The following information summary tables will be provided for the various maintenance projects.

### *2.1.1 Sediment Management Projects*

**Table 1.** Estimated sediment management project specifications and areas of impact

| Zone | Project or Reach | Volume Removed (cu. yds.) | Length of Channel (linear feet) | Acres Disturbed | | |
|---|---|---|---|---|---|---|
| | | | | Waters of the U.S. (below OHWM) | Waters of the State (above OHWM) | Total |
| **Region 1** | | | | | | |
| ***Reach Scale Sediment Removal Projects*** | | | | | | |
| | Reaches 1 and 2 | | | | | |
| ***Localized Scale Sediment Removal Projects*** | | | | | | |
| | Reach 3 | | | | | |
| | Reach 4 | | | | | |
| ***In-stream Sediment Basin Clearing Projects*** | | | | | | |
| | Reach 5 | | | | | |
| | **Project Totals** | | | | | |

### *2.1.2 Bank Stabilization Projects*

**Table 2.** Estimated bank stabilization project specifications and areas of impact

| Project Site | Length (linear feet) | Acres Disturbed | | Volume of Fill (cu.yds) | Treatment Approach (SMP Manual Figures 5-5, 5-6, or 5-7) |
|---|---|---|---|---|---|
| | | Waters of the U.S. (below OHWM) | Waters of the State (above OHWM) | | |
| *Example:* | | | | | |
| Reach 6 | 60 | 0.01 | 0.02 | 160 | Compacted Soil (Figure 5-5) |
| **Totals** | | | | | |

## 2.2 Designs, Location Maps, and Photographs

Submit design drawings for each project. The drawings will display the following information:

- Project Profiles (existing conditions and the project design)
- Plan Views (existing conditions, OHWM, and the project design)
- Cross Sections (existing conditions and the project design)

# 3. Project Resources, Impact Avoidance, Minimization and Best Management Practices

## 3.1 Programmatic Impact Avoidance and Minimization Measures

- Brief description of Sonoma Water's impact avoidance and minimization approach. Include cross-reference to applicable Manual chapters and tables including table of BMPs.

## 3.2 Listed Species with Potential to Occur

- Include list of special-status species that have potential to occur at proposed maintenance project sites. Include excerpt from Manual Table 10-3.

### *3.2.1 Pre-Maintenance Habitat Assessments, Plant and Wildlife Surveys*

- Include completed survey results and/or described planned pre-construction surveys for special-status species (e.g., California tiger salamander, California red-legged frog, foothill yellow-legged frog, site surveys for special-status plants, etc.).
- Describe planned species compensatory mitigation measures as applicable.

## 3.3 Cultural Resources

- Include results of pedestrian surveys for cultural resources. Reference completed/anticipated site reports.

# 4. Project Mitigation Plan

## 4.1 On-Site Mitigation Activities (Tier 1)

- Description of planned on-site restoration and enhancement activities and/or refer to associated Channel Form Planting exhibits.
- Include summary tables as appropriate such as the following:

**Table 3.** Planned Tier 1 mitigation sites

| Zone | Project | Channel Form | Planting notes |
|---|---|---|---|
| ***Reach Scale Sediment Removal Projects*** | | | |
| 1A | Copeland 4 | 1A | |
| ***Localized Sediment Removal Projects*** | | | |
| 1A | Laguna 3 | 1D | |

## 4.2 Off-Site Mitigation Activities (Tiers 2 and/or 3)

- Description of planned restoration or enhancement activities at other SCWA channels or properties, including:
  - Project name
  - Project location map
  - Area to be restored (project size)
  - Project Cost or Sonoma Water Funding
  - Anticipated completion date
  - Description of project purpose, activities
- Include table containing details of candidate off-site mitigation projects, including the project name, partners, cost, length, and area of mitigating activities. An example table summarizing Tier 3 (Watershed Partnership Program) mitigation projects is provided below in Table 4.

**Table 4.** Proposed Tier 3 (Watershed Partnership Program) mitigation projects summary

| Partner organization | Project name | Location | Scope Summary | Restoration/ Enhancement Area | Sonoma Water Funding |
|---|---|---|---|---|---|
| Ex: Laguna de Santa Rosa Foundation | Roseland Creek Restoration Project | | Invasive plant removal and planting of XX native trees and shrubs along riparian corridor. | X.X acres | $75,000 |
| | | | | | |
| | | | | | |

## 4.3 Previously Mitigated Impacts

### *4.3.1 Mitigation for In-Stream Sediment Basin, Reservoir Outlet and Concrete-lined Structure Clearings*

- Include summary table of proposed projects that will occur in areas that have undergone maintenance previously through the SMP and have been previously mitigated for. Tier 3 (off-site) mitigation at a ratio of 1:1.1 (area disturbed: area restored) should be applied. Information may be presented in a table similar to that provided below.

**Table 5.** Previously provided mitigation for [Year] projects, as documented in previous Annual Reports

| Zone | Previously Mitigated Project | Total Previous Mitigation Provided/Impact Previously Mitigated (acres) | Year(s) Previous Mitigation Applied |
|---|---|---|---|
| ***In-Stream Sediment Basin Clearing Projects*** | | | |
| 1A | Bloomfield 1 | | |
| ***Reservoir Clearing Projects*** | | | |
| 1A | Brush Reservoir 1 | | |

## 4.4 Estimated Project Impacts and Overall Mitigation Accounting

- Include tables summarizing the status of the SMP's mitigation accounting. One table should summarize annual construction costs for ground disturbing projects and associated Tier 3 contribution requirements (10% of cost). Another table should summarize ground disturbing project impact areas and applied Tier 1 and Tier 2/3 mitigation as described in previous sections. Information may be presented in the format of Tables 4-4 and 4-5 provided below.

**Table 6.** Estimated project construction costs and associated Tier 3 mitigation contributions

| Zone | Project | Estimated Project Cost | Estimated Tier 3 Contribution Requirement |
|---|---|---|---|
| ***Reach scale sediment removal projects*** | | | |
| 1A | Austin | $100,000 | $10,000 |
| ***Localized sediment removal projects*** | | | |
| 8A | Bloomfield 1 | $60,000 | $6,000 |
| ***In-stream sediment basin clearing projects*** | | | |
| | | | |
| | | | |
| **SMP Total (for this year)** | | **$XXX,XXX,XXX** (for this year) | **$XXX,XXX** (10% of total maintenance costs for this year) |
| **Tier 3 Contribution Accounting (for this year)** | | | |
| **Estimated Tier 3 contribution requirement:** | | | |
| **Tier 3 funding to be applied (Table 4-2):** | | | |
| **Banked funding credit at end of prior year:** | | | |
| **Banked funding credit that would be applied to given year of maintenance:** | | | |
| **Banked funding credit that would be available for application in future seasons:** | | | |

**Table 7.** Estimated impact and mitigation area accounting for proposed projects.

| Zone | Project | Total impact | Old impact (area previously mitigated) | Year previously mitigated | New impact (area not previously mitigated) | On-site (Tier 1) mitigation that would be applied at 1:1 | Off-Site (Tier 3) mitigation that would be applied at 1:1 | Additional 10% Tier 3 mitigation that would be applied (0.1:1) | Total mitigation that would be applied | Overall mitigation ratio |
|---|---|---|---|---|---|---|---|---|---|---|
| *Ex: Instream Sediment Basin Clearing Projects* | | | | | | | | | | |
| 8A | Bloomfield 1 | 0.138 | 0.138 | 2011 | 0.00 | 0.00 | 0.00 | 0.014 | 0.454 | 1:1.1 |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| **Anticipated [Year] Mitigation Accounting Summary (acres)** | | | | | | | | | | |
| **Total impact:** | | | | | | | | | | |
| **Old impact (area previously mitigated):** | | | | | | | | | | |
| **New impact (area not previously mitigated:** | | | | | | | | | | |
| **Total mitigation needed to meet 1:1.1** | | | | | | | | | | |
| | | | | | | | | | | |
| **On-site (Tier 1) mitigation that would be applied at 1:1** | | | | | | | | | | |
| **Off-site (Tier 3) mitigation that would be applied at 1:1:** | | | | | | | | | | |
| **Additional 10% Tier 3 mitigation that would be applied (0.1:1)** | | | | | | | | | | |
| **Total Tier 3 mitigation that would be applied** | | | | | | | | | | |
| **Total mitigation applied** | | | | | | | | | | |
| **Was required 1:1.1 met?** | | | | | | | | | | **Yes or No** |
| | | | | | | | | | | |
| **Tier 3 mitigation funded/to be implemented** | | | | | | | | | | |
| **Tier 3 mitigation funded less the area applied** | | | | | | | | | | |
| **Previously banked Tier 3 mitigation credits (as documented in prior year's Annual Report)** | | | | | | | | | | |
| **Total banked Tier 3 mitigation credit available to apply to subsequent seasons:** | | | | | | | | | | |

## 4.5 California Tiger Salamander Mitigation

- Describe proposed maintenance activities and impacts that would require CTS compensatory mitigation according to SMP Programmatic BO from USFWS.
- Include table summarizing CTS mitigation credit accounting similar to Table 48, below.

**Table 8.** California tiger salamander mitigation credit accounting

| Year | Credits Purchased | Credits used/ estimated need | Remaining balance |
|---|---|---|---|
| 2010 | | | |
| 2011 | | | |
| 2012 | | | |
| 2013 | | | |
| 2014 | | | |
| 2015 | | | |
| 2016 | | | |
| 2017 | | | |
| 2018 | | | |
| 2019 | | | |

## 4.6 Native Tree Removal Mitigation

- Brief description about how vegetation removed during program activities will be recorded and evaluated for mitigation (e.g. native riparian vegetation with a DBH of 4”> will be mitigated at 2:1 ratio). Describe how vegetation removal and replacement plantings will be accounted for in Annual Report.

# 5. Annual Sediment Disposal Plan

## 5.1 Sediment Sampling and Testing

- Describe when sediment sampling, testing and disposal/reuse plans (sediment disposal plans) for Region 1 and Region 2 were submitted to the North Coast and San Francisco Bay Boards.

## 5.2 Sediment Disposal and Reuse Plan

- Identify this year’s sediment disposal options and available capacity at each. Identify the preferred site. Include a map showing all site locations.

# 6. Appendices

**Appendix A.** San Francisco Bay Board Project Specific Notification Documentation

- Include pre-maintenance photo documentation

**Appendix B.** Supplemental Reach Information

- Include reach characterization sheets of SMP creek reaches that were previously not covered in SMP Manual or prior Annual Notifications

**Appendix C.** California Natural Diversity Database Maps

**Appendix D.** Prior Year SMP Annual Post-Maintenance Summary Report Addendum

**Appendix E.** Permit Fees and Application Materials

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## Appendix B-2
# OUTLINE FOR ANNUAL POST-MAINTENANCE SUMMARY REPORT

## Introduction / Cover Letter

- General introduction, including year of permitting program.
- Reference existing program permit numbers and authorizations received during the notification period.

# 1. Maintenance Projects Summary

## 1.1 Ground Disturbing Projects

### *1.1.1 Project List and Specifications*

- Insert table summarizing maintenance work completed during previous year. Confirms that projects were not completed (explain ones that were not), and confirms that activities were conducted according to project description. Notes/comments used to explain any differences. Example table provided below.

**Table 1.** Ground disturbing project list

| Project Site | Completed/Estimated | | | | | Notes |
|---|---|---|---|---|---|---|
| | **Length** (linear feet) | **Volume Removed** (cu. yds.) | **Acres Disturbed** | | | |
| | | | **Waters of the U.S** | **Waters of the State** | **Total** | |
| **Region 1** | | | | | | |
| ***Localized Scale*** | | | | | | |
| Project 1 | 120/120 | 100/100 | 0.001/0.001 | 0.02/0.02 | 0.02/0.02 | |
| Project 2 | 116 /65 | 88/54 | 0.05/0.02 | 0.02/0.02 | 0.07/0.04 | |
| Project 3 | 0/1,495 | 0/1,531 | 0/0.75 | 0/0 | 0/0.75 | Project not completed. Anticipated for next year. |

### *1.1.2 Project As-Built Graphics and Photographs*

- Completed project location and extent maps. Provide overview map of all completed project locations and detailed maps depicting project extents and any differences between the design and as-built.
- Completed project photos. Site photo sheets documenting conditions pre- and post-maintenance.
- Post-Maintenance Cross Sections. Cross sections for sediment removal and bank stabilization projects indicating historic (engineered channel as-built), pre-project and post-project conditions.

## 1.2 Vegetation Management Activities

- Summary of completed vegetation management projects. Include table listing vegetation management work locations (by reach), the type of vegetation management activities conducted and the approximate total distance worked per reach. Note projects not completed or differences from Notification. Example table below.

**Table 2.** Vegetation Management Work Summary

| | | Vegetation Management Activity | | | | | |
|---|---|---|---|---|---|---|---|
| **Zone** | **SMP Reach** | **Blackberry removal** | **Exotics removal** | **Willow and Tree Removal** | **Modified/Natural Channel blockage removal** | **Reach length** (linear feet) | **Approximate linear feet worked on** (non-contiguous) |
| ***Region 1*** | | | | | | | |
| | Austin 1 | Y | Y | | | 1,331 | 270 |
| | Austin 2 | Y | Y | | | 2,282 | 460 |
| | BellWil 2 | Y | | Y | | 1,987 | 400 |
| | Brush 1 | | Y | Y | | 1,264 | 250 |
| **Work Notified in But Not Conducted:** BellWil 1, 3 and 4; Colgan 2, 5A and 6. | | | | | | | |

## 1.3 Cumulative Activities on Restriction-Imposed Creeks

- Cumulative SMP maintenance activities on sensitive creeks with restrictions will be documented/tracked and a summary table provided. Tracking of cumulative SMP activities is important to demonstrate compliance with programmatic permits that have restrictions/conditions, such as Russian River BO conditions. Example table below provided below.

**Table 3.** Cumulative activities on Zone 1A Creeks with Maintenance Limits

| Creek Name | Permitting Condition from Russian River BO (NMFS, 2008) | | | Current Year SMP Activities (linear feet) | | | Activities available after current year |
|---|---|---|---|---|---|---|---|
| | **Reach scale sediment removal limits** | **Localized sediment removal limits** | **Vegetation removal limits** | **Reach Scale Sediment Removal** | **Localized Sediment Removal** | **Vegetation Management** | |
| Laguna de Santa Rosa Creek | 2,400 feet of sediment removal three times for the next 15 years | No more than three projects annually | 12,000 ft of vegetation removed annually | XX feet | One project, XX feet | Approximately X,XXX feet of non-contiguous vegetation removal | [describe amount of sediment removal and vegetation removal work allowed in future] |

## 1.4 Waste Discharge and Water Quality Certification Monitoring and Reporting

- Describe any Waste Discharge and Water Quality Certification permit violations from found during the report period to comply with Order No. R2-2016-0020 from the San Francisco Bay RWQCB.

# 2. Confirmation of Impact Avoidance, Minimization and Best Management Practices

## 2.1 Confirmation of Best Management Practices

- Discussion of implementation of avoidance/minimization and BMP measures. Review list of BMPs and identify additional minimization actions that were implemented as a result of site conditions or other unexpected issues.
- Include summary table showing BMPs implemented for each maintenance project completed that year.
- Provide updated Table 10-3 Listed Species by Reach information for all completed projects based on site surveys and habitat assessments conducted that year.
- Identify additional minimization actions that were implemented as a result of site conditions or other unexpected issues. Examples:
  - Were any sensitive species or other sensitive resources encountered during maintenance? If so, how was this handled, and what impact avoidance steps were taken?
  - Did any hazardous spills or other threats to water quality occur? If so, what actions were taken to remedy the situation?

## 2.2 Summary of Wildlife Survey, Habitat Assessments and Cultural Resource Findings

- Include results of species surveys and habitat assessments that were conducted after the Notification.

# 3. Mitigation Activities Implemented in Year 20XX

## 3.1 On-Site Mitigation Activities (Tier 1)

- Summarize completed on-site restoration activities. Include photos of completed projects.

## 3.2 Targeted Sediment Collection Areas (Reoccurring Projects) Mitigation

- Summarize maintenance activities that took place at previously established in-stream sediment basins, targeted sediment removal areas or concrete-lined channels. Include summary table to track whether additional mitigation needed/applied for that year. Example table provided below.

**Table 4.** Reoccurring projects implemented with initial impacts applied to Tier 3

| ***Previously Established Targeted Sediment Removal Areas*** | | | |
|---|---|---|---|
| **Reoccurring project** (targeted sediment collection area) | **Year established, area previously mitigated** (acres) | **2018 impact** (acres) | **Additional mitigation applied in 2018** (acres) |
| | | | |
| | | | |
| | | | |
| ***Targeted Sediment Removal Areas Established in Current Year*** | | | |
| **Reoccurring Project** (targeted sediment collection area) | | **Area Impacted (Area mitigated)** | |
| | | | |
| | | | |

## 3.3 Off-Site Mitigation Activities (Tiers 2 and 3)

- Summarize off-site restoration activities and provide status. Include summary table similar to the example below.

**Table 5.** Summary of Tier 3 Mitigation Projects

| Project Name | Partner Organization | Location | Description | Restoration/ Enhancement Area (acres) | Sonoma Water funding provided |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| **Total Tier 3 Mitigation (Watershed Partnership Program) Provided:** | | | | **XX acres** | **$XXX,XXX** |
| **Tier 3 Mitigation Required:** | | | | **X acres** | **$XXX,XXX** |

## 3.4 Species-Specific Compensatory Mitigation

- Provide mitigation accounting of Program compensatory mitigation requirements and credits available.

## 3.5 Mitigation Accounting Summary

- Summarize the status of the Program's mitigation accounting. Include summary tables similar to examples provided below to summarize annual construction costs for ground disturbing projects and associated Tier 3 contribution requirements (10% of cost), and ground disturbing project impact areas and applied Tier 1 (on-site) and Tier 3 (off-site) mitigation as described in previous sections. Example mitigation accounting summary tables provided below.

**Table 6.** Construction Costs, Tier 3 contribution requirements and Accounting

| Project | Construction Cost | Tier 3 Contribution Requirement (10%) |
|---|---|---|
| Austin 1 | $6,000 | $600 |
| | | |
| | | |
| **Total for Current Year** | | |

**Five Year Accounting**

| Year | Annual Construction Costs | Tier 3 Funding Requirement | Tier 3 Funding Provided | Running Balance |
|---|---|---|---|---|
| | | | | |
| | | | | |
| **Current Year** | | | | |

**Table 7.** Ground disturbing projects, impact and mitigation accounting

| Zone | Project | Total Impact (acres) | On-site Mitigation Applied (Tier 1) (Acres) | Off-Site Mitigation Applied (Tier 3) (Acres) | Total Mitigation (Tiers 1 and 3) | Overall Mitigation Ration (Area Disturbed: Area Restored |
|---|---|---|---|---|---|---|
| | Bloomfield 1 | 0.051 | 0.000 | 0.056 | 0.056 | 1:1.1 |
| | | | | | | |
| | | | | | | |

| 2018 Mitigation Accounting Summary | |
|---|---|
| **Total project impacts:** | |
| **Required Tier 1 mitigation:** | |
| **Required Tier 3 mitigation:** | |
| **Tier 3 mitigation applied:** | |
| **Tier 3 applied less the required area:** | |
| **Previously banked Tier 3 mitigation credits (for past 5 years):** | |
| **Total banked Tier 3 mitigation credit:** | |

**Table 8.** Tier 3 mitigation accounting (prior years-current year). Areas given are in acres.

| **Year applied as Tier 3 mitigation** | **On-going Tier 3** (Watershed Partnership Program) Project | **Zone** | **Partner Organization** | **Project restoration/ enhancement area** | **Current Project year** | **Current success rate** | **Area claimed** | **Annual Tier 3 requirement** | **Annual area restored** (area claimed) | **Annual surplus/ deficit** |
|---|---|---|---|---|---|---|---|---|---|---|
| 2012 | | | | | | | | | | |
| 2013 | | | | | | | | | | |
| 2014 | | | | | | | | | | |
| 2015 | | | | | | | | | | |
| 2016 | | | | | | | | | | |
| 2017 | | | | | | | | | | |
| 2018 | | | | | | | | | | |
| | | | **Subtotal 2012-2018:** | **X.XX acres** | | | **XX acre** | **X.XX acre** | **X.XX acre** | **X.XX acre** |
| **Current Year** | | | | | | | | | | |
| | | | | | | | | | | |
| **Subtotal Current Year:** | | | | | | | | | | |
| **Total 2012-Current Year:** | | | | | | | **XX acres** | **XX.XX** | **XX acres** | **XX acres** |

## 3.6 Vegetation Management Mitigation

- Provide mitigation accounting for Class 1 and Class 3 vegetation removed during field season. Example tables provided below.

**Table 9.** Class 1 and 3 tree species and quantities removed and associated mitigation requirements

| Reach | Date Added | Class 1 trees removed | Class 3 trees removed | Tree planting requirement | Trees to be planted |
|---|---|---|---|---|---|
| Piner 2 | 1/2/2019 | 13 | 0 | 2:1 | 26 |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

**Table 10.** Vegetation management mitigation accounting (2013-current year).

| Native Tree Mitigation Requirement | | | | | Replacement Trees Installed |
|---|---|---|---|---|---|
| Year | Removed | Class 1 Trees Removed | Class 3 Trees Removed | Mitigation Requirement | |
| | | | | | |
| | | | | | |
| | | | | | |
| **Total:** | | | | | |

## 3.7 California Tiger Salamander Mitigation

- Describe proposed maintenance activities and impacts that would require CTS compensatory mitigation according to SMP Programmatic BO from USFWS.
- Include table summarizing CTS mitigation credit accounting similar to Table 3.7-X, below.

**Table 11.** California tiger salamander mitigation credit accounting

| Year | CTS Credits Purchased | CTS Credits Used | Year End Remaining balance |
|---|---|---|---|
| 2010 | | | |
| 2011 | | | |
| 2012 | | | |
| 2013 | | | |
| 2014 | | | |
| 2015 | | | |
| 2016 | | | |
| 2017 | | | |
| 2018 | | | |
| 2019 | | | |

# 4. Program Mitigation Monitoring

## 4.1 Monitoring Status for Current Year Mitigation Projects

- Include summary table confirming monitoring status of on-site and off-site mitigation projects implemented in current year. Indicate that the mitigation projects will require monitoring for a minimum of 5 years. Example table included below.

**Table 12.** Status of Current Year Mitigation Projects

| Mitigation Project | Zone | Year of Implementation | Current Year of Monitoring | Remaining Years of Monitoring |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |

## 4.2 Monitoring Status for On-Going Mitigation Projects

### *4.2.1 Tier 1 and Tier 3 Mitigation Project Status*

- Include summary description and table of on-going Tier 1 and 3 projects (as well as Tier 2 if any) to describe current monitoring status and plant success rates. Example table provided below.

**Table 13.** Ongoing Tier 1 and Tier 3 Mitigation Projects Summary

| Mitigation Project | Year Implemented (Year Applied as SMP Mitigation) | Remaining Years of Mitigation | Plant Survival | Field Notes |
|---|---|---|---|---|
| *On-Site Tier 1 Mitigation Projects* | | | | |
| | | | | |
| | | | | |
| | | | | |
| *Off-site Tier 3 Mitigation Projects* | | | | |
| | | | | |
| | | | | |

### *4.2.2 Tier 1 Monitoring Photographs and Tier 3 Reports*

Cross-reference appendix including project reports and monitoring photo sheets of Tier 1 and 3 sites.

### *4.2.3 Native Tree (Vegetation Management) Mitigation Projects*

Include summary table showing survival rates for replacement trees installed over the last 5 years for the removal of Class 1 and Class 3 vegetation. Example summary table provided below.

**Table 14.** On-going Vegetation Management Mitigation Summary

| Native Tree Mitigation Plantings | | | | | | Monitoring Results | | | | Remaining Monitoring |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Quantity Installed | | | 2018 | | 2019 | | |
| Year(s) Installed | Reaches Installed | Zone | Willow Cuttings | Acorns | Total | Quantity Alive | Survival Rate | Quantity Alive | Survival Rate | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| Current Year Success Rate Summary | | | | | | | | | | |
| Mitigation requirement (last 5 years) | | | | | | | | | | |
| Total trees alive in current year | | | | | | | | | | |
| Current year success rate: | | | | | | | | | | |

# 5. Off-Site Sediment Disposal Summary

- Summary quantities of sediment disposed off-site and disposal locations (and acres affected, if applicable). Reference *Annual Sediment Sampling Report* for results of sediment testing.

| Sediment Disposal Site | Volume Disposed (cu.yds.) | Comments |
|---|---|---|
| Site A | XX | Sediment from project sites near Rohnert Park taken here. |
| Site B | XX | Sediment from project sites near Santa Rosa taken here. |
| **Total Disposed** | **XX** | |

# 6. Recommended Program Revisions or Updates (if needed)

- Potential revisions or updates to maintenance methods
- Potential revisions or updates to BMPs

# 7. Anticipated Future Maintenance Activities (if known)

- Projects that didn’t finish this year
- Anticipated projects for next year

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# Appendix B-1
# OUTLINE FOR SEDIMENT SAMPLING REPORT

## 1. Introduction

## 2. Project Sites and Sampling Locations

a. List of annual projects, types, and quantity and characteristics of sediment removed

b. Project site and Sampling Locations

   i. Map showing sites sampled for each project site

## 3. Disposal Options Evaluated

- ☐ On-site
- ☐ Other SCWA channel or property
- ☐ Wetland or Floodplain Restoration or Enhancement
- ☐ Upland Agricultural or Commercial Reuse (dry)
- ☐ Upland Agricultural or Commercial Reuse (wet)
- ☐ Landfill Disposal
- ☐ Hazardous Waste Disposal

## 4. Testing Criteria Applied and Results

Attach sampling results

## 5. Disposal Sites Selected

Explain reasons for selecting preferred and back-up sites.

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# Appendix C.
# CHANNEL CHARACTERIZATION

# Appendix C.
# SUBBASIN MAPS, REACH MAPS, AND EXAMPLE CHANNEL CHARACTERIZATION SHEETS

## C.1 Purpose and Overview

This appendix incudes the following:

- Subwatershed maps for the principal watersheds within Sonoma Water's maintenance zones including the Laguna de Santa Rosa watershed (Zone 1A), the Petaluma River watershed (Zone 2A), and the Sonoma Creek watershed (Zone 3A).
- Reach and vegetation maps for the subwatersheds and reaches maintained within Zones 1A, 2A, and 3A. Reach and vegetation maps maintained for other reaches in Zones 4A, 5A, 6A, 8A, and 9A are also provided.
- Example channel characterizations (reach sheets) for five channel segments in the SMP program area.

### C.1.1 Subwatershed Maps and Reach Maps

The maps are organized geographically by watershed, subwatershed, and then by specific stream reach. SMP channel reaches are defined according to SCWA's Facility Guide (SCWA 2007b). In general, a reach can be thought of as a continuous channel segment. Reaches are typically defined at their upstream and downstream ends by road crossings, railroad lines, or other structures.

For each subwatershed area in Zones 1A, 2A, and 3A, an index map is provided followed by a sequence of maps that locate and name the engineered channel reaches. These reach maps include an aerial photo base map and the primary vegetation classifications within the reach.

Table C-1 lists the reach and vegetation maps for the subwatersheds and reaches maintained within Zones 1A, 2A, and 3A. Table C-1 also lists vegetation maps in reaches maintained within Zones 4A, 5A, 6A, 8A, and 9A. Note that the vegetation maps are provided only for the engineered flood control channels of Zones 1A, 2A, and 3A (mapped as orange and red reaches in the subwatershed maps, and the program area maps in Chapter 1, Figures 1-1 through 1-9). Maintenance activities in Modified and Natural channels (mapped as blue and green reaches in the Chapter 1 maps) only occur on an as needed basis as described in Chapter 7.

### C.1.2 Reach Sheets

Finally, the example reach sheets provided at the end of this chapter provide the SMP program manager and regulatory agency staff a common resource inventory and atlas for the program area. These reach sheets were originally developed at the request of regulatory agency staff to provide a snapshot of conditions in effort to guide management options, assist the design of project features, and identify sensitive environmental concerns. Sonoma Water developed a number of reach characterization sheets for the 2009 Manual. Since then, additional reach sheets have been developed for all engineered channels in Zones 1A, 2A, and 3A. These reach sheets have been updated and will continue to be updated over time through program activities and resource inventories. The reach sheets are an integral part of the SMP tracking database and can be found online at Sonoma Water's SMP database. Five example reach sheets are provided at the end of this appendix.

The reach sheets contain four groups of information: (1) general setting information; (2) physical conditions; (3) biological conditions; and (4) management considerations and opportunities. The general setting section includes information on jurisdiction, location, adjacent land use, reach length, and channel width. The section on physical conditions includes description of the watershed/reach physical setting, active flow channel width, channel bank structure and composition, water quality, and channel geomorphic processes. The biological conditions section describes instream habitats, riparian corridor conditions, vegetation composition, and wildlife habitat and listed species. The management considerations and opportunities section includes relevant maintenance history, current maintenance priorities at the site, and recommendations on opportunities to enhance or protect natural resources while also achieving maintenance objectives. Over time, as maintenance is conducted, the "maintenance history" section of the reach sheets will be updated and maintained in Sonoma Water's SMP database.

The reach sheets were developed and continue to be updated by either an experienced and qualified hydrologist, geomorphologist, ecologist, and/or botanist. In the initial development phase, the reaches were walked from upstream to downstream, with observations, notes, and photographs taken. Following the first pass downstream, the reach was generally reviewed again on an upstream pass to confirm initial observations. Draft reach sheets were developed based on the initial site visit and additional references including channel auto-CAD files, Sonoma Water's GIS data, and various other available natural resource information including relevant information on plants and wildlife in the program area. Draft reach sheets were reviewed by Sonoma Water field managers familiar with the program Area for accuracy. For most of the program area, the reaches were visited a second time to confirm/verify initial observations.

**Table C-1:** SMP Reaches and Figure Numbers



| Subbasin Name | Creek Name | Reach Name | Figure Number |
|---|---|---|---|
| ***Zone 1A – Laguna de Santa Rosa Watershed*** | | | |
| Windsor Creek | | | **C-1** |
| | Windsor Creek | Windsor 1A | C-17 |
| | | Windsor 1B | C-15; C-17 |
| | | Windsor 2 | C-14, C-15 |
| | | Windsor 3 | C-14 |
| | | Windsor 4 | C-14 |
| | East Windsor | East Windsor 1 | C-14 |
| | | East Windsor 2 | C-14 |
| | Windsor Creek Tributary | Windsor Trib 1 | C-15 |
| | Jensen Creek | Jensen 1 | C-14 |
| | Starr Creek | Starr 0 | C-15 |
| | | Starr 1 | C-14 |
| | | Starr 2 | C-14 |
| | Starr Creek Tributary | Starr Trib 1 | C-14 |
| | Faught Creek | Faught 1 | C-16 |
| | Pruit Creek | Pruit 1 | C-16, C-18 |
| | Pool Creek | Pool 1 | C-17 |
| | Airport Creek | Airport 1 | C-17; C-19 |
| | | Airport 2 | C-17; C-18; C-19 |
| | Redwood Creek | Redwood 1 | C-17; C-19 |
| | | Redwood 2 | C-17; C-19 |
| | | Redwood 3 | C-18; C-19 |
| | | Redwood 4 | C-18; C-19 |
| Porter Creek-Mark West Creek | | | **C-2** |
| | Woolsey Creek | Woolsey 1 | C-21; C-22; C-24 |
| | | Woolsey 2 | C-22; C-24 |
| | Fulton Creek | Fulton 0 | C-21; C-22 |
| | | Fulton 0A | C-22 |
| | | Fulton 0B | C-22 |
| | | Fulton 1 | C-22 |
| | | Fulton 2 | C-20 |
| | | Fulton 3 | C-20 |
| | | Fulton 4 | C-20 |
| | Wikiup Creek | Wikiup 0 | C-20 |
| | | Wikiup 1 | C-20 |
| | Mark West Creek Conduit | Mark West Conduit 1 | C-23; C-28 |
| | Hartman Creek | Hartman 1 | C-23; C-24 |
| Lower Santa Rosa Creek | | | **C-3** |
| | Fountain Grove Creek | Fountain Grove 1 | C-26 |
| | | Fountain Grove 2 | C-26 |
| | | Fountain Grove 3 | C-26; C-27 |
| | | Fountain Grove 4 | C-27 |
| | | Fountain Grove 5 | C-25; C-27 |

**Table C-1:** Cont. Page 2 of 10

| Subbasin Name | Creek Name | Reach Name | Figure Number |
|---|---|---|---|
| | Piner Creek | Piner 1 | C-33 |
| | | Piner 2 | C-30; C-33; C-34 |
| | | Piner 3A | C-30 |
| | | Piner 3B | C-30 |
| | | Piner 4 | C-30 |
| | | Piner 5 | C-26; C-30 |
| | | Piner 6 | C-26 |
| | | Piner 7 | C-26 |
| | | Piner 8 | C-26 |
| | Piner Reservoir | Piner Reservoir 1 | C-31 |
| | Russell Creek | Russell 1A | C-26 |
| | | Russell 1B | C-26 |
| | | Russell 2 | C-26 |
| | Indian Creek | Indian 1 | C-26 |
| | Paulin Creek | Paulin 1 | C-30 |
| | | Paulin 2 | C-30 |
| | | Paulin 3 | C-30 |
| | | Paulin 4 | C-30 |
| | | Paulin 5 | C-30 |
| | | Paulin 6A | C-30 |
| | | Paulin 6B | C-30 |
| | | Paulin 7 | C-30; C-31 |
| | | Paulin 8 | C-27 |
| | | Paulin 9 | C-27 |
| | | Paulin 10 | C-27 |
| | | Paulin 11 | C-27 |
| | Olivet Creek | Olivet 1 | C-28 |
| | | Olivet 2 | C-28 |
| | | Olivet 3 | C-28; C-29 |
| | Abramson Creek | Abramson 1 | C-29; C-32; C-33 |
| | | Abramson 2 | C-29 |
| | Peterson Creek | Peterson 1 | C-29; C-33 |
| | | Peterson 2 | C-29 |
| | Forestview Creek | Forestview 1 | C-29 |
| | | Forestview 2 | C-29 |
| | | Forestview 3 | C-29 |
| | Coffey Creek | Coffey 1 | C-30 |
| | Steele Creek | Steele 1A | C-34 |
| | | Steele 1B | C-34 |
| | | Steele 2 | C-34 |
| | | Steele 3 | C-30; C-34 |
| | | Steele 4 | C-30 |
| | | Steele 5 | C-30; C-34 |

**Table C-1:** Cont.



| Subbasin Name | Creek Name | Reach Name | Figure Number |
|---|---|---|---|
| | Santa Rosa Creek | Santa Rosa 1 | C-28; C-32 |
| | | Santa Rosa 2 | C-32; C-33 |
| | | Santa Rosa 3 | C-33; C-34 |
| | | Santa Rosa 4 | C-34; C-35 |
| | | Santa Rosa 5 | C-35 |
| | | Santa Rosa 6 | C-35 |
| | | Santa Rosa 8 | C-35 |
| | | Santa Rosa 9 | C-35; C-36 |
| | College Creek | College 1 | C-34 |
| | | College 2 | C-34 |
| | | College 3 | C-34 |
| Upper Santa Rosa Creek | | | **C-4** |
| | Rincon Creek | Rincon 1 | C-39 |
| | | Rincon 2 | C-39 |
| | | Rincon 3 | C-37; C-39 |
| | Middle Fork Brush Creek | Middle Brush 1 | C-39 |
| | | Middle Brush 2 | C-37; C-38; C-39; C-40 |
| | Ducker Creek | Ducker 1 | C-39; C-40; C-41 |
| | | Ducker 2A | C-39; C-40 |
| | Brush Creek | Brush 1 | C-41 |
| | | Brush 2A | C-41 |
| | | Brush 2B | C-41 |
| | | Brush 2C | C-39; C-41 |
| | Brush Creek Tributary | Brush Trib 10 | C-40 |
| | Brush Reservoir | Brush Reservoir 1 | C-38 |
| | Austin Creek | Austin 1 | C-41 |
| | | Austin 2 | C-40; C-41; C-42 |
| | | Austin 3 | C-40; C-42 |
| | Santa Rosa Creek | Santa Rosa 0 | C-42 |
| | | Santa Rosa 10 | C-41 |
| | | Santa Rosa 11 | C-41; C-42 |
| | | Santa Rosa 12 | C-42 |
| | | Santa Rosa 13 | C-42 |
| | | Santa Rosa 14 | C-42; C-43 |
| | Santa Rosa Creek Diversion | Santa Rosa Div 1 | C-42 |
| | | Santa Rosa Div 2 | C-42 |
| | Spring Creek | Spring 1 | C-44 |
| | | Spring 1A | C-44 |
| | | Spring 1B | C-44 |
| | | Spring 2 | C-44 |
| | | Spring 3 | C-44; C-45 |
| | Spring Lake | Spring Lake 1 | C-42 |
| | Spring Creek Diversion | Spring Div 1 | C-42; C-45 |
| | Oakmont Creek | Oakmont 1 | C-42 |
| | | Oakmont 2 | C-46 |
| | | Oakmont 3 | C-46 |

**Table C-1:** Cont. Page 4 of 10

| Subbasin Name | Creek Name | Reach Name | Figure Number |
|---|---|---|---|
| | | Oakmont 4 | C-46 |
| | | Oakmont 5 | C-46 |
| | Matanzas Creek | Matanzas 1 | C-44 |
| | Matanzas Reservoir | Matanzas Reservoir 1 | C-49; C-50 |
| | | Matanzas Reservoir 2 | C-49; C-50 |
| | South Fork Matanzas Creek | SF Matanzas 1 | C-51 |
| | Sierra Park Creek | Sierra Park 1 | C-45 |
| | | Sierra Park 2 | C-45 |
| | | Sierra Park 3 | C-45 |
| | Lorna Dell Creek | Lorna Dell 1 | C-47; C-48 |
| | | Lorna Dell 2 | C-48 |
| | | Lorna Dell 3 | C-48 |
| Lower Laguna De Santa Rosa | | | **C-5** |
| | Irwin Creek | Irwin 1 | C-52 |
| | | Irwin 2 | C-52 |
| | Calder Creek | Calder 1 | C-56 |
| | Laguna Creek | Laguna 0 | C-56 |
| | Roseland Creek | Roseland 1 | C-57 |
| | | Roseland 1A | C-57 |
| | | Roseland 2 | C-57 |
| | | Roseland 3 | C-54; C-55; C-57 |
| | | Roseland 4 | C-55 |
| | | Roseland 5 | C-55 |
| | | Roseland 6 | C-53; C-55 |
| Upper Laguna De Santa Rosa | | | **C-6** |
| | Colgan Creek | Colgan 1 | C-63 |
| | | Colgan 2 | C-63; C-64 |
| | | Colgan 3 | C-64 |
| | | Colgan 4 | C-61; C-64 |
| | | Colgan 5A | C-59; C-61 |
| | | Colgan 5B | C-59 |
| | | Colgan 5C | C-59 |
| | | Colgan 6 | C-59; C-60 |
| | | Colgan 7 | C-60 |
| | Kawana Springs Creek | Kawana 1A | C-60 |
| | | Kawana 1B | C-60 |
| | Washoe Creek | Washoe 1 | C-71 |
| | Crane Creek | Crane 1 | C-72 |
| | | Crane 2 | C-72 |
| | | Crane 3 | C-72; C-73 |
| | Cotati Creek | Cotati 1 | C-75 |
| | | Cotati 2A | C-75 |
| | | Cotati 2B | C-75 |
| | Warrington Creek | Warrington 1 | C-65 |
| | Copeland Creek | Copeland 1 | C-71; C-72 |
| | | Copeland 2 | C-72 |
| | | Copeland 3 | C-72 |
| | | Copeland 4 | C-72 |

**Table C-1:** Cont. Page 5 of 10

| Subbasin Name | Creek Name | Reach Name | Figure Number |
|---|---|---|---|
| | | Copeland 5 | C-72 |
| | | Copeland 6 | C-72; C-73 |
| | South Fork Copeland Creek | SF Cope 1 | C-72; C-75 |
| | | SF Cope 2 | C-72 |
| | Todd Creek | Todd 1 | C-64; C-65; C-67; C-68 |
| | | Todd 2 | C-64 |
| | | Todd 3 | C-65 |
| | | Todd 4A | C-65 |
| | | Todd 4B | C-65 |
| | | Todd 5A | C-62; C-65 |
| | | Todd 5B | C-62 |
| | Golf Creek | Golf 1 | C-68; C-72 |
| | Bellevue Wilfred Channel | Bell Wil 1 | C-67; C-71 |
| | | Bell Wil 2 | C-67 |
| | | Bell Wil 3 | C-67 |
| | | Bell Wil 4 | C-67; C-68 |
| | Cook Creek | Cook 1 | C-68 |
| | | Cook 2 | C-69 |
| | Hinebaugh Creek | Hinebaugh 1 | C-71 |
| | | Hinebaugh 2 | C-71 |
| | | Hinebaugh 3A | C-71; C-72 |
| | | Hinebaugh 3B | C-72 |
| | | Hinebaugh 4 | C-72 |
| | | Hinebaugh 5A | C-72 |
| | | Hinebaugh 5B | C-72 |
| | | Hinebaugh 5C | C-72 |
| | | Hinebaugh 6 | C-72 |
| | | Hinebaugh 7A | C-72 |
| | | Hinebaugh 7B | C-72 |
| | | Hinebaugh 8 | C-72 |
| | Five Creek | Five 1 | C-68; C-72 |
| | Labath Creek | Labath 2 | C-71 |
| | Gossage Creek | Gossage 1 | C-71 |
| | | Gossage 2A | C-71; C-74 |
| | | Gossage 2B | C-74 |
| | | Gossage 3 | C-74 |
| | Coleman Creek | Coleman 1 | C-68 |
| | | Coleman 2 | C-68 |
| | Hessel Creek | Hessel 1 | C-66 |
| | | Hessel 2 | C-70 |
| | | Hessel 3 | C-70 |
| | | Hessel 4 | C-70 |
| | Wilfred Creek | Wilfred 1A | C-68 |
| | | Wilfred 1B | C-68 |
| | | Wilfred 1C | C-68 |
| | Wilfred Creek Extension | Wilfred Ext 1 | C-68 |
| | | Wilfred Ext 2 | C-68 |

**Table C-1:** Cont. Page 6 of 10

| Subbasin Name | Creek Name | Reach Name | Figure Number |
|---|---|---|---|
| | Moorland Creek | Moorland 1A | C-64 |
| | | Moorland 1B | C-64 |
| | | Moorland 1C | C-64 |
| | | Moorland 2 | C-61; C-64 |
| | Laguna Creek | Laguna 0A | C-63; C-66; |
| | | Laguna 1 | C-66; C-67; C-70; C-71 |
| | | Laguna 2 | C-71 |
| | | Laguna 3 | C-71; C-72; C-74; C-75 |
| | | Laguna 3A | C-75 |
| | | Laguna 4 | C-75 |
| | | Laguna 5 | C-75 |
| | | Laguna 6 | C-75 |
| | | Laguna 7 | C-75 |
| | Hunter Lane Channel | Hunter 1 | C-65 |
| | | Hunter 2 | C-65 |
| | | Hunter 3 | C-65 |
| ***Zone 2A – Petaluma River Watershed*** | | | |
| Petaluma River | | | **C-8** |
| | Lichau Creek | Lichau 1 | C-79; C-80 |
| | | Lichau 2 | C-80 |
| | | Lichau 3 | C-80 |
| | | Lichau 3A | C-78; C-80 |
| | | Lichau 3B | C-78 |
| | | Lichau 3C | C-78 |
| | | Lichau 3D | C-78 |
| | | Lichau 4 | C-78 |
| | | Lichau 5 | C-78 |
| | | Lichau 6 | C-77; C-78 |
| | | Lichau 7 | C-76 |
| | | Lichau 8 | C-77 |
| | Corona Creek | Corona 1 | C-83 |
| | | Corona 2 | C-80; C-83 |
| | | Corona 3 | C-80 |
| | | Corona 4 | C-80 |
| | | Corona 5 | C-80 |
| | | Corona 6 | C-80 |
| | | Corona 7 | C-80 |
| | Corona Creek Tributary | Corona Trib 1 | C-80 |
| | | Corona Trib 2A | C-80 |
| | | Corona Trib 2B | C-80 |
| | | Corona Trib 3 | C-80; C-83 |
| | Petaluma River | Petaluma 0A | C-83 |
| | | Petaluma 0B | C-83 |
| | | Petaluma 0C | C-80; C-83 |
| | | Petaluma 1 | C-80 |

**Table C-1:** Cont. Page 7 of 10

| Subbasin Name | Creek Name | Reach Name | Figure Number |
|---|---|---|---|
| | | Petaluma 2 | C-80 |
| | | Petaluma 3 | C-80 |
| | | Petaluma 4 | C-79; C-80 |
| | Capri Creek | Capri 1 | C-83 |
| | | Capri 2B | C-83 |
| | | Capri 3 | C-83 |
| | | Capri 4 | C-80; C-81; C-83 |
| | Lynch Creek | Lynch 0A | C-81 |
| | | Lynch 0B | C-84 |
| | | Lynch 1A | C-84 |
| | | Lynch 1B | C-84 |
| | | Lynch 2 | C-84 |
| | Wiggins Hill Creek | Wiggins Hill 1 | C-82 |
| | | Wiggins Hill 2 | C-82 |
| | Wilson Creek | Wilson 1 | C-82; C-85 |
| | | Wilson 2 | C-85 |
| | Jessie Lane Creek | Jessie Lane 1 | C-83 |
| | Washington Creek | Washington 1 | C-86 |
| | | Washington 2 | C-86 |
| | | Washington 3 | C-86 |
| | | Washington 4 | C-84 |
| | | Washington 5 | C-84 |
| | | Washington 6 | C-84 |
| | | Washington 7 | C-84 |
| | East Washington Creek | East Washington 1 | C-84 |
| | | East Washington 2 | C-84 |
| | | East Washington 3 | C-84 |
| | | East Washington 4 | C-84 |
| | | East Washington 5 | C-84 |
| | McDowell Creek | McDowell 1 | C-86 |
| | | McDowell 2A | C-86 |
| | | McDowell 2B | C-86 |
| | East Fork McDowell Creek | East Fork McDowell 1 | C-86 |
| | Adobe Creek | Adobe 1 | C-87; C-89 |
| | | Adobe 2 | C-87 |
| | Thompson Creek | Thompson 1 | C-88 |
| Adobe Creek-Frontal San Pablo Bay Estuaries | | | **C-9** |
| | Adobe Creek | Adobe 3 | C-91 |
| | | Adobe 4 | C-90; C-91 |
| | | Adobe 5 | C-90 |
| | Ellis Creek | Ellis 1 | C-91 |
| ***Zone 3A – Sonoma Creek Watershed*** | | | |
| Fowler Creek | | | **C-10** |
| | Fowler Creek | Fowler 1 | C-102; C-103 |
| | Rodgers Creek | Rodgers 0 | C-102 |
| | | Rodgers 0A | C-101 |
| | | Rodgers 1 | C-101 |

**Table C-1:** Cont. Page 8 of 10

| Subbasin Name | Creek Name | Reach Name | Figure Number |
|---|---|---|---|
| | | Rodgers 1A | C-101 |
| | | Rodgers 1B | C-101 |
| | | Rodgers 2 | C-101 |
| Lower Sonoma Creek | | | **C-11** |
| | Sonoma Creek | Sonoma 0B | C-111; C-112 |
| | | Sonoma 0C | C-110 |
| | | Sonoma 0D | C-110 |
| | | Sonoma 0E | C-110 |
| | | Sonoma 1 | C-110 |
| | | Sonoma 2 | C-110 |
| | | Sonoma 4 | C-107; C-108 |
| | | Sonoma 5 | C-107 |
| | | Sonoma 6 | C-107 |
| | | Sonoma 7 | C-106 |
| | | Sonoma 8 | C-105; C-106 |
| | | Sonoma 9 | C-104; C-105 |
| | Hooker Creek | Hooker 1 | C-106 |
| | Lilley Creek | Lilley 1 | C-108 |
| | Verano Creek | Verano 1 | C-110 |
| | | Verano 2 | C-110 |
| | | Verano 3 | C-109; C-110 |
| | O'Brien | O'Brien 1 | C-109 |
| | Dowdall Creek | Dowdall 0 | C-110 |
| | | Dowdall 1 | C-109 |
| Upper Sonoma Creek | | | **C-7** |
| | Mount Hood Creek | Mount Hood 1 | C-95 |
| | | Mount Hood 2 | C-94 |
| | Kenwood Creek | Kenwood 1 | C-95; C-96 |
| | | Kenwood 2 | C-95 |
| | | Kenwood 3 | C-95 |
| | Fisher Creek | Fisher 1 | C-96 |
| | | Fisher 2 | C-96 |
| | | Fisher 3 | C-95; C-96 |
| | | Fisher 4 | C-95; C-96 |
| | | Fisher 5 | C-95 |
| | Holly Creek | Holly 1 | C-96 |
| | Calabazas Creek | Calabazas 1 | C-98 |
| | | Calabazas 2 | C-98; C-100 |
| | Sonoma Creek | Sonoma 10 | C-99; C-100 |
| | | Sonoma 11 | C-99; C-100 |
| | | Sonoma 12 | C-99 |
| | | Sonoma 13 | C-97; C-99 |
| | | Sonoma 14 | C-97 |
| | | Sonoma 15 | C-97 |
| | | Sonoma 16 | C-95 |
| | | Sonoma 17 | C-95 |
| | Lawndale Creek | Lawndale 0 | C-95 |

**Table C-1:** Cont. Page 9 of 10

| Subbasin Name | Creek Name | Reach Name | Figure Number |
|---|---|---|---|
| | | Lawndale 1 | C-94; C-95 |
| | | Lawndale 2 | C-94; C-95 |
| Schell Creek-Frontal San Pablo Bay Estuaries | | | |
| | Nathanson Creek | Nathanson 0 | C-113; C-117 |
| | | Nathanson 0A | C-117 |
| | | Nathanson 0B | C-115; C-117 |
| | | Nathanson 1 | C-115 |
| | | Nathanson 2 | C-115 |
| | | Nathanson 3 | C-115 |
| | | Nathanson 4 | C-114; C-115 |
| | | Nathanson 5 | C-114 |
| | | Nathanson 6 | C-114 |
| | | Nathanson 7 | C-114 |
| | | Nathanson 8 | C-114 |
| | | Nathanson 9 | C-114 |
| | Nathanson Creek Bypass | Nathanson Bypass 1 | C-115 |
| | Schell Creek | Schell 1 | C-113; C-118 |
| | | Schell 2 | C-113; C-117; C-118 |
| | | Schell 3 | C-113; C-117 |
| | | Schell 4 | C-117 |
| | Arroyo Seco | Arroyo Seco 1 | C-116 |
| | | Arroyo Seco 2 | C-116 |
| | | Arroyo Seco 3 | C-114 |
| | Fryer Creek | Fryer 0 | C-117 |
| | | Fryer 0A | C-115; C-117 |
| | | Fryer 0B | C-115 |
| | | Fryer 0C | C-115 |
| | | Fryer 1 | C-115 |
| | | Fryer 2 | C-115 |
| | | Fryer 3 | C-115 |
| | | Fryer 4 | C-114 |
| | Lower East Fork Fryer Creek | Lower East Fork Fryer 1 | C-115 |
| | | Lower East Fork Fryer 1A | C-115 |
| | | Lower East Fork Fryer 2 | C-114; C-115 |
| ***Zone 4A*** | | | |
| Gill Creek – Russian River | | | |
| | Gill Creek | Gill 1 | C-121 |
| Sausal Creek – Russian River | | | |
| | Wood Creek | Wood 0A | C-122 |
| | | Wood 0B | C-122 |
| | | Wood 1 | C-122 |
| | Lytton Creek | Lytton 1 | C-123 |
| ***Zone 5A*** | | | |
| Dutch Bill Creek – Russian River | | | |
| | Fife Creek | Fife 1 | C-127 |

**Table C-1:** Cont. Page 10 of 10

| Subbasin Name | Creek Name | Reach Name | Figure Number |
|---|---|---|---|
| | | Fife 2 | C-126; C-127 |
| | | Fife 3 | C-126; C-127 |
| | | Fife 4 | C-126 |
| | | Fife 5 | C-126 |
| | | Fife 6 | C-126 |
| | | Fife 7 | C-126 |
| | | Fife 8 | C-125 |
| | | Fife 9 | C-125 |
| | Livereau Creek | Livereau 1 | C-127 |
| | | Livereau 2 | C-126; C-127 |
| | Mays Canyon Creek | Mays Canyon 1 | C-127 |
| | | Mays Canyon 2 | C-127 |
| | Pocket Canyon Creek | Pocket Canyon 1 | C-127 |
| | | Pocket Canyon 2 | C-127; C-128 |
| | | Pocket Canyon 2 | C-128 |
| | Hulbert Creek | Hulbert 1 | C-127 |
| Porter Creek – Russian River | | | |
| | Reiman Creek | Reiman 1 | C-124 |
| | | Reiman 2 | C-124 |
| ***Zone 6A*** | | | |
| West Slough – Dry Creek | | | |
| | West Slough | West Slough 0 | C-131 |
| | | West Slough 1 | C-129; C-130; C-131 |
| | Dry Creek | Dry 2 | C-131 |
| ***Zone 8A*** | | | |
| Estero Americano | | | |
| | Americano Creek | Americano 1 | C-132 |
| | | Americano 2 | C-132; C-133 |
| | Bloomfield Creek | Bloomfield 1 | C-133 |
| ***Zone 9A*** | | | |
| Tolay Creek – Frontal San Pablo Bay Estuaries | | | |
| | Sonoma Creek | Sonoma 0A | C-119; C-120 |
| | | Sonoma 0B | C-119 |

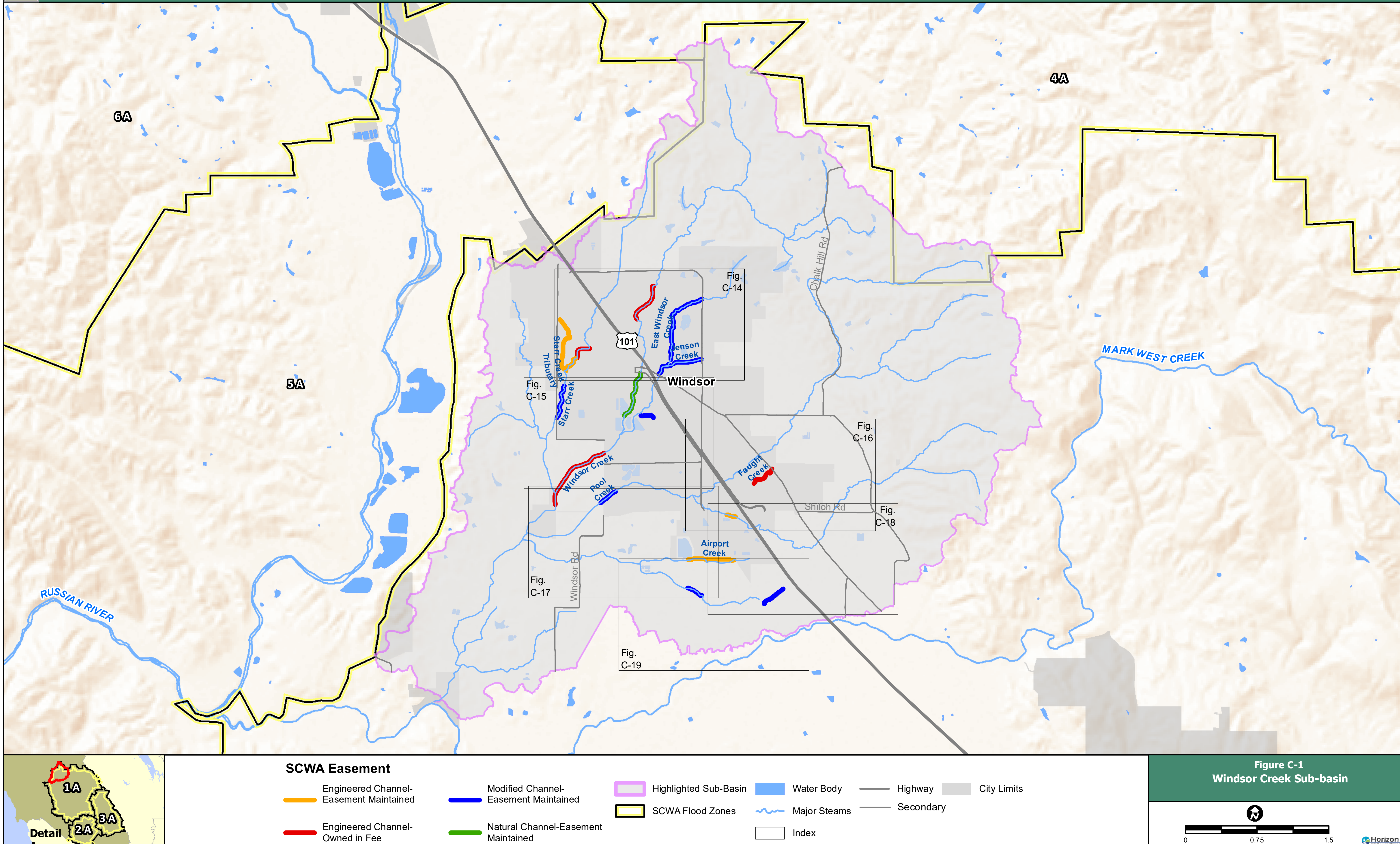



Figure C-1
Windsor Creek Sub-basin

# Sonoma County Water Agency

**Stream Maintenance Program (SMP)**

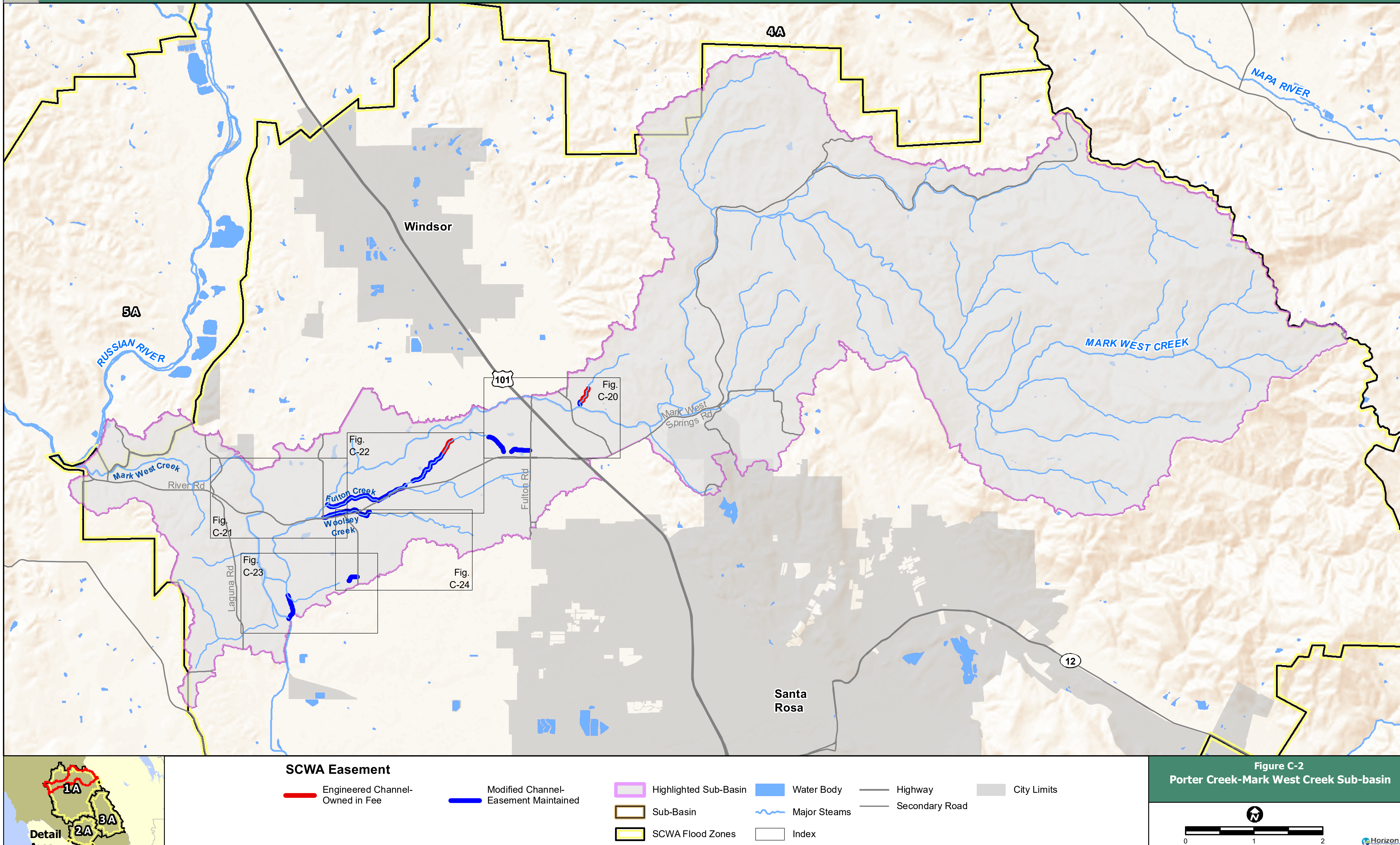
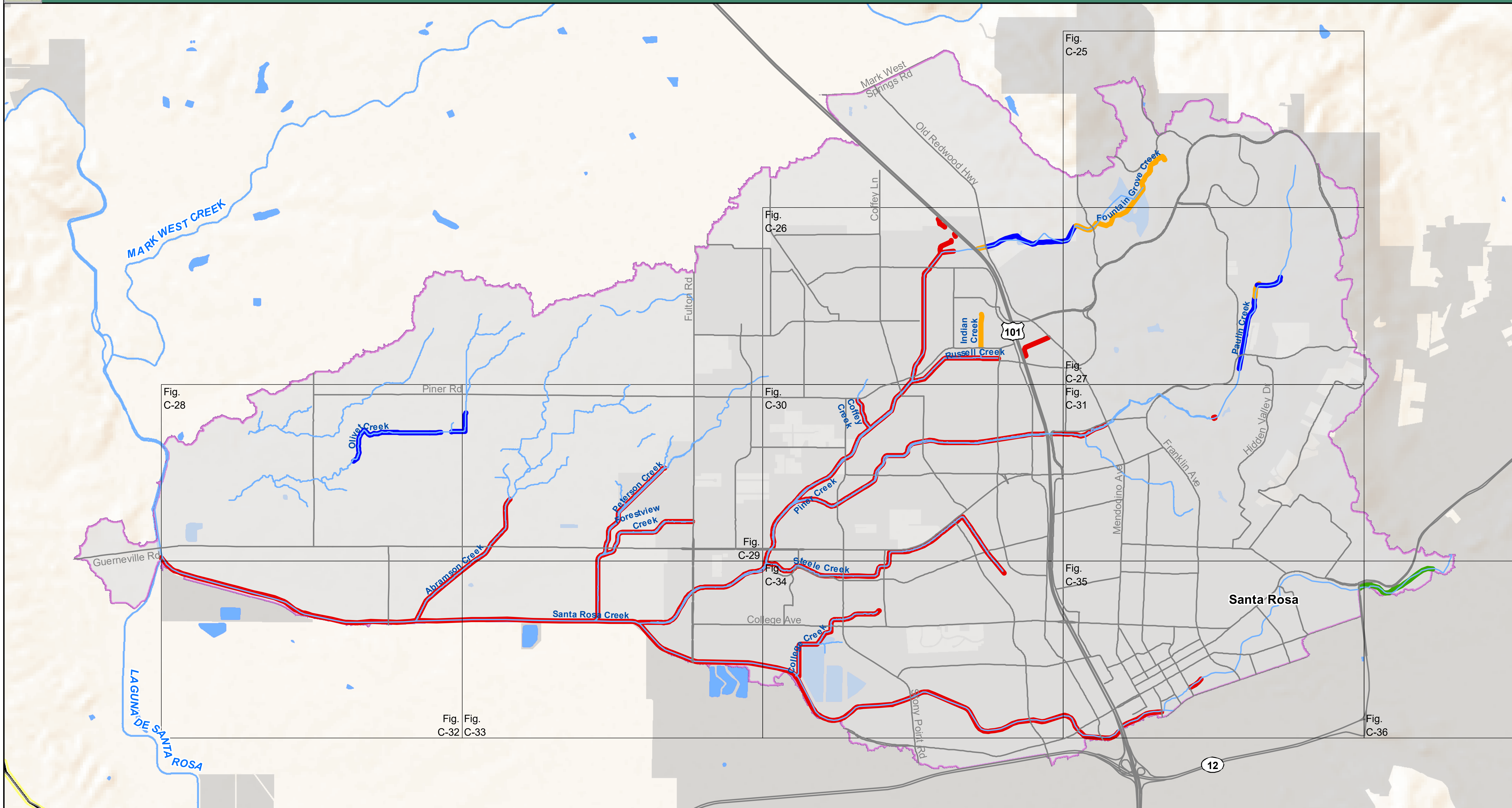



**Figure C-2**
**Porter Creek-Mark West Creek Sub-basin**

Sonoma County Water Agency

**Stream Maintenance Program (SMP)**





**SCWA Easement**

- Engineered Channel-Easement Maintained
- Engineered Channel-Owned in Fee
- Modified Channel-Easement Maintained
- Natural Channel-Easement Maintained
- Highlighted Sub-Basin
- Sub-Basin
- SCWA Flood Zones
- Water Body
- Major Steams
- Index
- Highway
- Secondary Road
- City Limits

0 0.5 1
Miles

Horizon

**Figure C-3**
**Lower Santa Rosa Creek Sub-basin**

Sonoma County Water Agency

Stream Maintenance Program (SMP)

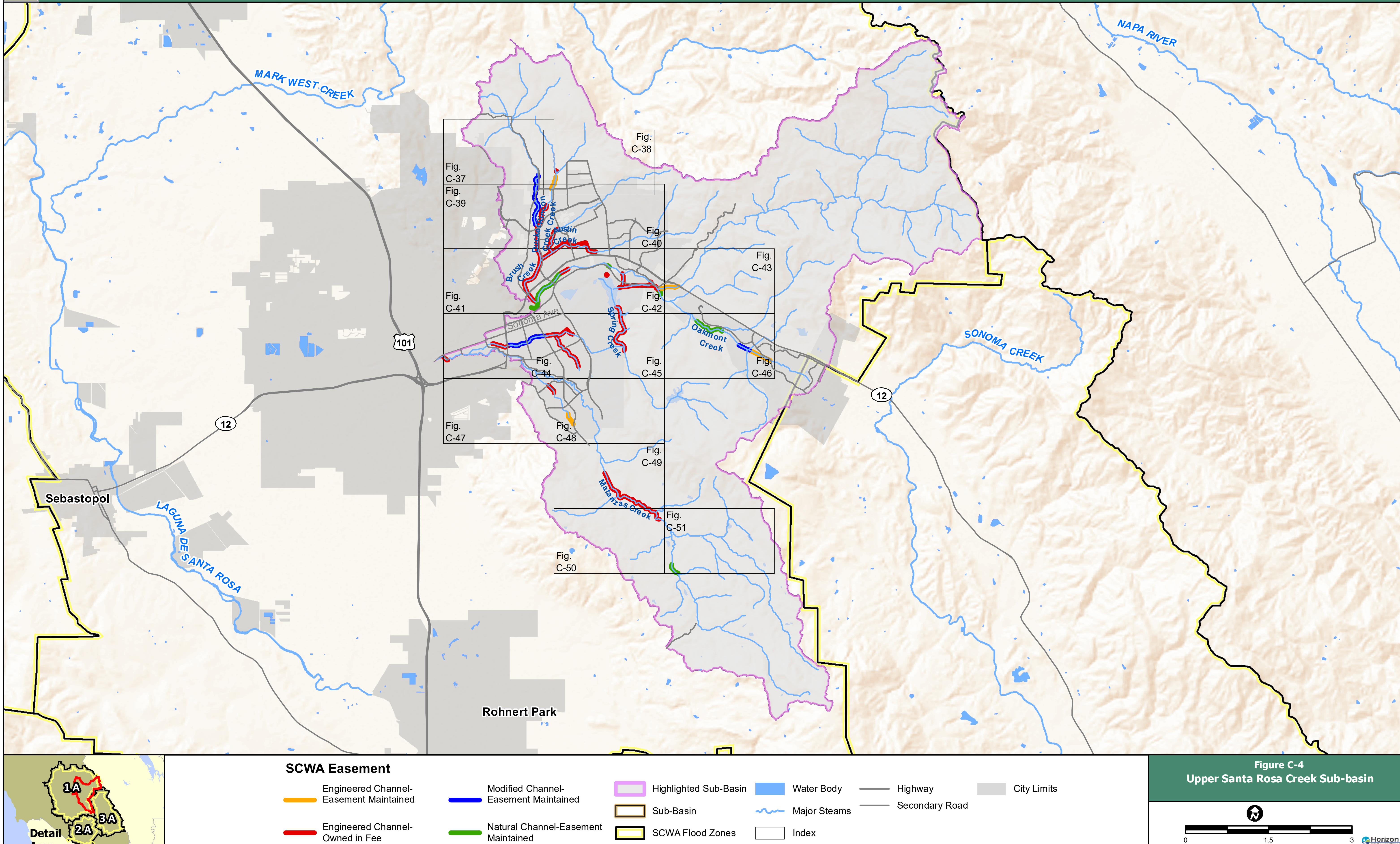



Figure C-4
Upper Santa Rosa Creek Sub-basin

Sonoma County Water Agency Stream Maintenance Program (SMP)

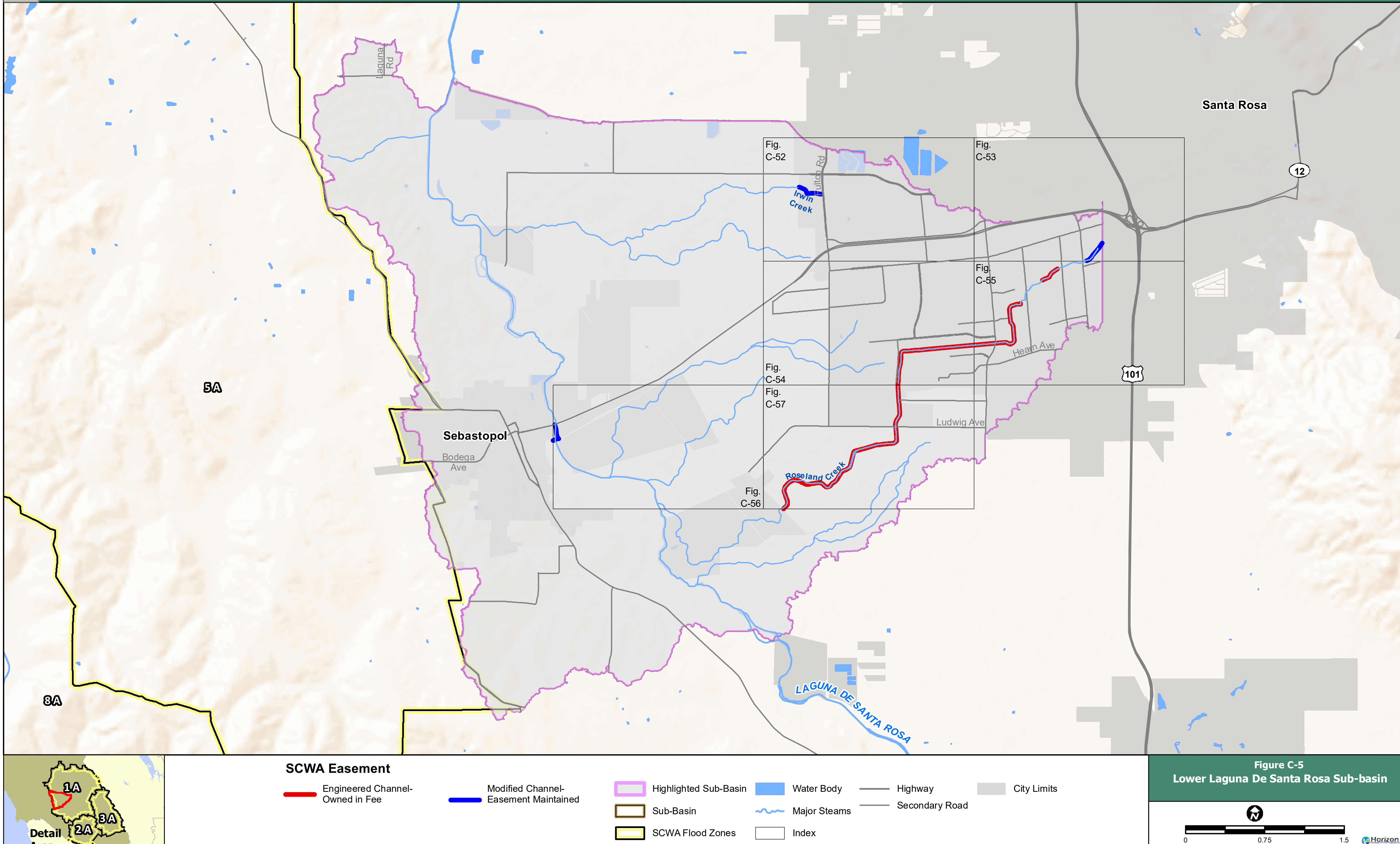
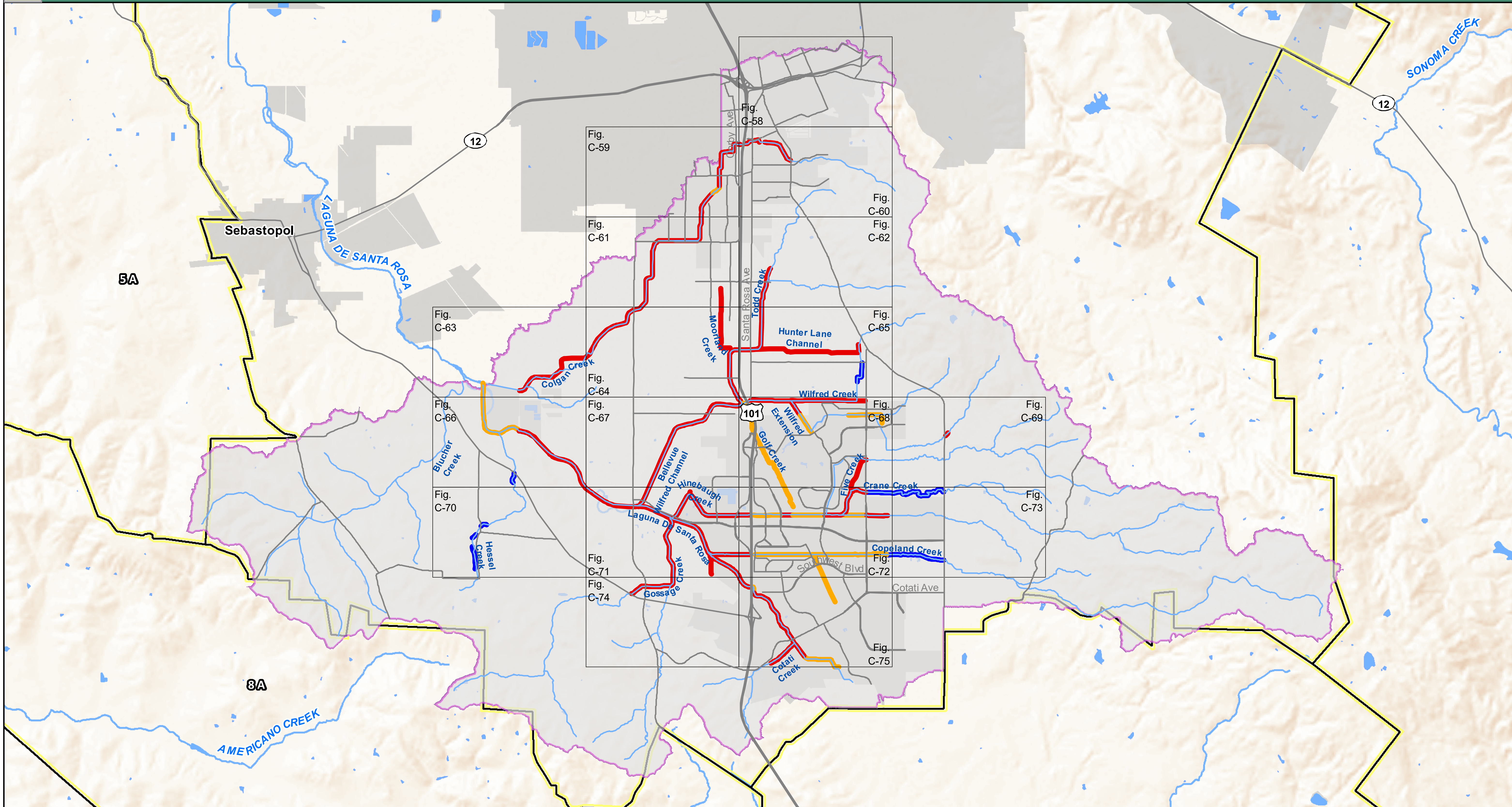



Figure C-5
Lower Laguna De Santa Rosa Sub-basin

# Sonoma County Water Agency

**Stream Maintenance Program (SMP)**






**SCWA Easement**

- Engineered Channel-Easement Maintained
- Engineered Channel-Owned in Fee
- Modified Channel-Easement Maintained
- Highlighted Sub-Basin
- Sub-Basin
- SCWA Flood Zones
- Water Body
- Major Steams
- Index
- Highway
- Secondary Road
- City Limits

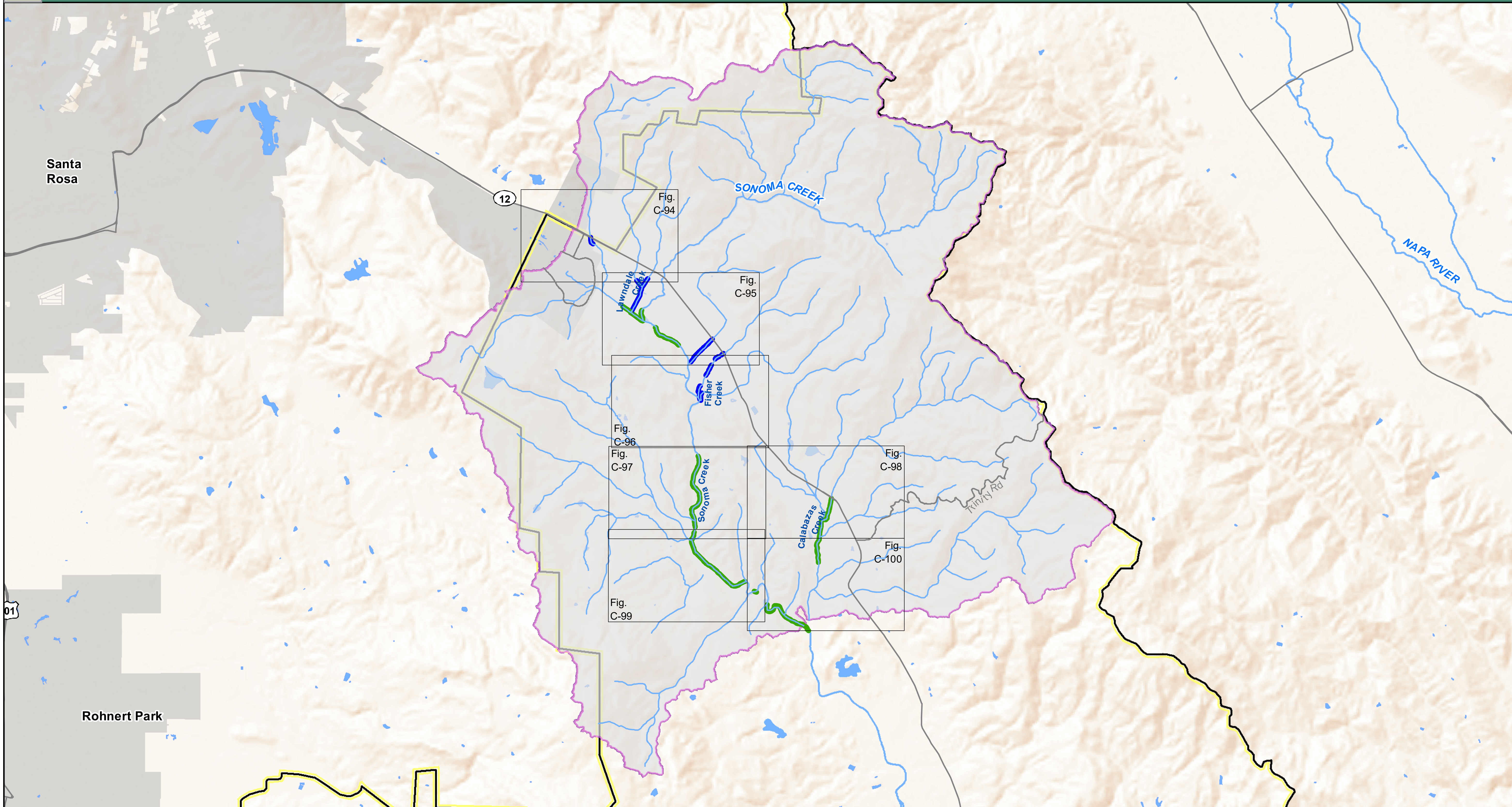
**Figure C-6**
**Upper Laguna De Santa Rosa Sub-basin**

0 1 2
Miles

Horizon

Sonoma County Water Agency

**Stream Maintenance Program (SMP)**





**SCWA Easement**

- Modified Channel-Easement Maintained
- Natural Channel-Easement Maintained
- Highlighted Sub-Basin
- Sub-Basin
- SCWA Flood Zones
- Water Body
- Major Steams
- Index
- Highway
- Secondary Road
- City Limits

**Figure C-7**
**Upper Sonoma Creek Sub-basin**

0 1 2
Miles

Horizon

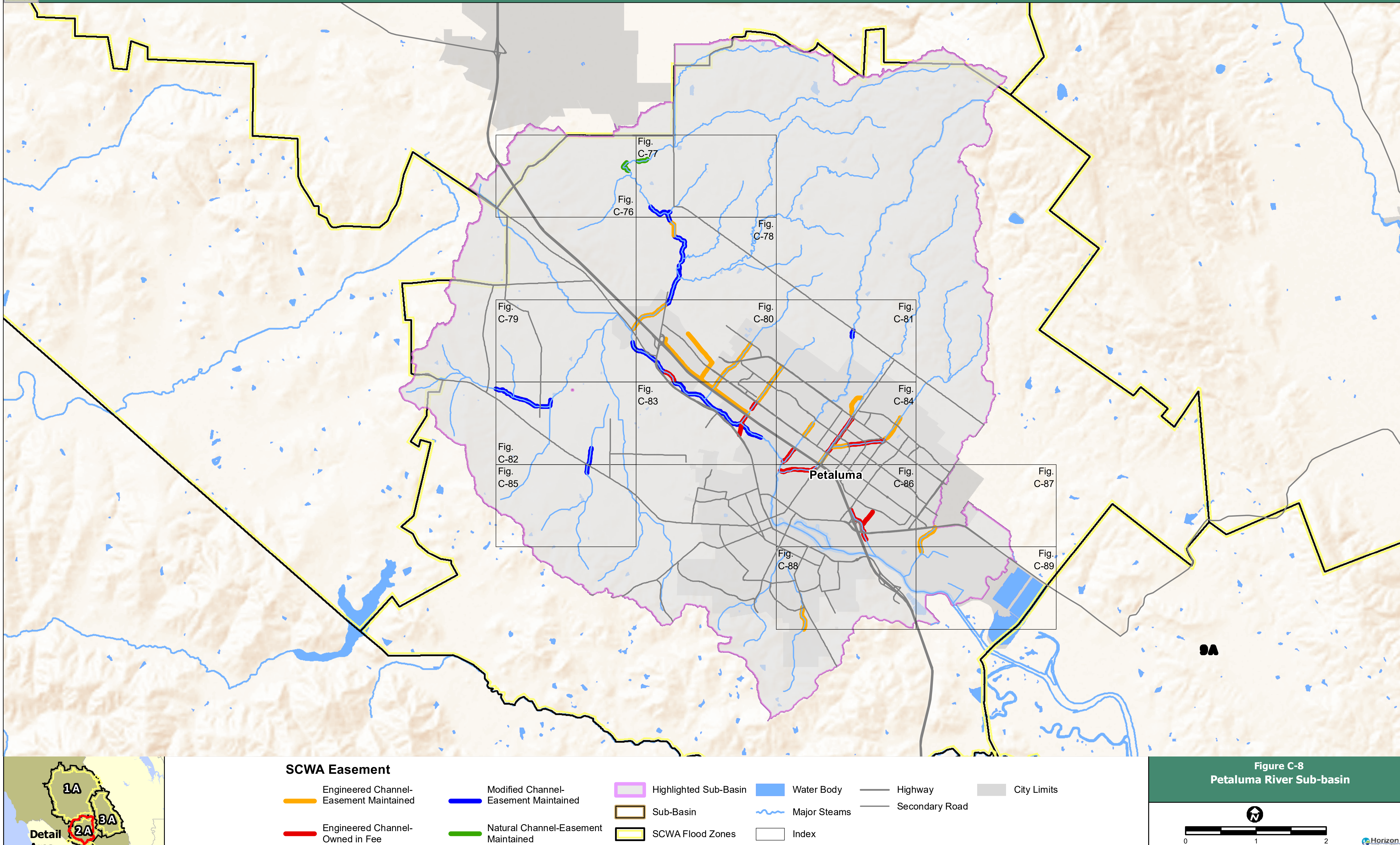



Figure C-8
Petaluma River Sub-basin

# Sonoma County Water Agency

## Stream Maintenance Program (SMP)

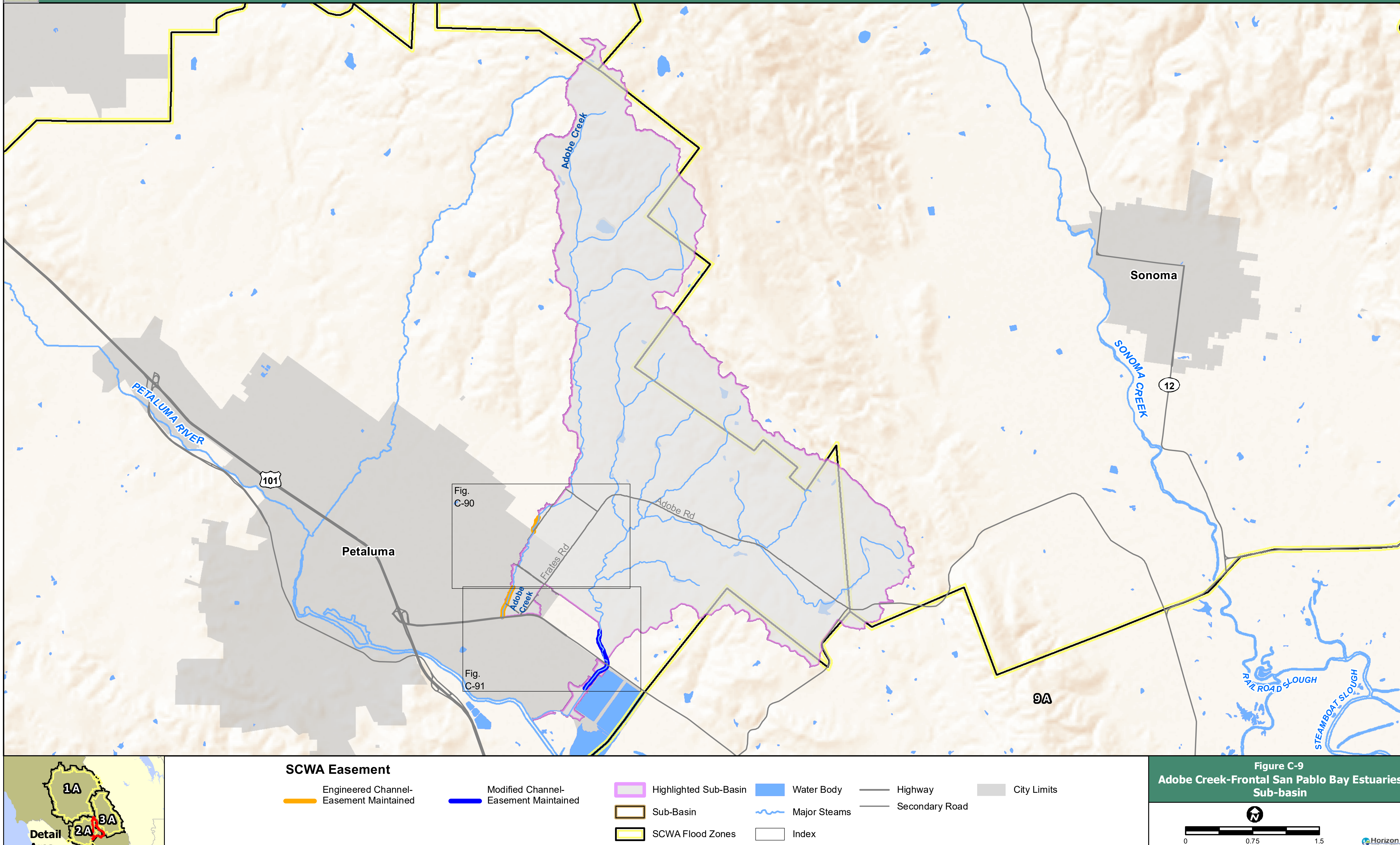
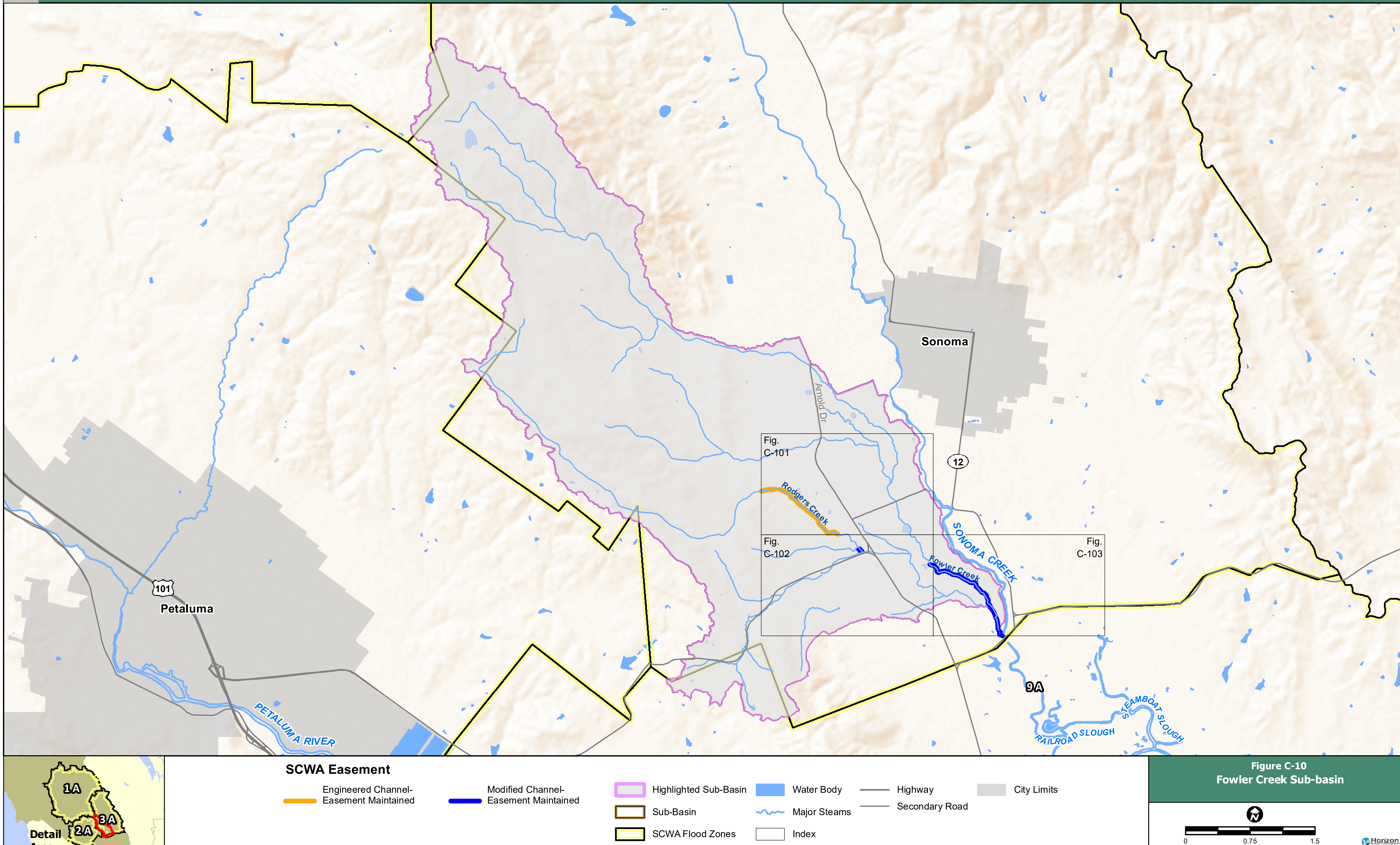



Figure C-9
Adobe Creek-Frontal San Pablo Bay Estuaries Sub-basin

# Sonoma County Water Agency

**Stream Maintenance Program (SMP)**




**SCWA Easement**

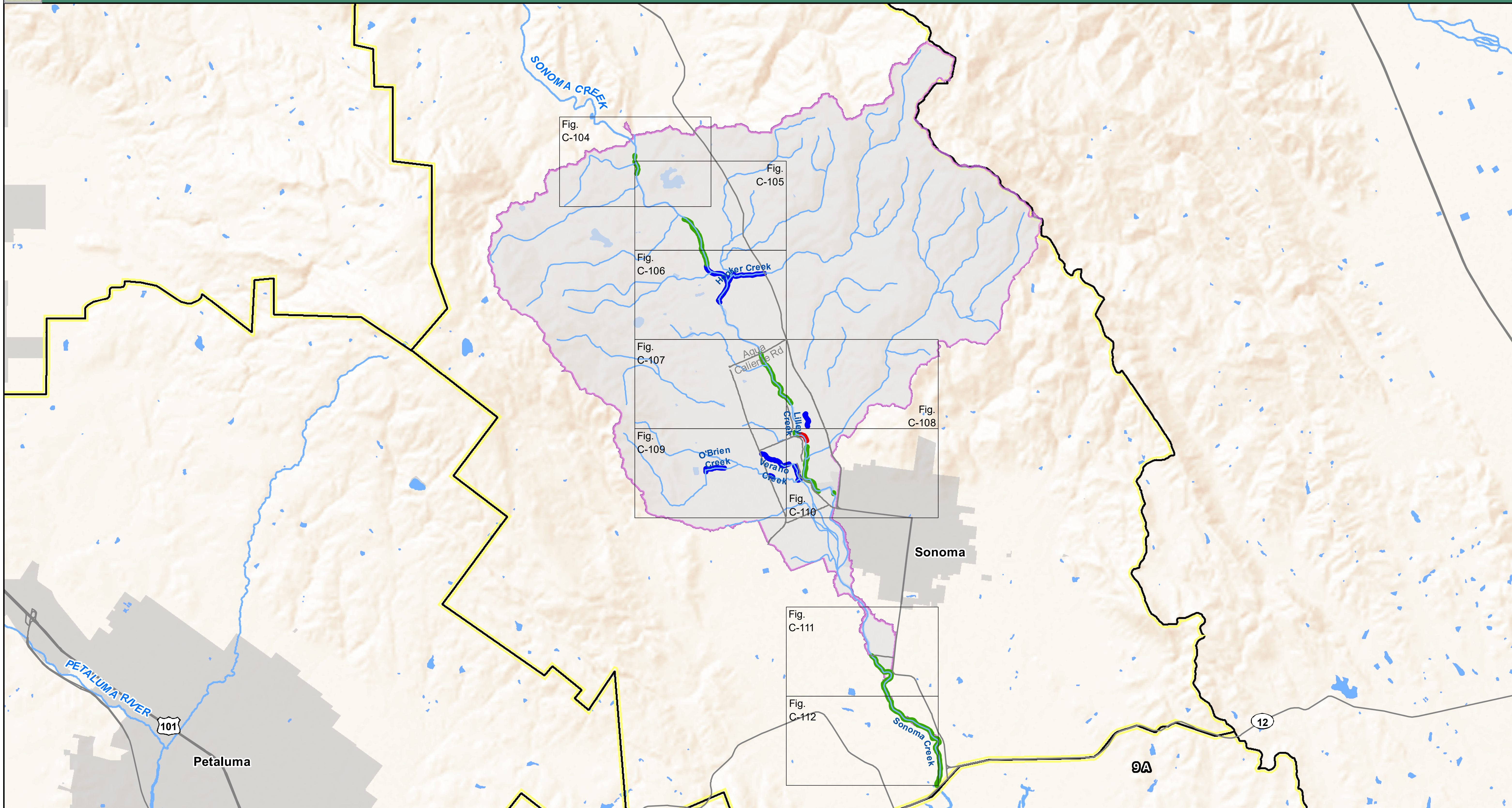
- Engineered Channel-Easement Maintained
- Modified Channel-Easement Maintained
- Highlighted Sub-Basin
- Sub-Basin
- SCWA Flood Zones
- Water Body
- Major Steams
- Index
- Highway
- Secondary Road
- City Limits

**Figure C-10**
**Fowler Creek Sub-basin**

0 0.75 1.5
Miles

Sonoma County Water Agency

**Stream Maintenance Program (SMP)**





**SCWA Easement**

- Engineered Channel-Owned in Fee
- Modified Channel-Easement Maintained
- Natural Channel-Easement Maintained
- Highlighted Sub-Basin
- Sub-Basin
- SCWA Flood Zones
- Water Body
- Major Steams
- Index
- Highway
- Secondary Road
- City Limits

**Figure C-11**
**Lower Sonoma Creek Sub-basin**

0 1 2
Miles

Horizon

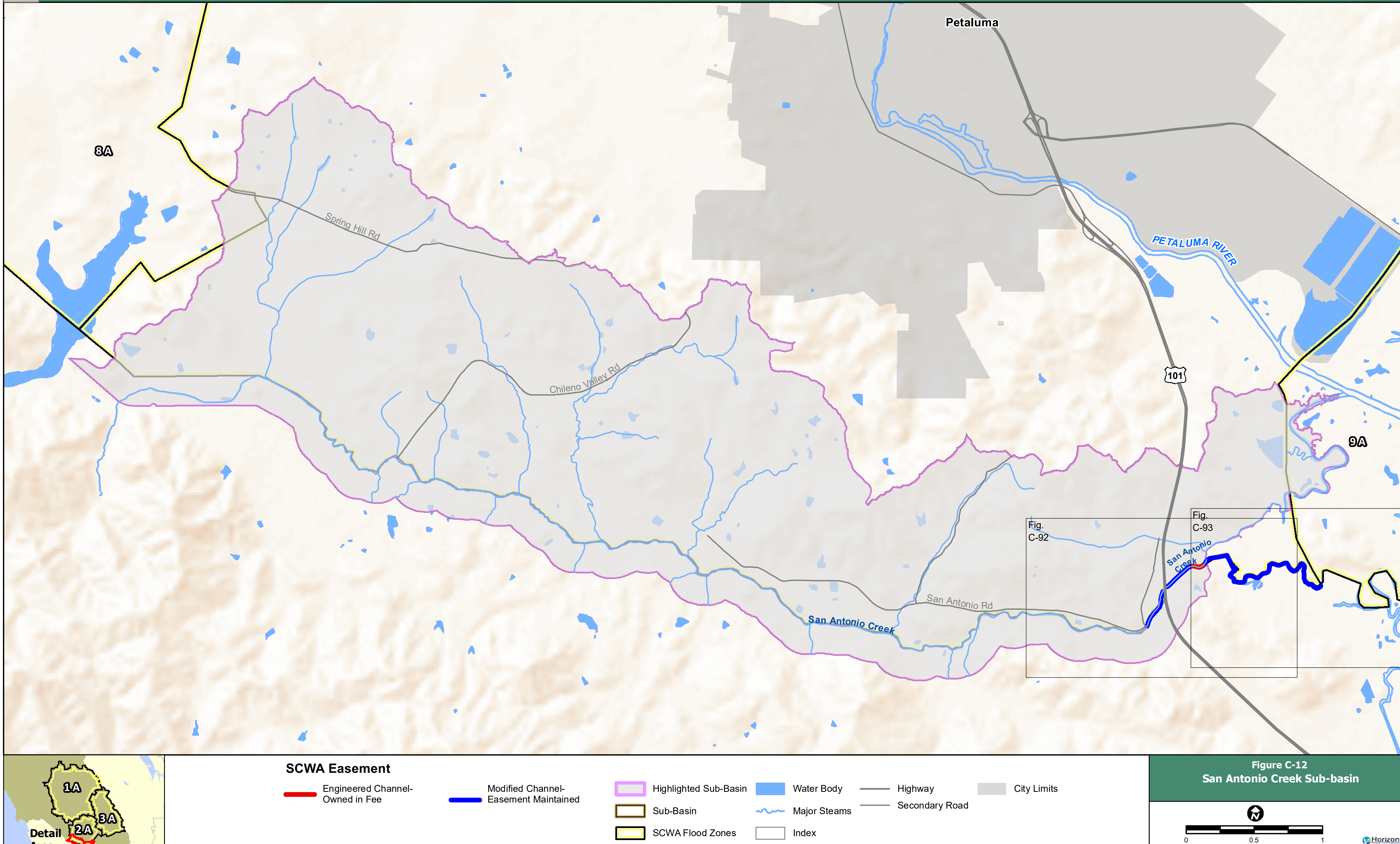
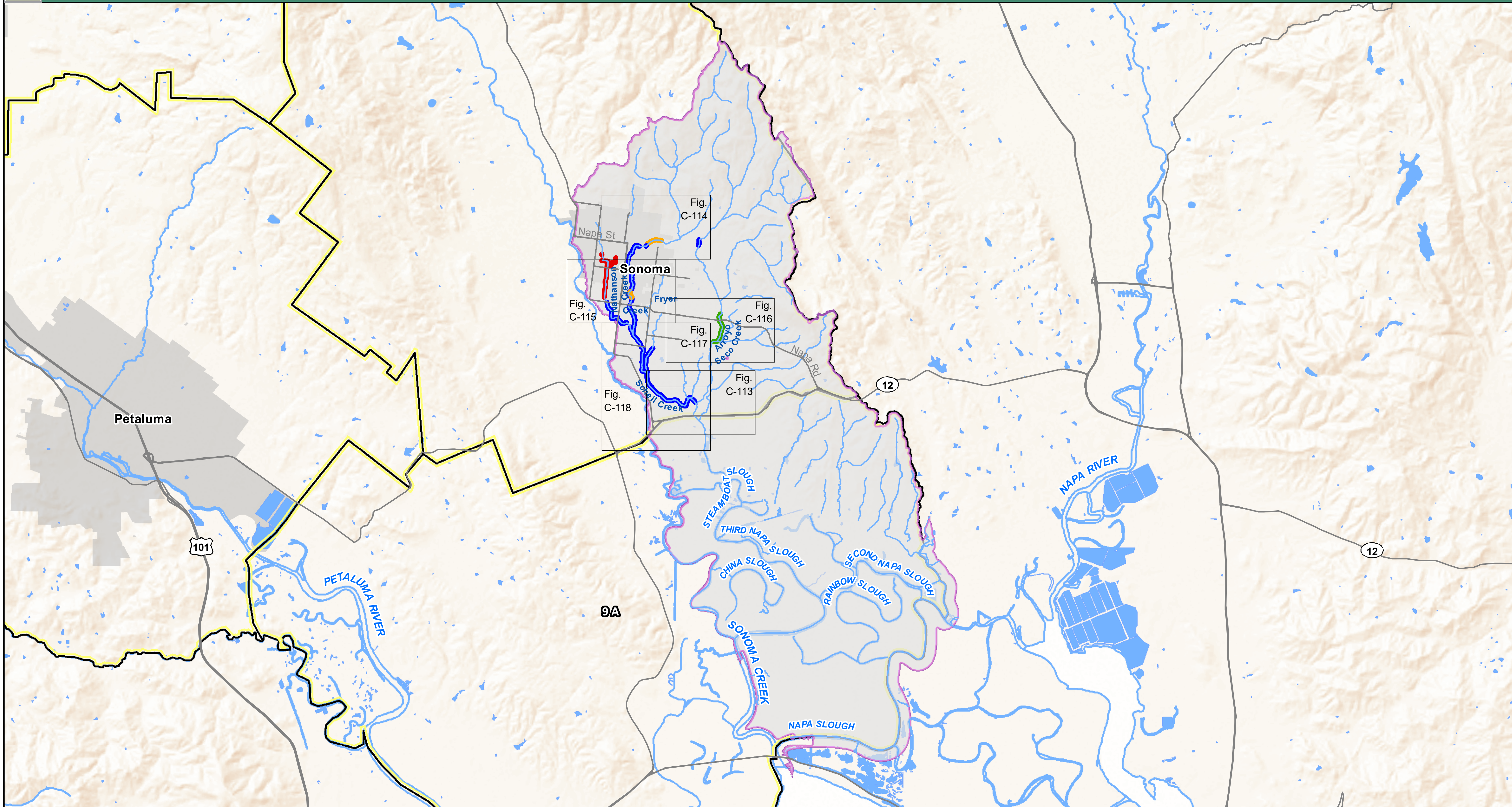



Figure C-12
San Antonio Creek Sub-basin





**SCWA Easement**

- Engineered Channel-Easement Maintained
- Engineered Channel-Owned in Fee
- Modified Channel-Easement Maintained
- Natural Channel-Easement Maintained
- Highlighted Sub-Basin
- Sub-Basin
- SCWA Flood Zones
- Water Body
- Major Steams
- Index
- Highway
- Secondary Road
- City Limits

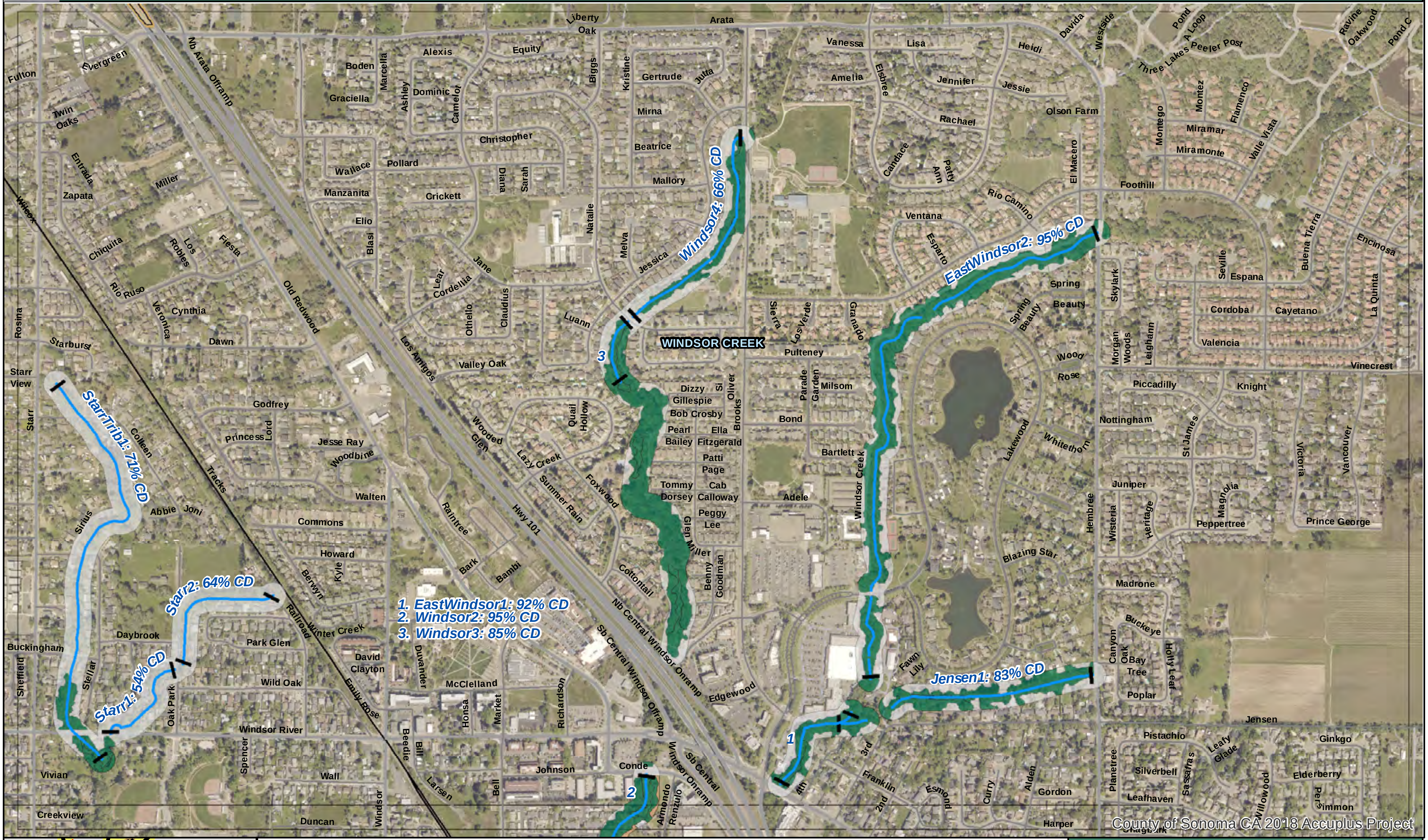
Figure C-13
Schell Creek-Frontal San Pablo Bay Estuaries Sub-basin

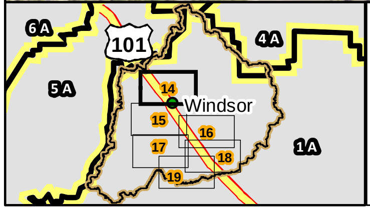
0 1.5 3
Miles

Horizon

Sonoma County Water Agency

Stream Maintenance Program (SMP)




SMP Maintenance Reaches

Sub-Basin

Flood Zones

Index

**Vegetation Class**

Developed

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-14

## Reaches and Vegetation

Windsor Creek

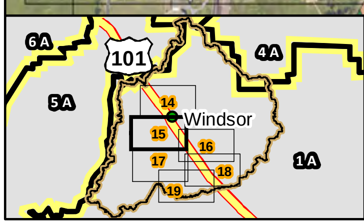
0 500 1,000 1,500 2,000

Feet

1 inch = 1,020 feet

# Sonoma County Water Agency

Stream Maintenance Program (SMP)


SMP Maintenance Reaches

Sub-Basin

Flood Zones

Index

**Vegetation Class**

Agriculture

Developed

Emergent Wetland

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-15

## Reaches and Vegetation

Windsor Creek

0 500 1,000 1,500 2,000

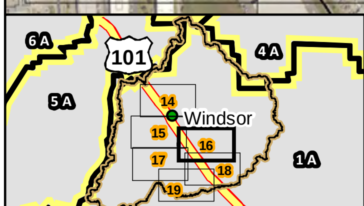
Feet

1 inch = 1,020 feet

Horizon

Sonoma County Water Agency

Stream Maintenance Program (SMP)


SMP Maintenance Reaches

Sub-Basin

Flood Zones

Index

**Vegetation Class**

Developed

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-16

## Reaches and Vegetation

Windsor Creek

0 500 1,000 1,500 2,000

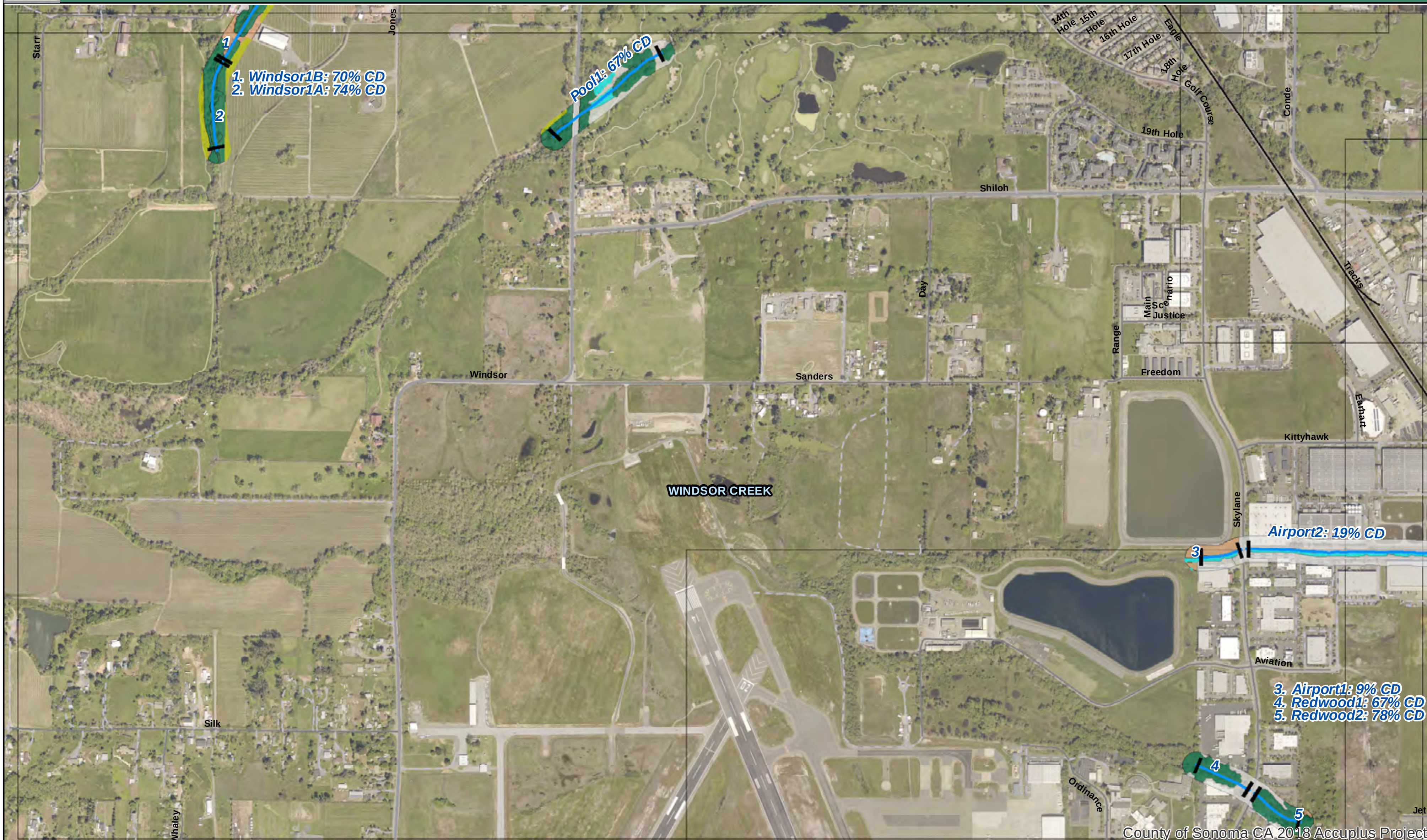
Feet

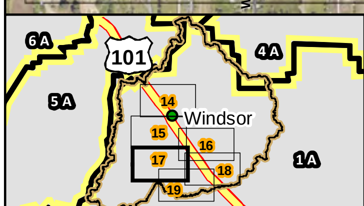
1 inch = 1,020 feet

Horizon

# Sonoma County Water Agency

Stream Maintenance Program (SMP)




SMP Maintenance Reaches

Sub-Basin

Flood Zones

Index

**Vegetation Class**

Agriculture

Developed

Emergent Wetland

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-17

## Reaches and Vegetation

Windsor Creek

0 500 1,000 1,500 2,000

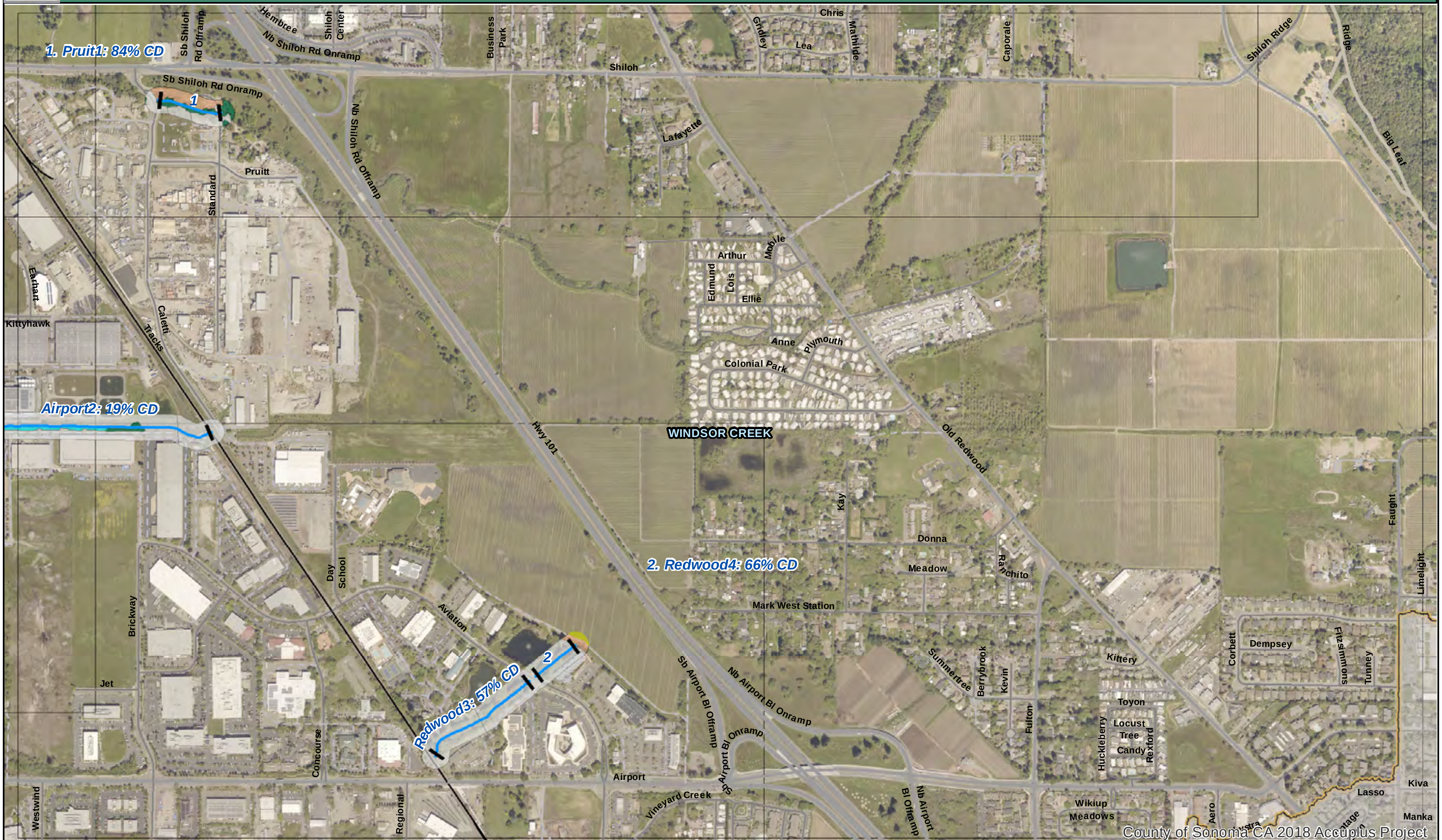
Feet

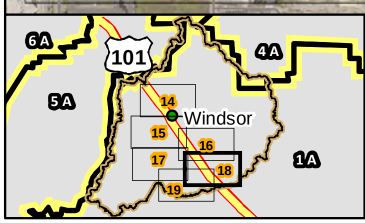
1 inch = 1,020 feet

SONOMA COUNTY WATER AGENCY

# Sonoma County Water Agency

Stream Maintenance Program (SMP)




SMP Maintenance Reaches

Sub-Basin

Flood Zones

Index

**Vegetation Class**

Agriculture

Developed

Emergent Wetland

Managed Mixed Riparian Woodland/Forest

Ruderal

Figure C-18

## Reaches and Vegetation

Windsor Creek

N

0 500 1,000 1,500 2,000

Feet

1 inch = 1,020 feet

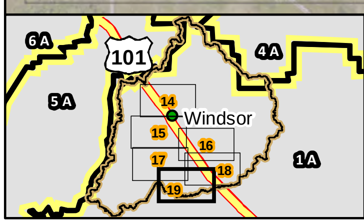
Horizon

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

# Sonoma County Water Agency

Stream Maintenance Program (SMP)


SMP Maintenance Reaches

Sub-Basin

Flood Zones

Index

**Vegetation Class**

Agriculture

Developed

Emergent Wetland

Eucalyptus

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-19

## Reaches and Vegetation

Windsor Creek

0 500 1,000 1,500 2,000

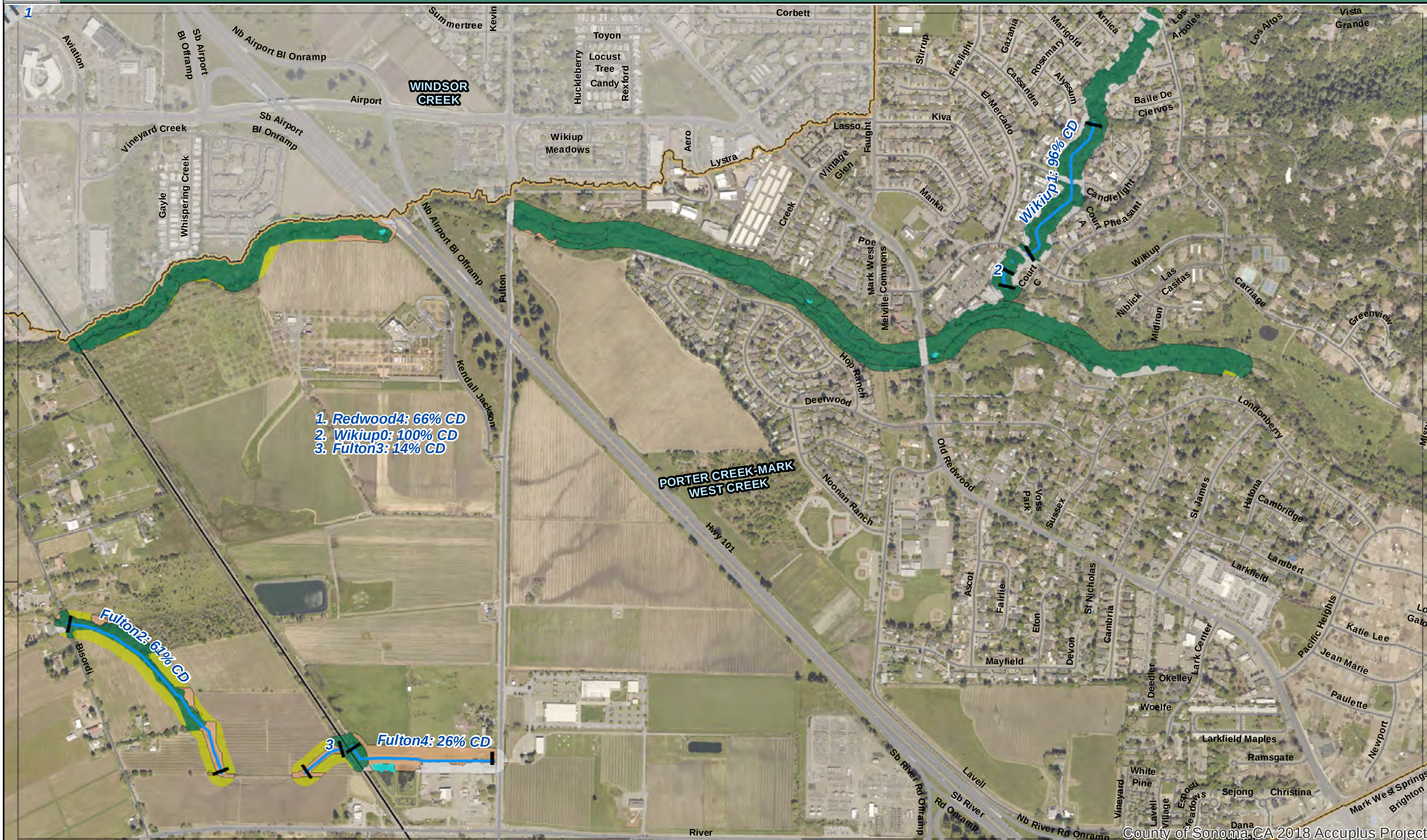
Feet

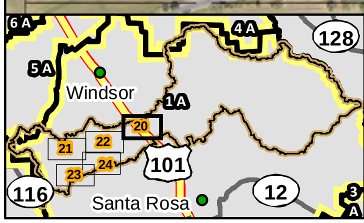
1 inch = 1,020 feet

Horizon

# Sonoma County Water Agency

Stream Maintenance Program (SMP)




SMP Maintenance Reaches

Sub-Basin

Flood Zones

Index

**Vegetation Class**

Agriculture

Developed

Emergent Wetland

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-20

## Reaches and Vegetation

Porter Creek-Mark West Creek

0 500 1,000 1,500 2,000

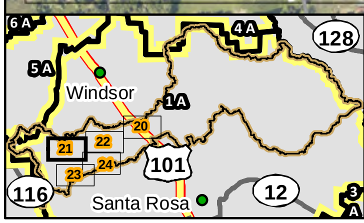
Feet

1 inch = 1,020 feet

Horizon

Sonoma County Water Agency

Stream Maintenance Program (SMP)


SMP Maintenance Reaches

Sub-Basin

Flood Zones

Index

**Vegetation Class**

Agriculture

Developed

Emergent Wetland

Eucalyptus

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-21

## Reaches and Vegetation

Porter Creek-Mark West Creek

0 500 1,000 1,500 2,000

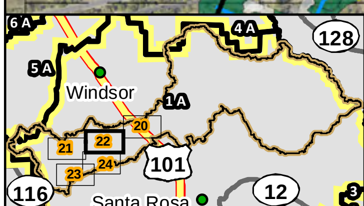
Feet

1 inch = 1,020 feet

Horizon

# Sonoma County Water Agency

Stream Maintenance Program (SMP)


SMP Maintenance Reaches

Sub-Basin

Flood Zones

Index

**Vegetation Class**

Agriculture

Developed

Emergent Wetland

Eucalyptus

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-22

## Reaches and Vegetation

Porter Creek-Mark West Creek

0 500 1,000 1,500 2,000

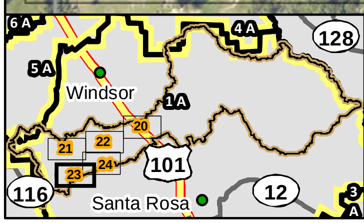
Feet

1 inch = 1,020 feet

Horizon

# Sonoma County Water Agency

Stream Maintenance Program (SMP)


SMP Maintenance Reaches

Sub-Basin

Flood Zones

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**Vegetation Class**

Agriculture

Developed

Emergent Wetland

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-23

## Reaches and Vegetation

Porter Creek-Mark West Creek

0 500 1,000 1,500 2,000

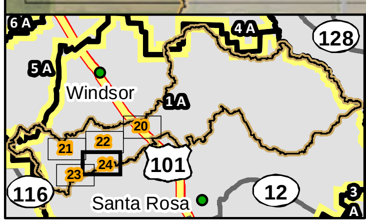
Feet

1 inch = 1,020 feet

Horizon

Sonoma County Water Agency

Stream Maintenance Program (SMP)


SMP Maintenance Reaches

Sub-Basin

Flood Zones

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**Vegetation Class**

Agriculture

Developed

Emergent Wetland

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-24

Reaches and Vegetation

Porter Creek-Mark West Creek

0 500 1,000 1,500 2,000

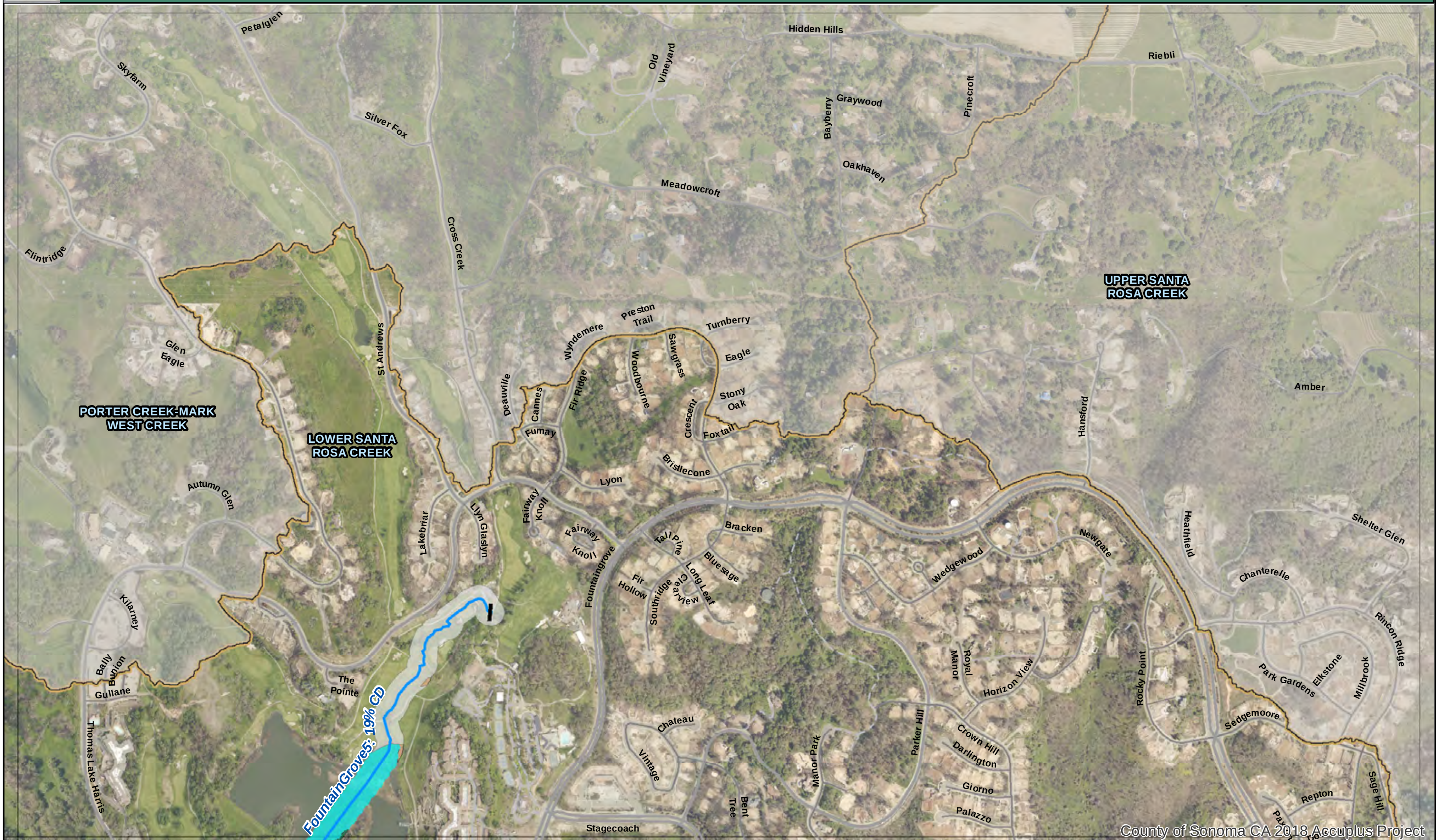
Feet

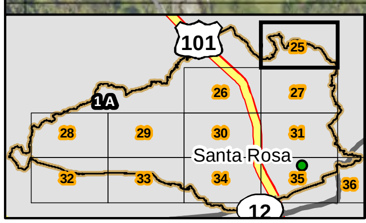
1 inch = 1,020 feet

Horizon

Sonoma County Water Agency

Stream Maintenance Program (SMP)




SMP Maintenance Reaches

Sub-Basin

Flood Zones

Index

**Vegetation Class**

Developed

Emergent Wetland

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-25

Reaches and Vegetation

Lower Santa Rosa Creek

0 500 1,000 1,500 2,000

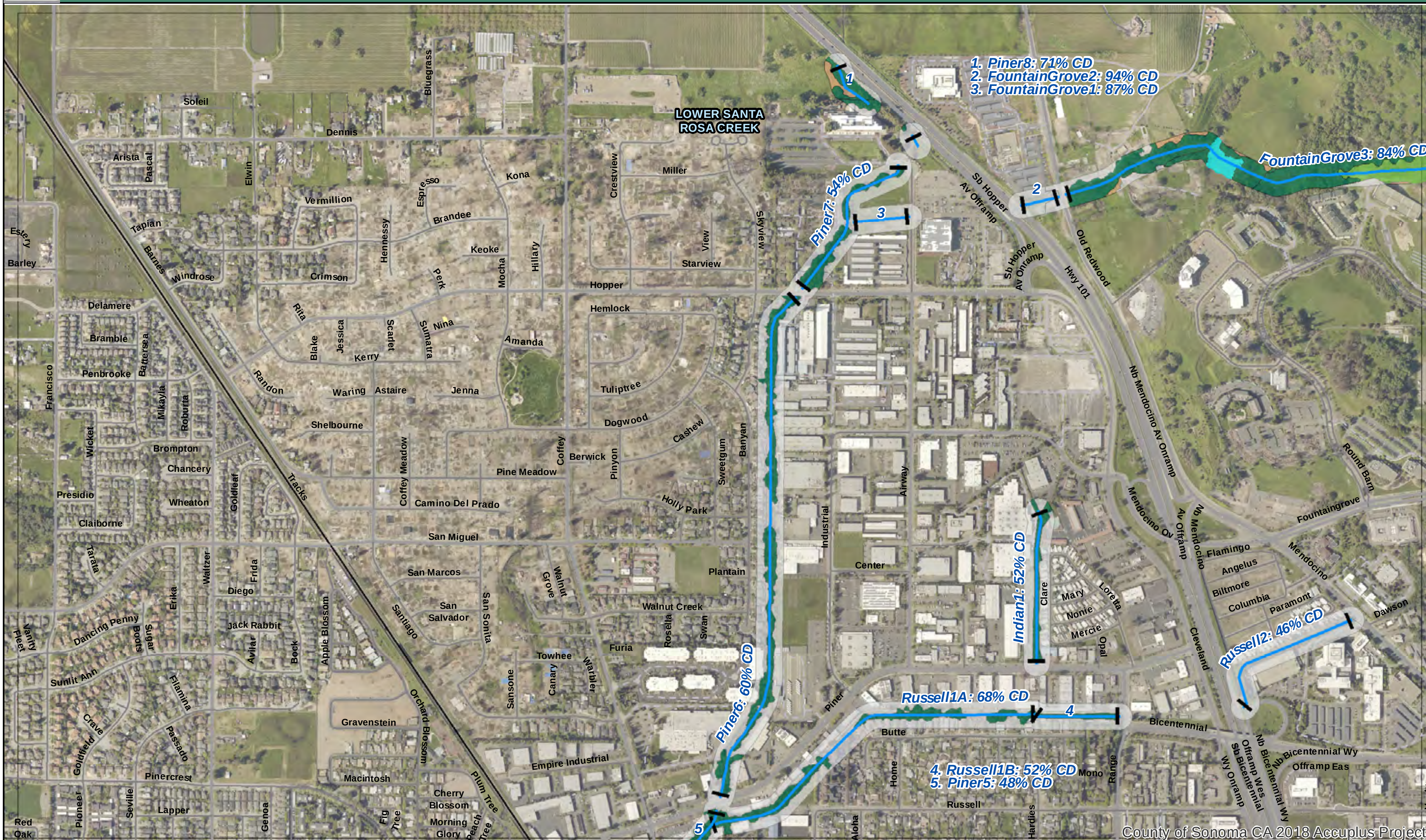
Feet

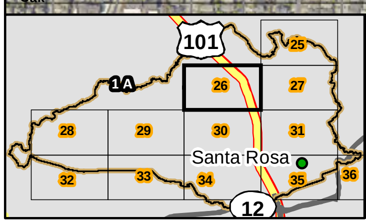
1 inch = 1,020 feet

Horizon

# Sonoma County Water Agency

Stream Maintenance Program (SMP)




SMP Maintenance Reaches

Sub-Basin

Flood Zones

Index

**Vegetation Class**

Developed

Emergent Wetland

Eucalyptus

Managed Mixed Riparian Woodland/Forest

Ruderal

Figure C-26

Reaches and Vegetation

Lower Santa Rosa Creek

0 500 1,000 1,500 2,000

Feet

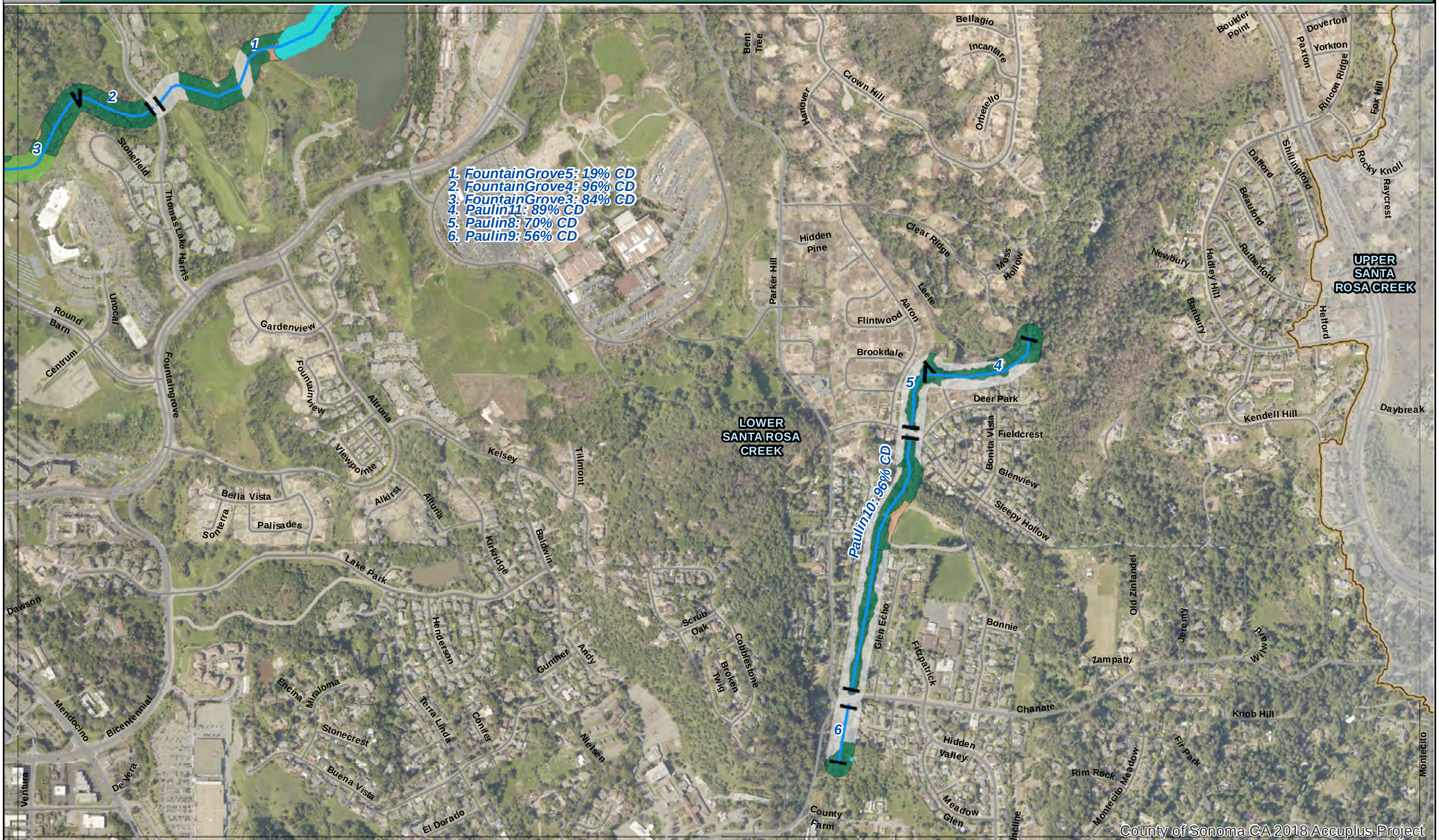
1 inch = 1,020 feet

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

# Sonoma County Water Agency

Stream Maintenance Program (SMP)




SMP Maintenance Reaches

Sub-Basin

Flood Zones

Index

**Vegetation Class**

Developed

Emergent Wetland

Eucalyptus

Managed Mixed Riparian Woodland/Forest

Ruderal

Figure C-27

## Reaches and Vegetation

Lower Santa Rosa Creek

0 500 1,000 1,500 2,000

Feet

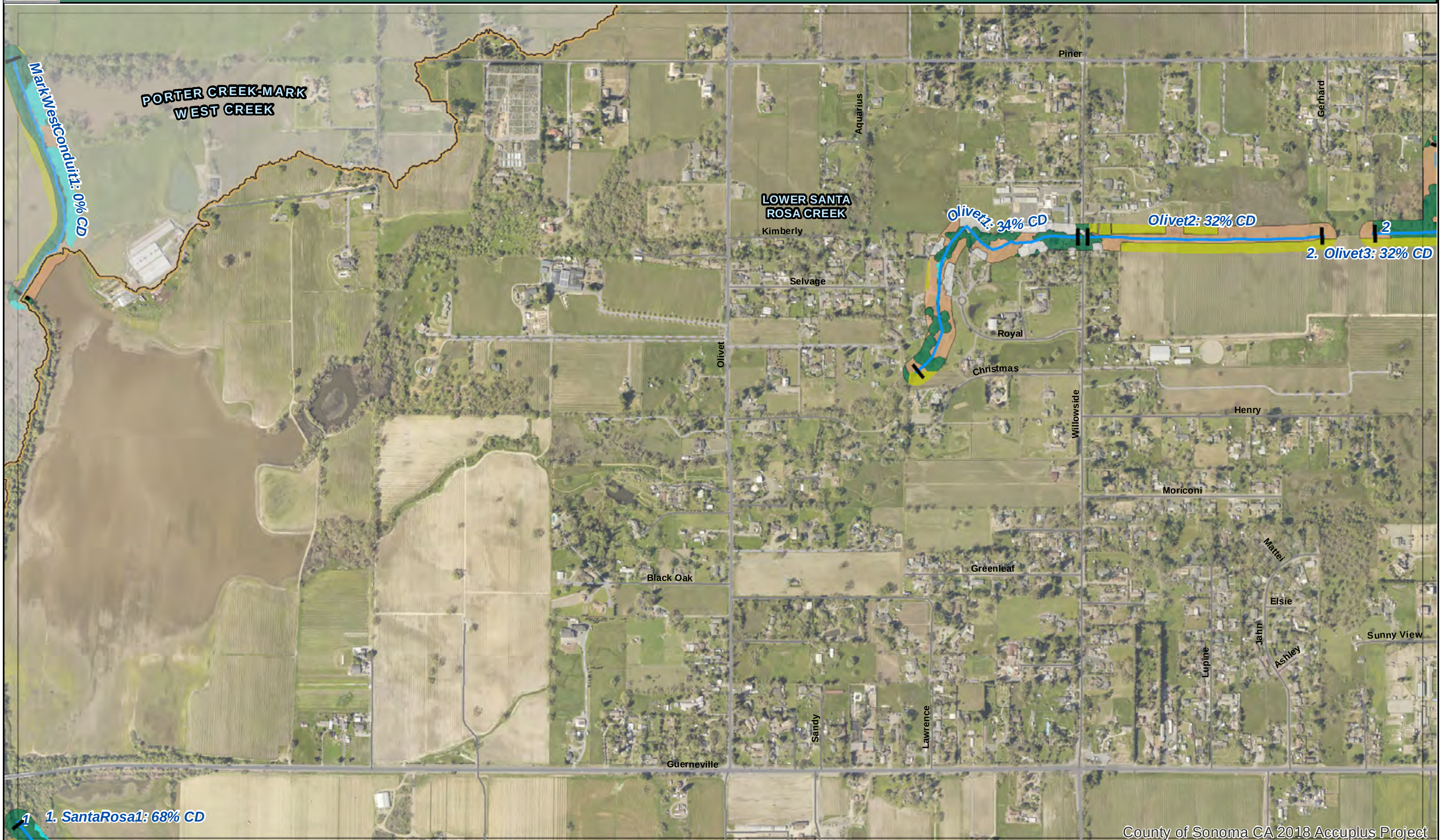
1 inch = 1,020 feet

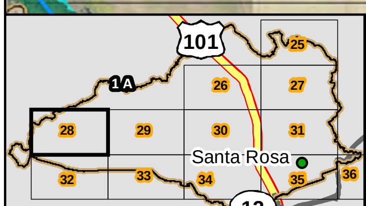
Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

# Sonoma County Water Agency

Stream Maintenance Program (SMP)




SMP Maintenance Reaches

Sub-Basin

Flood Zones

Index

**Vegetation Class**

Agriculture

Developed

Emergent Wetland

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-28

## Reaches and Vegetation

Lower Santa Rosa Creek

0 500 1,000 1,500 2,000

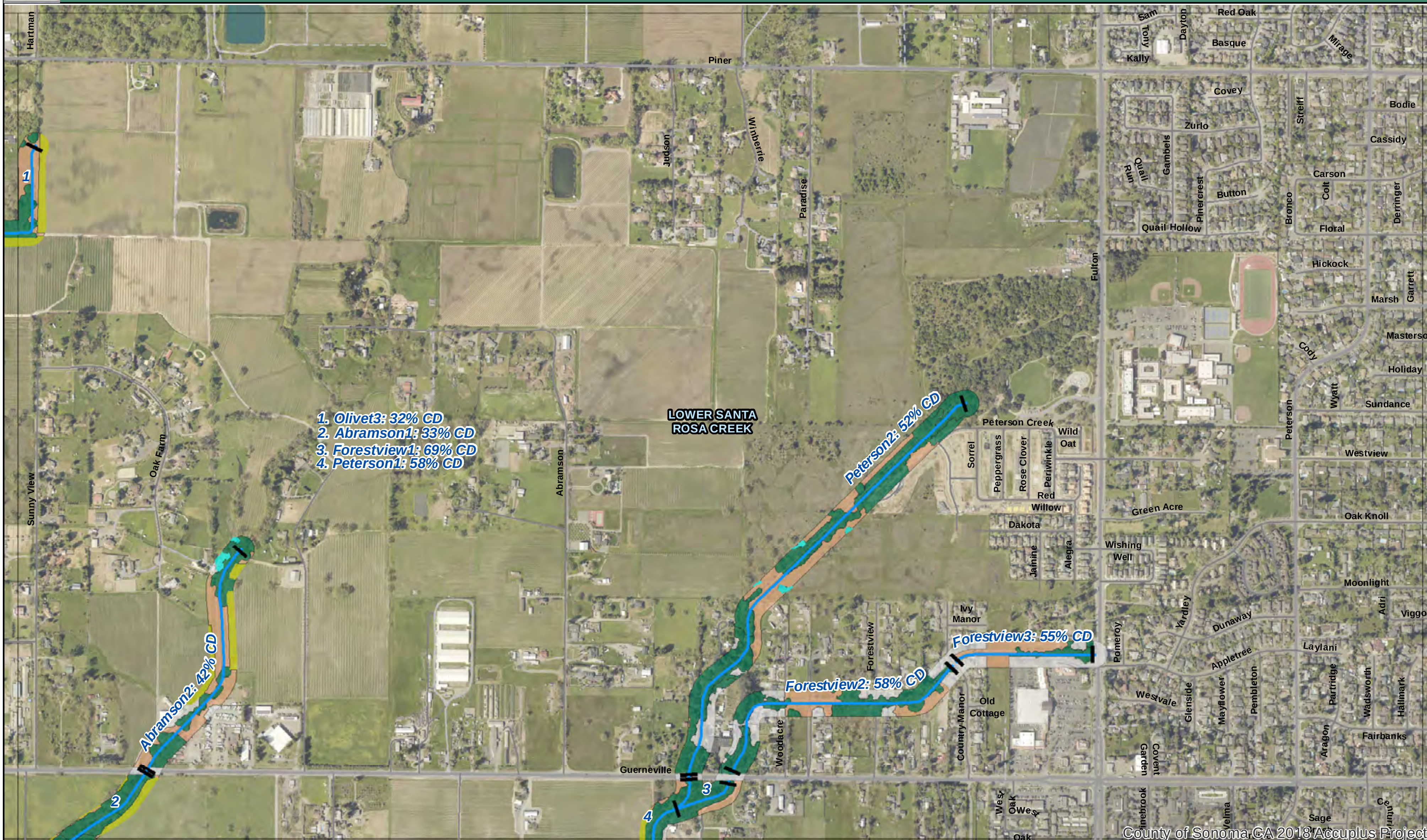
Feet

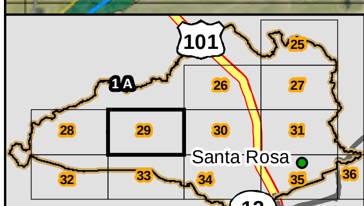
1 inch = 1,020 feet

Horizon

# Sonoma County Water Agency

## Stream Maintenance Program (SMP)




SMP Maintenance Reaches

Sub-Basin

Flood Zones

Index

**Vegetation Class**

Agriculture

Developed

Emergent Wetland

Managed Mixed Riparian Woodland/Forest

Ruderal

Figure C-29

### Reaches and Vegetation

Lower Santa Rosa Creek

N

0 500 1,000 1,500 2,000

Feet

1 inch = 1,020 feet

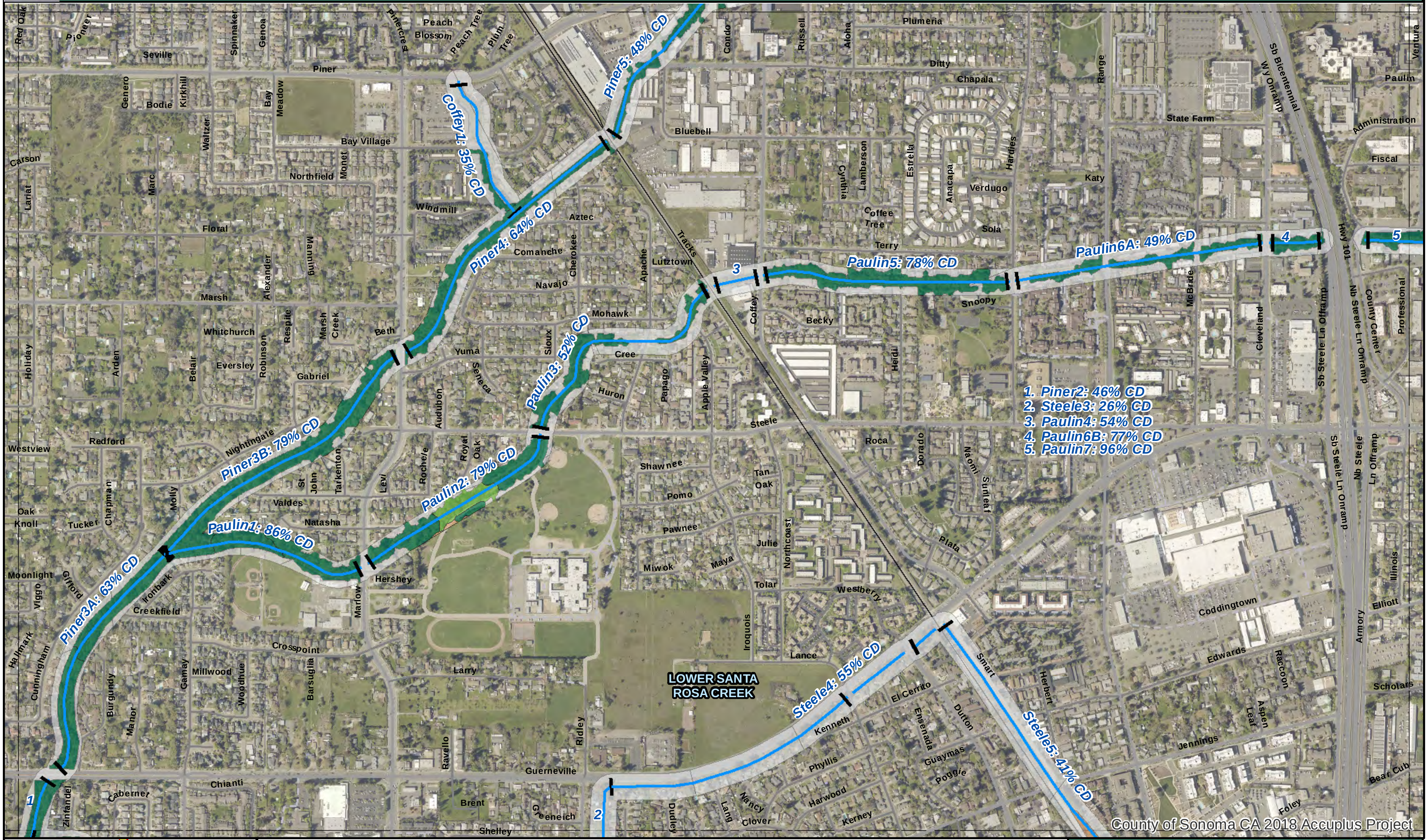
Horizon

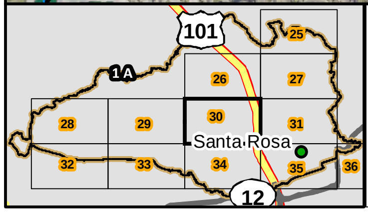
Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

# Sonoma County Water Agency

Stream Maintenance Program (SMP)




SMP Maintenance Reaches

Sub-Basin

Flood Zones

Index

**Vegetation Class**

Developed

Emergent Wetland

Eucalyptus

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-30

## Reaches and Vegetation

Lower Santa Rosa Creek

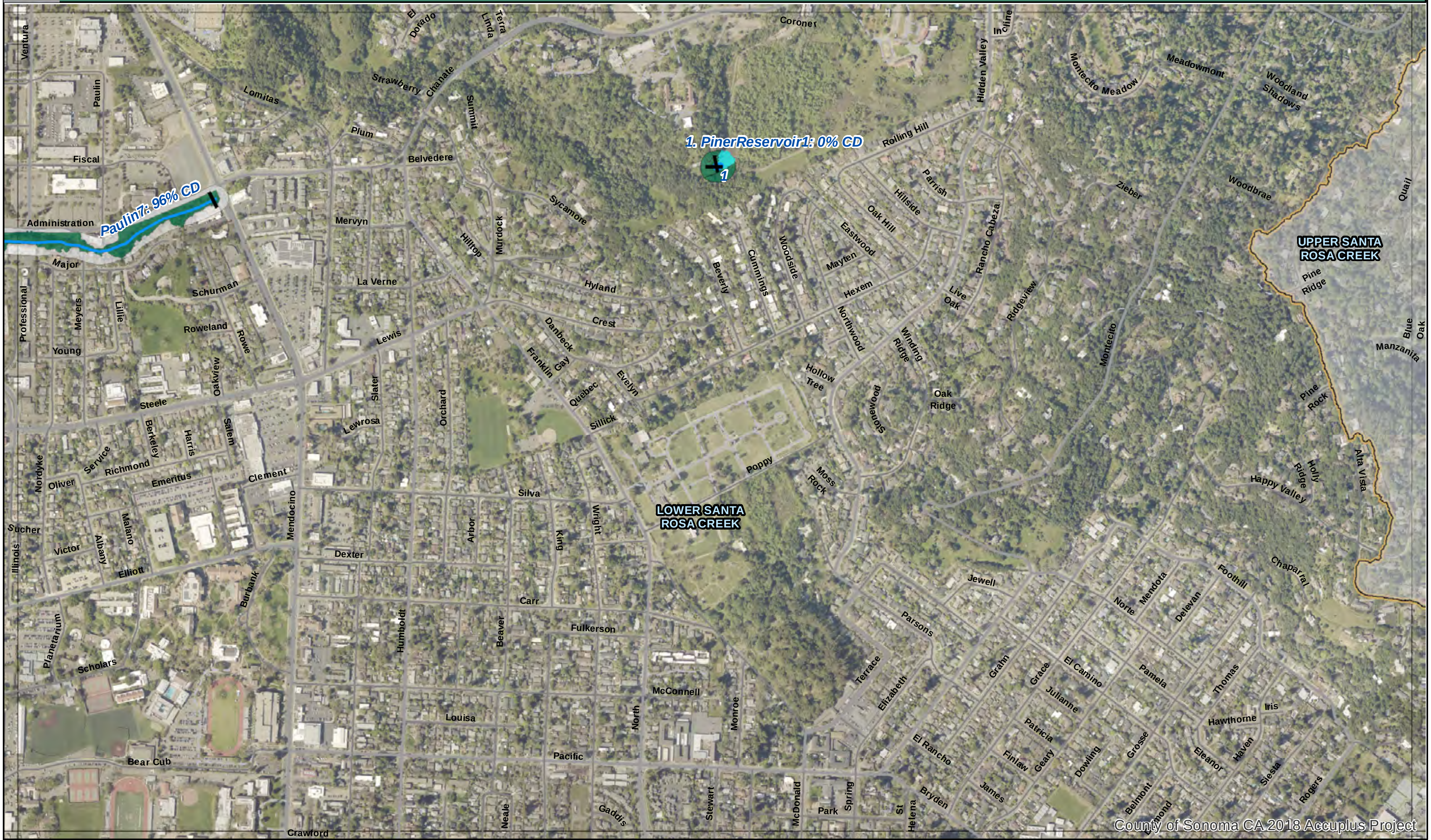
0 500 1,000 1,500 2,000

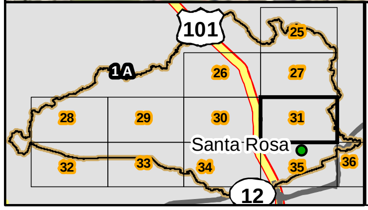
Feet

1 inch = 1,020 feet

# Sonoma County Water Agency

Stream Maintenance Program (SMP)




SMP Maintenance Reaches

Sub-Basin

Flood Zones

Index

**Vegetation Class**

Developed

Emergent Wetland

Managed Mixed Riparian Woodland/Forest

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-31

Reaches and Vegetation

Lower Santa Rosa Creek

0 500 1,000 1,500 2,000

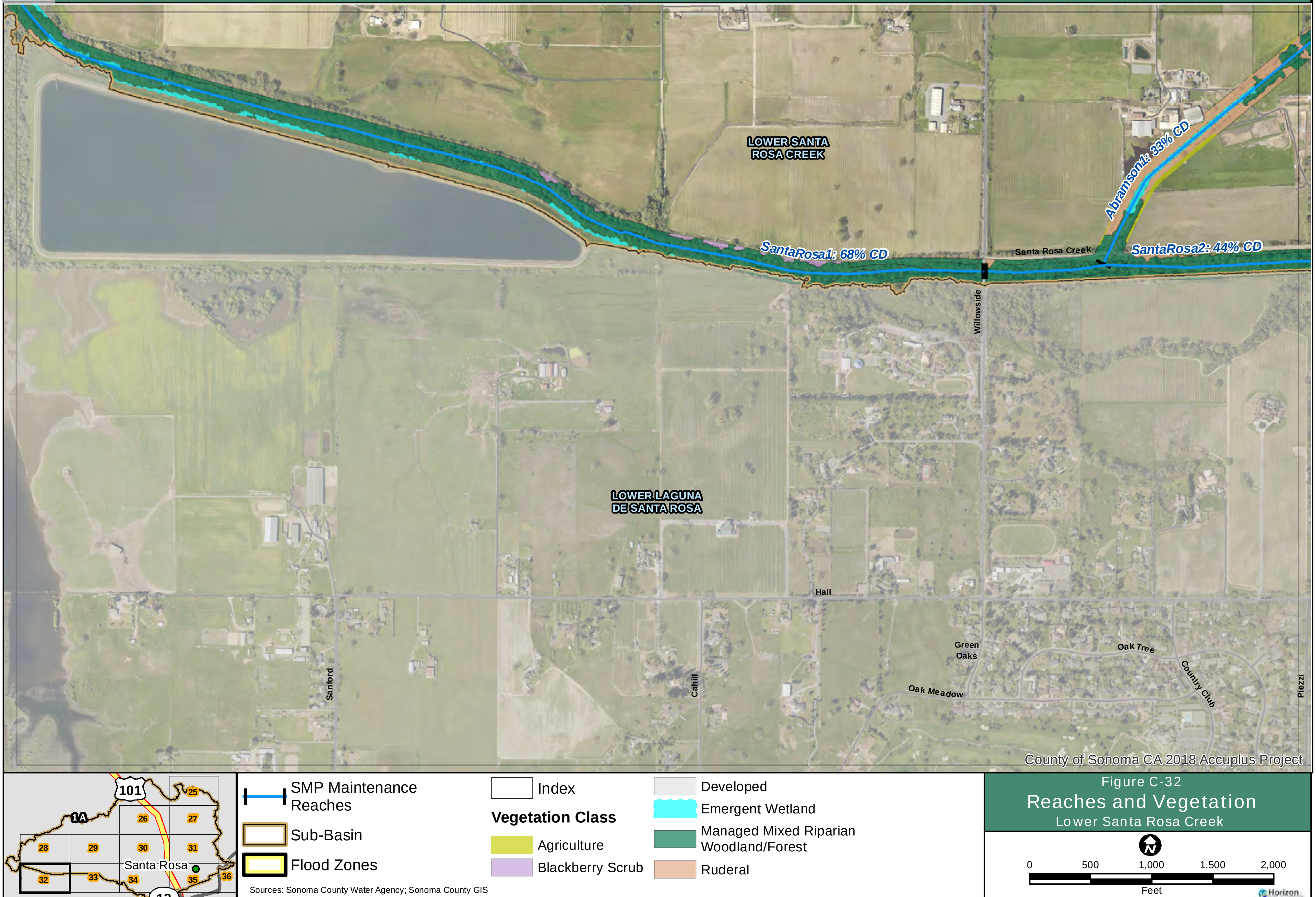
Feet

1 inch = 1,020 feet

Horizon

# Sonoma County Water Agency

Stream Maintenance Program (SMP)




SMP Maintenance Reaches

Sub-Basin

Flood Zones

Index

**Vegetation Class**

Agriculture

Blackberry Scrub

Developed

Emergent Wetland

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-32

Reaches and Vegetation

Lower Santa Rosa Creek

0 500 1,000 1,500 2,000

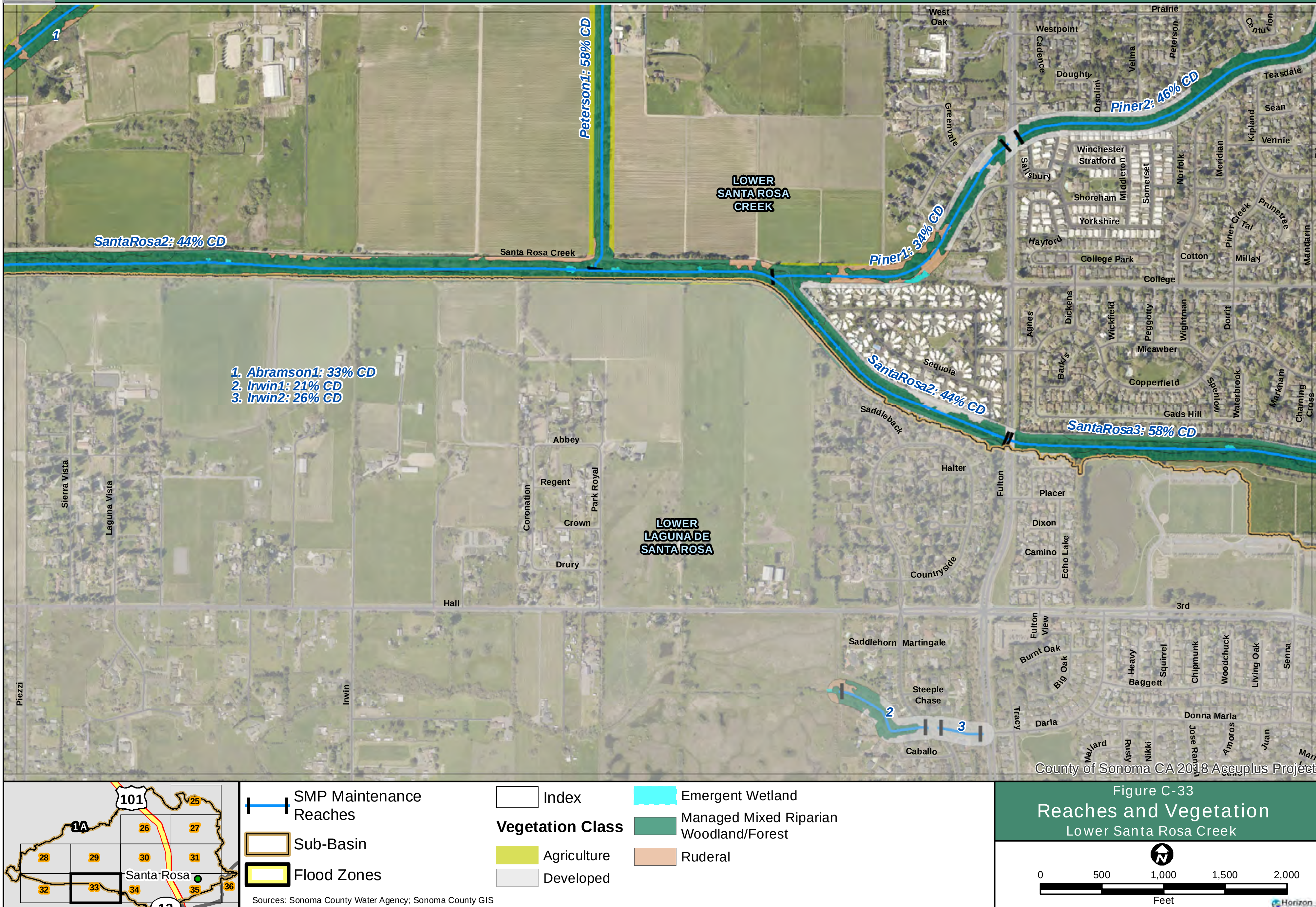
Feet

1 inch = 1,020 feet

Horizon

Sonoma County Water Agency

Stream Maintenance Program (SMP)




SMP Maintenance Reaches

Sub-Basin

Flood Zones

Index

Vegetation Class

Agriculture

Developed

Emergent Wetland

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-33

## Reaches and Vegetation

Lower Santa Rosa Creek

0 500 1,000 1,500 2,000

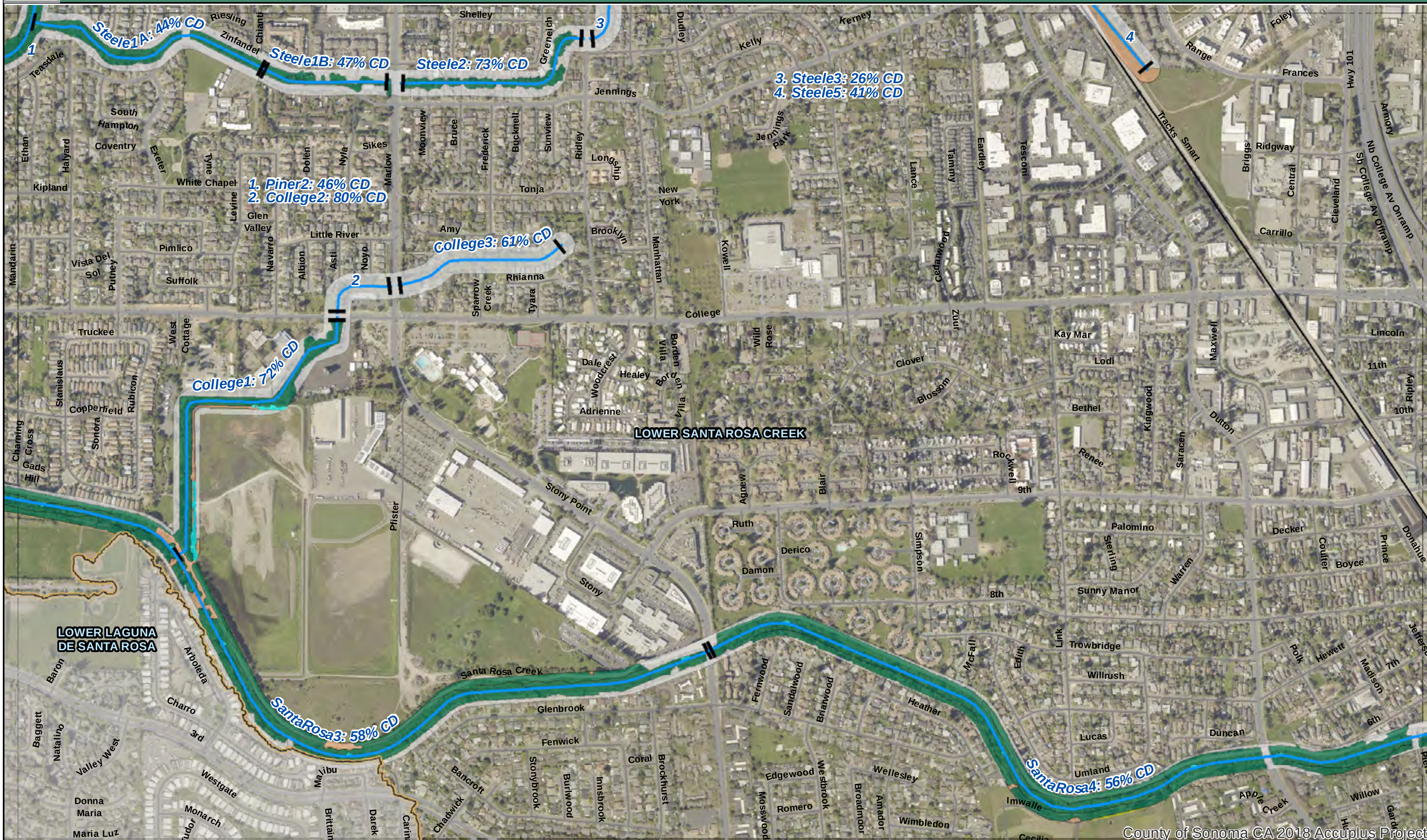
Feet

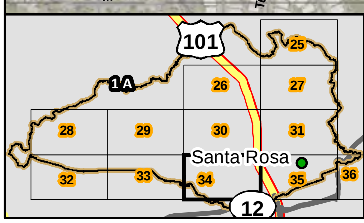
1 inch = 1,020 feet

Horizon

# Sonoma County Water Agency

Stream Maintenance Program (SMP)




SMP Maintenance Reaches

Sub-Basin

Flood Zones

Index

**Vegetation Class**

Agriculture

Developed

Emergent Wetland

Managed Mixed Riparian Woodland/Forest

Ruderal

Figure C-34

## Reaches and Vegetation

Lower Santa Rosa Creek

0 500 1,000 1,500 2,000

Feet

1 inch = 1,020 feet

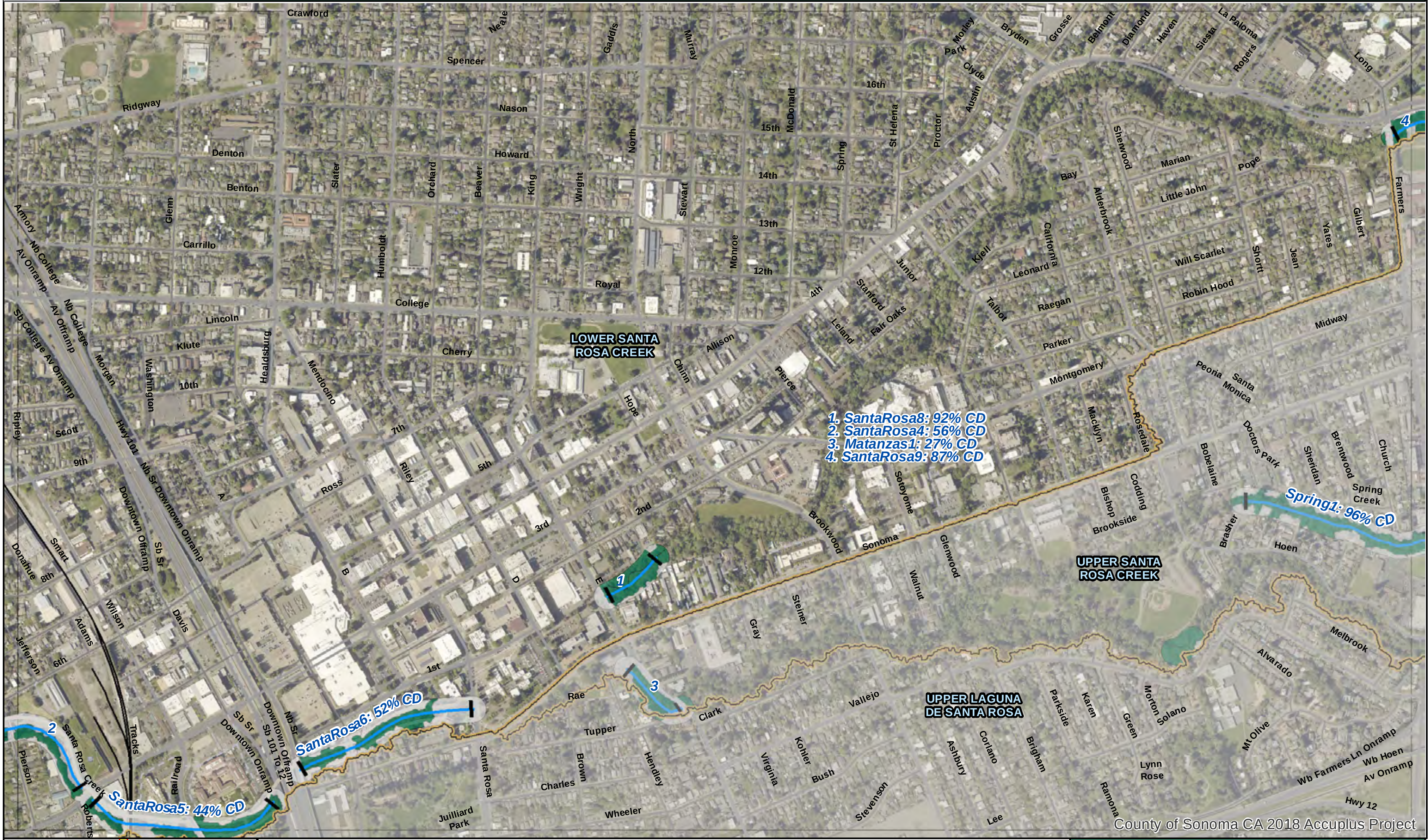
Horizon

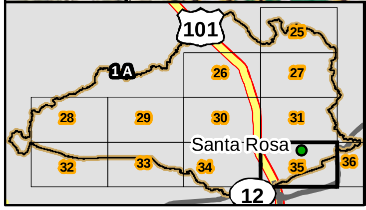
Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Sonoma County Water Agency

Stream Maintenance Program (SMP)




SMP Maintenance Reaches

Sub-Basin

Flood Zones

Index

**Vegetation Class**

Developed

Managed Mixed Riparian Woodland/Forest

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-35

Reaches and Vegetation

Lower Santa Rosa Creek

0 500 1,000 1,500 2,000

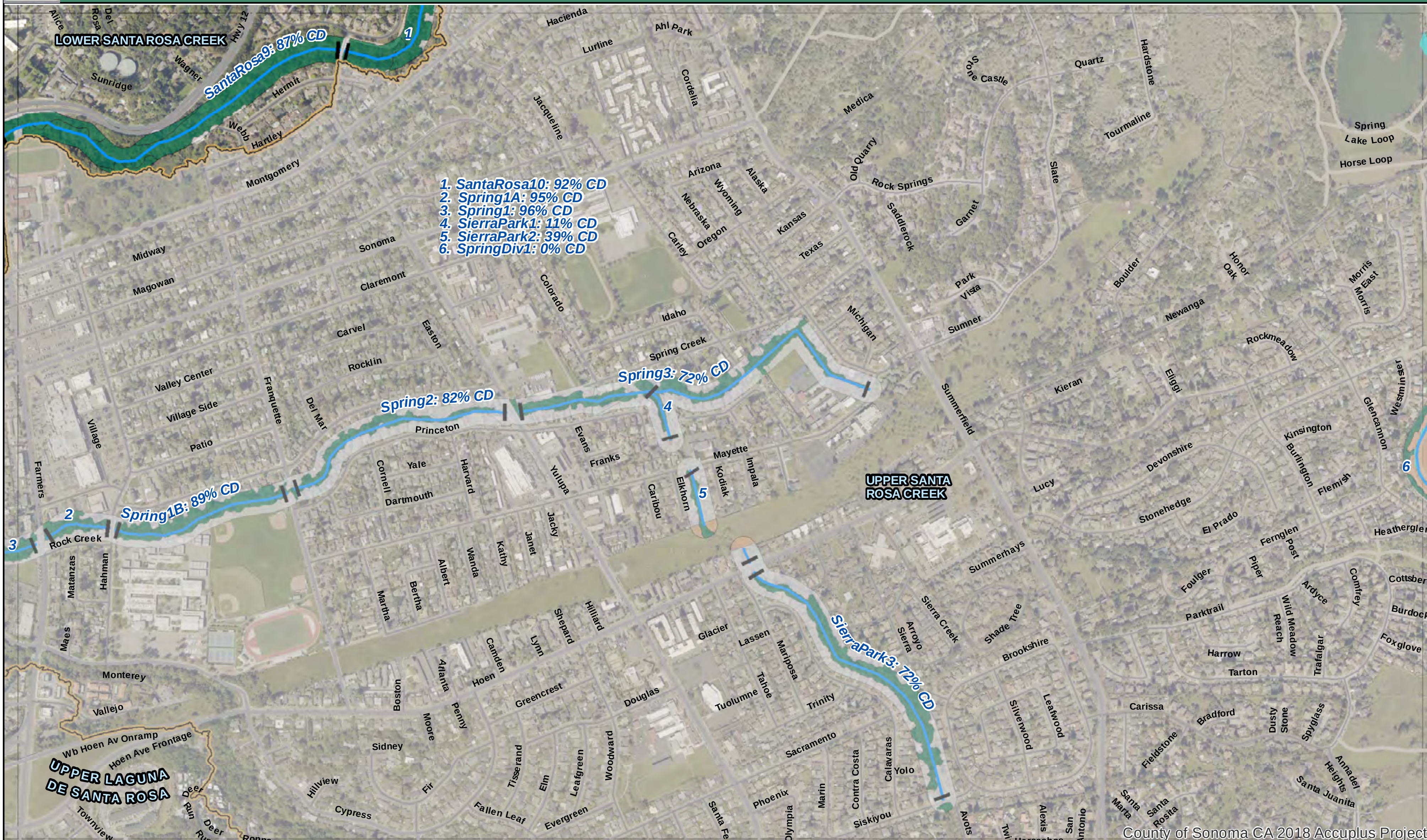
Feet

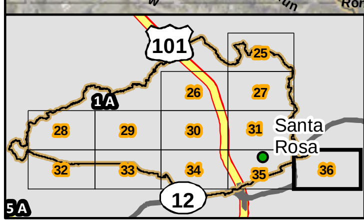
1 inch = 1,020 feet

Horizon

# Sonoma County Water Agency

Stream Maintenance Program (SMP)




SMP Maintenance Reaches

Sub-Basin

Flood Zones

Index

**Vegetation Class**

Developed

Emergent Wetland

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-36

## Reaches and Vegetation

Lower Santa Rosa Creek

0 500 1,000 1,500 2,000

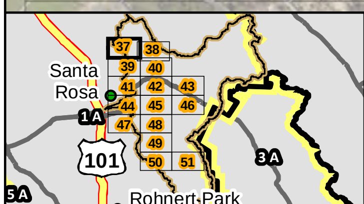
Feet

1 inch = 1,020 feet

Horizon

# Sonoma County Water Agency

Stream Maintenance Program (SMP)


SMP Maintenance Reaches

Sub-Basin

Flood Zones

Index

**Vegetation Class**

Developed

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-37

## Reaches and Vegetation

Upper Santa Rosa Creek

0 500 1,000 1,500 2,000

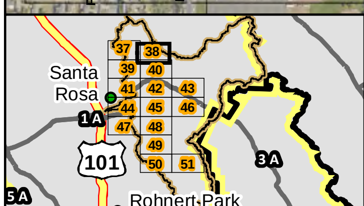
Feet

1 inch = 1,020 feet

Horizon

# Sonoma County Water Agency

Stream Maintenance Program (SMP)


SMP Maintenance Reaches

Sub-Basin

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**Vegetation Class**

Developed

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-38

## Reaches and Vegetation

Upper Santa Rosa Creek

0 500 1,000 1,500 2,000

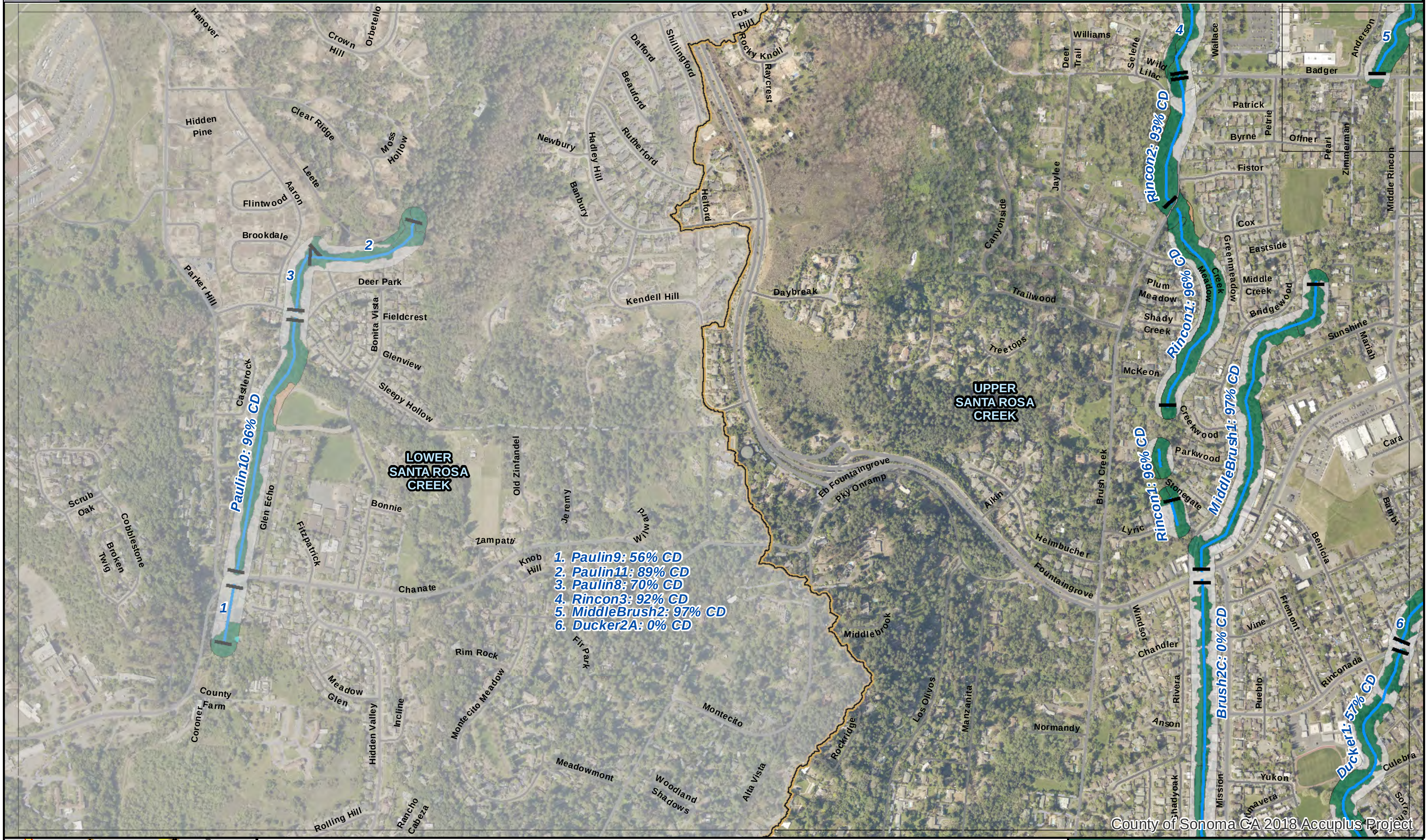
Feet

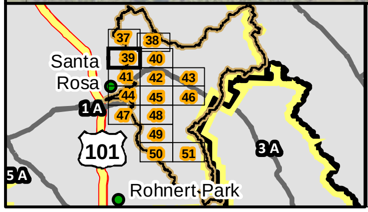
1 inch = 1,020 feet

Horizon

# Sonoma County Water Agency

Stream Maintenance Program (SMP)




SMP Maintenance Reaches

Sub-Basin

Flood Zones

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**Vegetation Class**

Developed

Emergent Wetland

Managed Mixed Riparian Woodland/Forest

Ruderal

Figure C-39

Reaches and Vegetation

Upper Santa Rosa Creek

0 500 1,000 1,500 2,000

Feet

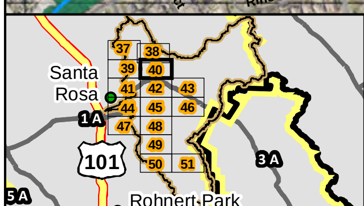
1 inch = 1,020 feet

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

# Sonoma County Water Agency

Stream Maintenance Program (SMP)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**Vegetation Class**

Developed

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-40

## Reaches and Vegetation

Upper Santa Rosa Creek

0 500 1,000 1,500 2,000

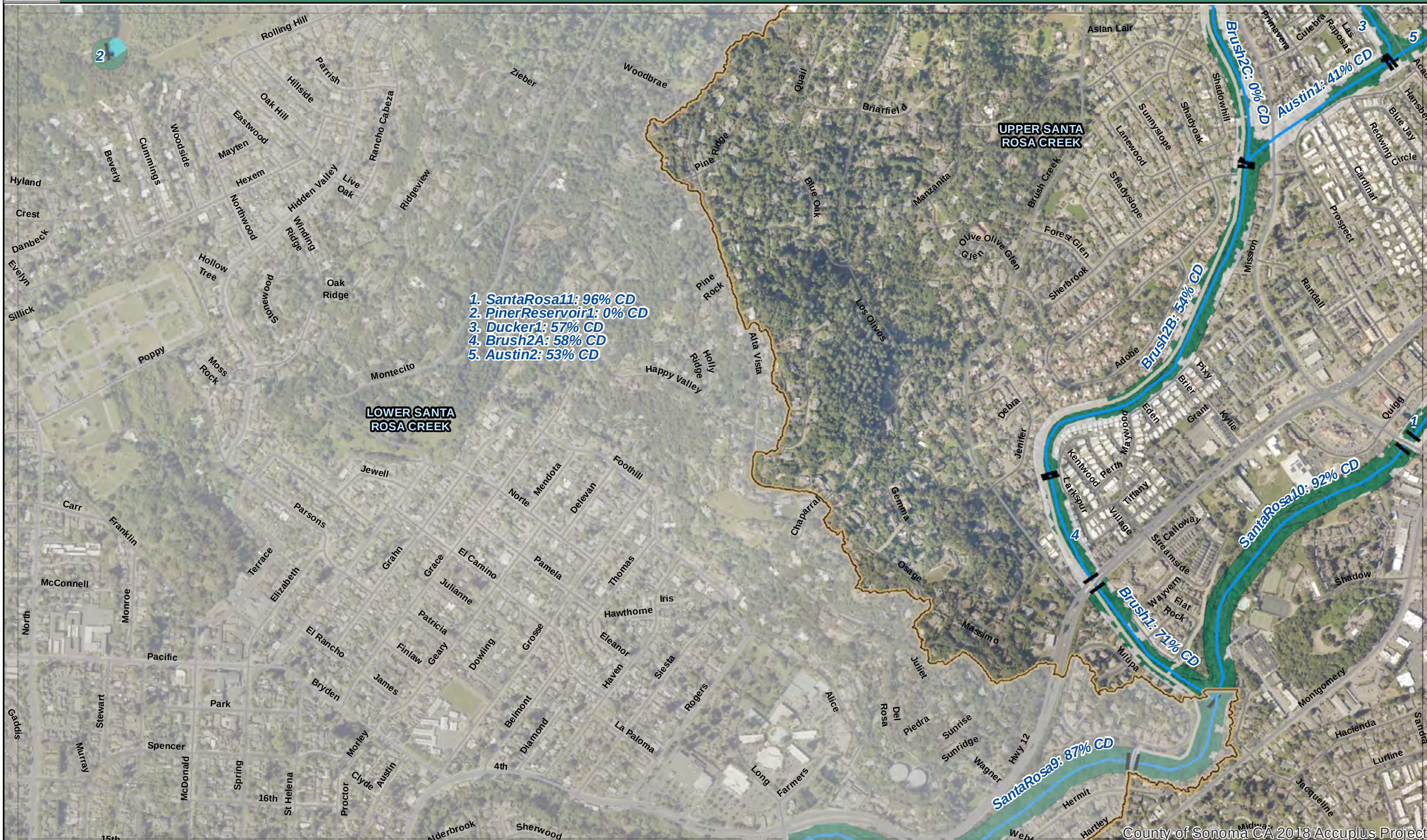
Feet

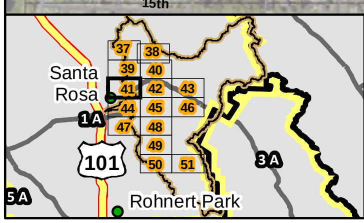
1 inch = 1,020 feet

Horizon

# Sonoma County Water Agency

Stream Maintenance Program (SMP)

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**Vegetation Class**

Developed

Emergent Wetland

Managed Mixed Riparian Woodland/Forest

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-41

## Reaches and Vegetation

Upper Santa Rosa Creek

0 500 1,000 1,500 2,000

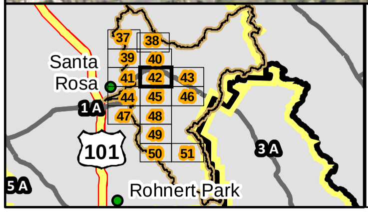
Feet

1 inch = 1,020 feet

Horizon

# Sonoma County Water Agency

Stream Maintenance Program (SMP)


SMP Maintenance Reaches

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**Vegetation Class**

Developed

Emergent Wetland

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-42

## Reaches and Vegetation

Upper Santa Rosa Creek

0 500 1,000 1,500 2,000

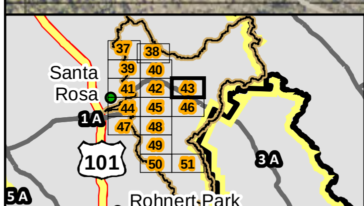
Feet

1 inch = 1,020 feet

Horizon

Sonoma County Water Agency

Stream Maintenance Program (SMP)


SMP Maintenance Reaches

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**Vegetation Class**

Agriculture

Developed

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-43

## Reaches and Vegetation

Upper Santa Rosa Creek

0 500 1,000 1,500 2,000

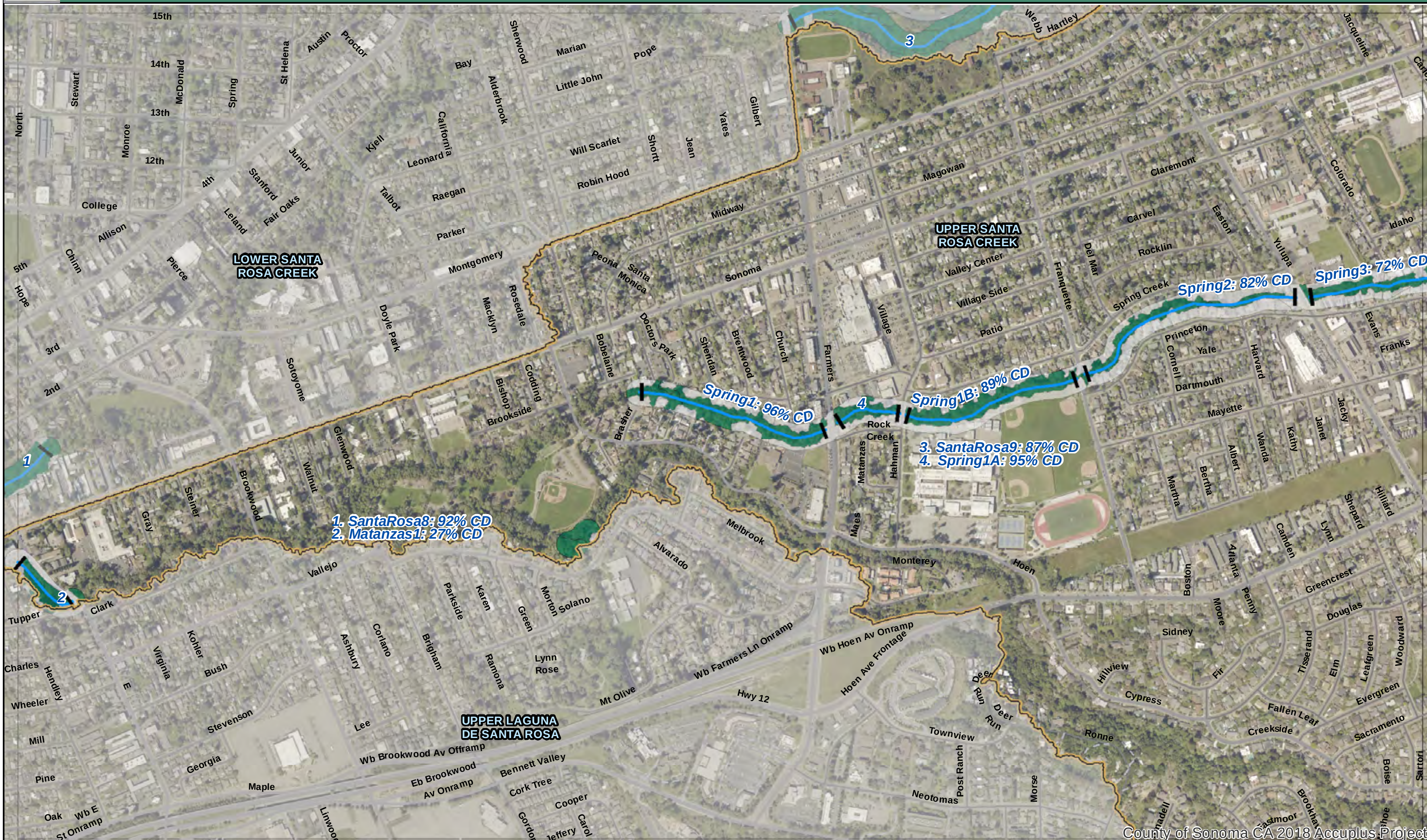
Feet

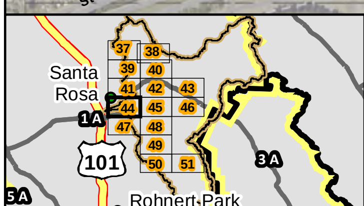
1 inch = 1,020 feet

Horizon

# Sonoma County Water Agency

Stream Maintenance Program (SMP)




SMP Maintenance Reaches

Sub-Basin

Flood Zones

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**Vegetation Class**

Developed

Managed Mixed Riparian Woodland/Forest

Figure C-44

## Reaches and Vegetation

Upper Santa Rosa Creek

0 500 1,000 1,500 2,000

Feet

1 inch = 1,020 feet

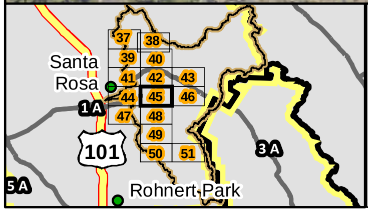
Horizon

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

# Sonoma County Water Agency

Stream Maintenance Program (SMP)


SMP Maintenance Reaches

Sub-Basin

Flood Zones

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**Vegetation Class**

Developed

Emergent Wetland

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-45

Reaches and Vegetation

Upper Santa Rosa Creek

0 500 1,000 1,500 2,000

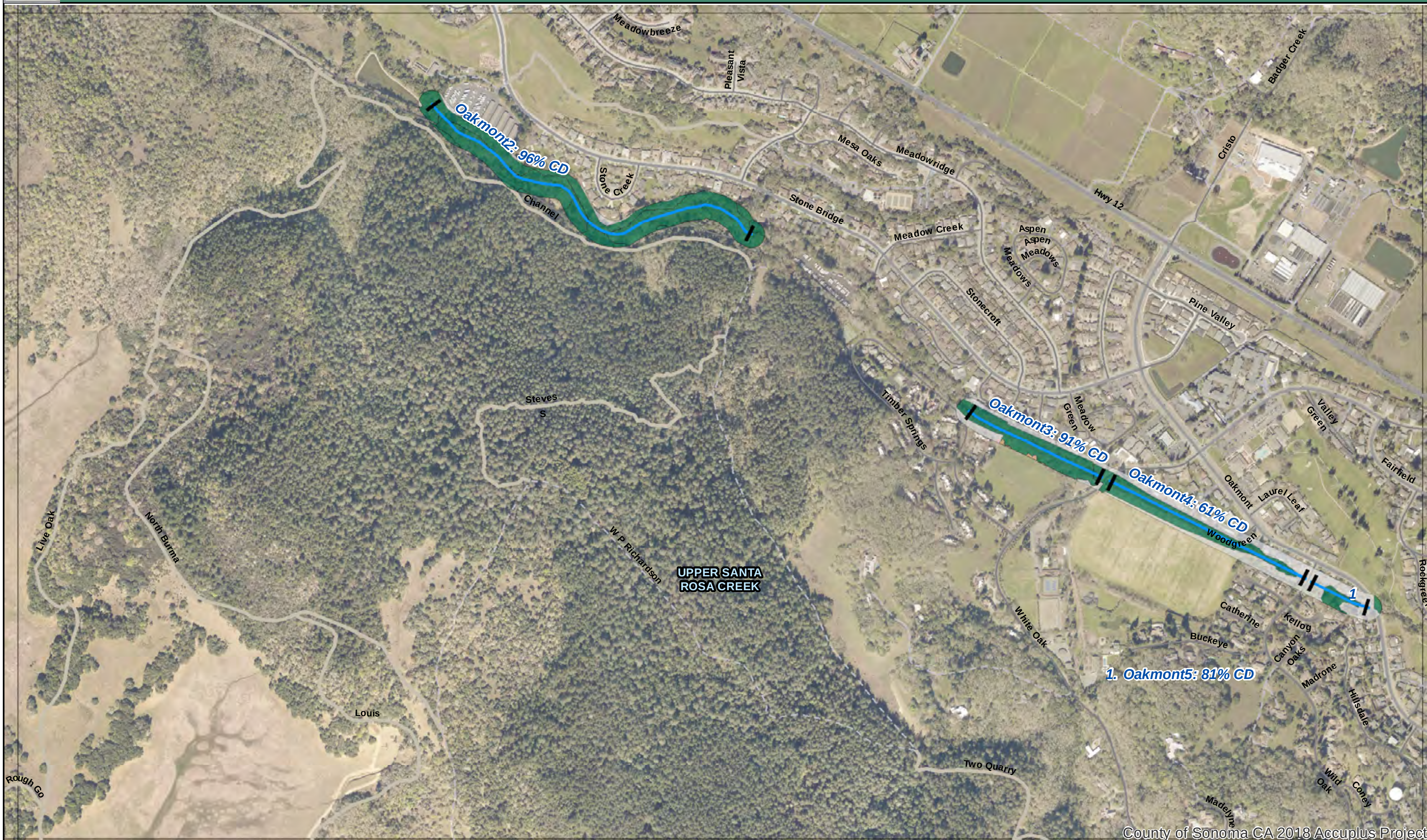
Feet

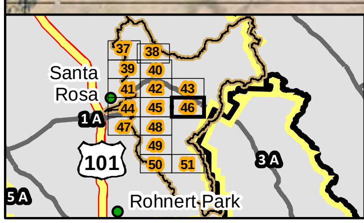
1 inch = 1,020 feet

Horizon

Sonoma County Water Agency

Stream Maintenance Program (SMP)




SMP Maintenance Reaches

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Vegetation Class

Developed

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-46

## Reaches and Vegetation

Upper Santa Rosa Creek

0 500 1,000 1,500 2,000

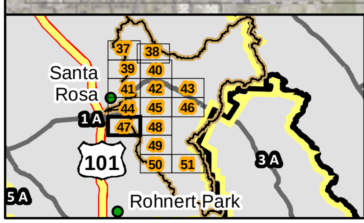
Feet

1 inch = 1,020 feet

Horizon

# Sonoma County Water Agency

Stream Maintenance Program (SMP)


SMP Maintenance Reaches

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**Vegetation Class**

Developed

Emergent Wetland

Managed Mixed Riparian Woodland/Forest

Ruderal

Figure C-47

## Reaches and Vegetation

Upper Santa Rosa Creek

0 500 1,000 1,500 2,000

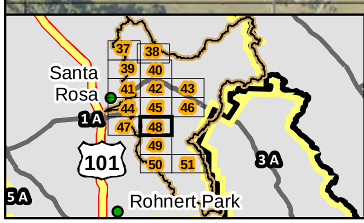
Feet

1 inch = 1,020 feet

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Sonoma County Water Agency Stream Maintenance Program (SMP)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**Vegetation Class**

Developed

Emergent Wetland

Managed Mixed Riparian Woodland/Forest

Sources: Sonoma County Water Agency; Sonoma County GIS
Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

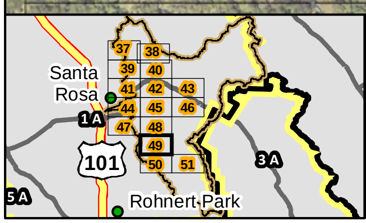
Figure C-48
Reaches and Vegetation
Upper Santa Rosa Creek

0 500 1,000 1,500 2,000
Feet
1 inch = 1,020 feet

Horizon

Sonoma County Water Agency

Stream Maintenance Program (SMP)


SMP Maintenance Reaches

Sub-Basin

Flood Zones

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**Vegetation Class**

Blackberry Scrub

Emergent Wetland

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-49

Reaches and Vegetation

Upper Santa Rosa Creek

0 500 1,000 1,500 2,000

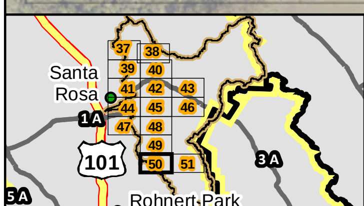
Feet

1 inch = 1,020 feet

Horizon

Sonoma County Water Agency

Stream Maintenance Program (SMP)


SMP Maintenance Reaches

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Sub-Basin

Flood Zones

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-50

Reaches and Vegetation

Upper Santa Rosa Creek

N

0 500 1,000 1,500 2,000

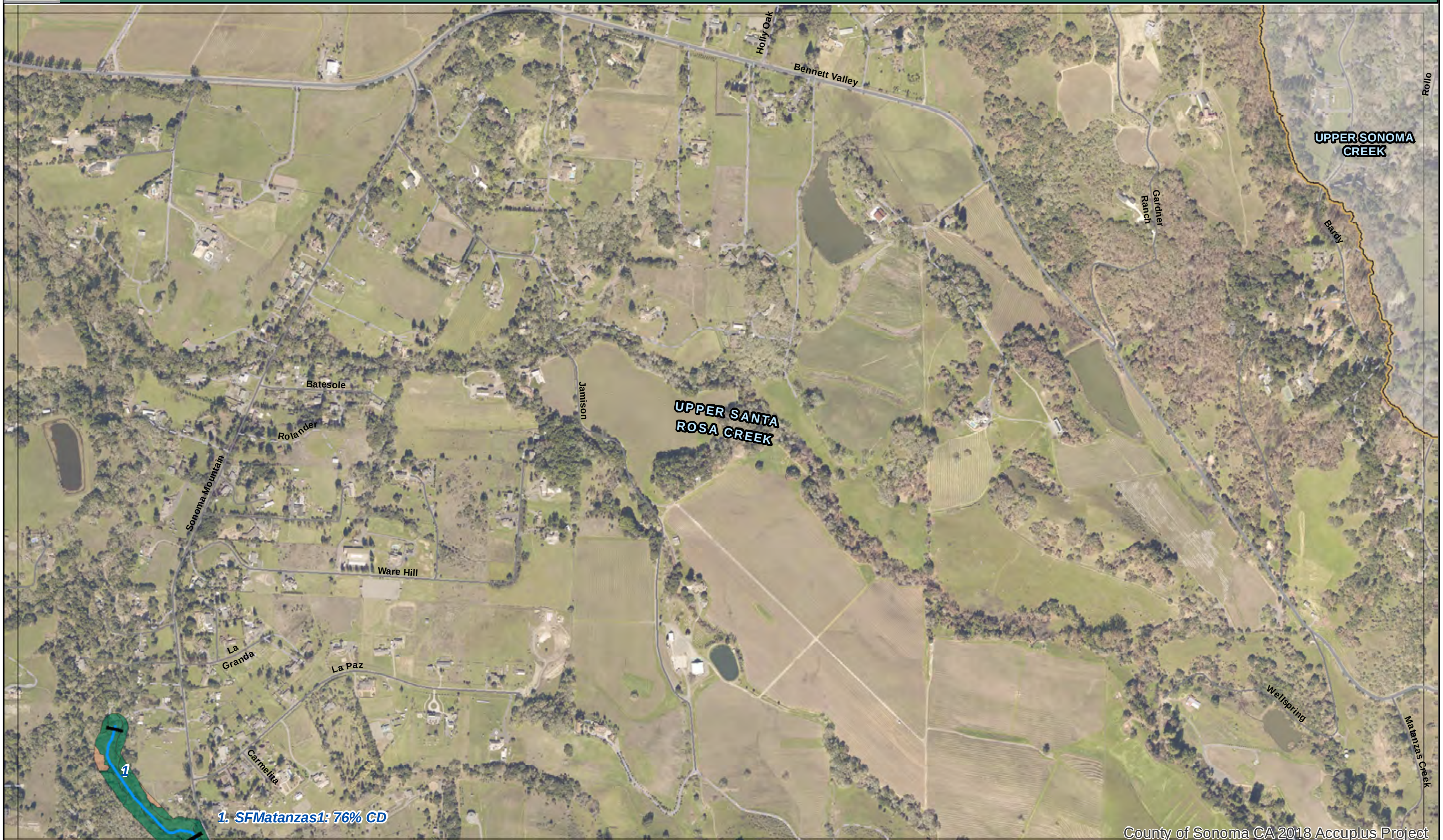
Feet

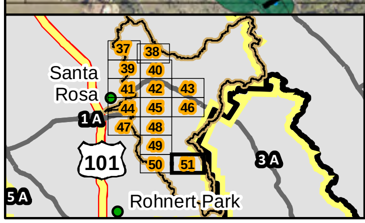
1 inch = 1,020 feet

Horizon

# Sonoma County Water Agency

Stream Maintenance Program (SMP)




SMP Maintenance Reaches

Sub-Basin

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**Vegetation Class**

Developed

Managed Mixed Riparian Woodland/Forest

Ruderal

Figure C-51

Reaches and Vegetation

Upper Santa Rosa Creek

0 500 1,000 1,500 2,000

Feet

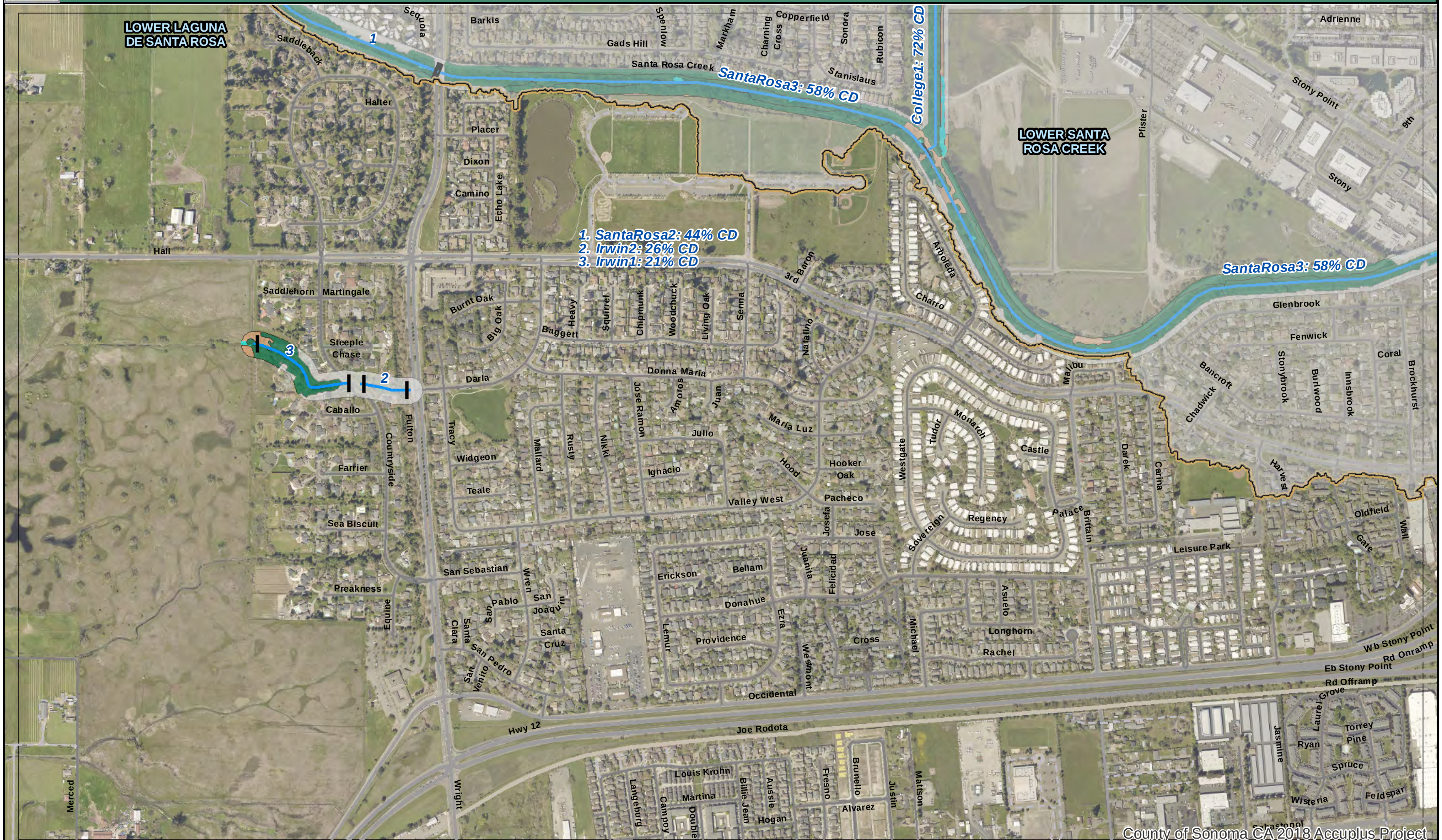
1 inch = 1,020 feet

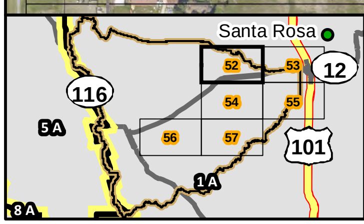
Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

# Sonoma County Water Agency

Stream Maintenance Program (SMP)




SMP Maintenance Reaches

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**Vegetation Class**

Developed

Emergent Wetland

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-52

## Reaches and Vegetation

Lower Laguna De Santa Rosa

0 500 1,000 1,500 2,000

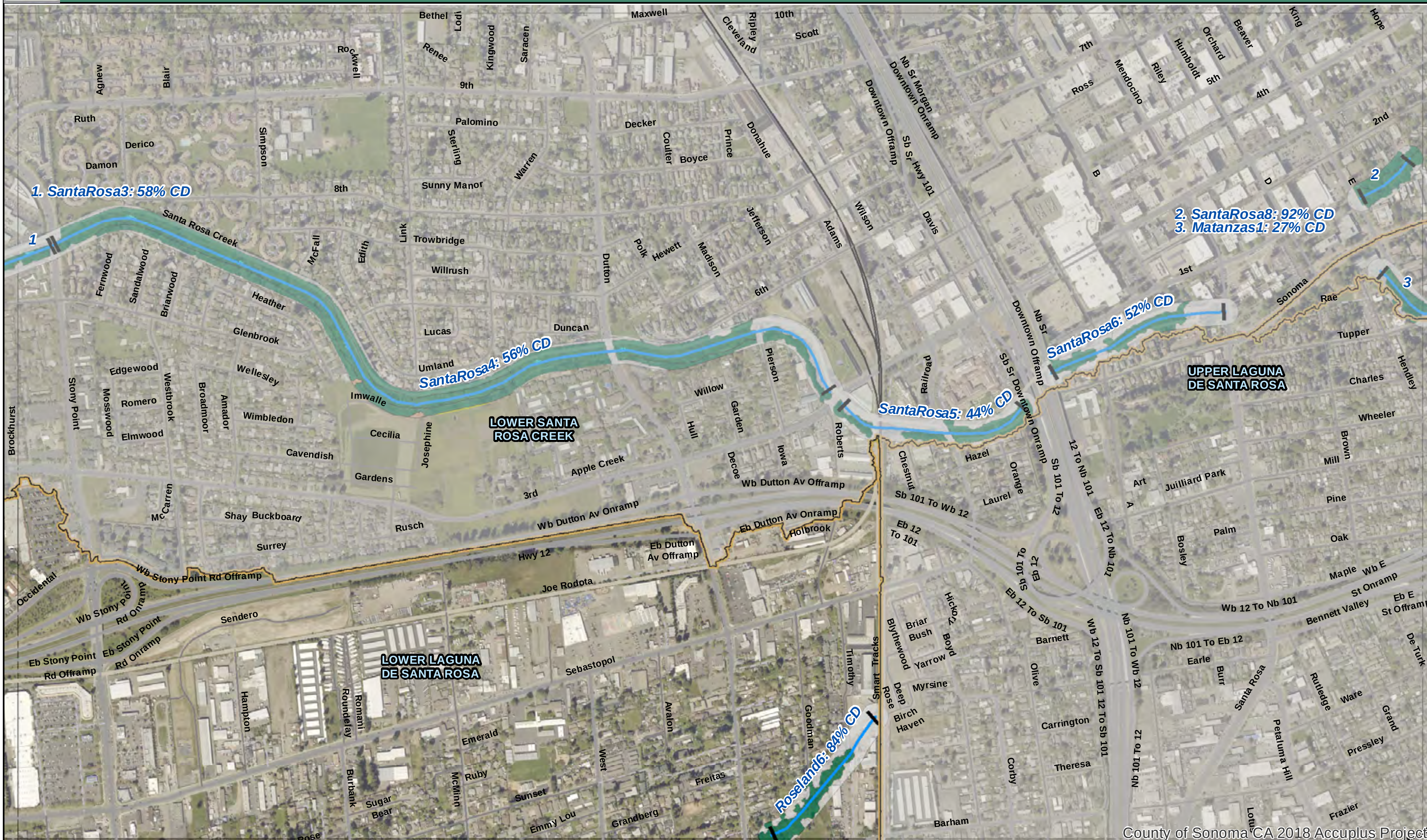
Feet

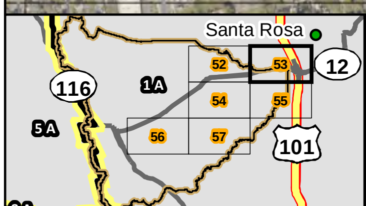
1 inch = 1,020 feet

Horizon

# Sonoma County Water Agency

Stream Maintenance Program (SMP)




SMP Maintenance Reaches

Sub-Basin

Flood Zones

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**Vegetation Class**

Agriculture

Developed

Emergent Wetland

Managed Mixed Riparian Woodland/Forest

Ruderal

Figure C-53

## Reaches and Vegetation

Lower Laguna De Santa Rosa

0 500 1,000 1,500 2,000

Feet

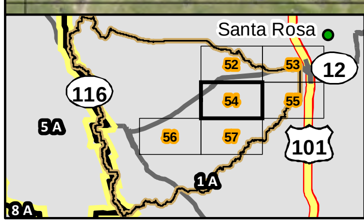
1 inch = 1,020 feet

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

# Sonoma County Water Agency

Stream Maintenance Program (SMP)


SMP Maintenance Reaches

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**Vegetation Class**

Developed

Emergent Wetland

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-54

## Reaches and Vegetation

Lower Laguna De Santa Rosa

0 500 1,000 1,500 2,000

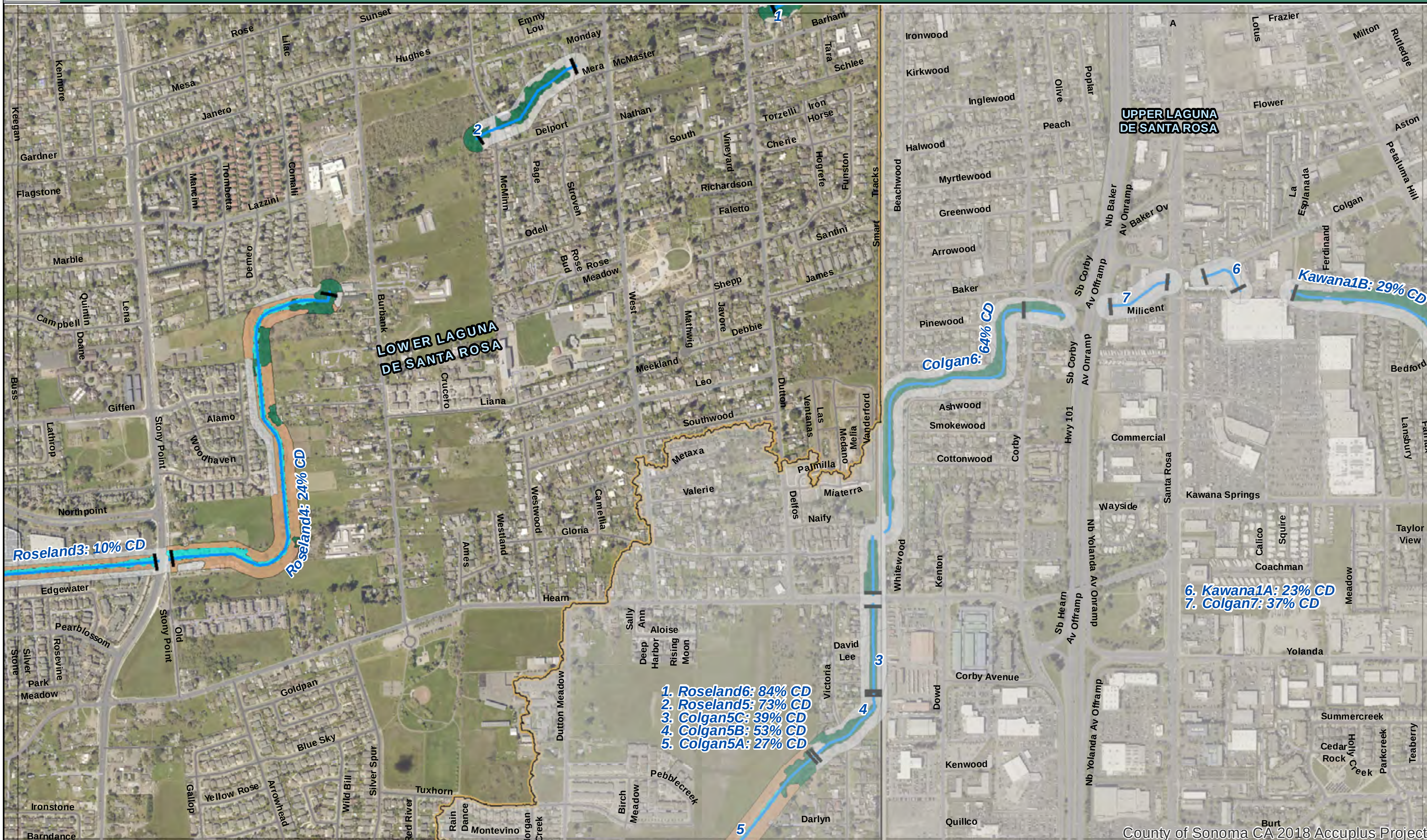
Feet

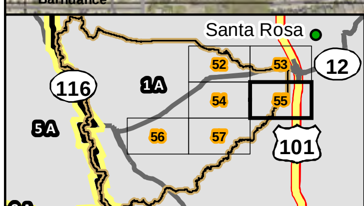
1 inch = 1,020 feet

Horizon

# Sonoma County Water Agency

Stream Maintenance Program (SMP)




SMP Maintenance Reaches

Sub-Basin

Flood Zones

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**Vegetation Class**

Developed

Emergent Wetland

Managed Mixed Riparian Woodland/Forest

Ruderal

Figure C-55

## Reaches and Vegetation

Lower Laguna De Santa Rosa

0 500 1,000 1,500 2,000

Feet

1 inch = 1,020 feet

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

# Sonoma County Water Agency

Stream Maintenance Program (SMP)


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**Vegetation Class**

Developed

Emergent Wetland

Managed Mixed Riparian Woodland/Forest

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-56

## Reaches and Vegetation

Lower Laguna De Santa Rosa

0 500 1,000 1,500 2,000

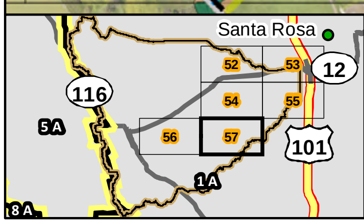
Feet

1 inch = 1,020 feet

Horizon

Sonoma County Water Agency

Stream Maintenance Program (SMP)


SMP Maintenance Reaches

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**Vegetation Class**

Agriculture

Developed

Emergent Wetland

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-57

Reaches and Vegetation

Lower Laguna De Santa Rosa

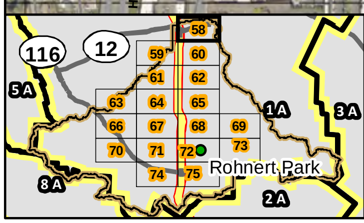
0 500 1,000 1,500 2,000

Feet

1 inch = 1,020 feet

Horizon

Sonoma County Water Agency Stream Maintenance Program (SMP)


SMP Maintenance Reaches

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**Vegetation Class**

Developed

Managed Mixed Riparian Woodland/Forest

Sources: Sonoma County Water Agency; Sonoma County GIS
Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

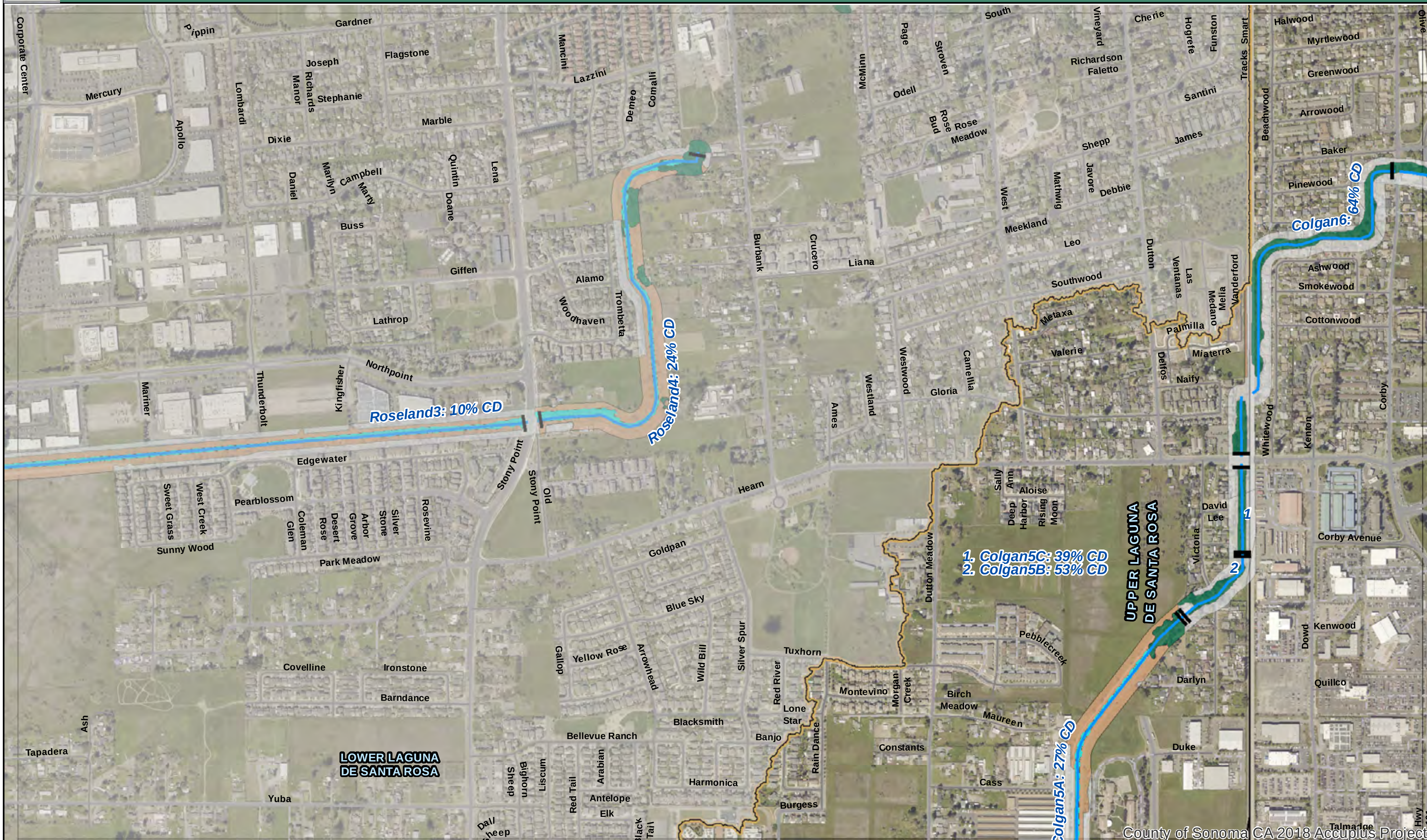
Figure C-58
## Reaches and Vegetation
Upper Laguna De Santa Rosa

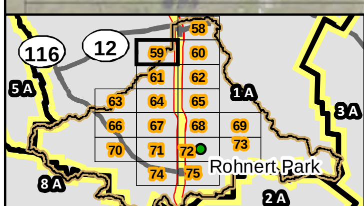
0 500 1,000 1,500 2,000
Feet
1 inch = 1,020 feet

Horizon

Sonoma County Water Agency

Stream Maintenance Program (SMP)




SMP Maintenance Reaches

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**Vegetation Class**

Developed

Emergent Wetland

Managed Mixed Riparian Woodland/Forest

Ruderal

Figure C-59

Reaches and Vegetation

Upper Laguna De Santa Rosa

0 500 1,000 1,500 2,000

Feet

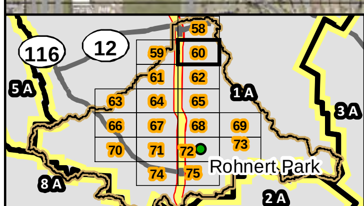
1 inch = 1,020 feet

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Sonoma County Water Agency

Stream Maintenance Program (SMP)


SMP Maintenance Reaches

Sub-Basin

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**Vegetation Class**

Developed

Managed Mixed Riparian Woodland/Forest

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-60

## Reaches and Vegetation

Upper Laguna De Santa Rosa

0 500 1,000 1,500 2,000

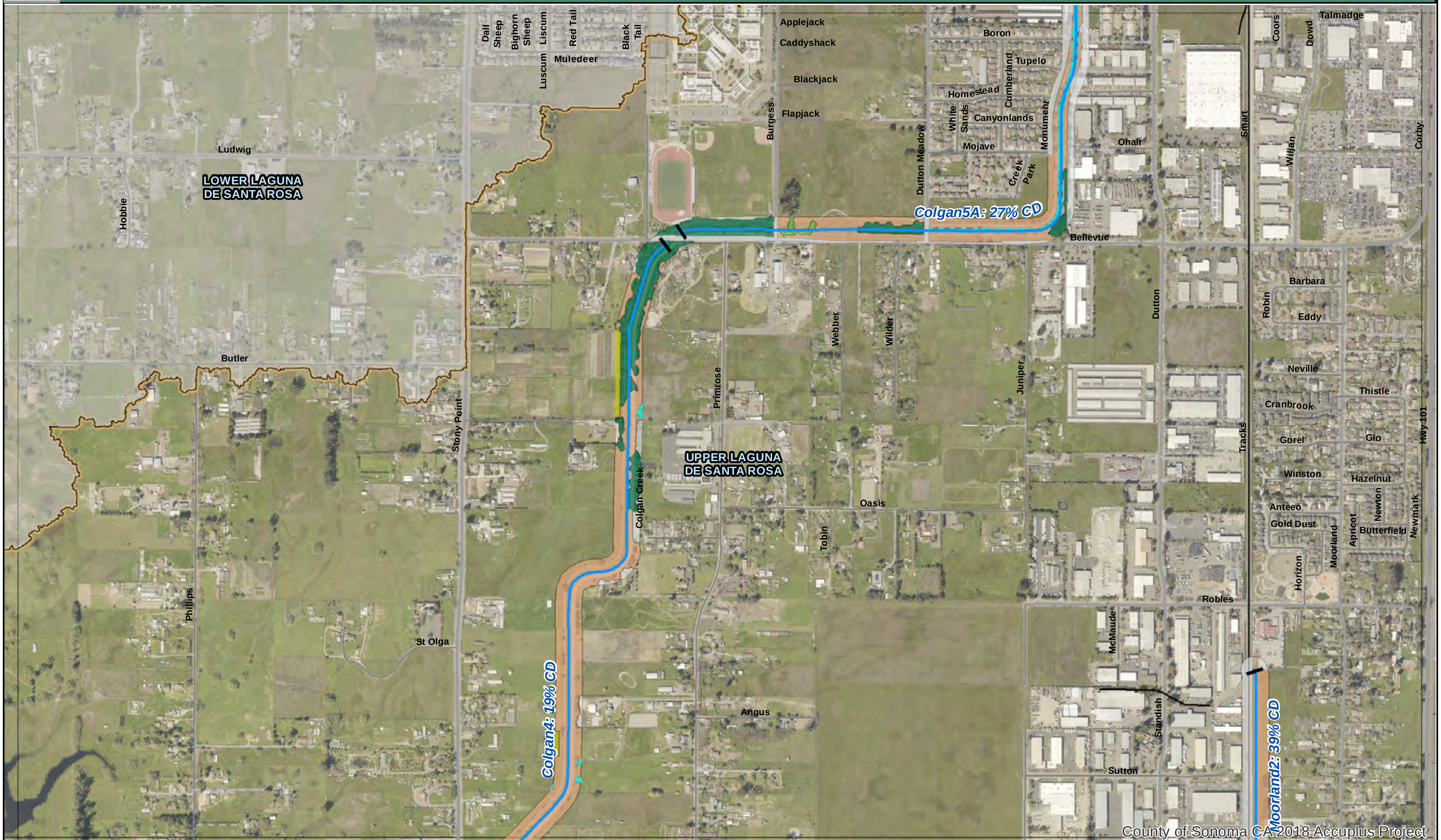
Feet

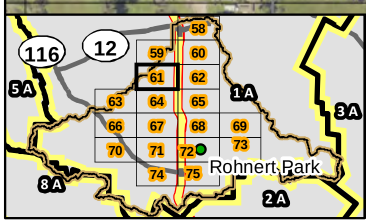
1 inch = 1,020 feet

Horizon

# Sonoma County Water Agency

Stream Maintenance Program (SMP)




SMP Maintenance Reaches

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**Vegetation Class**

Agriculture

Developed

Emergent Wetland

Eucalyptus

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-61

## Reaches and Vegetation

Upper Laguna De Santa Rosa

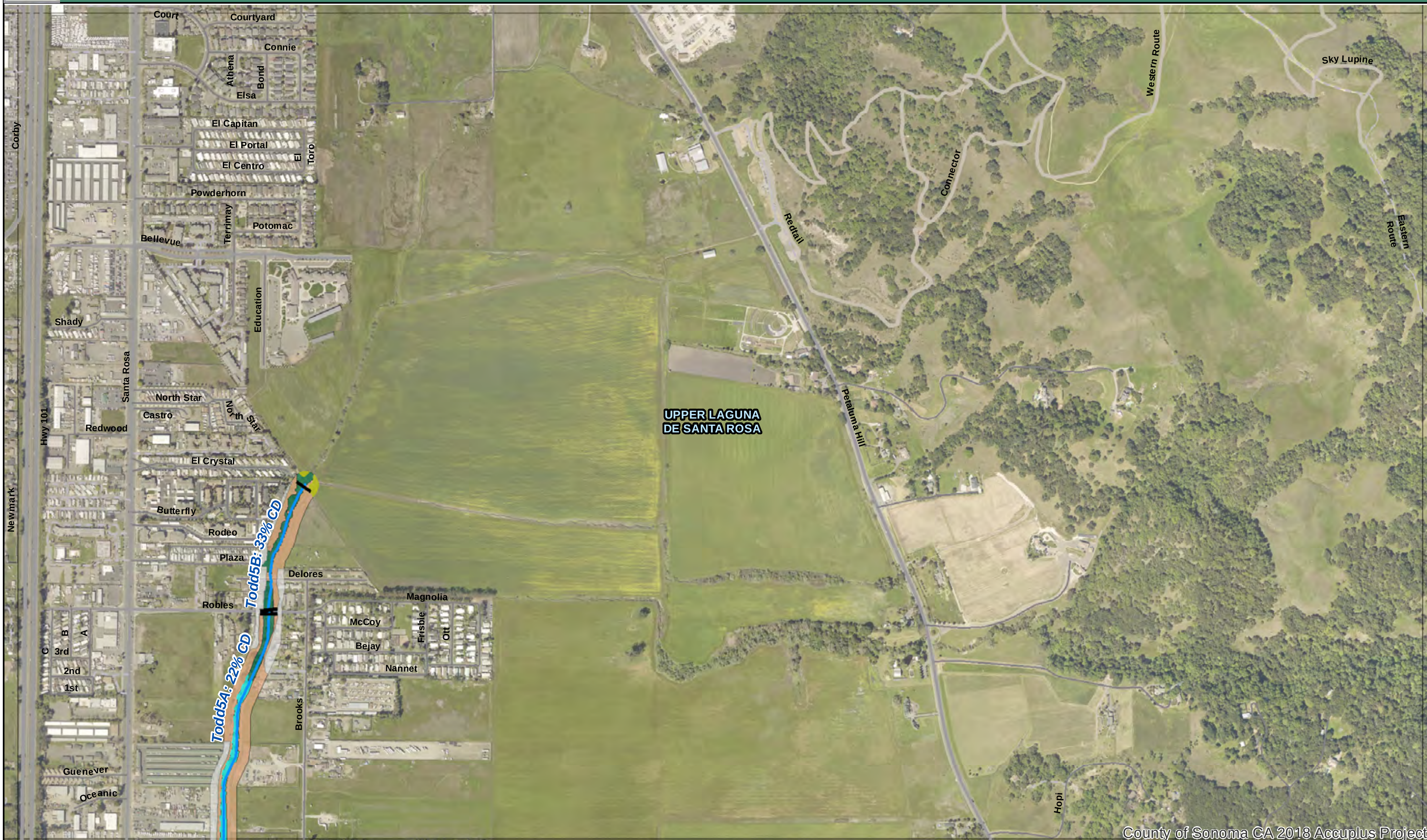
0 500 1,000 1,500 2,000

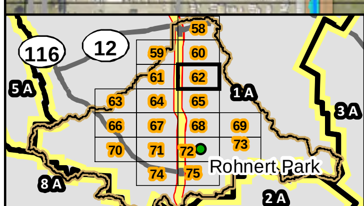
Feet

1 inch = 1,020 feet

Horizon

Sonoma County Water Agency    Stream Maintenance Program (SMP)




SMP Maintenance Reaches
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**Vegetation Class**
Agriculture
Developed
Emergent Wetland
Managed Mixed Riparian Woodland/Forest
Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS
Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

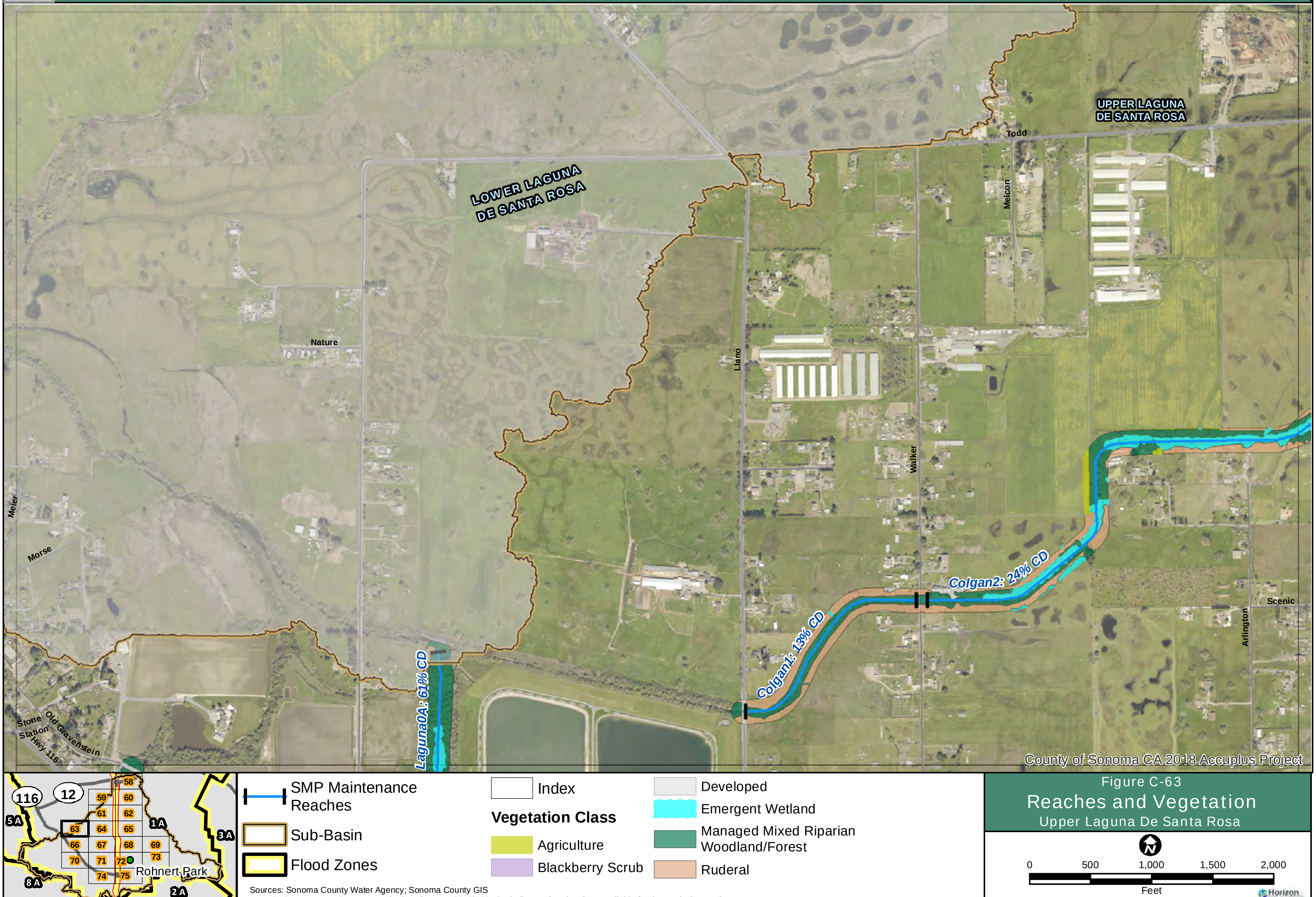
Figure C-62
## Reaches and Vegetation
Upper Laguna De Santa Rosa

0  500  1,000  1,500  2,000
Feet
1 inch = 1,020 feet

Horizon

# Sonoma County Water Agency

Stream Maintenance Program (SMP)




Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-63

## Reaches and Vegetation

Upper Laguna De Santa Rosa

0 500 1,000 1,500 2,000

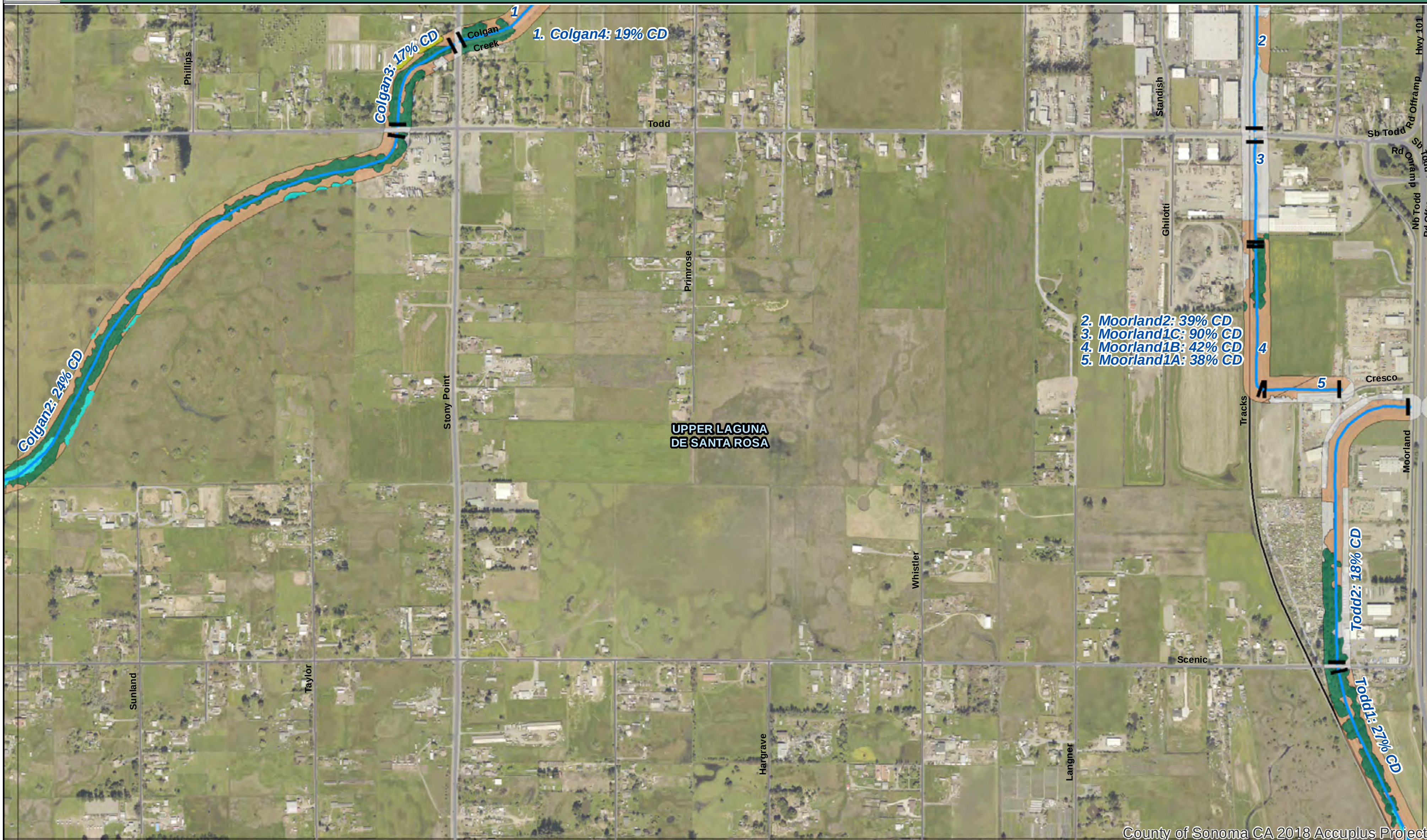
Feet

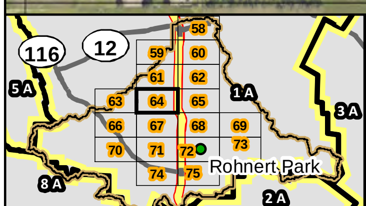
1 inch = 1,020 feet

Horizon

# Sonoma County Water Agency

Stream Maintenance Program (SMP)




SMP Maintenance Reaches

Sub-Basin

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**Vegetation Class**

Agriculture

Developed

Emergent Wetland

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-64

## Reaches and Vegetation

Upper Laguna De Santa Rosa

N

0 500 1,000 1,500 2,000

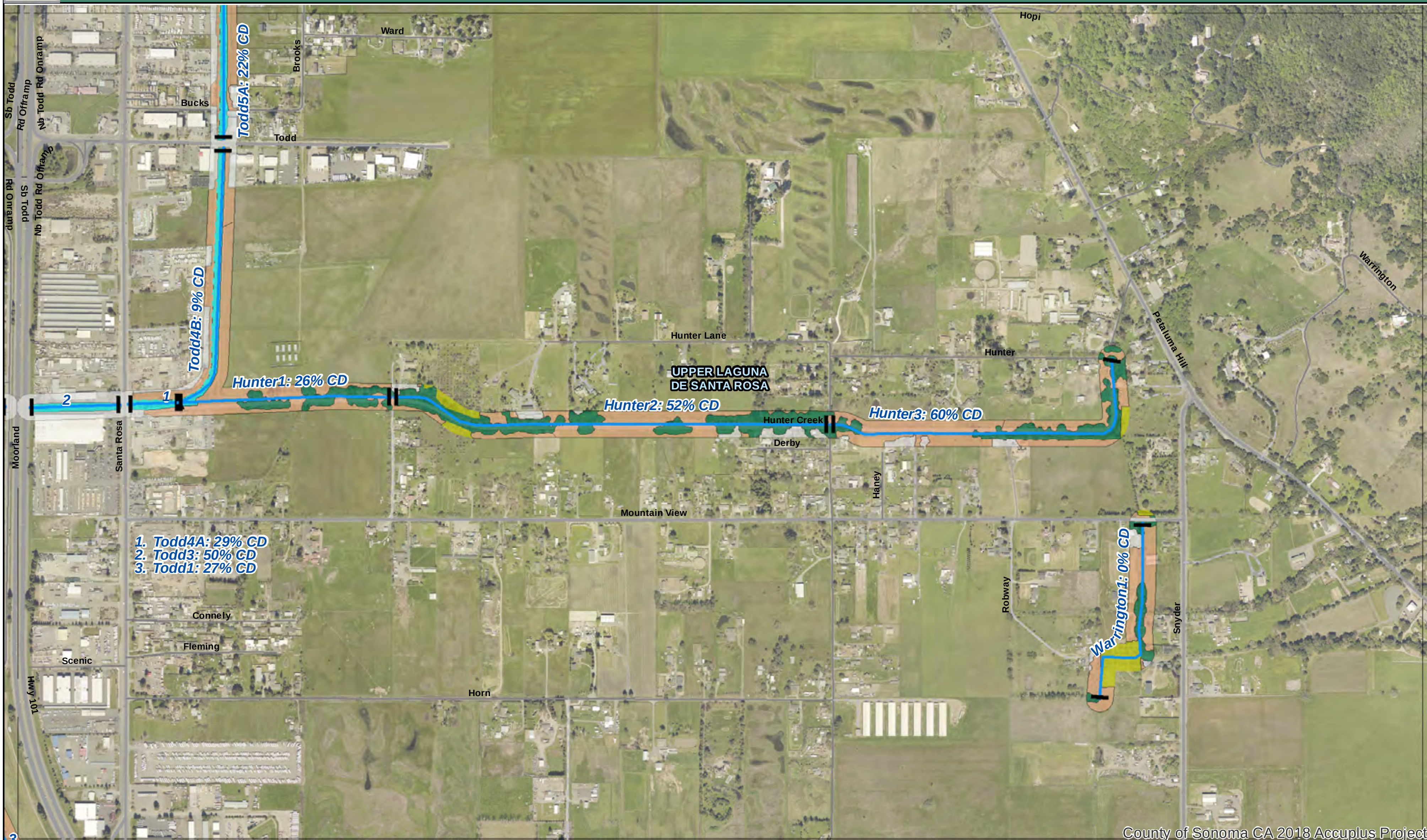
Feet

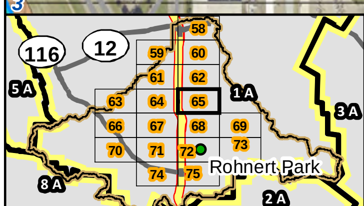
1 inch = 1,020 feet

Horizon

# Sonoma County Water Agency

Stream Maintenance Program (SMP)

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**Vegetation Class**

Agriculture

Developed

Emergent Wetland

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-65

## Reaches and Vegetation

Upper Laguna De Santa Rosa

0 500 1,000 1,500 2,000

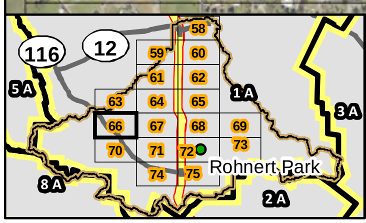
Feet

1 inch = 1,020 feet

Horizon

# Sonoma County Water Agency

Stream Maintenance Program (SMP)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**Vegetation Class**

Agriculture

Developed

Emergent Wetland

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-66

## Reaches and Vegetation

Upper Laguna De Santa Rosa

0 500 1,000 1,500 2,000

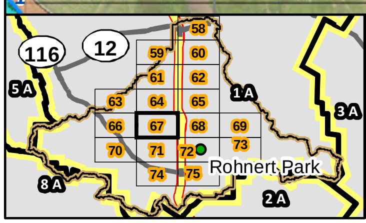
Feet

1 inch = 1,020 feet

Horizon

Sonoma County Water Agency

Stream Maintenance Program (SMP)


SMP Maintenance Reaches

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**Vegetation Class**

Agriculture

Developed

Emergent Wetland

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-67

## Reaches and Vegetation

Upper Laguna De Santa Rosa

0 500 1,000 1,500 2,000

Feet

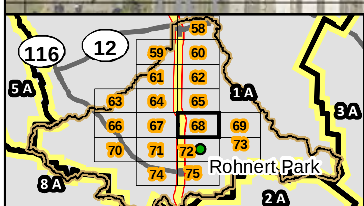
1 inch = 1,020 feet

Horizon

SONOMA COUNTY WATER AGENCY

# Sonoma County Water Agency

Stream Maintenance Program (SMP)


SMP Maintenance Reaches

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**Vegetation Class**

Agriculture

Developed

Emergent Wetland

Managed Mixed Riparian Woodland/Forest

Ruderal

Figure C-68

## Reaches and Vegetation

Upper Laguna De Santa Rosa

0 500 1,000 1,500 2,000

Feet

1 inch = 1,020 feet

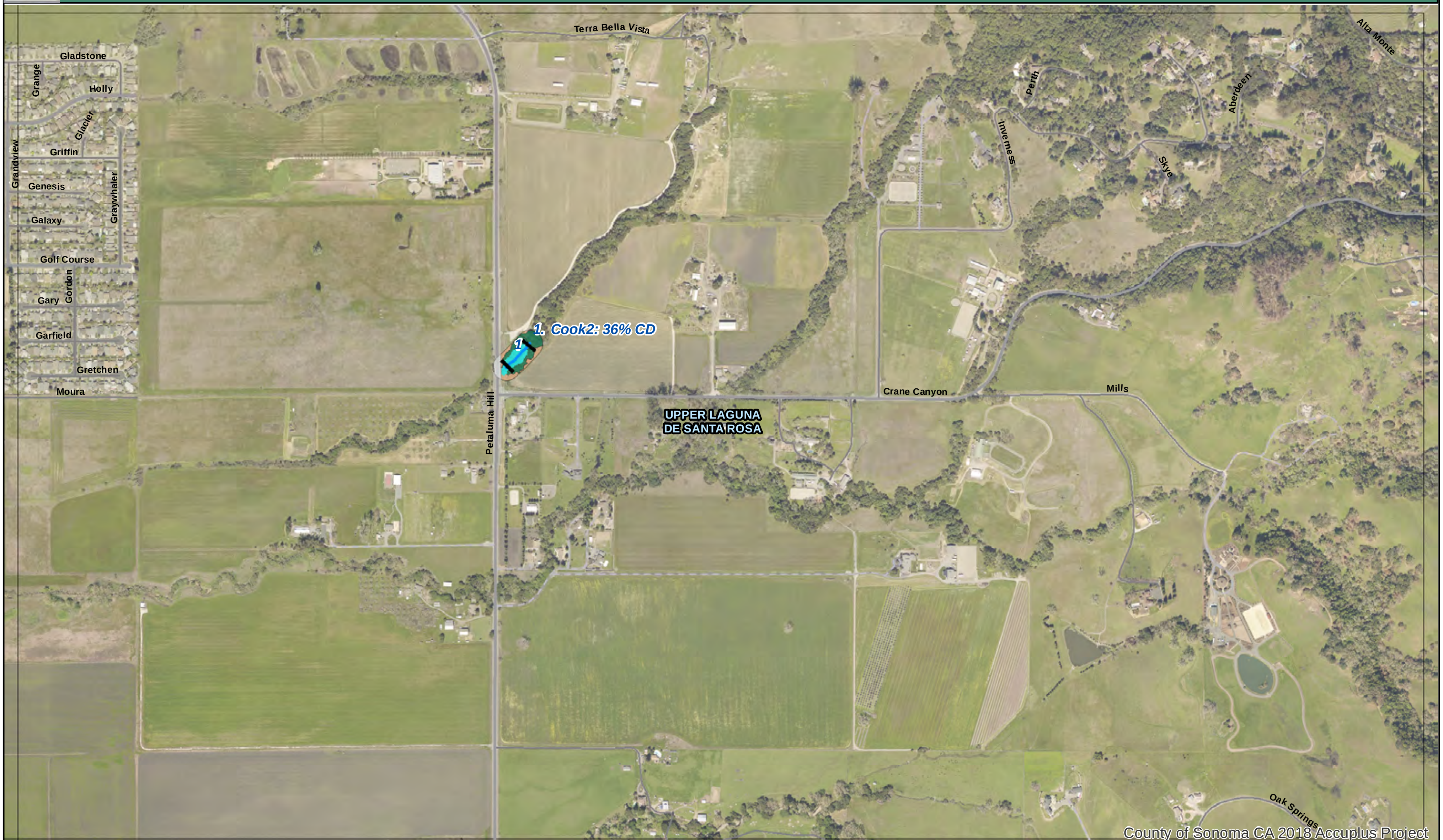
Horizon

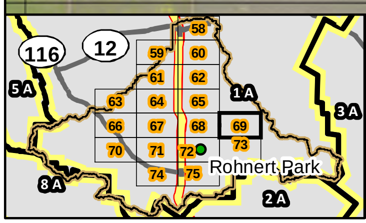
Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Sonoma County Water Agency

Stream Maintenance Program (SMP)

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**Vegetation Class**

Developed

Emergent Wetland

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-69

Reaches and Vegetation

Upper Laguna De Santa Rosa

0 500 1,000 1,500 2,000

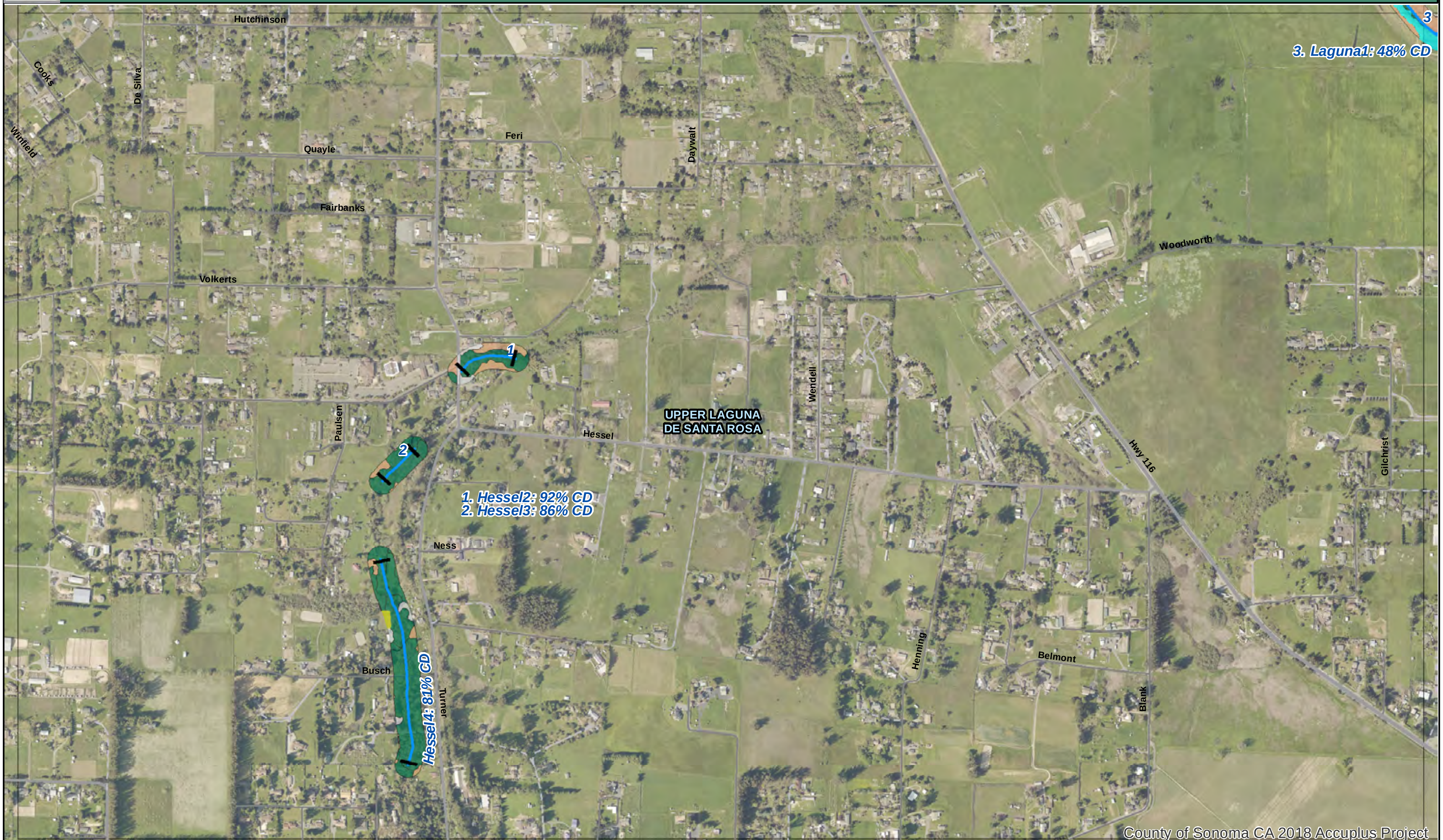
Feet

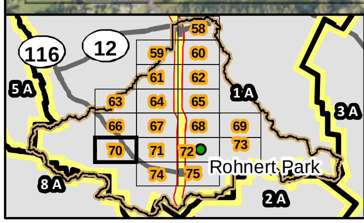
1 inch = 1,020 feet

Horizon

Sonoma County Water Agency

Stream Maintenance Program (SMP)




SMP Maintenance Reaches

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**Vegetation Class**

Agriculture

Developed

Emergent Wetland

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-70

Reaches and Vegetation

Upper Laguna De Santa Rosa

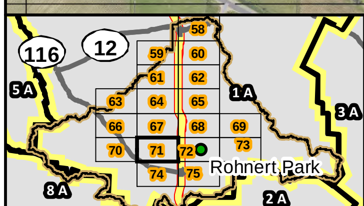
0 500 1,000 1,500 2,000

Feet

1 inch = 1,020 feet

# Sonoma County Water Agency

Stream Maintenance Program (SMP)


SMP Maintenance Reaches

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**Vegetation Class**

Agriculture

Developed

Emergent Wetland

Eucalyptus

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-71

## Reaches and Vegetation

Upper Laguna De Santa Rosa

0 500 1,000 1,500 2,000

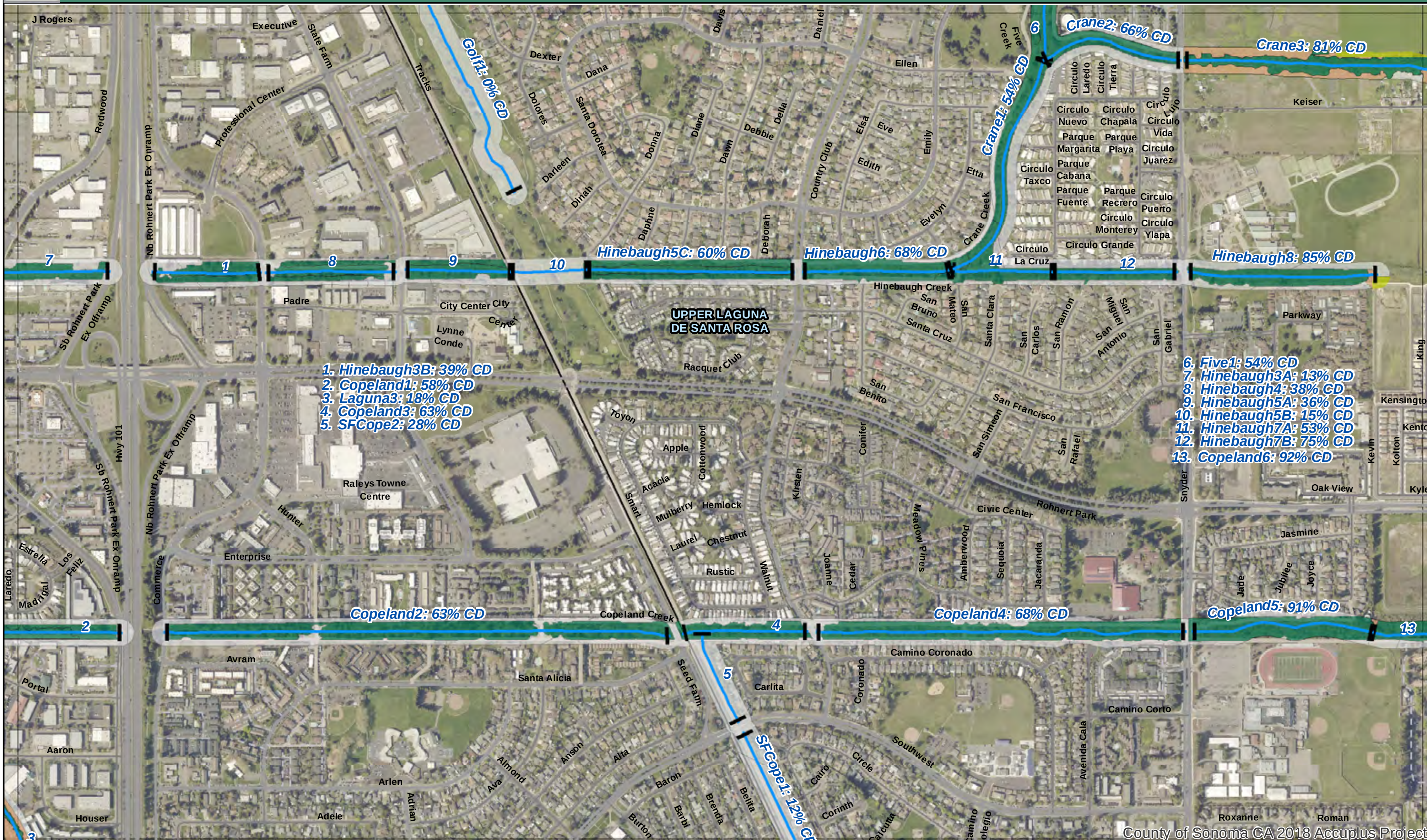
Feet

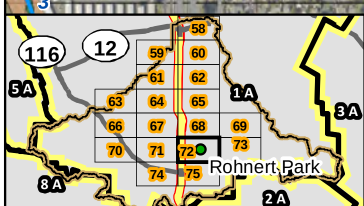
1 inch = 1,020 feet

Horizon

# Sonoma County Water Agency

Stream Maintenance Program (SMP)




SMP Maintenance Reaches

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**Vegetation Class**

Agriculture

Developed

Managed Mixed Riparian Woodland/Forest

Ruderal

Figure C-72

## Reaches and Vegetation

Upper Laguna De Santa Rosa

0 500 1,000 1,500 2,000

Feet

1 inch = 1,020 feet

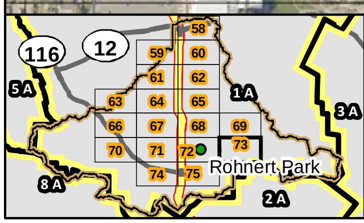
Horizon

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

# Sonoma County Water Agency

Stream Maintenance Program (SMP)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**Vegetation Class**

Agriculture

Developed

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS
Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-73

## Reaches and Vegetation

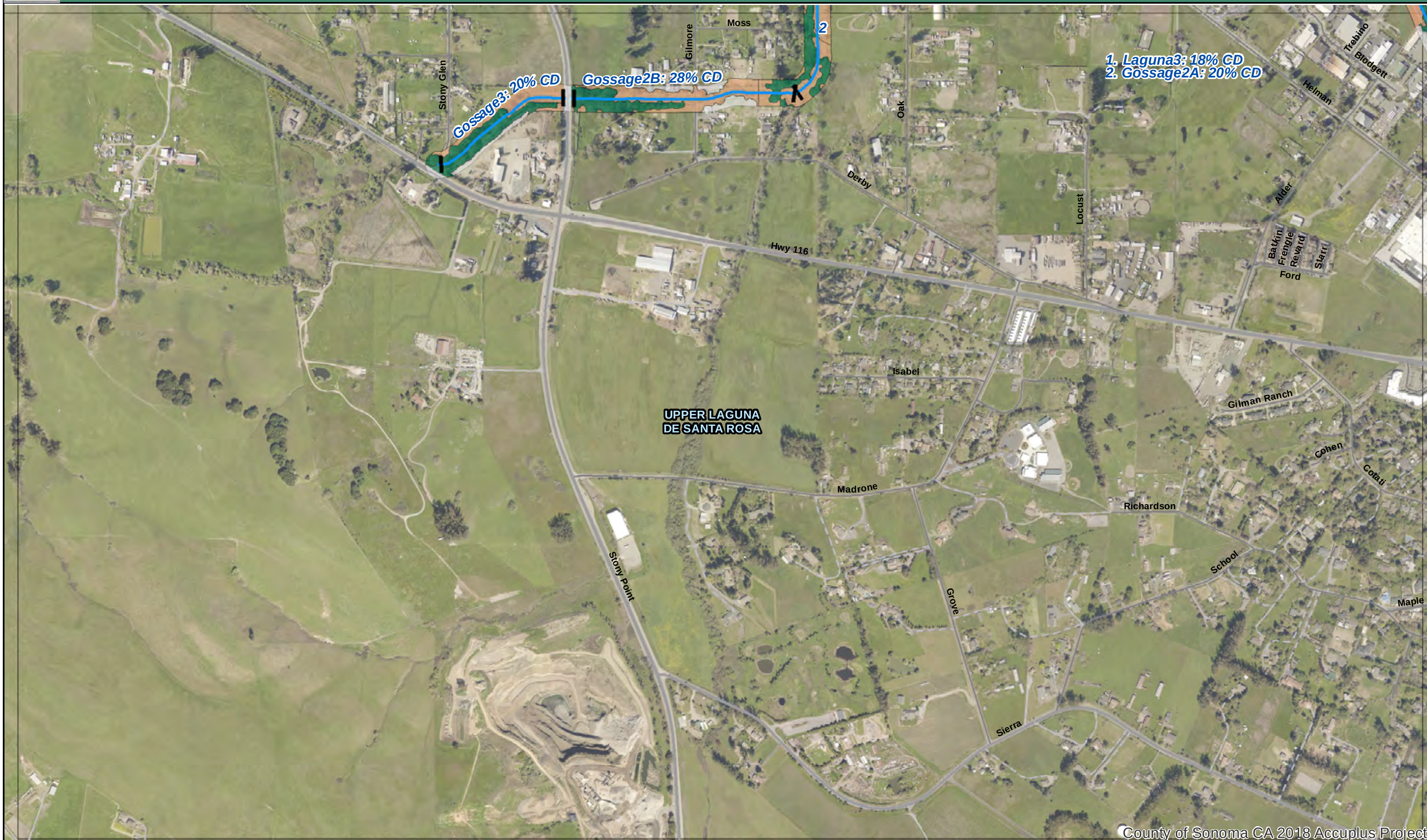
Upper Laguna De Santa Rosa

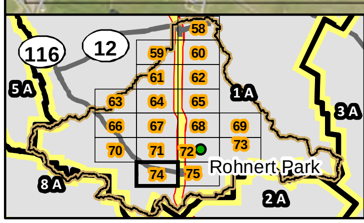
0 500 1,000 1,500 2,000
Feet
1 inch = 1,020 feet

Horizon

# Sonoma County Water Agency

Stream Maintenance Program (SMP)

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**Vegetation Class**

Developed

Managed Mixed Riparian Woodland/Forest

Ruderal

Figure C-74

## Reaches and Vegetation

Upper Laguna De Santa Rosa

0 500 1,000 1,500 2,000

Feet

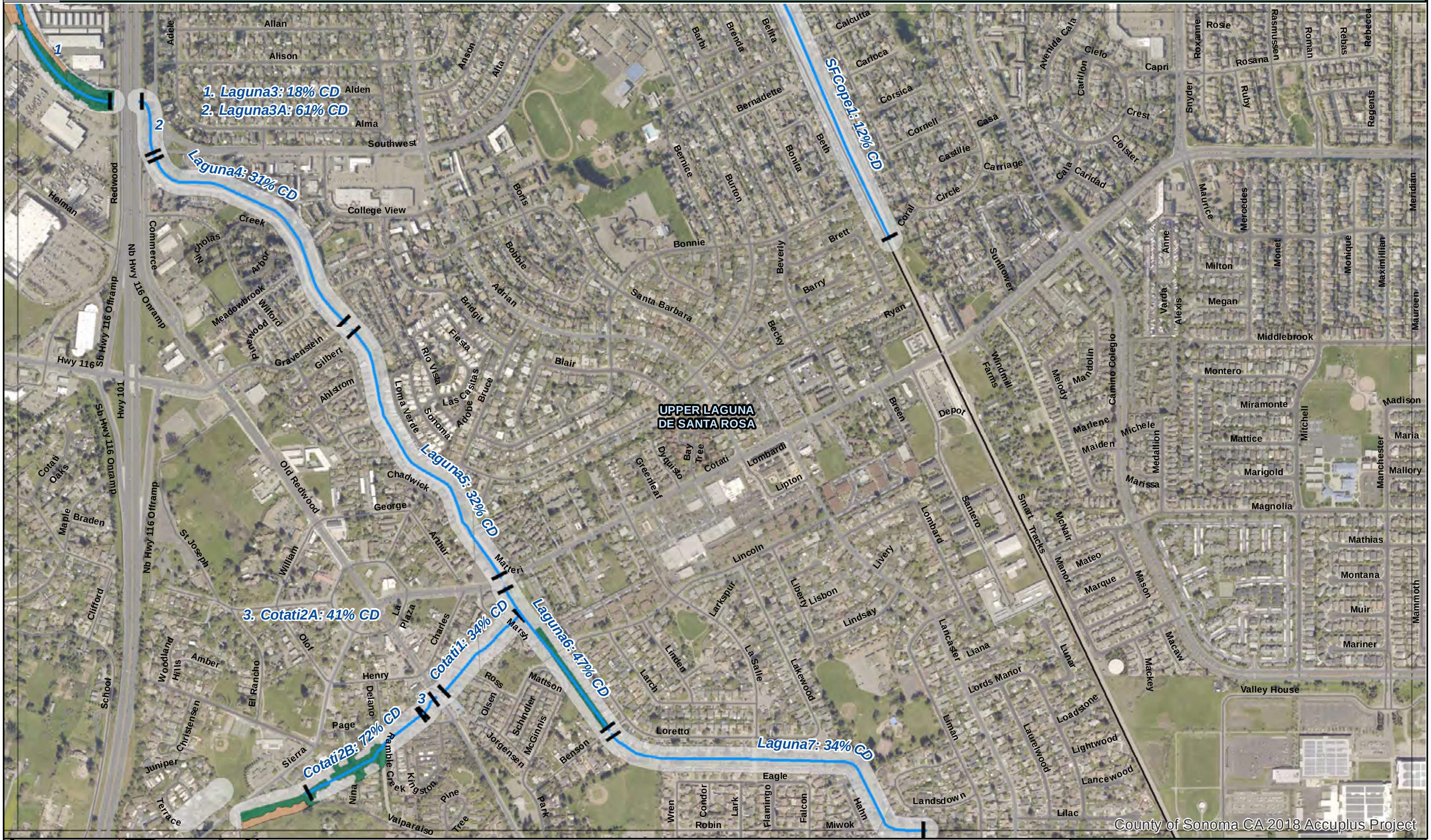
1 inch = 1,020 feet

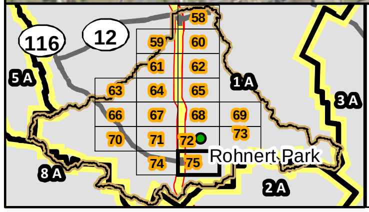
Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

# Sonoma County Water Agency

Stream Maintenance Program (SMP)

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**Vegetation Class**

Developed

Managed Mixed Riparian Woodland/Forest

Ruderal

Figure C-75

Reaches and Vegetation

Upper Laguna De Santa Rosa

0 500 1,000 1,500 2,000

Feet

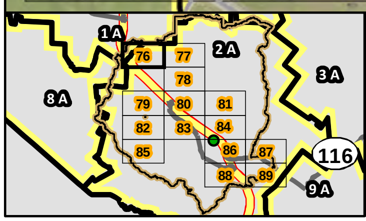
1 inch = 1,020 feet

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

# Sonoma County Water Agency

Stream Maintenance Program (SMP)

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**Vegetation Class**

Developed

Managed Mixed Riparian Woodland/Forest

Ruderal

Figure C-76

## Reaches and Vegetation

Petaluma River

0 500 1,000 1,500 2,000

Feet

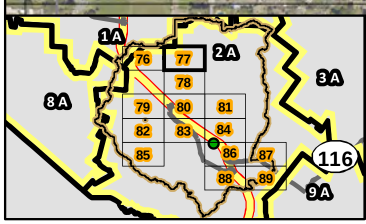
1 inch = 1,020 feet

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Sonoma County Water Agency

Stream Maintenance Program (SMP)


SMP Maintenance Reaches

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**Vegetation Class**

Blackberry Scrub

Developed

Eucalyptus

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS
Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-77

## Reaches and Vegetation

Petaluma River

0 500 1,000 1,500 2,000

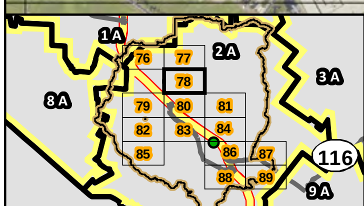
Feet

1 inch = 1,020 feet

Horizon

Sonoma County Water Agency

Stream Maintenance Program (SMP)


SMP Maintenance Reaches

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**Vegetation Class**

Blackberry Scrub

Developed

Emergent Wetland

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-78

Reaches and Vegetation

Petaluma River

0 500 1,000 1,500 2,000

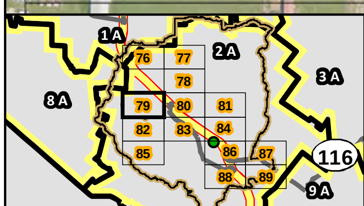
Feet

1 inch = 1,020 feet

Horizon

# Sonoma County Water Agency

Stream Maintenance Program (SMP)


SMP Maintenance Reaches

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**Vegetation Class**

Developed

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-79

## Reaches and Vegetation

Petaluma River

0 500 1,000 1,500 2,000

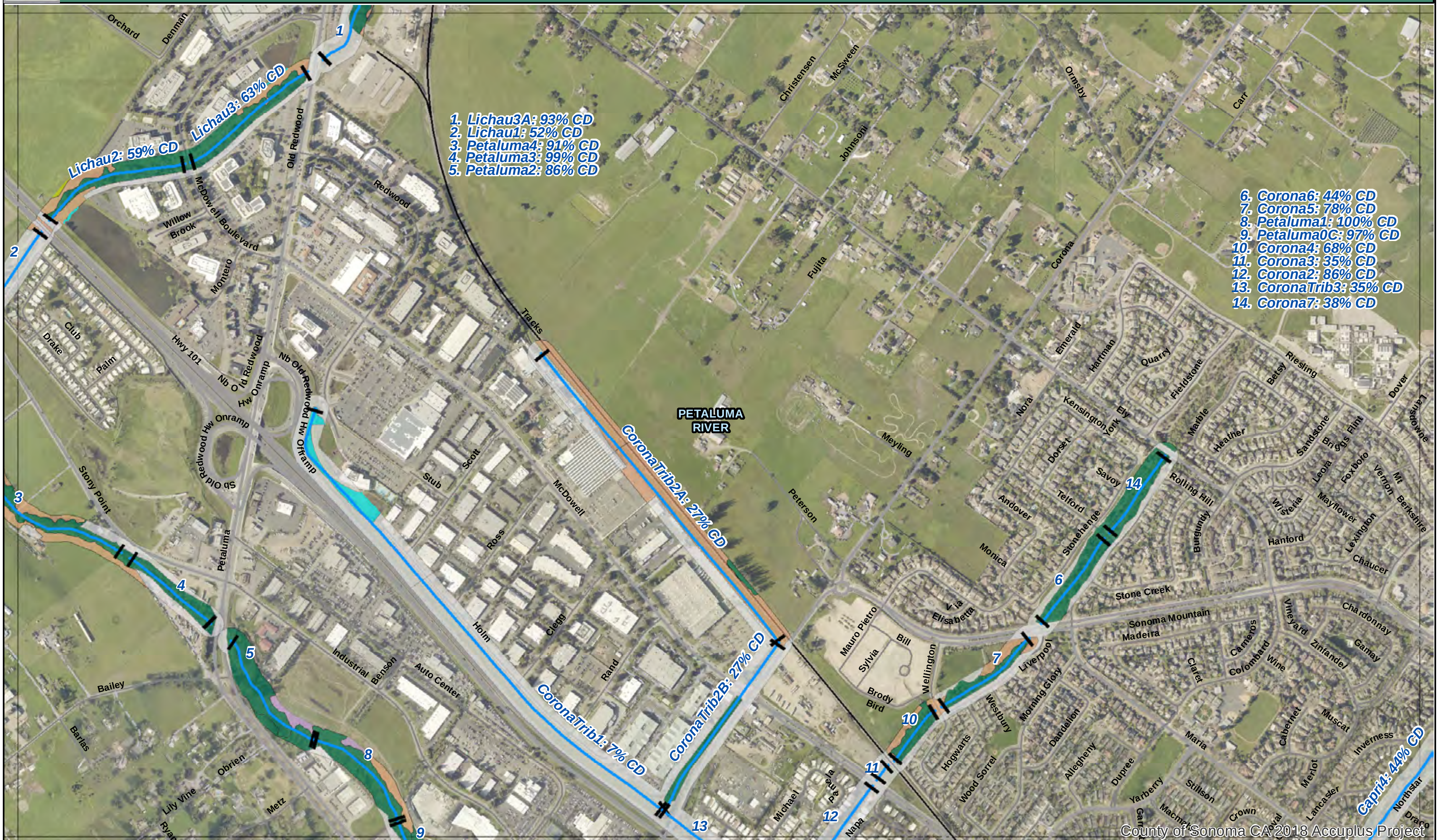
Feet

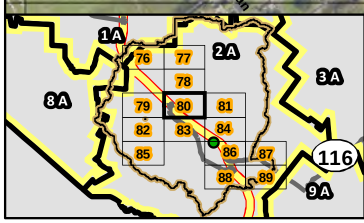
1 inch = 1,020 feet

Horizon

# Sonoma County Water Agency

Stream Maintenance Program (SMP)




SMP Maintenance Reaches

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**Vegetation Class**

Agriculture

Blackberry Scrub

Developed

Emergent Wetland

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-80

## Reaches and Vegetation

Petaluma River

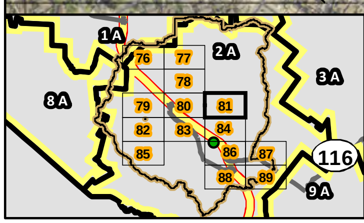
0 500 1,000 1,500 2,000

Feet

1 inch = 1,020 feet

# Sonoma County Water Agency

Stream Maintenance Program (SMP)


SMP Maintenance Reaches

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**Vegetation Class**

Agriculture

Developed

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-81

## Reaches and Vegetation

Petaluma River

0 500 1,000 1,500 2,000

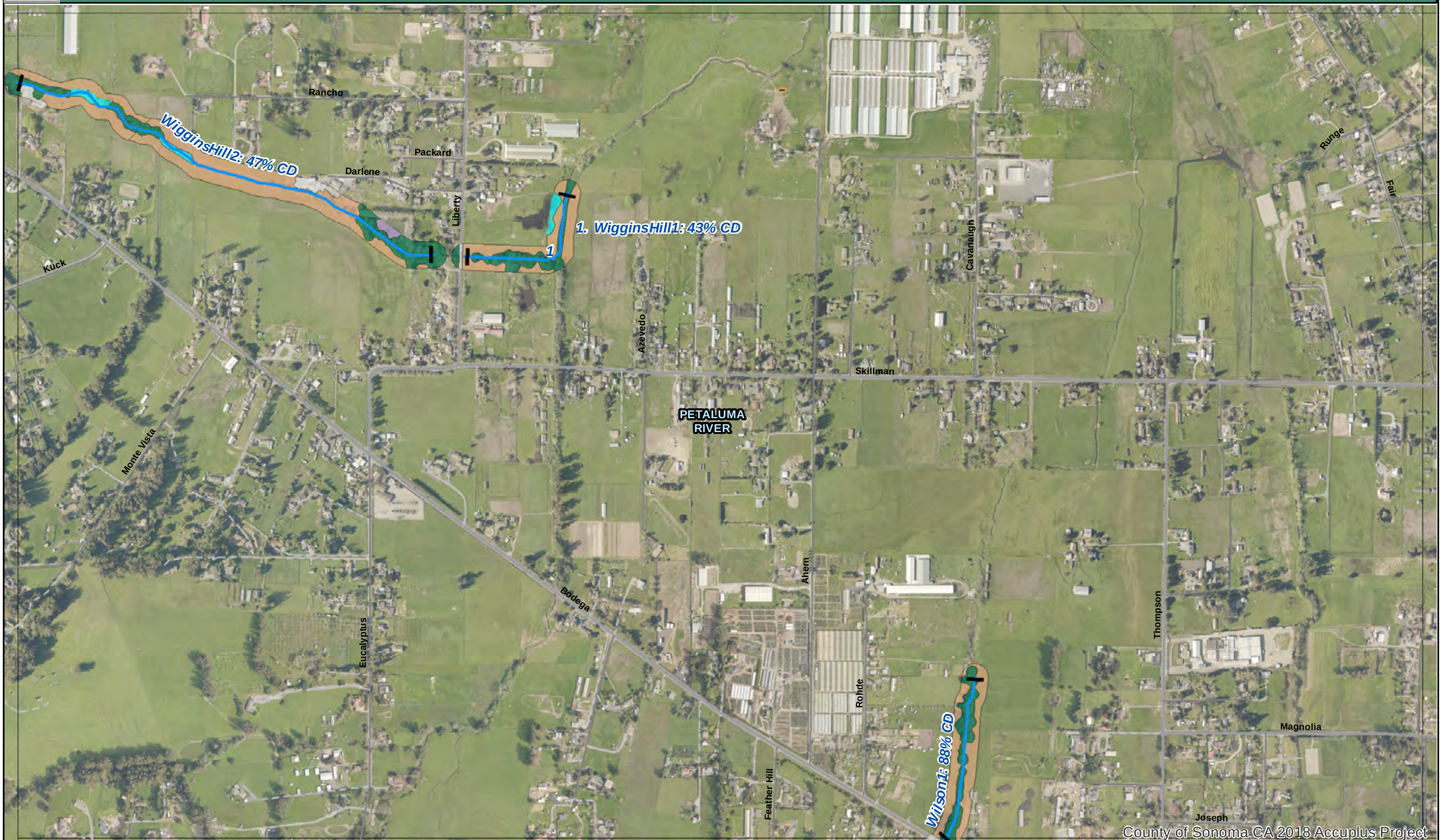
Feet

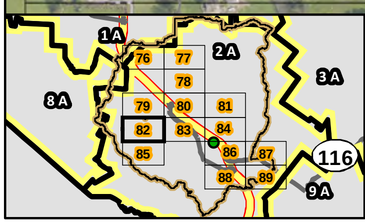
1 inch = 1,020 feet

Horizon

# Sonoma County Water Agency

Stream Maintenance Program (SMP)




SMP Maintenance Reaches

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**Vegetation Class**

Blackberry Scrub

Developed

Emergent Wetland

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-82

## Reaches and Vegetation

Petaluma River

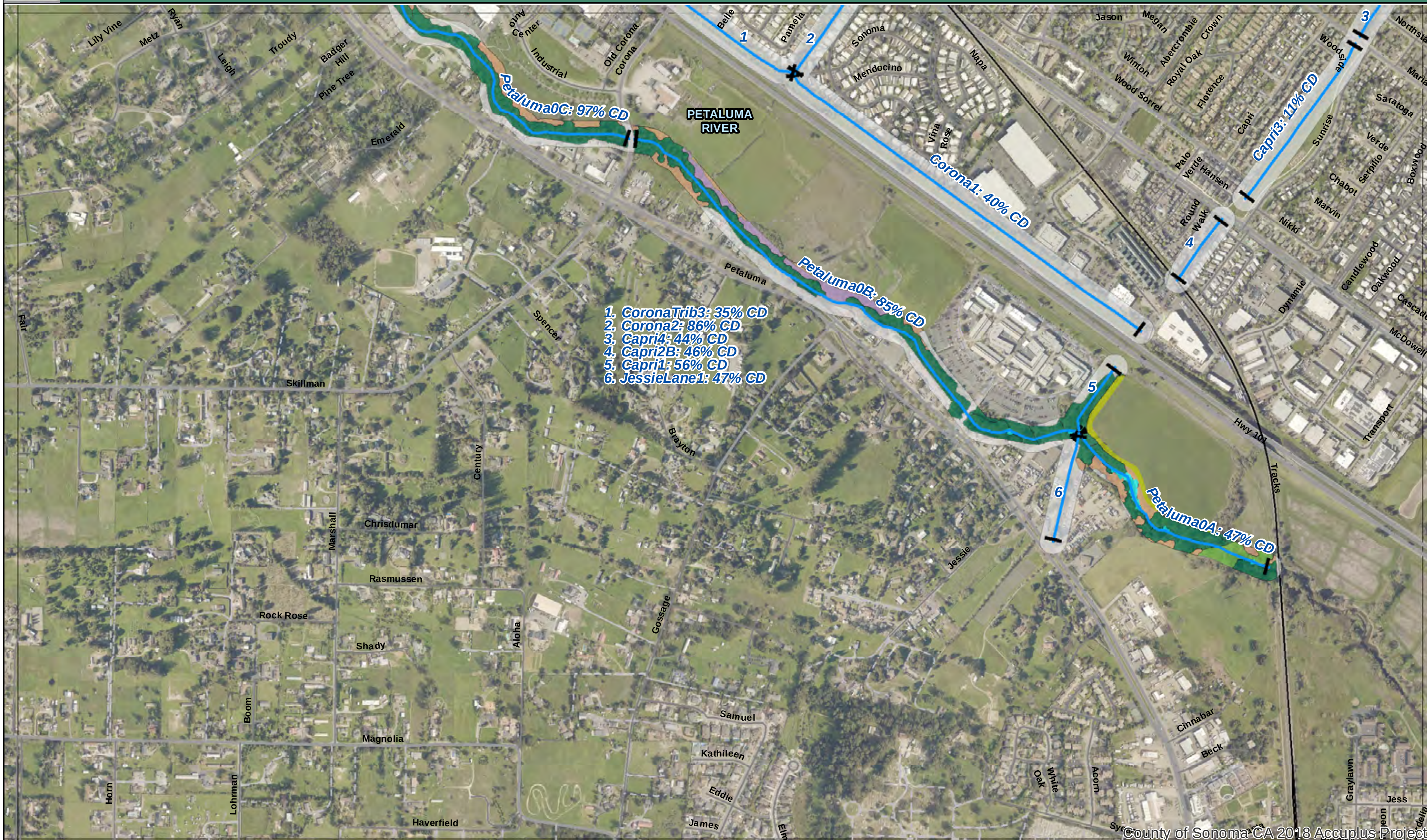
0 500 1,000 1,500 2,000

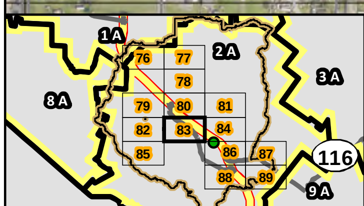
Feet

1 inch = 1,020 feet

# Sonoma County Water Agency

Stream Maintenance Program (SMP)




SMP Maintenance Reaches

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**Vegetation Class**

Agriculture

Blackberry Scrub

Developed

Emergent Wetland

Eucalyptus

Managed Mixed Riparian Woodland/Forest

Ruderal

Figure C-83

Reaches and Vegetation

Petaluma River

0 500 1,000 1,500 2,000

Feet

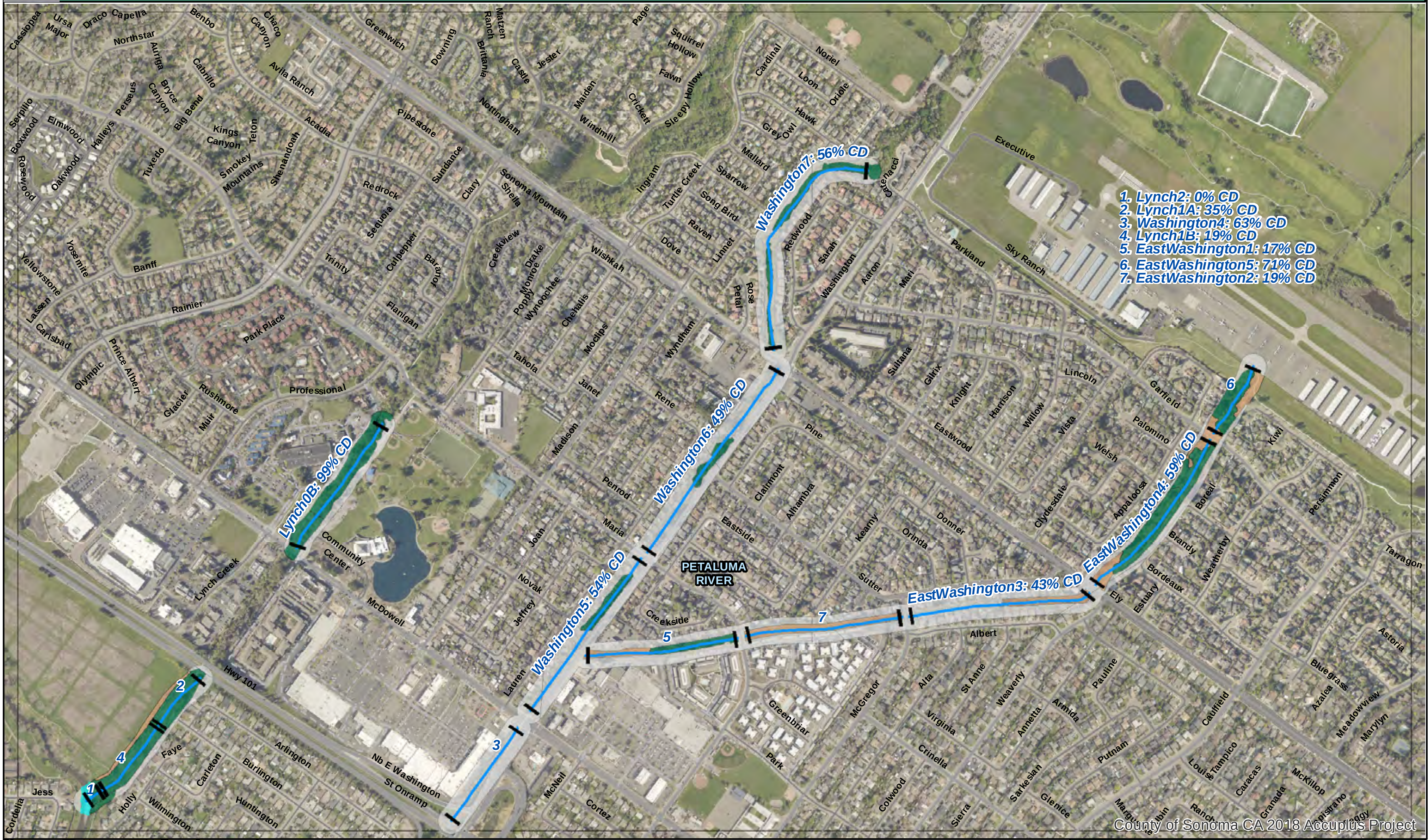
1 inch = 1,020 feet

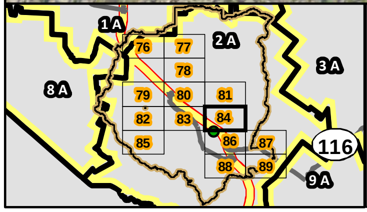
Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

# Sonoma County Water Agency

Stream Maintenance Program (SMP)




SMP Maintenance Reaches

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**Vegetation Class**

Developed

Emergent Wetland

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-84

## Reaches and Vegetation

Petaluma River

0 500 1,000 1,500 2,000

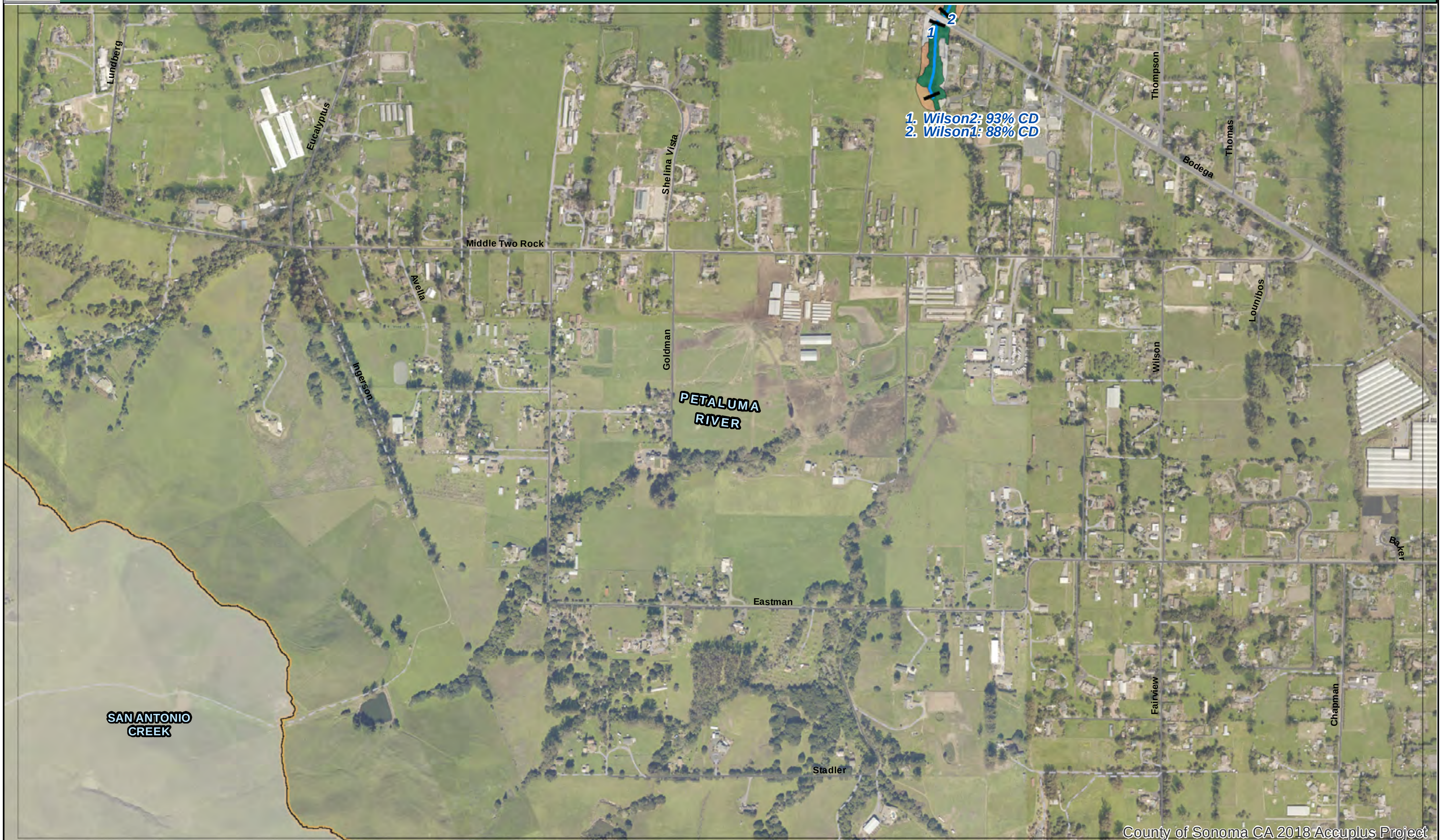
Feet

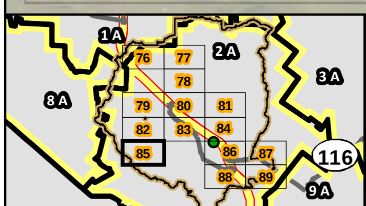
1 inch = 1,020 feet

Horizon

# Sonoma County Water Agency

Stream Maintenance Program (SMP)




SMP Maintenance Reaches

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**Vegetation Class**

Developed

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-85

## Reaches and Vegetation

Petaluma River

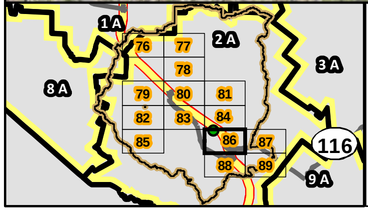
0 500 1,000 1,500 2,000

Feet

1 inch = 1,020 feet

# Sonoma County Water Agency

Stream Maintenance Program (SMP)


SMP Maintenance Reaches

Sub-Basin

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**Vegetation Class**

Developed

Emergent Wetland

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-86

Reaches and Vegetation

Petaluma River

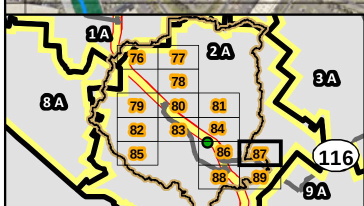
0 500 1,000 1,500 2,000

Feet

1 inch = 1,020 feet

# Sonoma County Water Agency

Stream Maintenance Program (SMP)


SMP Maintenance Reaches

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**Vegetation Class**

Agriculture

Developed

Eucalyptus

Managed Mixed Riparian Woodland/Forest

Ruderal

Figure C-87

## Reaches and Vegetation

Petaluma River

0 500 1,000 1,500 2,000

Feet

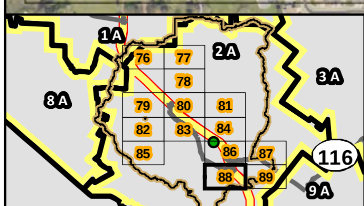
1 inch = 1,020 feet

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Sonoma County Water Agency

Stream Maintenance Program (SMP)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**Vegetation Class**

Developed

Managed Mixed Riparian Woodland/Forest

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-88

## Reaches and Vegetation

Petaluma River

N

0 500 1,000 1,500 2,000

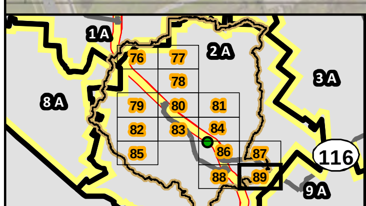
Feet

1 inch = 1,020 feet

Horizon

# Sonoma County Water Agency

Stream Maintenance Program (SMP)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**Vegetation Class**

Agriculture

Developed

Eucalyptus

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-89

## Reaches and Vegetation

Petaluma River

0 500 1,000 1,500 2,000

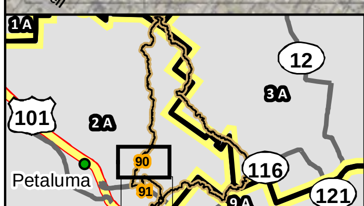
Feet

1 inch = 1,020 feet

Horizon

# Sonoma County Water Agency

Stream Maintenance Program (SMP)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**Vegetation Class**

Developed

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-90

## Reaches and Vegetation

Adobe Creek-Frontal San Pablo Bay Estuaries

0 500 1,000 1,500 2,000

Feet

1 inch = 1,020 feet

Horizon

# Sonoma County Water Agency

Stream Maintenance Program (SMP)


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**Vegetation Class**

Agriculture

Developed

Eucalyptus

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-91

## Reaches and Vegetation

Adobe Creek-Frontal San Pablo Bay Estuaries

0 500 1,000 1,500 2,000

Feet

1 inch = 1,020 feet

Sonoma County Water Agency Stream Maintenance Program (SMP)



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**Vegetation Class**

Blackberry Scrub

Developed

Emergent Wetland

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS
Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

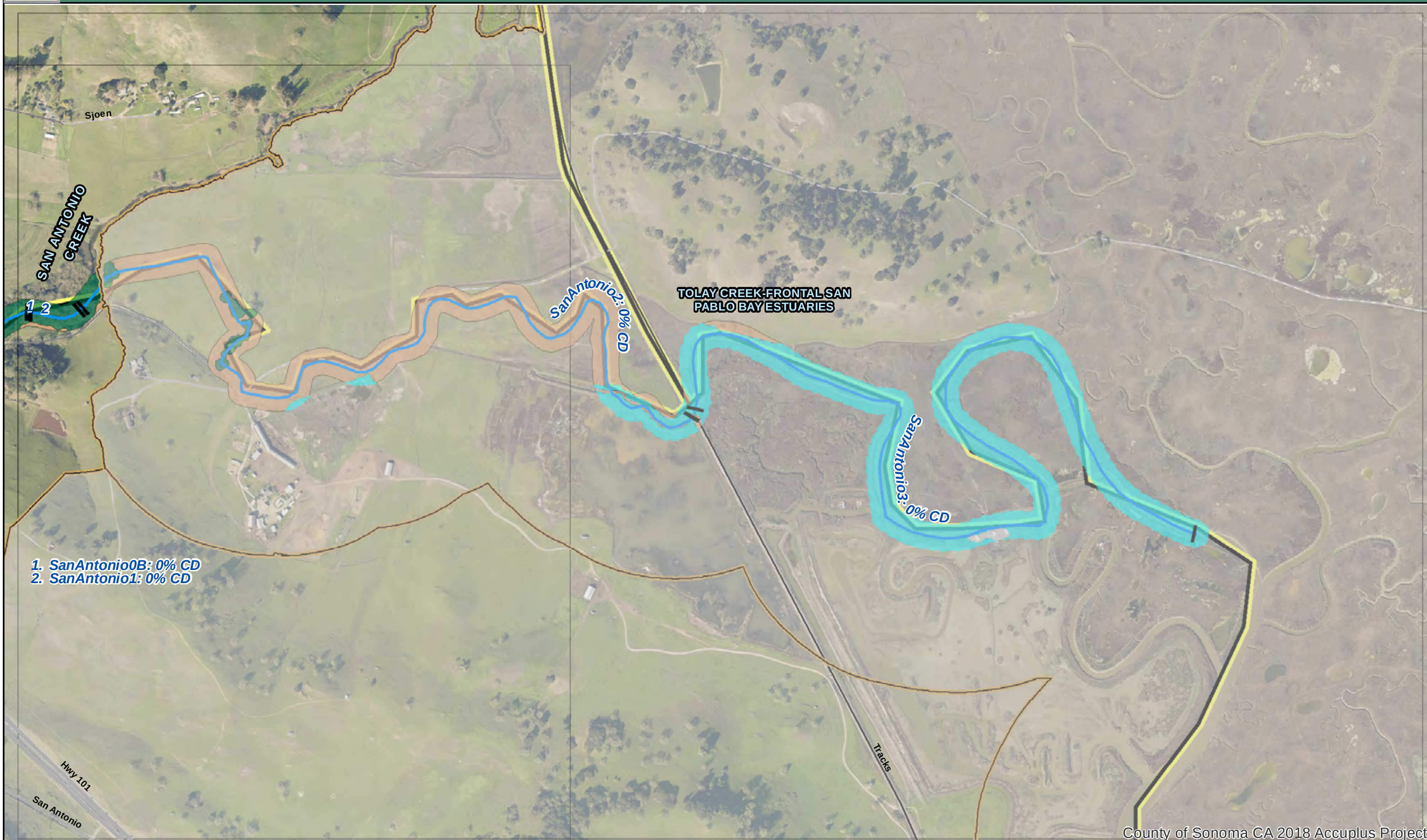
Figure C-92
Reaches and Vegetation
San Antonio Creek

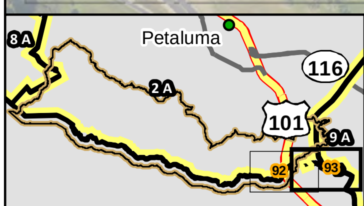
0 500 1,000 1,500 2,000
Feet
1 inch = 1,020 feet

SONOMA COUNTY WATER AGENCY

# Sonoma County Water Agency

Stream Maintenance Program (SMP)

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**Vegetation Class**

Blackberry Scrub

Developed

Emergent Wetland

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-93

## Reaches and Vegetation

San Antonio Creek

N

0 500 1,000 1,500 2,000

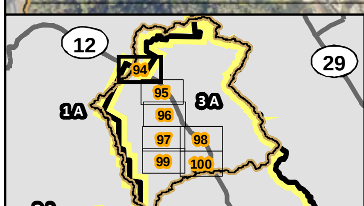
Feet

1 inch = 1,020 feet

Horizon

Sonoma County Water Agency

Stream Maintenance Program (SMP)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**Vegetation Class**

Agriculture

Blackberry Scrub

Developed

Emergent Wetland

Managed Mixed Riparian Woodland/Forest

Ruderal

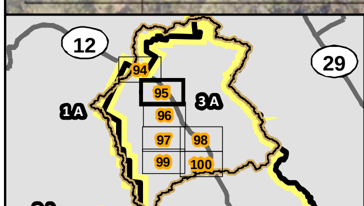
Sources: Sonoma County Water Agency; Sonoma County GIS
Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-94
Reaches and Vegetation
Upper Sonoma Creek

0 500 1,000 1,500 2,000
Feet
1 inch = 1,020 feet

# Sonoma County Water Agency

Stream Maintenance Program (SMP)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**Vegetation Class**

Agriculture

Blackberry Scrub

Developed

Emergent Wetland

Eucalyptus

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-95

## Reaches and Vegetation

Upper Sonoma Creek

0 500 1,000 1,500 2,000

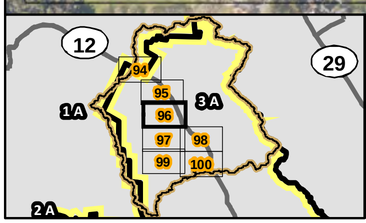
Feet

1 inch = 1,020 feet

Horizon

Sonoma County Water Agency

Stream Maintenance Program (SMP)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**Vegetation Class**

Agriculture

Developed

Emergent Wetland

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-96

Reaches and Vegetation

Upper Sonoma Creek

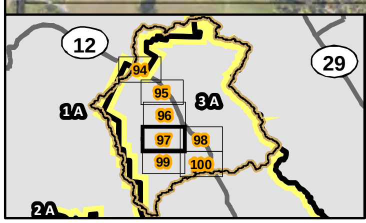
0 500 1,000 1,500 2,000

Feet

1 inch = 1,020 feet

# Sonoma County Water Agency

Stream Maintenance Program (SMP)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**Vegetation Class**

Agriculture

Developed

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-97

## Reaches and Vegetation

Upper Sonoma Creek

0 500 1,000 1,500 2,000

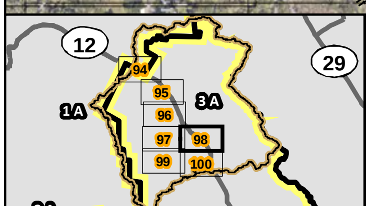
Feet

1 inch = 1,020 feet

Horizon

# Sonoma County Water Agency

Stream Maintenance Program (SMP)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**Vegetation Class**

Agriculture

Developed

Managed Mixed Riparian Woodland/Forest

Ruderal

Figure C-98

## Reaches and Vegetation

Upper Sonoma Creek

0 500 1,000 1,500 2,000

Feet

1 inch = 1,020 feet

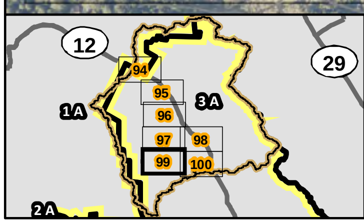
Horizon

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Sonoma County Water Agency

Stream Maintenance Program (SMP)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**Vegetation Class**

Developed

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-99

Reaches and Vegetation

Upper Sonoma Creek

0 500 1,000 1,500 2,000

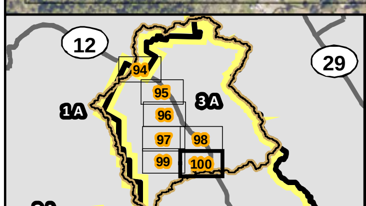
Feet

1 inch = 1,020 feet

Horizon

# Sonoma County Water Agency

Stream Maintenance Program (SMP)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**Vegetation Class**

Agriculture

Developed

Emergent Wetland

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-100

Reaches and Vegetation

Upper Sonoma Creek

0 500 1,000 1,500 2,000

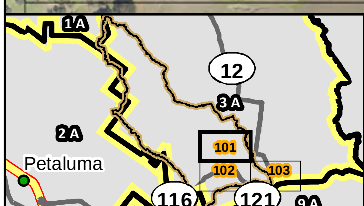
Feet

1 inch = 1,020 feet

Horizon

# Sonoma County Water Agency

Stream Maintenance Program (SMP)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**Vegetation Class**

Agriculture

Developed

Emergent Wetland

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-101

## Reaches and Vegetation

Fowler Creek

0 500 1,000 1,500 2,000

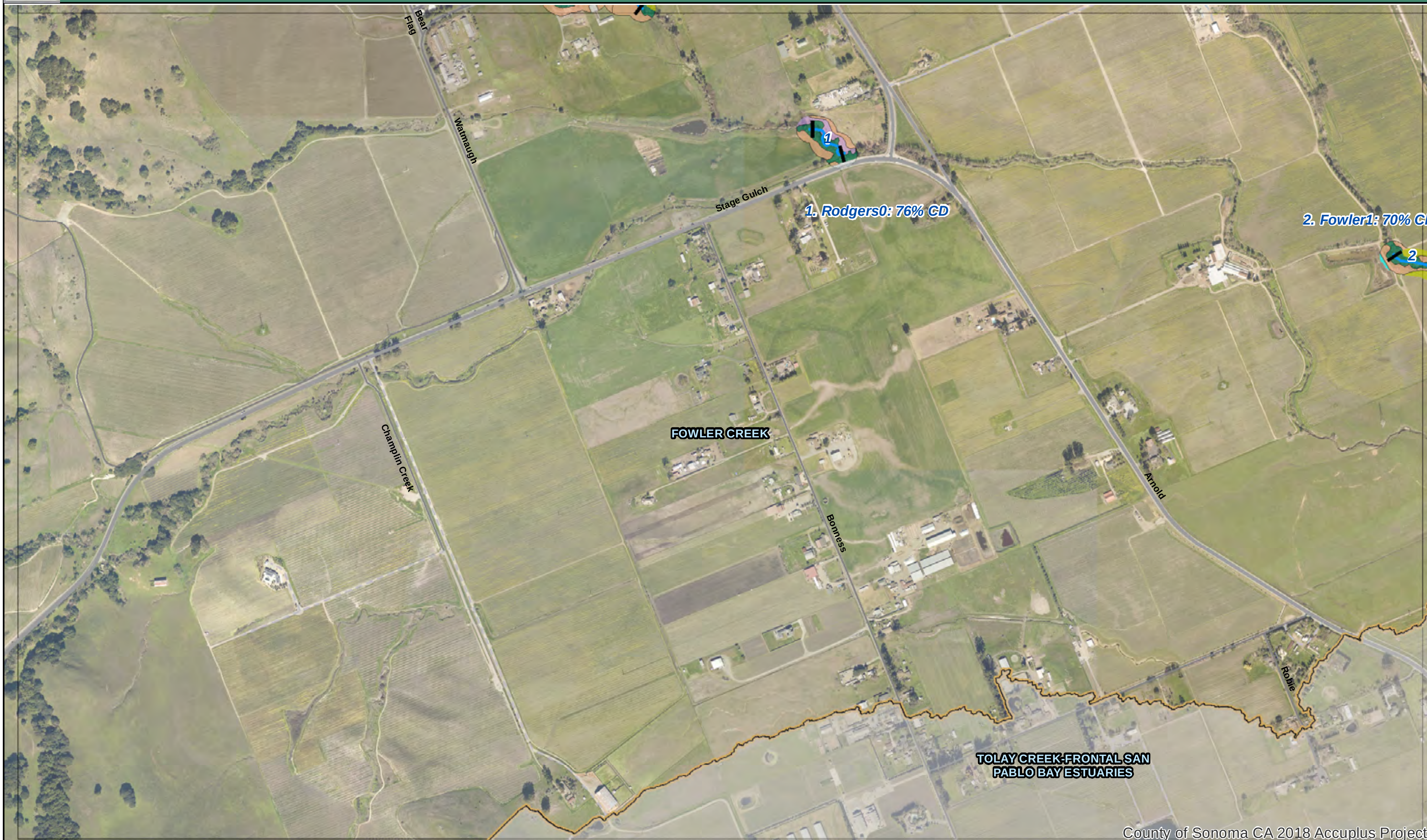
Feet

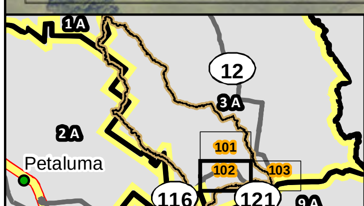
1 inch = 1,020 feet

Horizon

Sonoma County Water Agency

Stream Maintenance Program (SMP)

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**Vegetation Class**

Agriculture

Blackberry Scrub

Developed

Emergent Wetland

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-102

Reaches and Vegetation

Fowler Creek

N

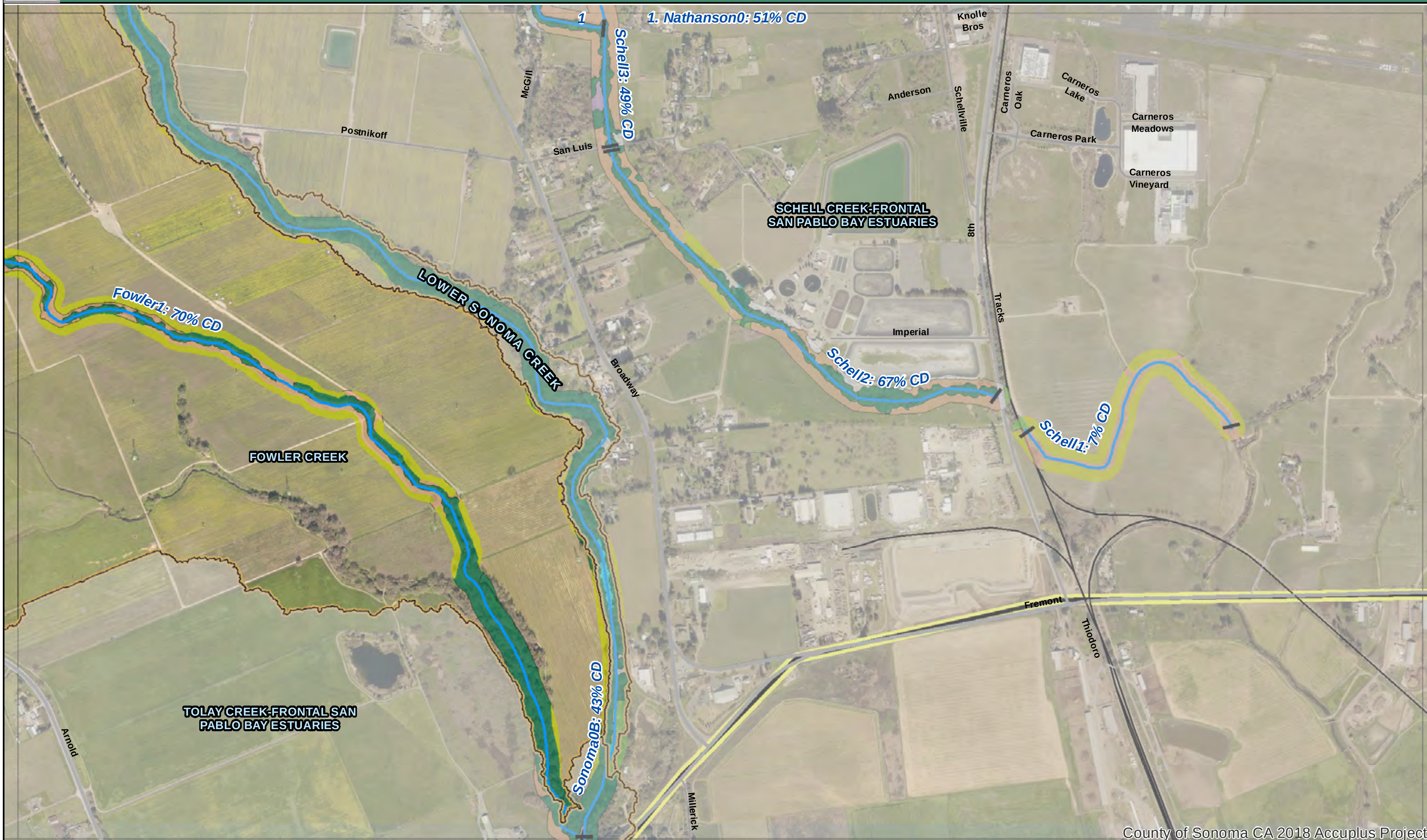
0 500 1,000 1,500 2,000

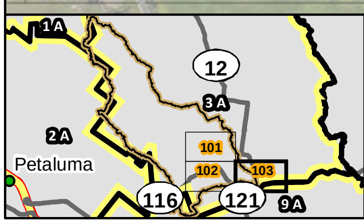
Feet

1 inch = 1,020 feet

# Sonoma County Water Agency

Stream Maintenance Program (SMP)




SMP Maintenance Reaches

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**Vegetation Class**

Agriculture

Blackberry Scrub

Developed

Emergent Wetland

Eucalyptus

Managed Mixed Riparian Woodland/Forest

Ruderal

Figure C-103

## Reaches and Vegetation

Fowler Creek

0 500 1,000 1,500 2,000

Feet

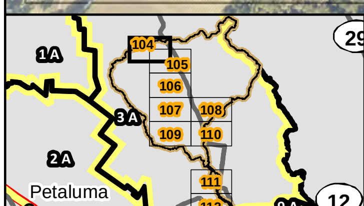
1 inch = 1,020 feet

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

# Sonoma County Water Agency

Stream Maintenance Program (SMP)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**Vegetation Class**

Developed

Emergent Wetland

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-104

Reaches and Vegetation

Lower Sonoma Creek

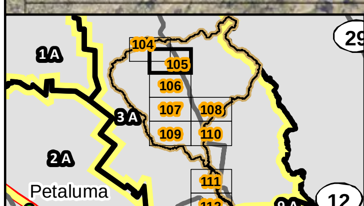
0 500 1,000 1,500 2,000

Feet

1 inch = 1,020 feet

Horizon

Sonoma County Water Agency Stream Maintenance Program (SMP)


SMP Maintenance Reaches

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**Vegetation Class**

Agriculture

Developed

Emergent Wetland

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-105

## Reaches and Vegetation

Lower Sonoma Creek

0 500 1,000 1,500 2,000

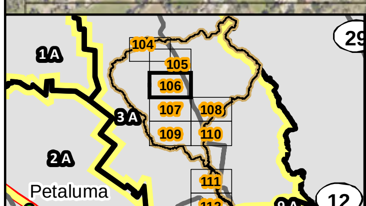
Feet

1 inch = 1,020 feet

Horizon

# Sonoma County Water Agency

Stream Maintenance Program (SMP)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**Vegetation Class**

Agriculture

Developed

Emergent Wetland

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-106

## Reaches and Vegetation

Lower Sonoma Creek

0 500 1,000 1,500 2,000

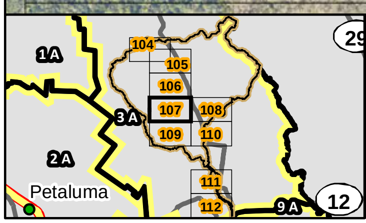
Feet

1 inch = 1,020 feet

Horizon

# Sonoma County Water Agency

Stream Maintenance Program (SMP)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**Vegetation Class**

Agriculture

Developed

Emergent Wetland

Managed Mixed Riparian Woodland/Forest

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-107

## Reaches and Vegetation

Lower Sonoma Creek

0 500 1,000 1,500 2,000

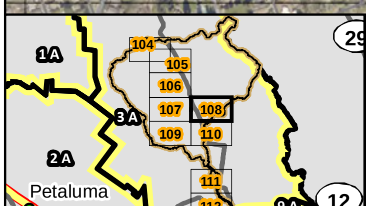
Feet

1 inch = 1,020 feet

Horizon

# Sonoma County Water Agency

Stream Maintenance Program (SMP)


SMP Maintenance Reaches

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**Vegetation Class**

Developed

Managed Mixed Riparian Woodland/Forest

Figure C-108

## Reaches and Vegetation

Lower Sonoma Creek

0 500 1,000 1,500 2,000

Feet

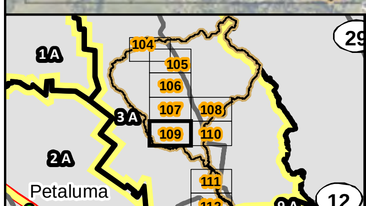
1 inch = 1,020 feet

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Sonoma County Water Agency

Stream Maintenance Program (SMP)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**Vegetation Class**

Agriculture

Developed

Emergent Wetland

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS
Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-109

Reaches and Vegetation

Lower Sonoma Creek

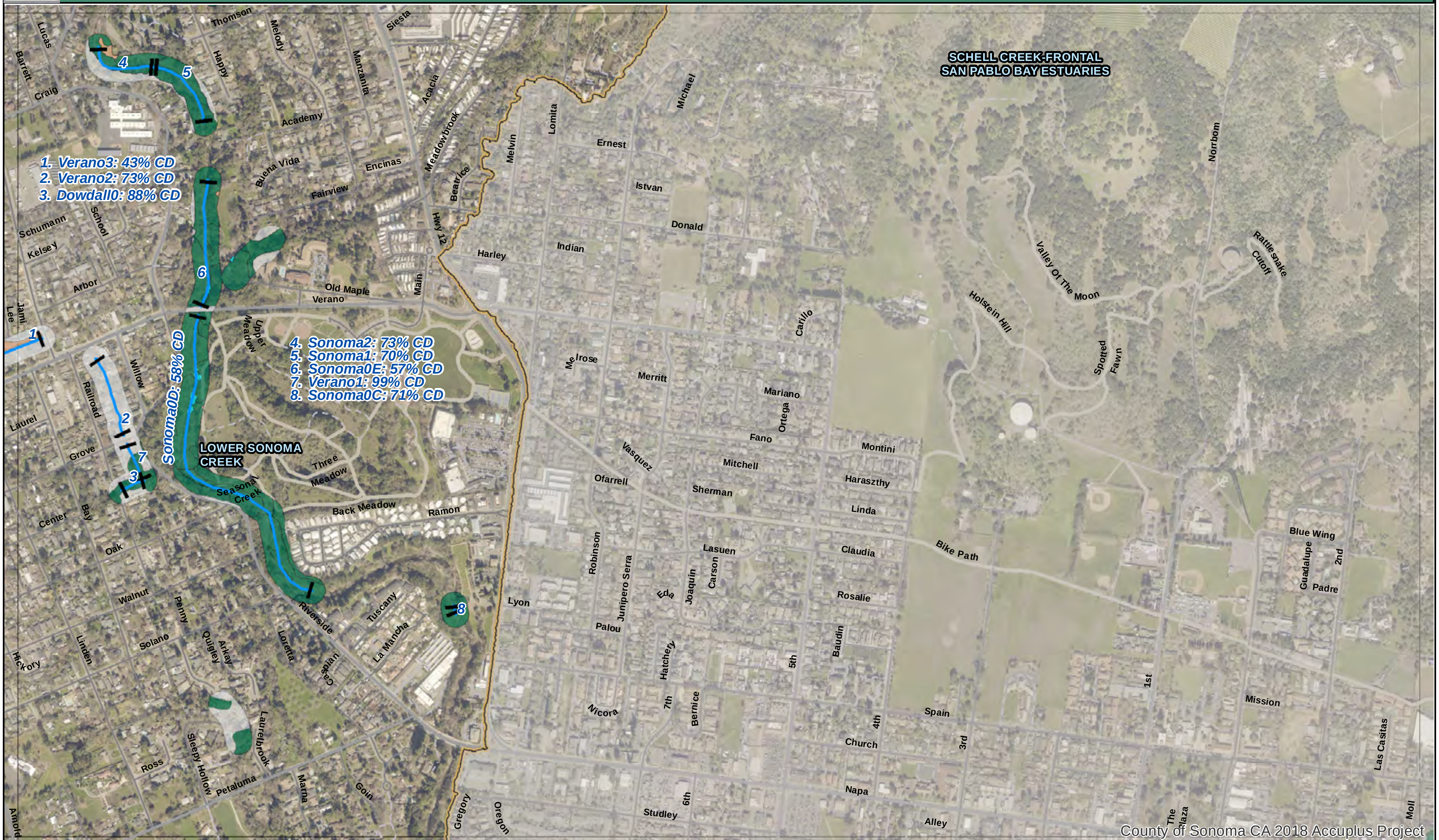
0 500 1,000 1,500 2,000

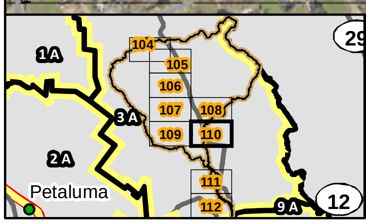
Feet

1 inch = 1,020 feet

# Sonoma County Water Agency

Stream Maintenance Program (SMP)




SMP Maintenance Reaches

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**Vegetation Class**

Developed

Emergent Wetland

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-110

## Reaches and Vegetation

Lower Sonoma Creek

0 500 1,000 1,500 2,000

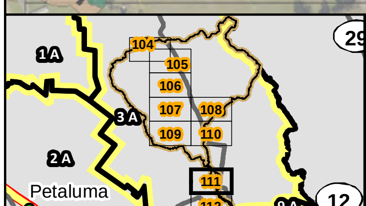
Feet

1 inch = 1,020 feet

Horizon

# Sonoma County Water Agency

Stream Maintenance Program (SMP)


SMP Maintenance Reaches

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**Vegetation Class**

Agriculture

Developed

Emergent Wetland

Eucalyptus

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-111

## Reaches and Vegetation

Lower Sonoma Creek

0 500 1,000 1,500 2,000

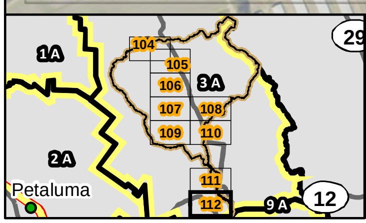
Feet

1 inch = 1,020 feet

Horizon

# Sonoma County Water Agency

Stream Maintenance Program (SMP)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**Vegetation Class**

Agriculture

Blackberry Scrub

Developed

Emergent Wetland

Eucalyptus

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-112

## Reaches and Vegetation

Lower Sonoma Creek

0 500 1,000 1,500 2,000

Feet

1 inch = 1,020 feet

# Sonoma County Water Agency

Stream Maintenance Program (SMP)


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**Vegetation Class**

Agriculture

Blackberry Scrub

Developed

Emergent Wetland

Eucalyptus

Managed Mixed Riparian Woodland/Forest

Ruderal

Figure C-113

## Reaches and Vegetation

Schell Creek-Frontal San Pablo Bay Estuaries

0 500 1,000 1,500 2,000

Feet

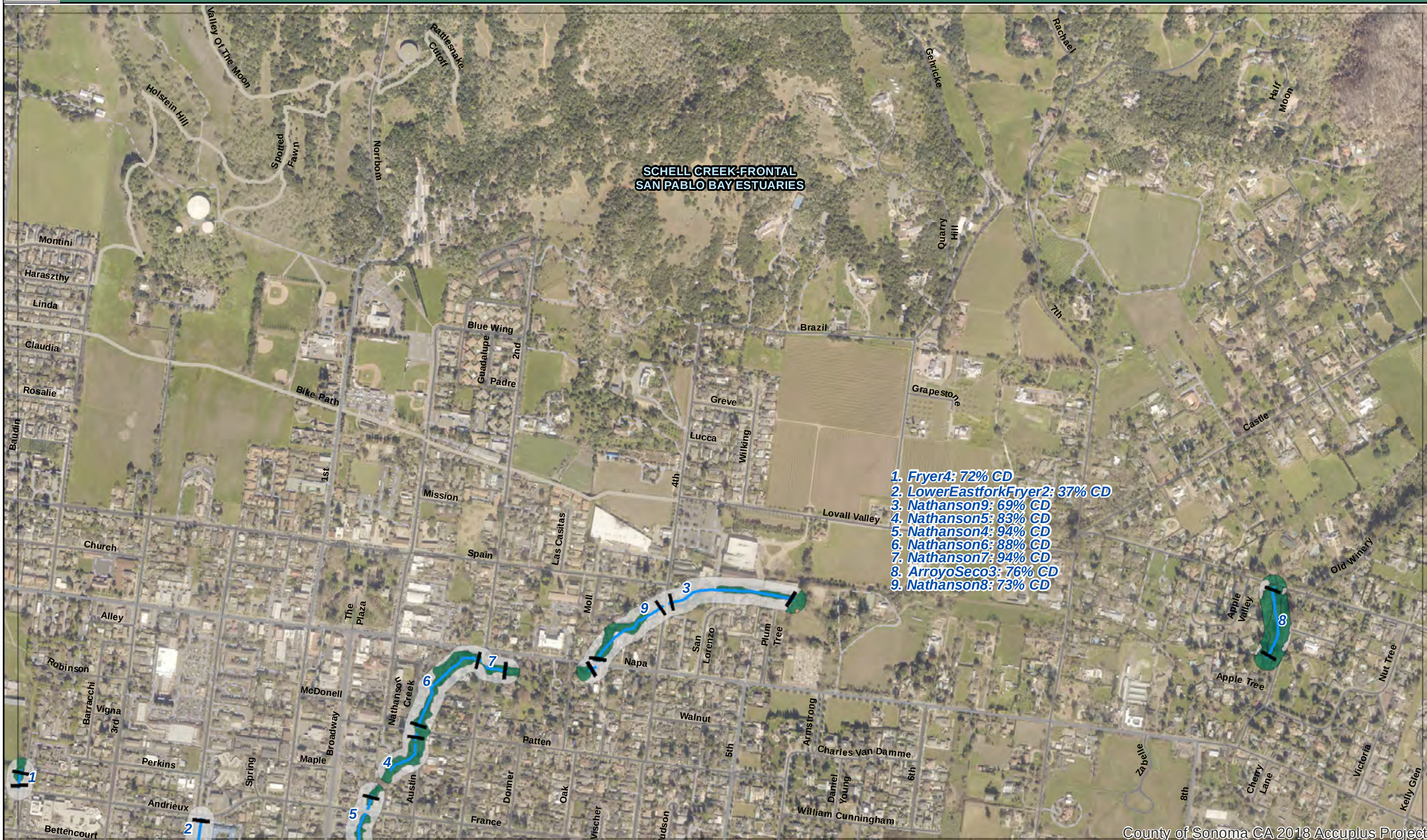
1 inch = 1,020 feet

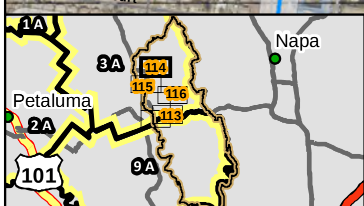
Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Sonoma County Water Agency

Stream Maintenance Program (SMP)

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**Vegetation Class**

Developed

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-114

Reaches and Vegetation

Schell Creek-Frontal San Pablo Bay Estuaries

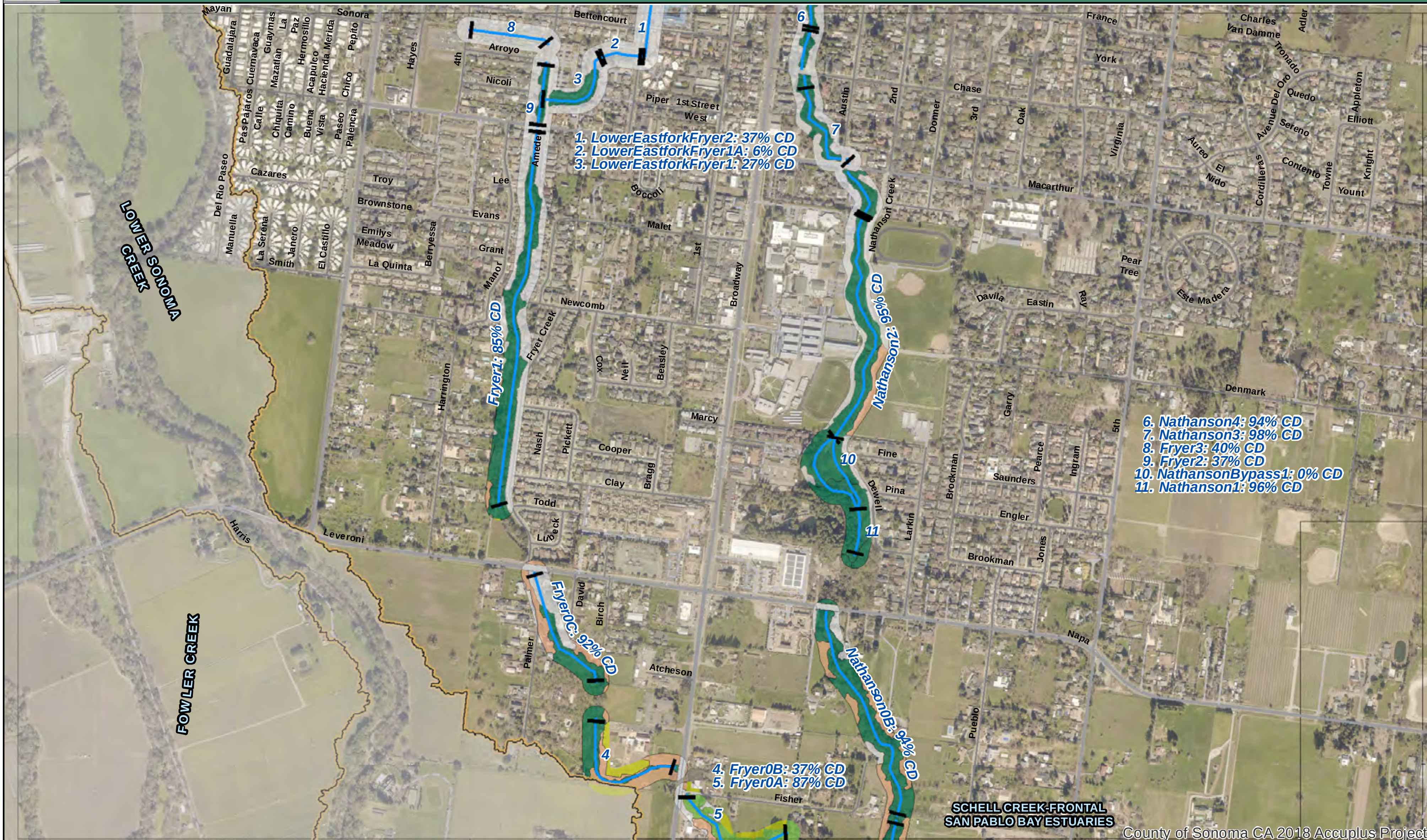
0 500 1,000 1,500 2,000

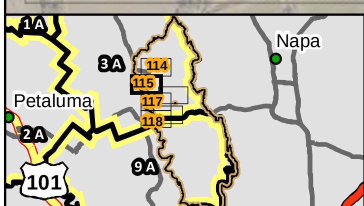
Feet

1 inch = 1,020 feet

# Sonoma County Water Agency

Stream Maintenance Program (SMP)




SMP Maintenance Reaches

Sub-Basin

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**Vegetation Class**

Agriculture

Developed

Eucalyptus

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-115

Reaches and Vegetation

Schell Creek-Frontal San Pablo Bay Estuaries

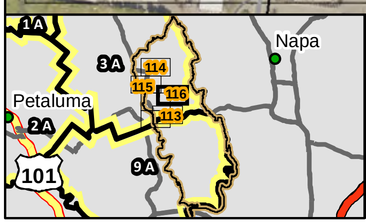
0 500 1,000 1,500 2,000

Feet

1 inch = 1,020 feet

Sonoma County Water Agency

Stream Maintenance Program (SMP)


SMP Maintenance Reaches

Sub-Basin

Flood Zones

Index

**Vegetation Class**

Agriculture

Developed

Eucalyptus

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-116

Reaches and Vegetation

Schell Creek-Frontal San Pablo Bay Estuaries

0 500 1,000 1,500 2,000

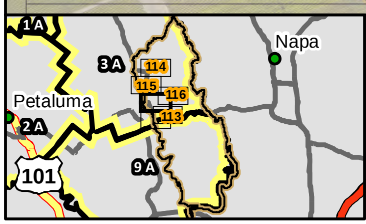
Feet

1 inch = 1,020 feet

Horizon

# Sonoma County Water Agency

Stream Maintenance Program (SMP)


SMP Maintenance Reaches

Sub-Basin

Flood Zones

Index

**Vegetation Class**

Agriculture

Blackberry Scrub

Developed

Emergent Wetland

Eucalyptus

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-117

## Reaches and Vegetation

Schell Creek-Frontal San Pablo Bay Estuaries

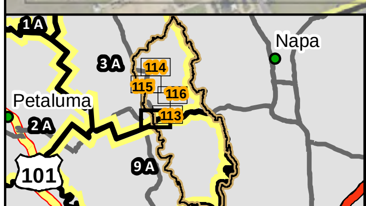
0 500 1,000 1,500 2,000

Feet

1 inch = 1,020 feet

# Sonoma County Water Agency

Stream Maintenance Program (SMP)


SMP Maintenance Reaches

Sub-Basin

Flood Zones

Index

**Vegetation Class**

Agriculture

Blackberry Scrub

Developed

Emergent Wetland

Eucalyptus

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-118

## Reaches and Vegetation

Schell Creek-Frontal San Pablo Bay Estuaries

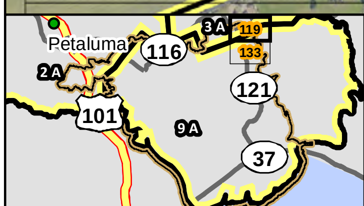
0 500 1,000 1,500 2,000

Feet

1 inch = 1,020 feet

# Sonoma County Water Agency

Stream Maintenance Program (SMP)


SMP Maintenance Reaches

Sub-Basin

Flood Zones

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**Vegetation Class**

Agriculture

Blackberry Scrub

Developed

Emergent Wetland

Eucalyptus

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-119

## Reaches and Vegetation

Tolay Creek-Frontal San Pablo Bay Estuaries

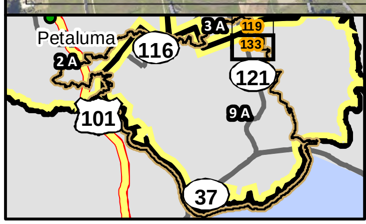
0 500 1,000 1,500 2,000

Feet

1 inch = 1,020 feet

# Sonoma County Water Agency

Stream Maintenance Program (SMP)


SMP Maintenance Reaches

Sub-Basin

Flood Zones

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**Vegetation Class**

Agriculture

Emergent Wetland

Managed Mixed Riparian Woodland/Forest

Ruderal

Figure C-120

Reaches and Vegetation

Tolay Creek-Frontal San Pablo Bay Estuaries

0 500 1,000 1,500 2,000

Feet

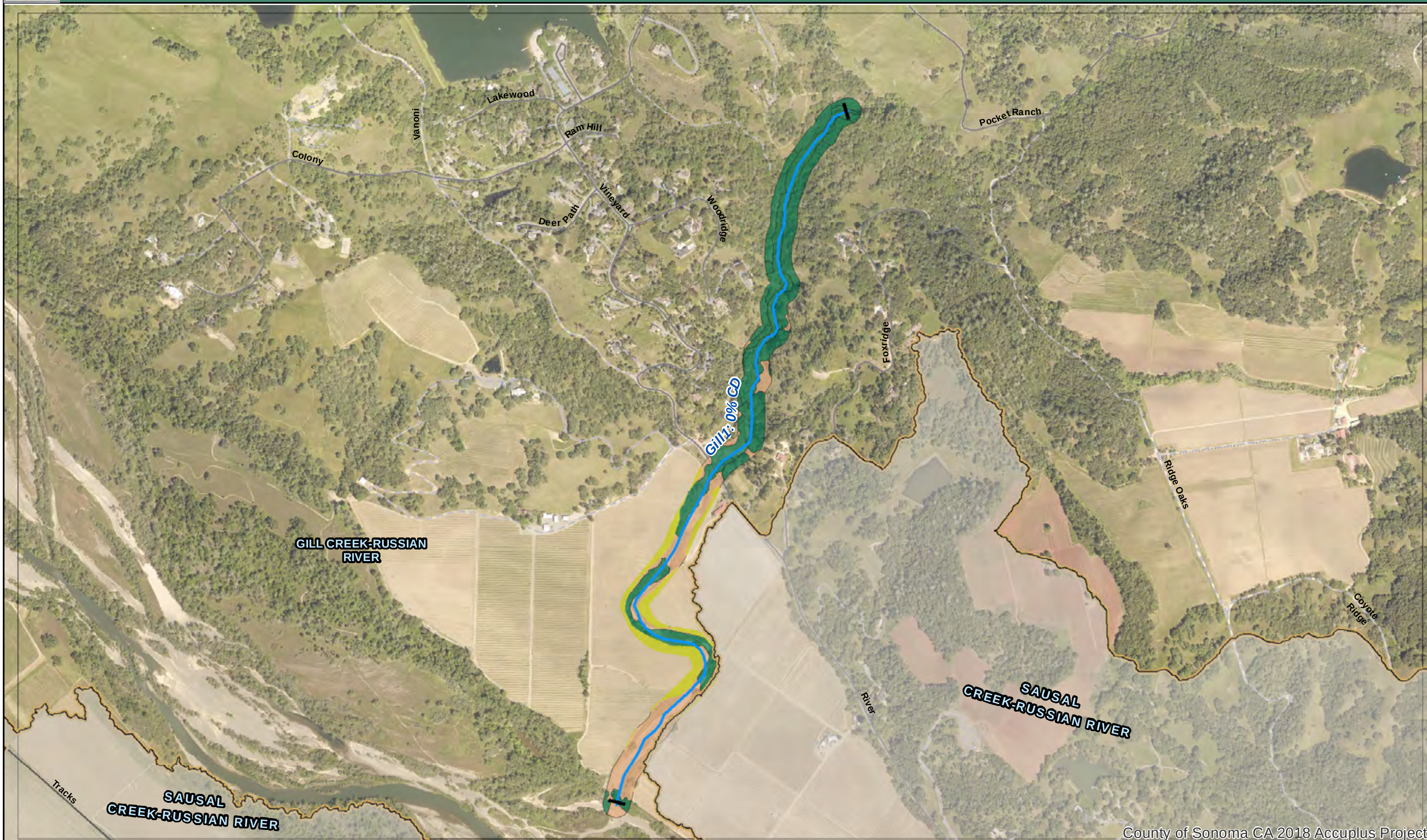
1 inch = 1,020 feet

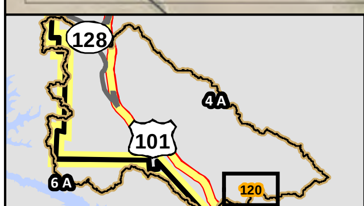
Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

# Sonoma County Water Agency

Stream Maintenance Program (SMP)




SMP Maintenance Reaches

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Flood Zones

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**Vegetation Class**

Agriculture

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-121

## Reaches and Vegetation

Gill Creek-Russian River

0 500 1,000 1,500 2,000

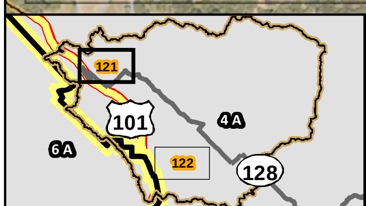
Feet

1 inch = 1,020 feet

Horizon

# Sonoma County Water Agency

Stream Maintenance Program (SMP)


SMP Maintenance Reaches

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**Vegetation Class**

Agriculture

Developed

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-122

## Reaches and Vegetation

Sausal Creek-Russian River

0 500 1,000 1,500 2,000

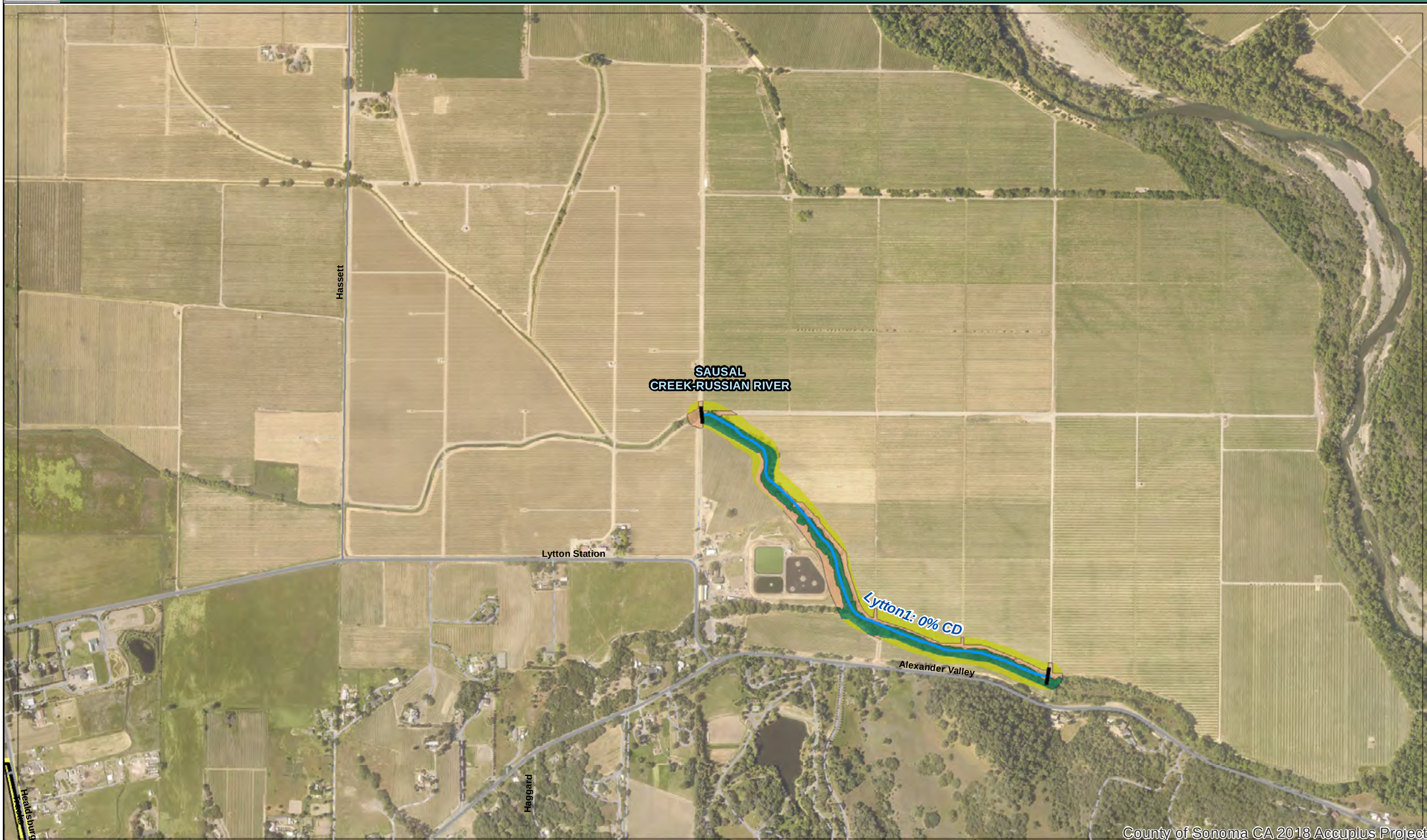
Feet

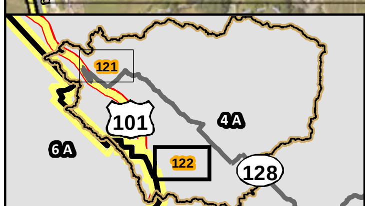
1 inch = 1,020 feet

Horizon

# Sonoma County Water Agency

Stream Maintenance Program (SMP)




SMP Maintenance Reaches

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**Vegetation Class**

Agriculture

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-123

## Reaches and Vegetation

Sausal Creek-Russian River

0 500 1,000 1,500 2,000

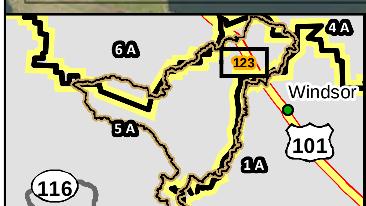
Feet

1 inch = 1,020 feet

Horizon

# Sonoma County Water Agency

Stream Maintenance Program (SMP)


SMP Maintenance Reaches

Sub-Basin

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**Vegetation Class**

Agriculture

Blackberry Scrub

Developed

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-124

## Reaches and Vegetation

Porter Creek-Russian River

0 500 1,000 1,500 2,000

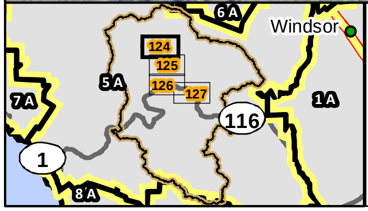
Feet

1 inch = 1,020 feet

Horizon

# Sonoma County Water Agency

Stream Maintenance Program (SMP)


SMP Maintenance Reaches

Sub-Basin

Flood Zones

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**Vegetation Class**

Agriculture

Developed

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-125

## Reaches and Vegetation

Dutch Bill Creek-Russian River

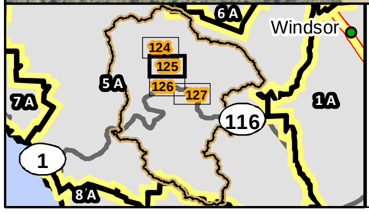
0 500 1,000 1,500 2,000

Feet

1 inch = 1,020 feet

# Sonoma County Water Agency

Stream Maintenance Program (SMP)


SMP Maintenance Reaches

Sub-Basin

Flood Zones

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**Vegetation Class**

Agriculture

Developed

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-126

## Reaches and Vegetation

Dutch Bill Creek-Russian River

0 500 1,000 1,500 2,000

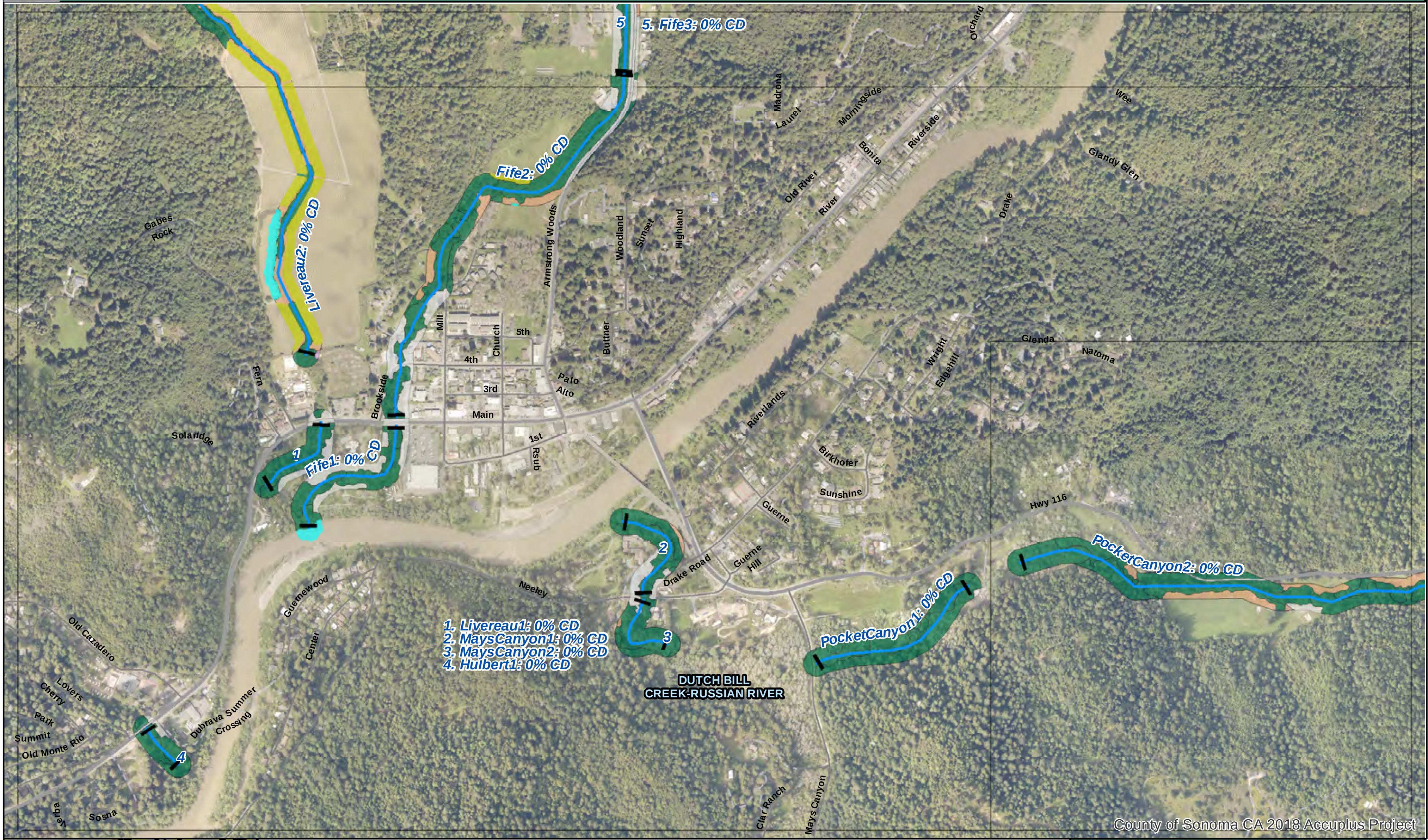
Feet

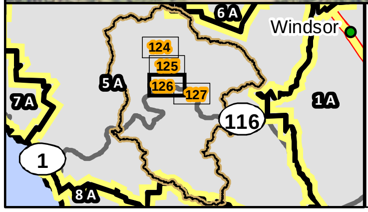
1 inch = 1,020 feet

Horizon

# Sonoma County Water Agency

Stream Maintenance Program (SMP)




SMP Maintenance Reaches

Sub-Basin

Flood Zones

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**Vegetation Class**

Agriculture

Blackberry Scrub

Developed

Emergent Wetland

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-127

## Reaches and Vegetation

Dutch Bill Creek-Russian River

0 500 1,000 1,500 2,000

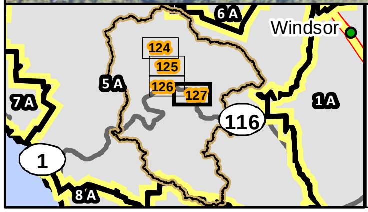
Feet

1 inch = 1,020 feet

Horizon

# Sonoma County Water Agency

Stream Maintenance Program (SMP)


SMP Maintenance Reaches

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**Vegetation Class**

Blackberry Scrub

Developed

Emergent Wetland

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-128

## Reaches and Vegetation

Dutch Bill Creek-Russian River

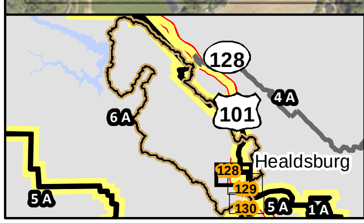
0 500 1,000 1,500 2,000

Feet

1 inch = 1,020 feet

Horizon

Sonoma County Water Agency Stream Maintenance Program (SMP)


SMP Maintenance Reaches

Sub-Basin

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**Vegetation Class**

Agriculture

Developed

Emergent Wetland

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS
Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

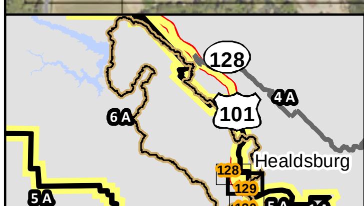
Figure C-129
Reaches and Vegetation
West Slough-Dry Creek

0 500 1,000 1,500 2,000
Feet
1 inch = 1,020 feet

Horizon

Sonoma County Water Agency

Stream Maintenance Program (SMP)


SMP Maintenance Reaches

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Flood Zones

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**Vegetation Class**

Agriculture

Blackberry Scrub

Developed

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-1**30**

Reaches and Vegetation

West Slough-Dry Creek

0 500 1,000 1,500 2,000

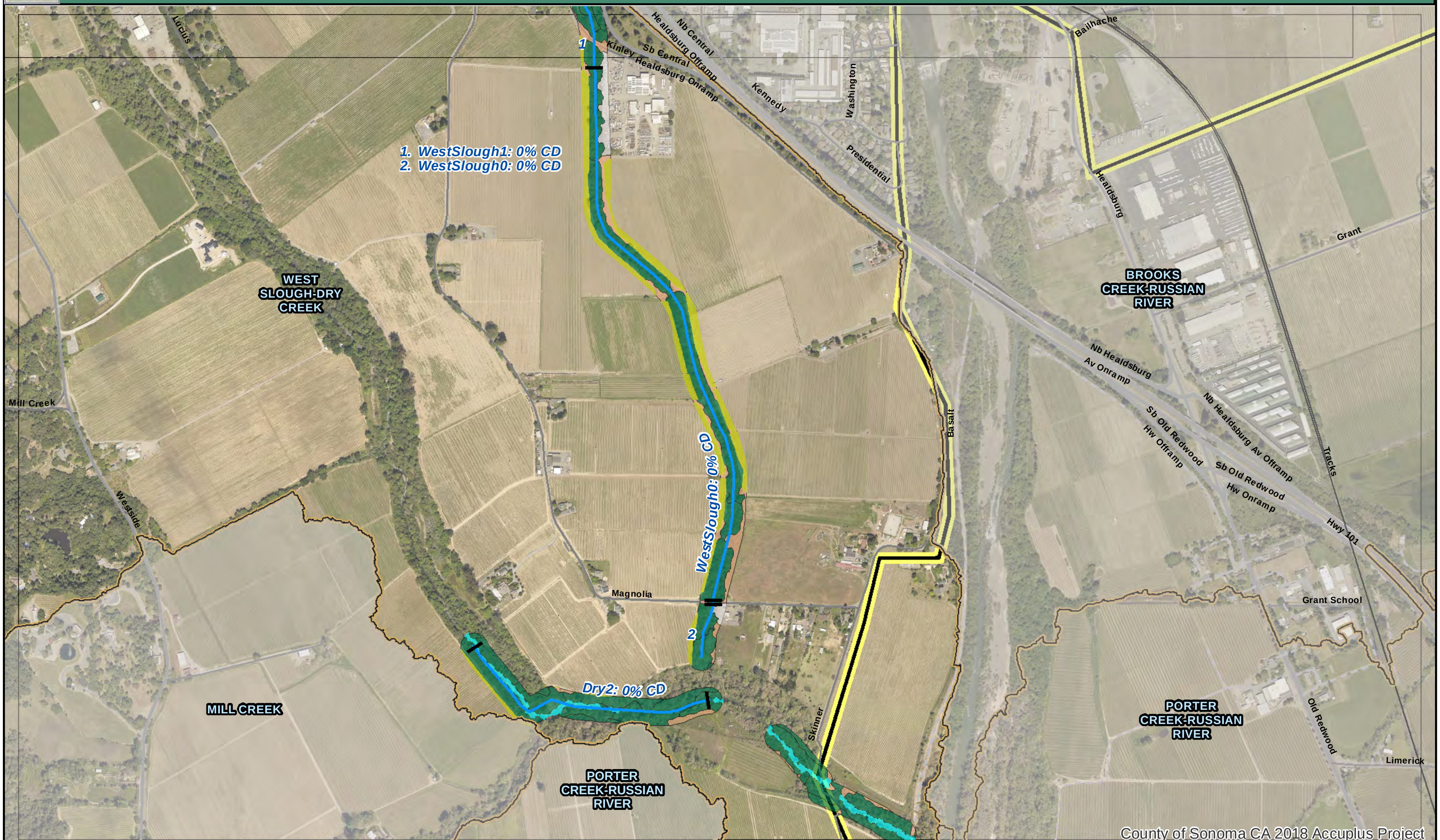
Feet

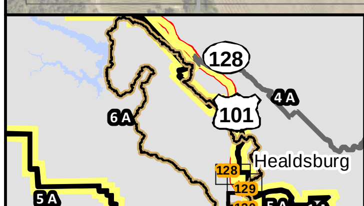
1 inch = 1,020 feet

Horizon

# Sonoma County Water Agency

Stream Maintenance Program (SMP)




SMP Maintenance Reaches

Sub-Basin

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**Vegetation Class**

Agriculture

Developed

Emergent Wetland

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-131

## Reaches and Vegetation

West Slough-Dry Creek

0 500 1,000 1,500 2,000

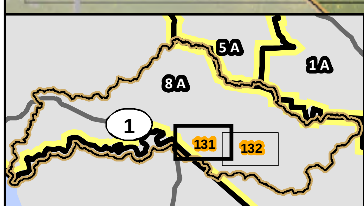
Feet

1 inch = 1,020 feet

Horizon

# Sonoma County Water Agency

Stream Maintenance Program (SMP)


SMP Maintenance Reaches

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**Vegetation Class**

Agriculture

Developed

Emergent Wetland

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-132

## Reaches and Vegetation

Estero Americano

0 500 1,000 1,500 2,000

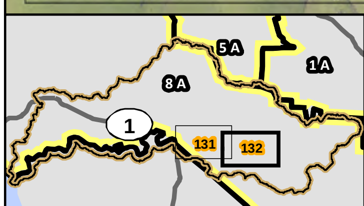
Feet

1 inch = 1,020 feet

Horizon

# Sonoma County Water Agency

Stream Maintenance Program (SMP)


SMP Maintenance Reaches

Sub-Basin

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**Vegetation Class**

Agriculture

Blackberry Scrub

Developed

Emergent Wetland

Managed Mixed Riparian Woodland/Forest

Ruderal

Sources: Sonoma County Water Agency; Sonoma County GIS

Note: % CD = Percent Canopy Density (as of August 2019); 0% CD indicates that data is unavailable for the particular reach.

Figure C-133

Reaches and Vegetation

Estero Americano

0 500 1,000 1,500 2,000

Feet

1 inch = 1,020 feet

Horizon

# Airport Creek – Reaches 2 & 1

**JURISDICTION:** Easement and maintained by SCWA

**LOCATION:** Airport 2: from Skylane Blvd. downstream approx. 300 ft.

Airport 1: from railroad tracks to Skylane Blvd.

**ADJACENT LAND USE:** Industrial

**UPSTREAM:** Localized drainage from developed flats (no clear sign of a channel)

**LENGTH:** Airport 2: 2,157 ft. (but SCWA maintenance easement only on upper 300 ft. of Reach 2)

Airport 1: 300 ft

**CHANNEL EASEMENT CORRIDOR WIDTH:**
Airport 2: 89 ft

Airport 1: 71 ft

**AVERAGE TOP-OF-BANK WIDTH:**
Airport 2: 73 ft

Airport 1: 66 ft

(b) Near the top of the reach looking downstream. Notice the engineered trapezoidal channel configuration and abundance of cattails growing across the flat channel bottom. Although this reach has very little riparian growth, plant poplars and oaks as well as willows appear to be thriving along a small section of creek (see photo c) (May 13, 2008).

**MAINTENANCE HISTORY**

(a) Upper Reach 2 looking upstream to concrete apron that marks the beginning of SCWA's easement. Area upstream of apron channel appears more like a shallow swale across the lower plain. Broad and wide channel. Note recently cut cattails in the channel re-growing and entering culvert in the lower right (May 13, 2008).

**PHYSICAL CONDITIONS**

*Reach setting:* Reaches 1 and 2 of Airport Creek appear to receive much of their flow from a mix of runoff from residential, industrial, and agricultural lands along the flat alluvial plain. The channel upstream of the engineered easement appears to originate west of Highway 101 as a swale across flat pasture. Downstream of the railroad tracks, the channel is fed by numerous storm drains from adjacent industrial complexes.

*Active channel:* 15-20 ft wide, water depths 0-6 in.

*Bed sediments/texture:* fine materials such as silt and mud line the channel bottom

*Bank/bed structure:* straight, trapezoidal engineered channel with earthen banks and some concrete at the upstream end of Reach 2 (photo a); bank slopes are not too steep 2:1 (photo b); channel cross section appears to become more shallow in the downstream direction toward Skylane Boulevard with increased sediment deposition across the channel in the lower reach.

*Water quality:* while no obvious impairments to water quality were observed, the majority of flow appears to be runoff from industrial complexes, which may result in impaired water quality; little active flow and shallow conditions could exacerbate these conditions.

*Channel processes:* This reach has clearly aggraded since it was built, and the Skylane culvert functions effectively as a hydraulic constraint, slowing flows and fostering deposition. There are no observable sediment bars; instead the sediment appears to be building from the culvert upstream.

## Biological Conditions

*Vegetation composition:* Ruderal grassland along most of the creek; in the middle part of Reach 2, some riparian woodland has developed due to willow growth along the channel margins and a variety of past plantings. Cattails fill the entire channel bottom.

*Riparian corridor and canopy closure:* Lack of tree growth leads to almost no canopy along the channel, except for the patch of willow creating approximately 25% closure for about 200 ft in the middle of Reach 2.

*Instream habitat:* The channel is straight and uniform with no pools, no shade and no deep water. This channel is likely dry or nearly dry during the summer/fall. It is bounded by the railroad tracks to the east and industrial development to the north and south. Although habitat conditions for fish, amphibians and reptiles are currently poor, wildlife could use this channel as a corridor between the pasture upstream and downstream habitats.

*Listed species with potential to occur*: Both reaches are potential habitat for western pond turtle; California tiger salamander are unlikely to occur in the upland habitat of either reach. Airport 2 is potential habitat for listed plant species.

(c) Middle of the reach, looking upstream. Although woody riparian species are limited throughout much of this reach, a 200+ft section in the middle of Reach 2 contains a dense patch of willows near the toe of slope and planted oaks and poplars at top of bank (May 13, 2008).

(d) Looking downstream at the culvert under Skylane Blvd. This aluminum arch is heavily impacted (as of 11/07) by sediment and cattail growth. It looks as though the culvert has lost at least ¾ of its capacity and the road bed is within a few feet of the top of the culvert. There is also a large sediment wedge on the downstream side of the culvert (May 13, 2008).

## Management Considerations and Opportunities

Management considerations for Airport Creek Reaches 1 and 2 focus on vegetation removal throughout the reach and sediment removal near the Skylane Blvd culvert crossing. Due to lack of sinuosity, complexity, and shade, a number of treatments could be used to improve habitat conditions and reduce in-channel emergent vegetation growth. Aggressive planting with riparian species to provide shade and habitat would help control cattail growth and increase the value of these reaches as a migration corridor.

# Bellevue-Wilfred Channel – Reach 4

**JURISDICTION:** SCWA owned and maintained

**LOCATION:** Unincorporated county area; reach is from Todd Cr./Wilfred Cr confluence (photo a) to Millbrae Ave Crossing (photo d)

**ADJACENT LAND USE:** Agriculture: grazing/pasture

**UPSTREAM:** Todd Cr Reach 1 & 2 and lower concrete section of Wilfred Creek

**LENGTH:** 2,385 ft

**CHANNEL EASEMENT CORRIDOR WIDTH:** 121 ft

**AVERAGE TOP-OF-BANK WIDTH:** 79 ft

(a) Upper end of Reach 4, looking upstream to Todd Cr Reach 1 (left) and Wilfred Cr (at center); note drop structure at base of Wilfred Cr. and sediment wedge at confluence (March 14, 2007).

(b) Reach 4 looking downstream from first bend at railroad crossing; note wide channel, 10-12 ft below banks, with small point bar forming at inside of meander bend; riprap seen along outside bank (lower left); flow depth is 1-2 ft deep (March 14, 2007).

## MAINTENANCE HISTORY

## PHYSICAL CONDITIONS

*Reach setting:* reach flows through low gradient topography of the lower alluvial plain; receives input flows from Wilfred Cr. and Todd/Hunter systems upstream; reach is northern branch of Upper Laguna system and experiences backwatering.

*Active channel:* ~30 ft wide, with 10-12 ft high banks, flows observed were 1-2 ft deep.

*Bed sediments/texture:* mostly silts and muds, with some sands collecting on bars or through thalweg.

*Bank structure:* 1.5:1 to 2:1 or steeper trapezoidal earthen slopes (photo b); occasional rock slope protection along outer channel bends; concrete reinforcement at Todd/Wilfred confluence.

*Water quality (qualitative):* turbidity moderate to low, water is generally flowing and not stagnating.

*Channel processes:* engineered channel with modest sinuosity that may follow historic stream alignment; aside from the depositional wedge at confluence of Todd and Wilfred creeks, deposition is limited to a few point bar formations formed at channel bends; with bars increasing in size and height moving downstream.

## BIOLOGICAL CONDITIONS

*Vegetation composition:* Riparian habitat in reach is dominated by herbaceous ruderal species with occasion riparian trees and shrubs including oaks and walnuts.

*Riparian corridor and canopy closure:* Limited woody canopy, with interspersed riparian shrubs and trees growing on the banks, has little to no canopy closure; riparian corridor is limited to toe of slope to levee hinge point (~15 ft) on each side.

*Instream habitat:* Reach maintains some sinuosity with related pools and shallower riffles; the reach contains several wide sections with 1-2 ft deep shallow runs; no coarse substrate observed in the channel; aquatic habitat is limited to shallow submerged bars, long runs, and occasional pools.

*Listed species with potential to occur:* Potential habitat for western pond turtle; moderate to high likelihood for occurrence of California tiger salamader in potential upland habitat.

(c) Mid Reach 4 looking downstream; note pool formed by large sediment and debris wedge blocking flows. Pool depths are in excess of 6 ft (March 14, 2007).

(d) Lower Reach 4 looking downstream to Millbrae Avenue; note large "D-shaped" bar along base of left bank where sediments collect on inner bend of channel (March 14, 2007).

### MANAGEMENT CONSIDERATIONS AND OPPORTUNITIES

Management considerations and opportunities for Bellevue-Wilfred Reach 4 are not extensive. There is a large sediment and debris blockage in the middle of the reach (photo c) but this dam and pooling do not appear to be creating any immediate flow hazard. This blockage should be monitored and may eventually require some clearing. Upper Reach 4 appears to have a steeper gradient than the lower Reach 4. The upper reach has some sinuosity and stream velocities under lower-flow conditions appear to be adequate to prevent settling and enable transport of finer sediments downstream. Besides the potential removal of sediment/debris at the blockage noted above, another opportunity includes enhancing the woody riparian corridor which is often lacking. Planting of riparian trees along the upper banks could benefit water quality and enhance habitat for a suite of species. Trash, plastic and other debris are observed in the lower reach and may need removal.

# *Piner Creek – Reaches 8 & 7*

**JURISDICTION:** Owned in-fee by SCWA

**LOCATION:** Reach 8: ~200 ft of channel just upstream of Santa Rosa city limits, west of Hwy 101

Reach 7: Airway Dr. to Hopper Ave.

**ADJACENT LAND USE:** Hwy 101 to the east and commercial office park to the west

**UPSTREAM:** Culvert under Hwy 101

**LENGTH:** Piner 8: 463 ft.

Piner 7: 1,261 ft.

**CHANNEL EASEMENT CORRIDOR WIDTH:**
Piner 8: 53 ft.

Piner 7: 81 ft.

**AVERAGE TOP-OF-BANK WIDTH:**
Piner 8: 46 ft.

Piner 7: 56 ft.

(b) Upper Reach 7 looking downstream: linear, trapezoidal channel is dry and choked with rushes and grasses. Several recent additions of rip-rap along banks (see left bank below the second tree) (August 2008).

(a) Piner Cr. Reach 8 looks more like a seasonal swale than a typical flood control channel. Reach 8 was mostly dry in Aug 2008 with stands of cattails where the channel was still wet. The narrow channel includes rip-rap on the bed and banks (August 2008).

**PHYSICAL CONDITIONS**

*Reach setting:* East of Hwy 101 Piner Cr. drains suburban developments and grasslands before reaching Hwy 101. At 101, the channel becomes a series of swales/culverts, becoming a more typical flood control channel by mid Reach 7.

*Active channel*: ~1-2 ft wide in Reach 8 increasing to ~4-8 ft wide in Reach 7 with surface water depths from 0” -2’ (photo b, c and d).

*Bed sediments/texture:* Reach 8 generally mud and organic matter on the bed with some sloughed rip-rap; Reach 7 eroded rip-rap and silts.

*Bank structure:* slopes are steep from 1:1 to vertical with either rip-rap or earthen banks (photo a and b).

*Channel processes:* Piner 8 and 7 are both straightened, engineered channels with Reach 7 conveying greater flow than 8. Lower sections of Reach 7 have sediment bars and pool sequences (photo d). Reach 7 has several eroding banks, with depositional bars forming at the toe of slope.

*Water quality (qualitative):* poor with surface water generally stagnant, brown and full of algae in August 2008.

### BIOLOGICAL CONDITIONS

*Instream Habitat:* Aquatic habitat in Reach 8 is limited to a few very small shallow pools during the dry season, and a sequence of pools/swale in the winter, temporarily detaining runoff. Reach 7 has very limited aquatic habitat along the upper 350', and the lower reach is dominated by shallow, stagnant water and small pools. Sediment deposits and toe-of-bank bars do provide limited complexity to the channel.

*Vegetation composition:* These reaches support a narrow and sparse riparian corridor along the immediate bank; the corridor becomes more vegetated moving downstream; with sparse oaks, maples, weeping willows, and acacia and the understory is dominated by bare dirt, teasel, blackberry, and annual grasses (photos b/c). Instream vegetation is dominated by cattails and tules with grasses growing on larger sediment bars (photo d).

*Riparian corridor and canopy closure:* 0-10ft. wide corridor on each bank with very limited canopy closure ranging from 0% (dominant case) to 25% (rare). The higher canopy coverage is at lower Reach 7.

*Listed species with potential to occur:* salmonids are not known from these reaches and occurrence is unlikely due to lack of spawning or rearing habitat. Reach 8 contains significant burrows and is adjacent to grasslands that could support California tiger salamander.

(c) Lower Reach 7 looking upstream. Eroded rip-rap extends into channel; several rip-rap banks appear unstable in many locations; water quality appears poor with brown stagnant water and extensive algal growth (August 2008).

(d) Lower Reach 7 looking downstream toward the Hopper Avenue Bridge. Photo shows transition between an open water pool and a large, vegetated (with grasses) sediment wedge approx 2-3 ft high; this deposit stretches from the Hopper Ave Bridge 75 ft. upstream (August 2008).

### MANAGEMENT CONSIDERATIONS AND OPPORTUNITIES

There are no urgent management considerations for Piner Creek Reach 8 at this time. Management considerations for Piner Creek Reach 7 include periodic inspection of banks for instability and focused sediment removal upstream of Hopper Ave. The current sediment wedge upstream of Hopper Ave. extends nearly 75 upstream and ranges from 2-3 ft. in height. Vegetation management may be necessary in Reach 7 if extensive cattail and tule growth impedes flow through the channel. Since these reaches do not appear to support much biological diversity, enhancements such as increased canopy might benefit an array of riparian species.

# *Santa Rosa Creek – Reaches 3 & 2*

**JURISDICTION:** Owned in-fee by SCWA

**LOCATION:** Santa Rosa 3: Marlow Road to Fulton Road

Santa Rosa 2: Fulton Road to Willowside

**ADJACENT LAND USE:** Mix of Residential and Park/Percolation Ponds

**UPSTREAM:** Santa Rosa Creek Reach 4

**LENGTH:** Santa Rosa 3: 8,750 ft.

Santa Rosa 2: 11,081 ft.

**CHANNEL EASEMENT CORRIDOR WIDTH:**
Santa Rosa 3: 141 ft.

Santa Rosa 2: 223 ft.

**AVERAGE TOP-OF-BANK WIDTH:**
Santa Rosa 3: 94 ft.

Santa Rosa 2: 158 ft.

(b) Reach 3, looking across the channel upstream from College Creek confluence. Notice how the dense riparian vegetation along the banks in photo (a) has been replaced by ruderal grassland type vegetation and the presence of a d-bar constricting flow to a small 2-3 wide vegetated channel with large open channel segments both upstream and downstream (9/29/08).

**MAINTENANCE HISTORY**

(a) Reach 3, looking downstream from just below the Marlow Road Bridge. Note the rip rap and swiftly flowing water observed in September 2008. Sediment deposition appears to be limited to small margin bars (both banks), and a moderate channel gradient leading to an open uniform channel geometry (9/29/08).

**PHYSICAL CONDITIONS**

*Reach setting:* Reaches 3 and 2 are located just west of downtown Santa Rosa, flow in a westerly direction, and mark the transition between the higher gradient urban upstream reaches and the lower gradient/lagoon agricultural reaches. These reaches are highly modified, straightened, flow between high, steep banks (photo b) and drain a number of tribs from the north including College, Piner, Peterson, and Abramson Creeks.

*Active channel:* Open water areas range between ~14 and 25 ft wide (photos a and d) with confined low flow channels 4 to 8 ft wide (photos b and c); depths range from 6 in. to 3 ft.

*Bed sediments/texture:* dominated by a mix of gravel, sand, and silt with extensive gravel and sand bars forming throughout.

*Bank structure:* slopes are generally between 2:1 and 1:1 with soil over rip-rap (photo b).

*Channel processes:* The major forces at play in these reaches are natural channel restoration and the increasing influence of lagoonal forces. In Reach 3, the bars and wedges are smaller and flow is generally more uniform, whereas in Reach 2, where gradient decreases and backwater effects begin to play out, bars become the dominate in-channel feature with large heavily vegetated bars on alternating banks (photos c and d). Limited instream management in concert with canopy enhancement efforts, has allowed the channel to begin "re-naturalizing" within the larger engineered x-section.

*Water quality (qualitative):* worsening downstream with significant stagnation observed in August 2008 in lower Reach 2.

## BIOLOGICAL CONDITIONS

*Instream Habitat:* Aquatic habitat in these reaches increases in quality and quantity moving downstream. Whereas upper Reach 3 contains limited complexity with a shallow uniform trapezoidal geometry (photo a and b), by mid-Reach 2 the channel contains a mix of bars, pools, riffles, undercut banks, hanging vegetation, etc., leading to improved aquatic habitat conditions (photos c and d).

*Vegetation composition:* Woody riparian vegetation is intermittent in Reach 3 with many areas of sparse growth (photo b) and some areas of moderate growth (photo a). In Reach 2, most of the banks are covered in dense shrub or woody riparian species including willows and alders along the toe of slope and a mix of oaks, maples, and weeping willows on the banks (photo d). Bank understory or non-woody vegetation includes annual grasses, blackberry, and a mix of ruderal species. Bars and wedges are heavily vegetated with cattails, sweet clover, and arroyo willow.

*Riparian corridor and canopy closure:* 15-40 ft. wide with an assortment of low floodplains and higher terraces; canopy is generally denser on southern banks and ranges from 0-25% closure in many locations to segments with full canopy (i.e. >75%).

*Listed species with potential to occur:* Reach 2 has a moderate to high likelihood of California tiger salamander in the potential upland habitat, they are unlikely to occur in reach 3; Both reaches have known steelhead occurrence (reaches are migration corridor with potential rearing habitat); Coastal Chinook observed in both reaches (reaches are migration corridor with potential spawning and rearing habitat; potential habitat for western pond turtle and listed plant species.

(c) Reach 2, about 500 ft downstream of Fulton Road Bridge, looking across the channel from a large vegetated bar to another large bar just downstream. At this location, the low flow channel has gone from being about 25 ft wide to about 8 ft wide due to confinement between alternating d-bars (8/21/08).

(d) Lower Reach 2, looking downstream from just upstream of the Abramson Creek confluence. Notice the large stand of cattails in the background and the stagnant "pool" in the foreground. Beyond the photo the cattail bar reduced the low flow channel from ~ 20 ft wide to ~6 ft wide creating a significant flow impediment and creating the stagnant conditions upstream. This photo is typical of the pool and wedge/bar geometry common to Reach 2 (8/21/08).

### MANAGEMENT CONSIDERATIONS AND OPPORTUNITIES

Management considerations for Reach 3 are currently limited to vegetation management along the toe of slope to reduce dense arroyo willow growth and to enhance other riparian canopy species. Small bars forming in Reach 3 should be watched for impacts to conveyance and/or capacity, but current conditions do not appear to warrant major in-channel maintenance. Reach 2, on the other hand, appears to be heavily impacted by the presence of large bars/wedges increasing in size and frequency moving downstream. These bars are large enough to support robust populations of arroyo willows and create the potential for significant flood control issues. One example is the large set of bars within a ~200 ft segment of stream upstream of the Willowside Road Bridge. Willows were removed from this bar in 2005 and by August 2008, the bar was covered completely obscured by a dense thicket of 20-30 ft tall willows. The key for successful management of these bars will be determining how much material and vegetation needs to be removed to provide safe flood conveyance while encouraging the passive restoration or re-naturalization of the aquatic environment. Finally, since any sediment mobilized from these bars will eventually be re-deposited in the Laguna de Santa Rosa, particular attention needs to be paid to managing sediment in these reaches to reduce future sediment deposition into the Laguna.

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# *Windsor Creek— Reaches 4 & 3*

**JURISDICTION:** Owned in-fee and maintained by SCWA

**LOCATION:** Reach 4: Brooks Rd. to Natalie Dr.

Reach 3:Natalie Dr. to ~500ft downstream

**ADJACENT LAND USE:** Residential

**UPSTREAM:** Non-SCWA maintained reach

**LENGTH:** Windsor 4: 1,755 ft.

Windsor 3: 512 ft.

**CHANNEL EASEMENT CORRIDOR WIDTH:**
Windsor 4: 124 ft.

Windsor 3: 135 ft.

**AVERAGE TOB CHANNEL WIDTH:**
Windsor 4: 79 ft.

Windsor 3: 81 ft.

(a) Upper Reach 4, looking downstream, right bank shows widespread bank erosion with an area of failure approximately 50-75 ft long. The sands from this eroding bank appear to be the source of numerous bars forming in and along the channel downstream. (November, 2008)

(b) Mid Reach 4, looking downstream. Note cut stump in foreground, this section of Reach 4 has experienced recent vegetation thinning and removal. Channel morphology includes pool and riffle sequences throughout Reaches 4 and 3. (November, 2008)

## PHYSICAL CONDITIONS

*Reach setting:* reach Reaches 4 and 3 are east of Hwy 101 flowing north to south along the base of the Mayacamas Mtns. These reaches represent a transition zone at the foot of the mountains that moves from the steeper canyon drainages (photo b) into the alluvial fan zone (photos c/d) and finally into the alluvial plain drainages downstream of Hwy 101.

*Active channel:* narrow in higher gradient and incised sections (3-6 ft wide), widening to 10-14 ft by Natalie Dr.; flow depths 1" to 2' deep with some larger pools and runs.

*Bed sediments/texture:* bars are either exposed or underlain with gravel and cobbles; recent sandy deposits from eroding banks (photo a) transported downstream.

*Bank structure:* steep mostly 1:1 or greater; deeply incised with a mix of riprap and earth.

*Channel processes:* Windsor 4 channel is incising and causing additional bank erosion and bank failures (photo a); traveling downstream the channel changes from incising to aggrading and sediment fines. It appears that chronic bank failures upstream are contributing to bar and wedge formations downstream.

*Water quality (qualitative):* moderate to good with clear flowing water in most places in November of 2008.

## BIOLOGICAL CONDITIONS

*Instream Habitat:* Aquatic habitat in Reach 4 is relatively good with pools and riffles, undercut banks, gravel bars, and some woody debris. This habitat is, however, severely impacted by bank failures and fine sediment wedges filling pools and covering riffles. Aquatic habitat in Reach 3 is not as good as Reach 4 as channel has more areas dominated by diffuse flow through large sediment wedges, which are usually associated with rock weirs or eroded rip-rap spanning the channel.

*Vegetation composition:* Canopy trees include a string of willow along the toe of slope throughout both reaches and an assortment of live oak, bay, ash, and buckeye on the banks. Top of banks have been planted with Manzanita and coyote brush. Understory vegetation includes blackberry, periwinkle, annual grasses and lots of duff. Wedges and bars are vegetated with understory species and the channel margins support rushes and sedges in some areas.

*Riparian corridor and canopy closure:* These reaches trend toward lower canopy cover with canopy between 50%-75% in Reach 4 and canopy between 0%-25% in Reach 3. The corridor ranges from ~25-50 ft-wide on each bank.

*Listed species with potential to occur:* Steelhead are not known from upstream of Hwy 101, but habitat for spawning and rearing may be present in Reach 4. The crossing at Brooks Rd. appears to be a passage impediment during most flows due to velocity. Reach 4 also contains suitable habitat for a host of amphibians, reptiles and birds with its dense riparian canopy and channel complexity.

(c) Bottom of Reach 4, looking downstream to Natalie Dr. crossing. Note large bar in the foreground on the left and background on the right. Reach 4 is dominated by numerous areas of bank instability and increasing bar formations

(d) Middle of Reach 3, looking downstream. Notice that the banks from the toe to the top are composed of large ungrouted rip-rap. This rip-rap is also found across the channel in many locations and appears to be functioning as grade control, and trapping and retaining sediments.

## MANAGEMENT CONSIDERATIONS AND OPPORTUNITIES

Management considerations for Reach 4 focus on addressing chronic bank failures, especially the large slip approximately 50 ft downstream from Brooks Rd. Management in Reach 4 should also address the large sediment wedges that have built-up upstream of the Natalie Dr. crossing. This series of bars and wedges extends at least 50 ft upstream from the crossing and is between 1-2 ft above the baseflow water surface elevation. There are also a number of localized sediment wedges in Reach 3 (generally behind rock features) that should be monitored. Based on existing channel capacity, planting to create a canopy in Reach 3 would benefit a wide array of wildlife species and possibly create conditions conducive to supporting steelhead.

# Appendix D
# Accounts of Special Status Species

# Table of Contents

# List of Acronyms

| | |
|---|---|
| °C | degrees Celsius |
| °F | degrees Fahrenheit |
| 1B | CRPR Rare, Threatened, or Endangered in California and Elsewhere |
| 2B | CRPR Rare, Threatened, or Endangered in California, but more Common Elsewhere |
| .1 | CRPR Seriously Threatened in California |
| .2 | CRPR Moderately Threatened in California |
| .3 | Not very threatened in California |
| BMP | Best Management Practice |
| CCH | Consortium of California Herbaria |
| CDFG | California Department of Fish and Game |
| CDFW | California Department of Fish and Wildlife |
| CESA | California Endangered Species Act |
| CFR | Code of Federal Regulations |
| cm | centimeter |
| CNDDB | California Natural Diversity Database |
| CNPS | California Native Plant Society |
| CRPR | California Rare Plant Rank |
| DPS | Distinct Population Segment |
| ESA | Endangered Species Act |
| F&G Code | California Fish and Game Code |
| FR | Federal Regulation |
| in | inch |
| km | kilometer |
| m | meter |
| MSL | mean sea level |
| NMFS | National Marine Fisheries Service |
| NOAA | National Oceanic and Atmospheric Administration |
| Program | Stream Maintenance Program |
| SMP | Stream Maintenance Program |
| Sonoma Water | Sonoma County Water Agency |
| SRPCS | Santa Rosa Plain Conservation Strategy |
| USACE | United States Army Corps of Engineers |
| USC | United States Code |
| USFWS | U.S. Fish and Wildlife Service |
| USGS | U.S. Geological Survey |

# Appendix D
# ACCOUNTS OF SPECIAL STATUS SPECIES

This appendix includes a description of special status species that have potential to occur in the Stream Maintenance Program (SMP or program) and a description of considerations that should be taken into consideration when conducting maintenance activities throughout the program area. A list of federally endangered and threatened species that may be affected by SMP maintenance activities was obtained online from the U.S. Fish and Wildlife (USFWS) website (USFWS 2019), and is contained in the Biological Assessment prepared for the SMP. The California Natural Diversity Database (CNDDB) and the California Native Plant Society (CNPS) electronic inventory were also queried for the 14 quadrangles and a 1-mile buffer around these quadrangles. Figures 3-20 and 3-21 in Chapter 3, *Environmental Setting,* depict all CNDDB occurrences within the program area (California Department of Fish and Wildlife [CDFW] 2019). In the SMP Manual update, updated CNDDB searches and USFWS searches were conducted to evaluate whether additional species should be included as potentially occurring within the SMP. In evaluating the occurrence potential of special status plant and wildlife species in the program area, relevant literature, knowledge of regional biota, and observations made during the field investigations were applied as analysis criteria. For the purposes of this assessment, special status species are those that are listed as California Rare Plant Rank (CRPR) 1A, 1B, 2A, or 2B species; and species designated as rare, species of concern, candidate, threatened, or endangered by the USFWS, National Marine Fisheries Service (NMFS), or CDFW.

## Special Status Plants

Sonoma County's streams and floodplains host and provide habitat for a diversity of plant species, both common and rare. Several special status plant species have the potential to occur in the SMP program area. It should be noted that habitats of some of these listed plant species have existed historically in the SMP or only exist in isolated areas of adjacent quadrangles. Much of the historical habitat no longer exists in the SMP due to agricultural, residential and commercial development, infrastructure and road development. It should also be noted that reaches and their access roads within the program area have, in most cases, been altered due to flood control management. This alteration along with the prevalence of weedy native and non-native plant species may reduce the potential for special status plant species to occur in the program area. However, in some locations, small areas of suitable habitat for listed plants do persist adjacent to Sonoma County Water Agency (Sonoma Water) rights-of-way.

Generally, SMP activities are not anticipated to affect these species as most work is accomplished during the dry season. Focused surveys for these species have failed to reveal their presence along Sonoma Water channels.

The CRPRs are defined below:

- 1B Rare, Threatened, or Endangered in California and Elsewhere
- 2 Rare, Threatened, or Endangered in California, but more Common Elsewhere

The threat rank follows the Rare Plant Rank, and is defined below:

- .1 Seriously Threatened in California
- .2 Moderately Threatened in California
- .3 Not very threatened in California

### *Burke's Goldfields*

Burke's goldfields (*Lasthenia burkei*), was listed as endangered under the federal Endangered Species Act (ESA) on December 2, 1991. This species was also listed as endangered under the California Endangered Species Act (CESA) in September of 1979. Burke's goldfields is also designated as a CRPR 1B.1 species (CNPS 2018). The USFWS determined that it was not prudent to designate critical habitat for this species because published maps and a critical habitat description would make the plant more vulnerable to incidents of vandalism or attractive to rare plant collectors, which could contribute to the decline of these species (USFWS 1991). However, this species is included in the Santa Rosa Plain Conservation Strategy (SRPCS) (USFWS 2005b).

#### Natural History

Burke's goldfields is an annual species of the sunflower (*Asteraceae*) family. Burke's goldfields grow to a height of 12 inches (30 centimeters) and have erect distally branched, hairy stems. Burke's goldfields is supported by mesic meadows and seeps as well as vernal pools on nearly level to slightly sloping loams, clay loams, and clays between 49 and 1,969 feet above mean sea level (MSL) (15 to 600 meters [m] above MSL) in elevation. Huichica loam is the predominant soil Burke's goldfields is found on in the northern part of the Plain (USFWS 2007). In the southern part of the plain this species occurs on mostly on Clear Lake clay or Wright loam. Historically, this taxon extended north from Cotati Valley to Napa, Mendocino, and Lake Counties. Currently it is known from Sonoma, Napa, and Lake Counties with most occurrences occurring within Laguna de Santa Rosa and the Windsor area (USFWS 2016). According to the USFWS (1991), the only Mendocino County occurrence, the type locality for this taxon, was considered extirpated, but was rediscovered in 2010. This species has a blooming period from April through June; however, a majority of the herbarium specimens have been collected during the month of May (Consortium of California Herbaria [CCH] 2008).

#### Occurrence in the Program Area

In the program area, Burke's goldfields has been recorded from 39 sites in Cotati Valley (Laguna de Santa Rosa) (USFWS 1991). A total of 28 occurrences in Sonoma County are represented in the CNDDB, of which 86 percent are presumed extant (California Department of Fish and Wildlife [CDFW] 2019). These occurrences are located in grassland swales and vernal pools and coincide with Zones 1A and 4A. The Laguna Foundation also has population information for a number of sites that are not represented in the CNDDB. However, none of these occurrences are located within SMP channels. The nearest record to an SMP reach is a specific occurrence (EONDX #(4769) located south of Saunders Avenue and east of Sonoma County Airport, approximately 0.15 miles west of Airport Creek (reach Airport 2).

### Stream Maintenance Considerations

Within the program area, it is not likely that program related activities will impact potential habitat for this species as the areas confined within the fenced rights-of-way do not support vernal pools or grassland swales. However, there are areas where SMP reaches bisect vernal pool complexes or SRPCS Plant Conservation Areas in Zones 1A and 3A. Additionally, some earthen v-ditches may also provide marginally suitable habitat conditions for this species if adjacent to extant populations. Specific reaches where potential Burke's goldfields habitat is present include Roseland 1 and 3, Colgan 2, Fryer 1, Laguna 1, Peterson 2, and Bellevue-Wilfred 1. Based on habitat quality and the SMP's proximity to extant occurrences, potential for occurrence of Burke's goldfields is possible but considered low.

## *Many-flowered Navarretia*

Many-flowered navarretia (*Navarretia leucocephala* ssp. *plieantha*) was listed as endangered under ESA on June 18, 1997. This species was also listed as endangered under the CESA in November of 1979, but under the name of *N. plieantha*. This taxon is also designated CRPR 1B.2 (CNPS 2018). The USFWS determined that it was not prudent to designate critical habitat for this species because published maps and a critical habitat description would make the plant more vulnerable to incidents of vandalism or attractive to rare plant collectors, which could contribute to the decline of these species (USFWS 1997). However, this species is included in the SRPCS.

### Natural History

Many-flowered navarretia is a spiny annual species of the phlox (*Polemoniaceae*) family. This plant forms small mats that can range from 2-8 inches wide. The leaves are about 1 inch (in) long, linear and have a few lobes. The flowers are clustered in a head at the end of stems composed of 20-50 white to blue flowers. Many-flowered navarretia is supported by volcanic ash flow vernal pools between 98 and 3,117 feet above MSL (30 to 950 m above MSL) in elevation. Historically, this taxon is known from Lake and Sonoma counties. According to the Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon (USFWS 2005a), three of the occurrences in the Santa Rosa area consist of plants intermediate between *N. leucocephala* ssp. *plieantha* and *N. leucocephala* ssp. *bakeri*. Currently, all occurrences are considered extant (USFWS 2005a). This species has a blooming period from May through June; however, a majority of the herbarium specimens have been collected during the month of June (CCH 2008).

### Occurrence in the Program Area

In the program area, many-flowered navarretia has been recorded from three sites: Bennett Mountain Lake; the northeast corner of Sonoma County Airport; Shiloh Ranch near Santa Rosa; and two miles southwest of Windsor (Best, et al. 1996). A total of two occurrences are represented in the CNDDB, of which 100 percent are considered extant (CDFW 2019). These two CNDDB occurrences are located in swales and vernal pools that coincide with Zone 1A. However, neither of these occurrences is located within SMP channels. The nearest record to an SMP reach is a specific occurrence (EONDX # 4676) located south of Saunders Avenue and east of Sonoma County Airport, approximately 500 feet west of Airport Creek (reach Airport 2).

### Stream Maintenance Considerations

Within the program area, it is not likely that program related activities will impact potential habitat for this species as the areas confined within the fenced rights-of-way do not support vernal pools or grassland swales. However, there are areas where SMP reaches bisect vernal pool complexes or SRPCS Plant Conservation Areas in Zone 1A and 3A. Additionally, some earthen v-ditches may also provide marginally suitable habitat conditions for this species if adjacent to extant populations. Specific reaches where potential many-flowered navarretia habitat is present include Windsor 1 and Airport 2. Based on habitat quality and the SMP's proximity to extant occurrences, potential for occurrence of many-flowered navarretia is possible but considered low.

## *Sebastopol Meadowfoam*

Sebastopol meadowfoam (*Limnanthes vinculans*) was listed as endangered under ESA on December 2, 1991. This species was also listed as endangered under the CESA in November of 1979. Sebastopol meadowfoam is designated as a CRPR 1B.1 species (CNPS 2018). The USFWS determined that it was not prudent to designate critical habitat for this species because published maps and a critical habitat description would make the plant more vulnerable to incidents of vandalism or attractive to rare plant collectors, which could contribute to the decline of these species (USFWS 1991). However, this species is included in the SRPCS.

### Natural History

Sebastopol meadowfoam is a small (up to 12-inch tall), multi-stemmed annual species of the meadowfoam (*Limnanthaceae*) family. Although the first leaves are narrow and undivided, leaves on the mature plant have three to five undivided leaflets along each side of a long stalk (petiole). The shape of the leaves distinguishes Sebastopol meadowfoam from other members of the Limnanthes genus. Small, bowl-shaped, white flowers appear April through May. The white flowers are born singly at the end of stems. Sebastopol meadowfoam is supported on vernally mesic sites in meadows and seeps, grasslands, and vernal pools between 49 and 1,000 feet above MSL (15 to 305 m above MSL) in elevation. Soils confirmed as supporting this species include Clear Lake clay and Wright loam (USFWS 2007). Both historic and current distributions include Laguna de Santa Rosa (Cotati Valley) and the area near Graton. Two outlying populations have also been recorded in Knights Valley in Lake County and at the Napa River Ecological Reserve and southeast of Calistoga in Napa County (CDFW 2019). This species has a blooming period from April through May; however, a majority of the herbarium specimens have been collected during the month of May (CCH 2008).

### Occurrence in the Program Area

In the program area, Sebastopol meadowfoam has been recorded from two sites in Cotati Valley (Laguna de Santa Rosa) (USFWS 1991). A total of 44 occurrences in Sonoma County are represented in the CNDDB, of which 84 percent are considered extant (CDFW 2019). These occurrences are located in ditches, vernally wet meadows, marshy creek margins, grassland swales, and vernal pools which coincide with Zones 1A, 4A, and 5A. The Laguna Foundation also has population information for a number of sites that are not represented in the CNDDB. However, none of these occurrences are located within SMP channels. The nearest record to an SMP reach is a specific occurrence (Laguna Foundation) located within the Santa Rosa Air Center approximately 100 feet east of Roseland Creek (reach Roseland 3).

## Stream Maintenance Considerations

Within the program area it is not likely that program related activities will impact potential habitat for this species as the areas confined within the fenced rights-of-way do not support vernal pools or grassland swales. However, there are areas where SMP reaches bisect vernal pool complexes or SRPCS Plant Conservation Areas in Zones 1A and 3A. Additionally, some earthen v-ditches may also provide marginally suitable habitat conditions for this species if adjacent to extant populations. Specific reaches where potential Sebastopol meadowfoam habitat is present include Roseland 1 and 3, Colgan 2, Fryer 1, Laguna 1, Peterson 2, and Bellevue-Wilfred 1. Based on habitat quality and the SMP's proximity to extant occurrences, potential for occurrence of Sebastopol meadowfoam is possible but considered low.

# *Sonoma Alopecurus*

Sonoma alopecurus (*Alopecurus aequalis* var. *sonomensis*), also known as Sonoma shortawn foxtail, was listed as endangered under the authority of the ESA on October 22, 1997. This taxon is also designated as a CRPR 1B.1 species (CNPS 2018). It is mentioned as not clearly distinct in Best et al. (1996). The USFWS determined that it was not prudent to designate critical habitat for this species because doing so would increase the degree of threat to this species (USFWS 1997).

## Natural History

Sonoma alopecurus is a perennial herbaceous species of the grass (*Poaceae*) family. The plant reaches 12 to 30 inches in height. Leaf blades are up to 0.3-inch wide and the stems are mostly straight or weakly bent near the base. Spikelets are usually violet-gray near the tip. The awn (bristle-like part) is straight, and exceeds the lemma (the bracts that enclose the awn) by 0.04 to 0.1 inch. Panicles (branching flower clusters) are 1 to 3.5 inches long and 0.1 to 0.3 inch wide. Sonoma alopecurus may be difficult to distinguish from other varieties of the species. It is distinguished from *Alopecurus aequalis* var. *aequalis* by the violet-gray spikes, more upright appearance and generally wider panicle. Sonoma alopecurus occurs in moist soils in permanent freshwater marshes between 15 and 1,200 feet above MSL (5 and 365 m above MSL) in elevation. Historically, this taxon extended north from the Point Reyes Peninsula to Guerneville and east to Cunningham Marsh. Currently, it is known from Marin and Sonoma counties (CNPS 2018). This species has a blooming period from May through July however a majority of the herbarium specimens have been collected during the month of May (CCH 2008).

## Occurrence in the Program Area

In the program area, Sonoma alopecurus has been recorded from Duncan Mills Marsh, Guerneville Marsh, Occidental Marsh, Freestone Marsh, Ross Marsh, Pitkin Marsh, Cunningham Marsh, near Bloomfield, near Llano Road, and at Bennett Mountain Lake (Best, et al. 1996). A total of 13 occurrences are represented in the CNDDB from Sonoma County, of which 92 percent are considered extant (CDFW 2019). These occurrences are located on the edges of lake margins and in moist areas of low fields, and coincide with Zones 1A, 3A, 5A, and 8A. However, none of these occurrences are located within SMP channels. The nearest record to an SMP reach is a non-specific occurrence (EONDX #22479) near Llano Road and Highway 116 northwest of Cotati, approximately 0.5 miles southwest of Laguna de Santa Rosa (reach Laguna 1).

### Stream Maintenance Considerations

Within the program area, potential habitat is present in Zones 1A, 3A, 5A, and 8A where reaches support willow scrub, and emergent wetlands. Since Pitkin Marsh is essentially associated with tributaries of Atascadero Creek, potential habitat for this species is considered to occupy the aforementioned vegetation associations of Atascadero Creek proper. The occurrence nearby Laguna de Santa Rosa is considered extant; therefore, it is possible that any reach along the creek with appropriate vegetation may support undiscovered populations of this species. Additionally, there is a historic collection near Bloomfield that may still be extant. Therefore, suitable habitat may be present along Bloomfield Creek (reach Bloomfield 1). Based on habitat quality and the SMP's proximity to extant occurrences, potential for occurrence of Sonoma alopecurus is considered possible but low.

## *Sonoma Sunshine*

Sonoma sunshine (*Blennosperma bakeri*), also known as Baker's stickyseed, was listed as endangered under the ESA on December 2, 1991. This species was also listed as endangered under the CESA in February of 1992. Sonoma sunshine is also designated as a CRPR 1B.1 (CNPS 2018).

### Natural History

Sonoma sunshine is a small (up to 12 inches) annual species of the sunflower (*Asteraceae*) family. The plant has alternate, narrow, hairless leaves, 2 to 6 inches long. The upper ones have 1 to 3 lobes, the lower ones none. The species produces yellow daisy-like flowers. The yellow disk flowers have white pollen and stigmas. Sterile ray flowers, which are yellow or sometimes white, have red stigmas. The lobe pattern of the leaves and the color of ray stigmas separate this species from other in the genus. Sonoma sunshine occurs in mesic grasslands and vernal pools between 33 and 360 feet above MSL (10 and 110 m above MSL) in elevation. Both historic and current distribution includes Laguna de Santa Rosa (Cotati Valley) and Sonoma Valley. According to CNPS (2018), it is known from Sonoma and Mendocino counties. This species has a blooming period from March through May; however, a majority of the herbarium specimens have been collected during the month of March (CCH 2008).

### Occurrence in the Program Area

In the program area, USFWS documents 18 extant occurrences and five extirpated or possibly extirpated occurrences (USFWS 2016). A total of 23 occurrences are represented in the CNDBB, of which 78 percent are considered extant (CDFW 2019). These occurrences are located in grassland swales, vernal pools, the margin of shallow creeks, and in flat open fields that coincide with Zones 1A and 3A. The Laguna Foundation also has population information for a number of sites that are not represented in the CNDDB. However, none of these occurrences are located within SMP channels. The nearest record to an SMP reach is a specific occurrence (EONDX #5298) located north of Four Corners and South of Newcomb Street approximately 0.15 miles east of Fryer Creek (reach Fryer 1).

### Stream Maintenance Considerations

Within the program area, it is not likely that program related activities will impact potential habitat for this species as the areas confined within the fenced rights-of-way do not support vernal pools or grassland swales. However, there are areas where SMP reaches bisect vernal pool complexes or SRPCS Plant Conservation Areas in Zones 1A and 3A. Additionally, some earthen v-ditches may provide marginally suitable habitat conditions for this species if adjacent to extant populations. Specific reaches where potential Sonoma sunshine habitat is present include Roseland 1 and 3, Colgan 2, Fryer 1, Laguna 1, Peterson 2, and Bellevue-Wilfred 1. Based on habitat quality and the SMP's proximity to extant occurrences, potential for occurrence of Sonoma sunshine is possible but considered low.

### *Sonoma White Sedge*

Sonoma white sedge (*Carex albida*), also known as white sedge, was listed as endangered under the ESA on October 22, 1997. This species was also listed as endangered under the CESA in November of 1979. Sonoma white sedge was designated as a CRPR 1B.1 species, but has since been removed from the list due to taxonomic changes (CNPS 2018). This species is also no longer tracked in CNDDB (CDFW 2019). The USFWS determined that it was not prudent to designate critical habitat for this species because doing so would increase the degree of threat to this species (USFWS 1997).

#### Natural History

Sonoma white sedge is a rhizomatous herb species of the sedge (*Cyperaceae*) family. The triangular stems are 1.3 to 2 feet tall, and longer than the leaves. The leaves are flat, 1 to 2 inches wide, and have closed sheaths. The inflorescence consists of 4 to 7 oval to oblong spikelets that are 0.3 to 0.7 inches long. The fruits are three-sided when mature. The Flora of North America (Flora of North America Editorial Committee 1993) gives the habitat for this species as occurring in Sphagnum bogs less than 295 feet above MSL (90 m above MSL) in elevation and is currently known from only one station in Sonoma County, Pitkin Marsh. The only other habitat type this species has been recorded as occupying is swamps of Santa Rosa Creek from a 1977 Rubtzoff collection. This location is now considered extirpated because the marsh habitat has been destroyed (California Department of Fish and Game [CDFG] 2008). Historically this Sonoma white sedge was also known from Perry Marsh (CCH 2008). This species has a blooming period from May through July, however a majority of the herbarium specimens have been collected during the months of May and June (CCH 2008).

#### Occurrence in the Program Area

In the program area, Sonoma white sedge has been recorded from Perry Marsh, Pitkin Marsh, and Santa Rosa Creek (CDFG 2008). Since 2005, a total of four occurrences are represented in the CNDDB, of which 50 percent are considered extant. As described above, this species is no longer tracked in CNDDB, so updated CNDDB occurrence information is not available for this species. These occurrences are located at upper and lower Pitkin Marsh (EONDX #4603 & 4610) in wet meadows and quaking bog areas and coincide with Zone 5A. An occurrence considered extirpated (EONDX #47272) was located in Santa Rosa Creek within Zone 1A. This section of Santa Rosa Creek was apparently destroyed in the 1960's by channelization and other alterations to Santa Rosa Creek (USFWS 1997). This extirpated occurrence is the nearest record to an SMP reach and is a non-specific occurrence located southeast of the intersection of College Avenue and Wright Road approximately 0.10 miles southwest of the confluence of Santa Rosa Creek (reach Santa Rosa 3) and College Creek (reach College 1).

### Stream Maintenance Considerations

Within the program area, potential habitat is present in select reaches in Zones 1A and 5A where emergent wetlands are present. Since Pitkin and Perry's marshes are essentially associated with tributaries of Atascadero Creek, potential habitat for this species is considered to occupy emergent wetlands of Atascadero Creek proper. Although the occurrence on Santa Rosa Creek is considered extirpated, it is possible that any reach along the creek with emergent wetland vegetation may support undiscovered populations of this species. Based on habitat quality and the SMP's proximity to extant occurrences, potential for occurrence of Sonoma white sedge is considered possible but low.

## *Swamp Harebell*

Swamp harebell (*Campanula californica*) is a rhizomatous herb designated CRPR 1B.2 (CRPR 2018). It is in the bellflower family (*Campanulaceae*). The species is a slender stemmed sparingly branched perennial with nearly sessile, scalloped, alternately borne leaves. The plant bears pale blue bell-shaped flowers.

### Natural History

Generally, this species grows in mesic areas in bogs and fens, closed-cone coniferous forest, coastal prairie, meadows and seeps, freshwater marshes and swamps, and North Coast coniferous forest. The typical elevation range is from 1 to 405 m above MSL, and the blooming period is from June to October.

### Occurrence in the Program Area

Swamp harebell has been documented in 39 Sonoma locations, with 35 of those populations presumed extant (CDFW 2019). Most of those observances occurred along or near the northern Sonoma coast in Flood Control Zone 7A. Threats to the species are competition, grazing, development, marsh habitat loss, logging, road maintenance, and trampling.

### Stream Maintenance Considerations

Within the program area, potential habitat is present in select reaches in Zones 7A where emergent wetlands are present. It is possible that any reach along the SMP channels with emergent wetland vegetation may support undiscovered populations of this species. Based on habitat quality and the SMP's proximity to extant occurrences, potential for occurrence of swamp harebell is considered possible but low.

## *Baker's Navarretia*

Baker's navarretia (*Navarretia leucocephala* ssp. *bakeri*) is a spiny annual herb designated as CRPR 1B.1. It is in the phlox (*Polemoniaceae*) family. This plant can be either branched or not and grows from 1-4 inches in height. Stems are white with purple streaks. Tiny flowers occur in clusters and are white or pale blue.

### Natural History

Habitat for this plant includes mesic areas in cismontane woodland, lower montane coniferous forest, meadows and seeps, valley and foothill grassland, and vernal pools. Elevation range for the species is typically between 5 and 1,740 m above MSL and the blooming period is from April through July.

#### Occurrence in the Program Area

In Sonoma County, 18 occurrences have been documented with 12 presumed extant (CDFW 2019). Some sightings were in the Laguna de Santa Rosa watershed, including in Mark West Creek and Santa Rosa Creek watersheds.

#### Stream Maintenance Considerations

Within the program area, it is not likely that program-related activities will impact potential habitat for this species as the areas confined within the fenced rights-of-way do not support potential habitat for Baker's navarretia. However, there are areas where SMP reaches bisect vernal pool complexes or Santa Rosa Plain Conservation Strategy (SRPCS) Plant Conservation Areas in Zones 1A and 3A. Additionally, some earthen v-ditches may also provide marginally suitable habitat conditions for this species if adjacent to extant populations.

### *California Beaked-Rush*

California beaked-rush (*Rhynchospora californica*) is designated CRPR 1B.1. It is a rhizomatous herb in the sedge family (*Cyperaceae*). It bears long, thin stems topped with dense inflorescences of dark brown flowers enfolding grainlike fruits that have white-fuzzy tubercles. Its range is in the southern part of northwestern California, the northern and central Sierra Nevada foothills, and northern San Francisco Bay area.

#### Natural History

California beaked-rush grows in bogs and fens, lower montane coniferous forest, meadows and seeps, and freshwater marshes and swamps. Its elevation range is 45 to 1,010 m above MSL, with a blooming period from May to July (CNPS 2018).

#### Occurrence in the Program Area

California beaked-rush has been documented in three locations in Sonoma County, of which two populations are considered extant (CDFW 2019).

#### Stream Maintenance Considerations

Within the program area, potential habitat is present in select reaches where emergent wetlands are present. It is possible that any reach along the SMP channels with emergent wetland vegetation may support undiscovered populations of this species. Based on habitat quality and the SMP's proximity to extant occurrences, potential for occurrence of California beaked rush is considered possible but low.

### *Dwarf Downingia*

Dwarf downingia (*Downingia pusilla*) is designated CRPR 2B.2. The species is an annual herb in the bellflower family (*Campanulaceae*), 3 to 8 centimeter (cm) tall, with small linear leaves. Its small, radially symmetric flowers are less than 1 cm across, in contrast to all other *Downingia* species, which have larger, showy, asymmetric flowers. The flowers, borne at the ends of branches, are white or blue with two small yellow spots near the throat (Hickman 1993). Dwarf downingia's range is the Inner North Coast Ranges, southern Sacramento Valley, and northern and central San Joaquin Valley. Sonoma County is the only coastal county known to support this species (CNPS 2018).

### Natural History

Its habitat includes mesic areas in valley and foothill grassland and vernal pools, usually below 445 m above MSL in elevation. Dwarf downingia's blooming period is from March to May (CNPS 2018).

### Occurrence in the Program Area

Seventeen occurrences have been documented in Sonoma County, and 14 of those are considered extant (CDFW 2019).

### Stream Maintenance Considerations

Within the program area, it is not likely that program related activities will impact potential habitat for this species as the areas confined within the fenced rights-of-way do not support vernal pools or grassland swales. However, there are areas where SMP reaches bisect vernal pool complexes or SRPCS Plant Conservation Areas in Zones 1A and 3A. Additionally, some earthen v-ditches may also provide marginally suitable habitat conditions for this species if adjacent to extant populations.

## *Legenere*

Legenere (*Legenere limosa*) is designated a CRPR 1B.1 (CNPS 2018). An annual species of the bellflower family (*Campanulaceae*), it is entirely hairless and has a reclining stem that can grow up to 30 centimeters. It has lateral branches that are erect, slender, stiff, and sometimes fleshy. The inflorescence is a terminal raceme with a zig-zag axis and one a leaf like bract per flower. The flowers are white and two-lipped, with the upper lip 2-lobed and the lower lip is 3-lobed. Leaves are cauline, narrowly triangular, entire, sessile, and early deciduous. It is the only species of Legenere in California (Morin in Hickman 1993).

### Natural History

Legenere occurs in vernal pools. It is known from Alameda, Lake, Monterey, Napa, Placer, Sacramento, Santa Clara, Shasta, San Joaquin, San Mateo, Solano, Sonoma, Tehama, and Yuba counties from between 1 to 880 m above MSL (CNPS 2018). It is presumed extirpated from Stanislaus County (CNPS 2018). Many historical occurrences are extirpated. Currently this species threatened by grazing, road widening, non-native invasive weeds, agricultural conversion, and development (CNPS 2018). This species is included in the Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon (USFWS 2005a). Legenere flowers from April to June (CNPS 2018).

### Occurrence in the Program Area

Two CNDDB occurrences have been documented in Sonoma County with one considered extant (CDFW 2019). Threats have included historic agriculture production and grazing, and invasive plant species.

#### Stream Maintenance Considerations

Within the program area, it is not likely that program related activities will impact potential habitat for this species as the areas confined within the fenced rights-of-way do not support vernal pools or grassland swales. However, there are areas where SMP reaches bisect vernal pool complexes or SRPCS Plant Conservation Areas in Zone 1A and 3A. Additionally, some earthen v-ditches may also provide marginally suitable habitat conditions for this species if adjacent to extant populations.

### *Saline Clover*

Saline clover (*Trifolium depauperatum* var. *hydrophilum*) is an annual herb designated CRPR 1B.2 (CNPS 2018). It is in the legume family (*Fabaceae*). The small, often fleshy plant has typical "clover-leaves"; each of the three leaflets is 0.5 to 2 cm long. The stipules of the upper leaves are tipped with bristles. The white-tipped, pink-purple flowers are 6.5 to 9 mm long and clustered in small heads that are 0.5 to 1.5 cm in diameter. The banner, or upper petal, becomes inflated and encloses the 2 to 3 mm long fruit (legume) as it ripens. Its range includes Sacramento Valley and central western California.

#### Natural History

Saline clover's typical habitats include marshes and swamps, mesic and alkaline areas in valley and foothill grassland, and vernal pools, usually below 300 m above MSL in elevation. This plant's blooming period is from April to June (CNPS 2018).

#### Occurrence in the Program Area

Of the seven population documented in Sonoma County, four are considered extant (CDFW 2019).

#### Stream Maintenance Considerations

Within the program area, it is not likely that program related activities will impact potential habitat for this species as the areas confined within the fenced rights-of-way do not support vernal pools or grassland swales. However, there are areas where SMP reaches bisect vernal pool complexes or SRPCS Plant Conservation Areas in Zones 1A and 3A. Additionally, some earthen v-ditches may provide marginally suitable habitat conditions for this species if adjacent to extant populations.

## Special Status Fish

Some of the channels within the program area are known to support the federally threatened Central California Coast steelhead trout (*Oncorhynchus mykiss*) and federally threatened California Coastal Chinook salmon (*Oncorhynchus tshawytscha*) (NOAA 2004). After careful consideration and discussion with NMFS, Sonoma Water removed all creeks and/or creek reaches from the program area known to support the federally endangered Central California Coast Coho Salmon (*Oncorhynchus kisutch*) (Figure 1-12 in Chapter 1, *Introduction and Program Summary*). The Russian River has been designated critical habitat for these three species, though the Laguna de Santa Rosa subwatershed was excluded from the final critical habitat designation for the Central California Coast Steelhead Distinct Population Segment (USFWS 2005c). Figures 3-22, 3-23, and 3-24 depict critical habitat for steelhead trout, Chinook salmon, and Coho Salmon, respectively. These three special status fish are described in detail below, as well as other fish species of special concern which are present in the program area.

### *Central California Coast Steelhead*

Central California Coast steelhead was listed as a federally threatened species on August 18, 1997 (62 Federal Regulation [FR] 43937). The historical range of Central California Coast steelhead includes coastal streams from the Russian River south to and including Soquel Creek in Santa Cruz County. This includes the stream tributaries of the San Francisco Bay and San Pablo Bay basins. Central California Coast steelhead are still present in most of the coastal streams in their historic range, though abundance may be reduced and distribution may be restricted.

#### Natural History

Smith (1999) describes two different habitat types used by Central California Coast steelhead and resident trout. The primary habitat consists of shaded pools of small, cool, low-flow upstream reaches typical of the original steelhead habitat in the region. However, steelhead have also been found to use less than optimal habitat including warm water areas below dams or pipeline outfalls and areas where summer releases provide high summer flows and fast water feeding habitat, provided that environmental conditions are still acceptable to the steelhead. Trout rely heavily on insect drift for food, and drift increases with flow velocity.

Upper lethal temperatures for adult Pacific salmonids are in the range of 75 degrees Fahrenheit (°F) to 77°F (24 degrees Celsius [°C] to 25°C) for continuous long-term exposure (Brett, et al. 1982). Optimal temperatures for growth and survival vary between species, as mentioned previously in Section 3.8 *Water Quality*. Preferred temperatures for steelhead parr range from 54°F to 64°F (12°C to 18°C), although optimum growth rates may occur at slightly higher temperatures if food is abundant. Temperatures also influence the smoltification process. In some studies, steelhead have exhibited decreased migratory behavior and decreased seawater survival at temperature in excess of 55°F (13°C) (Zaugg and Wagner 1973; Adams, et al. 1975).

Steelhead along the central California coast enter freshwater to spawn when winter rains have been sufficient to raise streamflows and breach the sandbars that form at the mouths of many streams during the summer. Increased streamflow during runoff events also appears to provide cues that stimulate migration and allows better conditions for fish to pass obstructions and shallow areas on their way upstream (Moyle 2002). The season for upstream migration of Central California Coast steelhead adults typically occurs from December through March (depending on rainfall) with peak migration occurring in January and February (Moyle 2002). At the Warm Springs Fish Hatchery, most adults return from January to April.

Steelhead select spawning sites with gravel substrate and sufficient flow velocity to maintain circulation through the gravel. This provides a clean, well-oxygenated environment for incubating eggs. After emergence from the gravel, fry inhabit low velocity areas along the stream margins. As they feed and grow, they gradually move to deeper and faster water. In the Russian River, steelhead typically rear for two years in freshwater before emigrating to the ocean (Chase 2008, pers. comm.).

In the Russian River, smolt emigration occurs primarily from March through May, extending at low levels through June. In addition, some movement (both upstream and downstream) of young-of-year fish (less than a year old) likely occurs throughout the year. This movement is related to natural dispersal mechanisms, and is an adjustment of fish based on densities and habitat availability.

### Occurrence in the Program Area

Historical data show that steelhead were widespread in the Russian River watershed, occupying all of the major tributaries and most of the smaller ones, including creeks in Zone 1A. Currently, steelhead occupy habitat in Zones 2A, 3A, 8A, and 9A. Figure 3-27 depicts critical habitat for steelhead in these four Sonoma Water maintained Zones.

The lower sections of many of the streams within the SMP project area are low gradient, lack suitable spawning gravels, and typically support summer water temperatures above levels suitable for rearing steelhead. Although these stream reaches generally do not support either spawning or rearing habitat preferred by steelhead, they may function as a migration corridor for juvenile and adult salmonids. These stream sections are dominated (naturally) by warm water fisheries such as cyprinids (minnows) and catastomids (suckers).

There is general agreement that the steelhead population has declined in the last 30 years (CDFG 1984; CDFG 1991), but limited quantitative data are available to support this assumption. In 2005 and 2006, Sonoma Water conducted fish surveys in several creeks throughout Zone 1A. Surveys documented fairly large numbers of steelhead in Santa Rosa Creek, and low numbers of steelhead in Brush Creek, Matanzas Creek, Spring Creek, Piner Creek, Paulin Creek, Windsor Creek, and Copeland Creek (Chase 2006, pers. comm. Sonoma Water). In Zone 2A, surveys documented zero live steelhead in Adobe Creek (UACG [United Anglers of Casa Grande Inc.] 2017).

Estimates of historic steelhead populations in the Russian River are unknown, but may have ranged from 40,000 to 60,000 (NMFS 2015). There are no recent population estimates for steelhead in the Russian River. However, during snorkel surveys conducted by Sonoma Water in 2002, rearing steelhead were observed in the upper mainstem of the Russian River, mostly between Hopland and Cloverdale, but also as far south as Healdsburg (Cook 2003). Young-of-the-year steelhead are captured annually at the Mirabel inflatable dam during spring sampling; however, few are captured during electrofishing surveys later in the summer. The data indicates that steelhead rear at low numbers in the mainstem near the Mirabel Inflatable Dam (Chase et al. 2005).

There has been substantial planting of hatchery-reared steelhead within the Russian River basin, which may have affected the genetic constitution of the remaining natural population. Almost all steelhead planted prior to 1980 were from out-of-basin stocks (Steiner 1996). Since 1982, stocking of hatchery-reared steelhead has been limited to progeny of fish returning to the Don Clausen Fish Hatchery (DCFH) (also known as Warm Springs Fish Hatchery) and the Coyote Valley Fish Facility (CVFF).

### Stream Maintenance Considerations

Stream maintenance activities that have the potential to directly and indirectly impact steelhead include sediment removal, vegetation clearing, and bank stabilization. Low gradient streams, such as those that make up the majority of the channels maintained under the SMP, tend to provide little spawning and rearing habitat, and are more important for fish passage and migration.

When performing any type of stream maintenance activity that necessitates work within the active channel, effective sediment control practices, such as minimizing disturbance to the stream bank and dewatering the channel, will be utilized. Increases in turbidity and sediment input may cause stress to steelhead due to displacement. In-stream maintenance activities may also inflict direct injury or mortality from equipment. In some cases, fish may need to be removed from the site during dewatering and temporarily excluded from the work area to prevent direct injury or mortality. In-stream work (i.e., work within the active channel) will be conducted during the dry season (between June 15 and October 31) to avoid affecting fish during migration.

Another concern is loss of instream cover such as rocks and vegetation that provide refugia for migrating adults and over-summering juveniles. To the extent feasible given flood control requirements, such cover should be allowed to remain in place. In situations where flood control requirements allow for it, habitat elements may be added to the system as a part of maintenance activities (e.g., meandering low flow channels, riparian plantings, etc.). Channel clearing and removal of large woody debris should be avoided when possible.

Removal of riparian vegetation has the potential to reduce cover, increase water temperatures, and reduce the number of aquatic invertebrates, which are the primary food source for these fish species. As much canopy cover needs to be retained as possible. Improper application of herbicides for vegetation removal could result in potential injury to fish or other aquatic species. However, targeted and controlled application can be effective without harming aquatic environments.

### *Central California Coast Coho*

Central California Coast Coho Salmon is a federal and state endangered species. Data describing the historic range of Coho Salmon in Sonoma County are limited. However, CDFW has compiled and reviewed salmonid presence data collected between 1920 and 2000 for streams in the Russian River watershed.

#### Natural History

Freshwater habitat requirements for Coho Salmon rearing include adequate cover, food supply, and suitable water temperatures. Primary habitat for Coho Salmon includes pools with extensive cover. The factors most limiting to juvenile Coho Salmon production are not completely understood, but may include high water temperatures, poor summer and winter habitat quality, and predation.

Coho Salmon spawn and rear in tributaries to the Russian River. Emigrating smolts and adults migrating upstream use the mainstem Russian River primarily for migration to and from spawning and nursery areas in the tributaries. There are no data indicating that Coho Salmon spawn or rear in the mainstem (ENTRIX, Inc. 2004).

Most Coho Salmon enter the Russian River in November and December and spawn in December and January. After spawning adult Coho Salmon die. Young Coho Salmon spend approximately one year in fresh water after hatching, occupying pool and backwater habitats with adequate cover, food supply, and lower water temperatures. Because of the time spent rearing in fresh water, their distribution throughout the Russian River basin is generally limited by water temperature and hydrology (Garza 2003).

The Coho Salmon life history is quite rigid, with a relatively fixed 3-year lifecycle. Outmigration of juvenile Coho Salmon takes place in late winter and spring. Coho Salmon live in the ocean for a year and a half, return as 3-year-olds to spawn, and then die.

### Occurrence in the Program Area

Historic distribution of Coho Salmon is believed to have included numerous tributaries in the lower and upper Russian River as far north as Corral Creek. Presence-absence data for Coho Salmon presented in the status review update (NMFS 1996) and CDFW surveys (Cox 2008, pers. comm.) identify streams within the entire Russian River basin for which Coho Salmon presence has been noted since 1989. Data have been prioritized to indicate streams for which: (1) the most recent survey recorded Coho Salmon presence; (2) the most recent survey recorded Coho Salmon absence but which had an equal or greater number of surveys noting Coho Salmon presence; (3) the most recent and the majority of surveys recorded Coho Salmon absence.

According to the latest status review, estimates of spawner abundance (considered to be "best-guesses" because data are limited) have shown a decrease within the Russian River from approximately 5,000 fish in 1963 to 255 in 1991 (Good, et al. 2005). It is believed that these numbers have continued to decline. Only three of 26 historic Coho streams are currently known to support juvenile wild Coho Salmon (Conrad, et al. 2006), and this only occurs during intermittent years. No Coho Salmon have been observed during survey efforts conducted in 2002 on Mark West Creek and between 1999 and 2001 on Santa Rosa and Millington creeks for Sonoma Water's Russian River Basin Steelhead and Coho Salmon Monitoring Program (Pilot Study). However, CDFW reports Coho Salmon present in Mark West Creek in 2001 (Coey 2001, pers. comm.). It is unlikely that any of the engineered or modified channels within the SMP program area support Coho Salmon.

The Don Clausen Fish Hatchery on Dry Creek at Warm Springs Dam produced and released an average of approximately 70,000 Age 1+ Coho Salmon each year, from 1980 to 1998. The DCFH Coho Salmon hatchery was shut down in 1999 due to concerns about genetic impacts on remnant native Coho Salmon populations. As an interim measure, Sonoma Water, working with NMFS, CDFW, United States Army Corps of Engineers (USACE) and others, has implemented an experiment Coho Salmon Captive Broodstock (CSCB) Program. The primary goal of the CSCB Program is to reestablish self-sustaining runs of Coho Salmon in historic habitat within the Russian River watershed. The program planted the first juveniles in the fall of 2004. Plantings were done in Mill Creek, Sheephouse Creek, and Ward Creek.

No Coho Salmon observed in the watershed occur in the current project area. Coho Salmon are considered to be substantially less widespread and less abundant than either Chinook salmon or steelhead in the Russian River basin.

## Stream Maintenance Considerations

A subset of the natural channels, of which Sonoma Water holds maintenance easements, has been removed from the program area due to presence of habitat for California Coast Coho Salmon. Under the SMP, Sonoma Water will not remove debris or clear vegetation in the following natural channels: Blucher Creek (Zone 1A), Willow Creek (Zone 5A), Sheephouse Creek (Zone 5A), Dutch Bill Creek (Zone 5A), Green Valley Creek (Zone 5A), Jonive Creek (Zone 5A), and Salmon Creek (Zone 8A). In addition, Sonoma Water maintenance activities for the Russian River (mainstem) and Dry Creek (mainstem) would not be covered under the SMP, as actions in these systems are governed by existing agreements between Sonoma Water and USACE. Figure 1-12 shows these removed channels as green dashed lines. Additionally, the conditions of the Biological Opinion issued by NMFS on the Russian River watershed include restrictions on SMP activities in the upper Mark West Creek watershed, upstream of the Laguna.

# *California Coastal Chinook*

California Coastal Chinook salmon was listed as a federally threatened species on September 16, 1999 (64 FR 50394). There are over a thousand spawning populations of Chinook salmon on the North American coast from southeastern Alaska to California (Healey 1991). Chinook salmon is one of the most abundant salmon species in North America.

## Natural History

Adult Chinook salmon migrate upstream to their spawning habitat, located primarily in the mainstem Russian River above Asti and in selected tributaries such as Dry Creek (ENTRIX, Inc. 2004) between late September and early November. As such, Chinook salmon are the first salmonids to arrive in the system during a given water year. Young Chinook salmon begin their outmigration soon after emerging from the gravel. This is a critical life history difference between Chinook salmon and the other salmonids because juvenile Chinook salmon are out of the system prior to commencement of the in-channel maintenance season (July-October). Moreover, unlike steelhead and Coho Salmon, adult Chinook salmon could be present in the system during the end of the in-channel maintenance season. However, this scenario is highly unlikely as adult Chinook salmon require fairly substantial rains to provide adequate flows to allow for migration. Flows of this magnitude are uncommon prior to October 31 (the end of Sonoma Water's in channel work window) and such flows would also likely inhibit any in channel work from being conducted.

Ocean residence can be from 1 to 7 years, but most Chinook salmon return to the Russian River as 2- to 4-year-old adults. Adult Chinook salmon begin returning to the Russian River as early as late August, but most upstream migration occurs in late-October and early-November (Chase et al. 2005). Chinook salmon may continue to enter the river through December and spawn into January. Freshwater residence in coastal California stocks, including outmigration, usually ranges from 2 to 4 months. Juvenile Chinook salmon in the Russian River emigrate as smolts from late February through June.

Chinook salmon are dependent upon suitable water temperature and substrate for successful spawning and incubation. Although the suitability of gravel substrates for spawning depends largely on the fish size, generally Chinook salmon require substrates of approximately 0.1–5.9 inches (Bjornn and Reiser 1991). The quality of spawning habitat is also correlated with intra-gravel flow. Low intra-gravel flow may lead to insufficient dissolved oxygen, contribute to the growth of fungus and bacteria, and result in high levels of metabolic waste. A high percentage of fine sediment in gravel substrates can substantially limit intra-gravel flow, affecting the amount of spawning gravel available in the river (Healey 1991). Aelvins of Chinook salmon, steelhead, and Coho Salmon have been observed in laboratory studies to have difficulty emerging when gravels exceeded 30–40 percent fine sediments (Phillips et al. 1975 in Bjornn and Reiser 1991; Waters 1995).

Rearing habitat quality for salmonids is defined by environmental conditions such as water temperature, dissolved oxygen, turbidity, substrate, area, water velocity, water depth, and cover (Bjornn and Reiser 1991; Healey 1991; Jackson 1992). Environmental conditions and interactions among individuals, predators, competitors, and food sources determine habitat quantity and quality and the productivity of the stream (Bjornn and Reiser 1991). Rearing habitat for juvenile Chinook salmon includes riffles, runs, pools, and inundated floodplains.

Survival of juvenile Chinook salmon declines as water temperatures increase from 64.4°F to 75.2°F (18°C to 24°C). Juveniles require cooler water temperature to complete the parr-smolt transformation and to maximize their saltwater survival. Successful smolt transformation deteriorates at temperatures of 62.6°F to 73.4°F (17°C to 23°C) (Myrick and Cech 2001). At the Mirable rubber dam, healthy Chinook salmon smolts were captured at maximum daily surface water temperatures greater than 23°C (Chase, et al. 2005).

### Occurrence in the Program Area

Several reports and correspondences suggest there were few, if any, Chinook salmon in the Russian River historically (Shapovalov 1946, 1947, 1955; Murphy 1945, 1947; Pintler and Johnson 1958; Fry 1979 cited in Steiner 1996). Stocking records from the United States Commission of Fish and Fisheries (USCFF) documented planting of Chinook salmon between 1881 and 1907. Snyder (1908) described Chinook salmon in the Russian River and cannery records from before 1890, but suggested that most of the salmon harvested were too small (less than 20 pounds) to be Chinook salmon. There is no information on the presence or absence of Chinook salmon in the Russian River watershed prior to the first stocking records (USCFF 1892 in Chase, et al. 2007).

Research by Sonoma Water and CDFW reveal an abundant and widely distributed population of Chinook salmon in the Russian River today. CDFW compiled and reviewed salmonid presence data collected between 1920 and 2000 for streams in the Russian River watershed; this confirmed a Chinook salmon presence in the mainstem Russian River, the East Fork Russian River, and Dry Creek (ENTRIX, Inc. 2004). Sonoma Water monitored the entire Chinook salmon run for the first time in 2000 at the Mirabel inflatable dam, and counted approximately 1,500 Chinook salmon in 2000 and at least that many in 2001 (Chase, et al. 2001, 2002). A total of 6,103 Chinook salmon adults were observed in 2002 (Chase, et al. 2003). Of the 31 Chinook salmon trapped, only 2 were larger than 20 pounds (Chase, et al. 2003). The latter study indicates that fish size may be a poor indicator of species, and Chinook salmon may, therefore, have been historically present in the watershed at some level.

Sonoma Water continued monitoring fish migration through the Mirabel Dam from 2000 to 2004 using video counts. Results from those surveys ranged from 1,383 Chinook salmon in 2001 to 6,081 in 2003 (Chase, et al. 2007). Sonoma Water also counted redds along a 100-km (kilometer) reach of the mainstem from Ukiah to Windsor annually from 2002 to 2004. Adult

Chinook salmon were the only fish observed on spawning gravels, and up to 1,044 were observed in a single year (Chase, et al. 2007). Results from migrant trapping downstream of Mirabel dam ranged from 1,361 in 2000 to 19,319 in 2002 (Chase, et al. 2007).

Chase et al. (2007) reported the results of Chinook salmon monitoring on Russian River tributaries as well as other Sonoma County streams. During spawning surveys between 2002 and 2004, Sonoma Water observed Chinook salmon on Dry Creek, four other tributaries to the Russian River, and Santa Rosa Creek. National Oceanic and Atmospheric Administration (NOAA) Fisheries captured juveniles on Austin Creek[1] in 2003 and 2004. Finally, CDFW observed redds and carcasses on Forsythe Creek in 1999.

Stream Maintenance Considerations

Zone 1A falls within the Evolutionary Significant Unit for California Coastal Chinook salmon. As discussed in Chapter 2, the Russian River Biological Opinion addresses the potential for California Coastal Chinook salmon to occur in the Russian River and its tributaries. The Laguna de Santa Rosa is a tributary to the Russian River and, therefore, may also support populations of Chinook salmon.

Maintenance activities are unlikely to impact Chinook salmon in the SMP project area. Juvenile Chinook salmon are not present in the project area during the dry months (July through October) when instream activities occur. Some adults may begin their upstream migration in late August, but most upstream migration occurs in late-October and early-November (Chase, et al. 2005). In the unlikely event that Chinook salmon are present at project sites, implementation of avoidance measures for the other salmonids (e.g., exclusion netting, silt fencing, fish removal during dewatering, etc.) will reduce any direct impacts to migrating adults. It should be noted that although unlikely, stream activities that include dewatering could temporarily prevent upstream migration of Chinook salmon. Please refer to the steelhead section for a more detailed discussion of impacts and avoidance measures.

## Fish Species of Special Concern

### *Hardhead*

Hardhead (*Mylopharodon conocephalus*) is listed as a state species of special concern by CDFW. Hardhead are generally found in clear, deep pools and runs with sand, gravel, and boulder substrates and slow velocities. Most steams in which they occur have summer temperatures in excess of 20$^{o}$C (Moyle 2002). Hardhead are widely distributed in low to medium elevation streams within Sacramento-San Joaquin drainage and are also know from a number of other drainages including the Russian River. This species is occasionally captured in low numbers with in the SMP Area (Chase 2008, pers. comm.).

1 There are two Austin creeks in the Russian River watershed. The Austin Creek noted here as providing Chinook salmon habitat is located in the lower Russian River and is not a Sonoma Water-maintained channel. There is also an Austin Creek tributary to Brush Creek/Santa Rosa Creek (seen east of Santa Rosa on Figure 1-2) that is a maintained engineered channel. The engineered Austin Creek east of Santa Rosa does not support sensitive fish habitat.

## *Pacific lamprey*

Pacific lamprey (*Entosphenus tridentatus*) is listed as a species of concern by the USFWS and a species of special concern by CDFW. Pacific lamprey are anadromous an adults generally move into spawning streams between March and June and are known to migrate in freshwater for up to a year prior to spawning. Migrations of 500-600 km are thought to have been normal prior to habitat loss and barriers. Lamprey need cool water (12-18ºC) to spawn and, like salmon, use riffles with clean gravel/cobble substrates. Young lampreys, called ammocoetes, generally require cold water (~15ºC) to emerge. After emerging from gravels, ammocoetes move to muddy or silty slack water areas to feed on detritus and spend up to seven years in freshwater before undergoing metamorphosis that allows them to survive in the ocean (Moyle 2002). Pacific lamprey are the most common and largest lamprey in California and are found in coastal rivers and stream throughout the state as well as in the Sacramento-San Joaquin drainages. In the Russian River watershed, Pacific lamprey have been found in the mainstem, as well as in Santa Rosa Creek (Chase 2008, pers. comm.).

## *River lamprey*

River lamprey (*Lampetra ayresi*) is listed as a state species of special concern by CDFW. The biology of river lamprey has not been well studied in California and most information about their habitat requirements has been gleaned from research in British Columbia. This species is anadromous with lamprey spawning in freshwater riffles. Young lampreys, called ammocoetes, feed on detritus, algae and microorganisms in slack water environments for 3-5 years before undergoing a 9-10 month metamorphosis that allows them to survive in the ocean. Timing of outmigration and adult spawning is not well known in California, but it is thought to occur between February and May (Moyle 2002). River Lamprey are known from as far north as Alaska to the southern extent of their known range in the San Francisco Bay. Most California populations are known from the lower Sacramento and San Joaquin Rivers and their tributaries. Populations are also known from the Russian River, Sonoma Creek, Napa River, and Alameda Creek (Moyle 2002). Within the SMP Area river lamprey have been identified in Mark West Creek, are considered likely occur in Santa Rosa Creek and occur in Sonoma Creek (Chase 2008, pers. comm.).

## *Russian River tule perch*

Russian River tule perch (*Hysterocarpus traskii pomo*) is listed as a species of special concern by CDFW. The Russian River tule perch inhabits low elevation streams of the Russian River system. It requires clear, flowing water with abundant cover, and deep runs or pools (>0.5m). Tule perch are rarely found in streams warmer than 25ºC for extended periods and generally are known to prefer temperatures below 22ºC (Moyle, 2002). Cover is especially important for near-term females and young because it serves as refuge from predators. Key types of cover include tule beds, other dense instream vegetation beds, and/or submerged branches. The subspecies is known from a number of locations along the mainstem Russian River and potentially occurs in low elevation tributaries that support habitat requirements such as lower Santa Rosa Creek where the species has been observed by Sonoma Water biologists (Chase 2008, pers. comm.).

### *Navarro Roach*

The Navarro roach (*Lavinia symmetricus navarroensis*) is listed as a California species of special concern by CDFW. There have been limited observations of Navarro roach in California, and no studies have specifically addressed their life history; it is presumed to be similar to other roach subspecies (Moyle et al. 2015). Navarro roach are freshwater obligate fish that prefer pools and low water velocity in mid-elevation stream habitats associated with rangeland, agriculture, developed land uses. They are confined to the Navarro River and its watershed. The Navarro roach CNDDB search resulted in two records in northern Sonoma County in 1999 (CDFW 2019). No records were located in proximity to program area Zones 1A through 3A.

### *Sacramento Splittail*

The Sacramento splittail is listed as a California species of special concern by CDFW. They utilize brackish-water habitats in the San Francisco Estuary and the river-edge habitats upstream of the estuary to the north for rearing and spawning, respectively (Moyle et al. 2015). The Petaluma/Napa populations spawn in the river in March and April, the larvae remain in flooded river vegetation for up to 6 weeks and then rear in the estuary for up to 2 years. They feed on shrimp, clams and other benthic invertebrates. This species also has a Delta/Suisun Marsh population, and historically had a southern Central Valley population, which has been extirpated. A CNDDB search resulted in two observations of the Sacramento Splittail in the Petaluma Valley watershed (CDFW 2019). One observation occurred in the Petaluma River within Zone 2A of the program area in 1999.

# Special Status Wildlife

## Invertebrates

### *California Freshwater Shrimp*

California freshwater shrimp (*Syncaris pacifica*; CFWS) is a federal and state endangered species that occurs in low-elevation, perennial freshwater streams within Marin, Sonoma, and Napa counties. The current understanding of the historical distribution of this species is based on its known distribution, local topography and watershed boundaries, and patterns in geologic activity and climatic changes that may have isolated populations among watersheds and streams. A recovery plan for the species was released in July 1998 (USFWS 1998). The most recent USFWS 5-year review for this species was released in 2011 (USFWS 2011).

#### Natural History

CFWS are adapted to freshwater and have not been found in brackish or estuarine environments. While seemingly restricted to low-elevation and low-gradient perennial streams, relatively little is known about the shrimp's habitat requirements. Previous studies have shown that CFWS are typically found in streams 12 to 36 inches in depth (30.5 to 91.4 centimeters) with exposed live roots along submerged undercut banks greater than 6 inches (15 centimeters) and overhanging woody debris/vegetation (USFWS 1998). These areas provide refuge from swift currents as well as protection from heavy sediment loads associated with high stream flows.

No data are currently available for defining the optimum temperature and stream flow regime for the CFWS or the minimum and maximum limits it can tolerate. CFWS seem to have evolved to survive a broad range of hydrologic and temperature fluctuations characteristic of the small, perennial streams they inhabit. While relatively sedentary and slow-moving, CFWS do move around within their microhabitat based on seasonal variations and preferences in response to water currents, water temperature, and food supply.

The habitat preferences of the shrimp change between the winter and late-spring/summer months, with shrimp living beneath undercut banks in the winter months and resting/feeding on submerged leafy branches in the spring and summer. While downstream migration of less than 9 miles (15 kilometers) has been observed, upstream migration is also believed to occur, but has not been documented (USFWS 1998). CFWS are typically found attached to submerged plant material and debris which provides both cover from predators and fine particulate organic matter which the shrimps feed on. CFWS are most likely to be found in low gradient portions of the active stream channel, particularly in areas where cover is provided by undercut banks, woody debris, root structures, or stream vegetation.

### Occurrence in the Program Area

The CNDDB contains 14 localities for this species (Figure D-1) (CDFW 2019). This species is currently known from 23 stream segments in Napa, Marin, and Sonoma Counties that can be separated into four general drainage units: 1) tributary streams in the lower Russian River drainage (Austin Creek [different from the Austin Creek that is a tributary to Brush Creek in Zone 1A]); 2) coastal streams flowing westward directly into the Pacific Ocean; 3) streams draining into a small coastal embayment (Tomales Bay); and 4) streams flowing southward into northern San Pablo Bay, including Napa River and Sonoma Creek (USFWS 1998). In Sonoma County, CFWS are known from Sonoma, Green Valley, Blucher, Jonive, Salmon, Austin, Ebabias, Franz, Yulupa, and Redwood creeks (CDFG 2008 and USFWS 2011).

CFWS are known to occur in Sonoma Water Flood Control Zones 1A, 3A, 5A, and 8A (Figure D-1). In Zone 1A, CFWS occur in Blucher Creek, a tributary of the upper Laguna de Santa Rosa (Martini-Lamb 2007). Now extirpated, this species also historically occurred in the Santa Rosa Creek (Zone 1A). CFWS are known to occur at several locations along Sonoma Creek and Yulupa Creek in Zone 3A (CDFW 2008). There are occurrences of shrimp from several tributaries of the lower Russian River within Zone 5A, including Big Austin, East Austin, Green Valley, Ebabias, Jonive, and Hudspeth creeks. In Zone 8A, CFWS have been found in Salmon Creek, which is a coastal stream (CDFG 2008; Martini-Lamb 2007).

### Stream Maintenance Considerations

Natural channels provide the highest quality habitat for CFWS. These channels typically have in-channel vegetation and slow moving, backwater areas that provide microhabitat features essential for this species. This does not preclude CFWS from occurring in SMP engineered or modified channels, but the overall habitat quality is lower in those channels since there is generally less in-stream structure and flows are faster than in natural channels. Overall the likelihood of occurrence is less.

To avoid impacts to CFWS and potential habitat several natural channels have been removed from the program area including: Blucher Creek (Zone 1A), Willow Creek (Zone 5A), Sheephouse

Creek (Zone 5A), Dutch Bill Creek (Zone 5A), Green Valley Creek (Zone 5A), Jonive Creek (Zone 5A), Hudspeth Creek (Zone 5A), and Salmon Creek (Zone 8A). Channels that have been removed from the SMP are shown in Figures 1-2 through 1-9 and 1-12. The only stream maintained under the SMP known to support CFWS is Sonoma Creek (Zone 3A). This creek has natural and modified channel reaches and no SMP engineered channels. Pre-maintenance surveys are conducted for CFWS. If present, Sonoma Water consults with regulatory agencies on how to avoid or minimize impacts to CFWS or may cancel maintenance to avoid affecting CFWS resources.

## Amphibians

### *California Tiger Salamander*

The California tiger salamander (*Ambystoma californiense*) Sonoma Distinct Population Segment (DPS) is a federal endangered species and a California threatened species. Historically, the California tiger salamander occurred in lowland grassland habitats throughout much of central California. Although this species still occurs within much of its range, it has been extirpated from several areas it once occupied (Fisher and Shaffer 1996, Stebbins 1985). The loss of California tiger salamander populations has been due primarily to habitat loss (Fisher and Shaffer 1996). Based on genetic analysis, there are six populations of California tiger salamanders, of which one is distinct to the Santa Rosa area of Sonoma County (Shaffer and Trenham 2005). Critical habitat was designated for California tiger salamander in Sonoma County in 2011 (76 FR 54346-54372).

#### Natural History

California tiger salamanders require both aquatic habitat for egg and larvae life stages and uplands for terrestrial life stages. California tiger salamanders inhabit valley and foothill grasslands and the grassy understory of open woodlands, usually within one mile of water (Jennings and Hayes 1994). The California tiger salamander is terrestrial as an adult and spends most of its time underground in subterranean refuge sites, or refugia. Underground retreats are usually California ground squirrel (*Spermophilus beecheyi*) or pocket gopher (*Thomomys* sp.) burrows and, occasionally, cracks in the ground or human-made structures.

Adult California tiger salamanders migrate at night to aquatic breeding sites during warm rains, primarily between November and February (Shaffer and Fisher 1991, Barry and Shaffer 1994). California tiger salamanders are rarely observed except during this period (Loredo et al. 1996). During the winter rains, adults breed and lay eggs primarily in vernal pools and other shallow, ephemeral ponds that fill during the wet season and often dry by summer (Loredo et al. 1996). This species also uses artificial aquatic habitats (without predatory fish) for reproduction but streams and reservoirs are rarely used. Breeding usually occurs within a few days after migration and adults return to their upland refuges soon thereafter (Barry and Shaffer 1994 citing Storer 1925).

California tiger salamander larvae and embryos are susceptible to predation by fish (Stebbins 1972; Zeiner et al. 1988; Shaffer et al. 1994), and larvae are rarely found in aquatic sites that support predatory fish (Shaffer and Fisher 1991; Shaffer and Stanley 1992; Shaffer et al. 1994). Aquatic larvae are taken by herons and egrets and possibly garter snakes (Zeiner et al. 1988). Shaffer, et al. (1993) also found a negative correlation between the occurrence of California tiger salamanders and the presence of bullfrogs.

## Occurrence in the Program Area

Approximately 56 miles of the SMP's over 200 miles of maintenance channels are located within the potential range of California tiger salamander (Cook 2008b). There are 78 extant CNDDB occurrences of California tiger salamander located in Zone 1A within one mile of the program area and three (3) CNDDB occurrences in Zone 2A (CDFW 2019, Figure D-2). Most of these occurrences are breeding pools and road observations of migrating adults (CDFW 2019; Cook 2008a; Cook 2008b). These occurrences are primarily located west of Santa Rosa, Rohnert Park, and Cotati, and south of Cotati. Two individuals were collected within the Wilfred Creek corridor (Zone 1A) in 2014. Larvae have been observed in mitigation sites (e.g., vernal pools and engineered pools) within upland areas near Colgan Creek (CDFW 2019). Adults have been observed in breeding pools in upland areas adjacent to Roseland Creek (CDFW 2019).

Most of the aquatic habitats in the program area consist of channelized creeks that do not provide potential California tiger salamander breeding habitat (Cook 2008b). These channels typically have high winter flood flows, contain fish and other aquatic predators, such as bullfrog and crayfish, and are degraded. Upland habitats that occur along the channel banks and along access road shoulders vary from dense riparian to grassland/ruderal. The probability of adult California tiger salamander occupying upland habitats within the project area range from unlikely in areas that are greater than 1.3 miles and isolated from known California tiger salamander breeding sites by development to moderate-high probability where grasslands or other undeveloped lands are adjacent to Sonoma Water maintained channels and are within close proximity to known breeding sites (Cook 2008b).

## Stream Maintenance Considerations

Since California tiger salamanders do not typically occur in stream channels, in-channel maintenance activities will have little effect on this species. Road mortality of migrating California tiger salamanders can be a concern during early winter rains if breeding pools are near high-volume roadways (Cook 2008d). However, Sonoma Water maintenance activities are unlikely to affect salamanders because migration occurs also exclusively at night during rainfall and Sonoma Water crews work during daylight hours due to safety concerns.

During the dry season (summer months) California tiger salamanders are typically underground and may be affected by maintenance activities that result in ground disturbance (i.e., excavation, grading). If ground disturbance along the shoulders of access roads or banks adjacent to engineered or modified channels occurs, there is the potential for individuals to be crushed in burrows or excavated out of burrows. During any time of year excavation of pocket gopher burrows could impact upland habitat for this species. As such, specific avoidance and minimization practices will be conducted during maintenance activities that could directly impact suitable upland habitat. Similarly, rodent control on levees or along engineered channels could have a cumulative effect on the amount of refugia habitat that is available over the long term.

USFWS issued a Biological Opinion (BO) for the Sonoma Water SMP (USFWS 2009) that includes measurements to reduce the potential harm to selected species, including California tiger salamander. Additional avoidance and minimization measures described in the BO include: scheduling ground disturbing maintenance activities outside of the rainy season, when possible, to reduce the chance of encountering above-ground California tiger salamanders; avoidance of adjacent wetlands or temporary pools along roadways or along natural channels; avoidance of upland aestivation habitat; pre-maintenance surveys for and, if necessary, removal of tiger salamanders by permitted biologist(s); and pedestrian-only access across upland channel banks and adjacent upland habitats within 48 hours of a California tiger salamander observation at that site.

SMP activities may benefit the tiger salamander through the development and enhancement of the understory vegetation, reduction in exotic invasive species, reduced sediment loading in vernal pools that are downstream of SMP activities through the repair of destabilized banks, and through targeted sediment capture and removal activities in areas that are not considered sensitive.

## *California Red-legged Frog*

The California red-legged frog (*Rana draytonii*) is a federal threatened species and a California species of special concern. The historical range of the California red-legged frog extended from the California coast in the vicinity of Navarro River, Mendocino County, inland to Redding, Shasta County, and southward to northwestern Baja California, Mexico (Jennings and Hayes 1985, Hayes and Krempels 1986, Shaffer, et al. 2004). All individuals and populations of California red-legged frogs receive federal protection throughout the species' range. Figure D-3 depicts critical habitat areas for California red-legged frog within Sonoma County. These designated areas do not intersect with any of the SMP channels. Figure D-3 also depicts general critical habitat areas designated by the USEPA as restricted for uses of certain pesticides (USEPA 2007). As a result of a court-ordered injunction, USEPA has in identified certain critical habitat areas for California red-legged frog whereby use of certain pesticides is disallowed or allowed with use restrictions, such as no-use buffers.

### Natural History

The California red-legged frog is primarily found in lentic aquatic habitats at mid- to low elevations. The species may use upland habitat adjacent to aquatic habitat for foraging, cover, dispersal, and temporary aestivation. California red-legged frogs may also use temporary pools in ditches along the side of access roads. California red-legged frogs may move over 2 miles up or down drainages from breeding sites and have been observed using adjacent riparian woodlands up to 100 feet from the water (Rathbun, et al. 1993).

California red-legged frogs breed from November through April (Storer 1925; USFWS 2002), but in Sonoma County they typically breed in January and February (Cook 2008, pers. comm.). Breeding sites include a variety of aquatic habitats, including slow sections of creeks, ponds, and marshes. Breeding adults are commonly found in deep (greater than 2 feet), still or slow-moving water with shrubby riparian or emergent vegetation (Hayes and Jennings 1988). Females attach egg masses to wetland vegetation, and tadpoles metamorphose between July and September (Storer 1925; Wright and Wright 1949; USFWS 2002). Suitable breeding sites must hold water at least until mid-summer when tadpoles metamorphose (Cook 2019 pers. comm.).

During summer, California red-legged frogs often disperse from their breeding habitat to forage and seek summer habitat if water is not available (USFWS 2002). This habitat may include shelter under boulders, rocks, logs, debris, agricultural drains, watering troughs, abandoned sheds, or haystacks. The frogs will also use small mammal burrows, incised streamed channels, or areas with moist leaf litter (Jennings and Hayes 1994; USFWS 1996; USFWS 2002).

### Occurrence in the Program Area

In 2008, Sonoma Water completed the *California Red-legged Frog Site Assessment for the Stream Maintenance Program*, an assessment of documented California red-legged frog occurrences as well as a summary of a detailed habitat assessment conducted at 188 sites (105 unique streams) within the SMP Area (Cook 2008a). Focused surveys for CRLF were completed at 46 SMP reaches consisting of 323 field visits during spring and summer from 2010 to 2015 with no detections of California red-legged frog in SMP reaches (Cook 2016).

There are 62 CNDDB occurrences of California red-legged frog within Flood Control Zones in the program area (CDFW 2019) (Figure D-3). California red-legged frogs have been documented in Santa Rosa Creek and Copeland Creek watersheds (Zone 1A), Petaluma Creek watershed (Zone 2A), upper Sonoma Creek watershed (Zone 3A), as well as Willow and Sheephouse Creeks, and Fife Creek upper watershed in Zone 5A, and in Salmon Creek, American Creek, and Stemple Creek watersheds in Zone 8A. Willow, Sheephouse, and Salmon creeks have been removed from the SMP; no maintenance activities would occur in these creeks.

Most California red-legged frog occurrences are located in the Petaluma River and Sonoma Creek watersheds. Many of these occurrences are in the upper reaches of the tributaries to Petaluma River, on both the east and west side of the valley. A cluster of California red-legged frog occurrences are located near creeks west of Petaluma including on Wiggins, Wilson, and Thompson creeks on which Sonoma Water has easements to maintain hydraulic capacity. Wiggins, and Wilson creeks are not engineered channels, and therefore maintenance activities would be very limited. The section of Thompson Creek that is surrounded by urban development and maintenance activities are infrequent (see Thompson Creek, Reach 1 on Figure C-88).

California red-legged frog has been found within engineered channels at Rodgers Creek (Zone 3A) and Bloomfield Creek (Zone 8A) and from modified and natural channels at Higgins and Marin creeks in Zone 2A. Also, California red-legged frog has been reported from Ellis Creek in Zone 2A (CDFW 2019), but has not been detected within the SMP area (Cook 2008a; Figure D-3).

### Stream Maintenance Considerations

Natural channels potentially provide the highest quality habitat for California red-legged frogs in the program area. These channels typically have complex in-channel vegetative cover and pools that provide microhabitat features essential for this species. This does not preclude California red-legged frogs from occurring in engineered or modified channels. For example, California red-legged frog have been found at Rodgers and Bloomfield creeks with marginal habitat conditions. Nonetheless, the overall habitat quality is lower in engineered channels since they often do not contain the habitat complexity necessary to support the frog’s life history.

The SMP has incorporated several Best Management Practices (BMP) to avoid and minimize impacts to California red-legged frogs and implements mitigation measures included in the SMP Programmatic Biological Opinion (USFWS 2009). These conservation measures are implemented before and during annual maintenance activities. Habitat evaluations of project areas are conducted annually. Pre-maintenance surveys are conducted in areas with potential or marginal frog habitat and important habitat features are avoided. A biological monitor is onsite during maintenance work. If California red-legged frogs are present they are relocated outside of the work area. Regulatory agencies are regularly notified of findings.

### *Foothill yellow-legged frog*

The foothill yellow-legged frog (*Rana boylii*) is a California species of concern and a candidate for state listing. Historically, foothill yellow-legged frogs occurred from west of the crest of the Cascade Mountains in Oregon, south to the Transverse ranges in Los Angeles County, and in the Sierra Nevada foothills south to Kern County (Zweifel 1955; Stebbins 1985). The current range excludes coastal areas south of northern San Luis Obispo County and foothill areas south of Fresno County, where the species is apparently extirpated (Jennings and Hayes 1994).

#### Natural History

Foothill yellow-legged frogs are a highly aquatic amphibian, spending most or all of their life in or near streams, though foothill yellow-legged frogs have been documented more than 165 feet from water (Nussbaum et al. 1983). Adult foothill yellow-legged frogs have high site fidelity and typically occupy small home ranges. Normal home ranges are probably less than 33 feet in the longest dimension, with occasional long-distance movements of 165 feet during periods with high water conditions (Zeiner et al. 1988). During the breeding season, March through June, adults may migrate several hundred yards or more to congregate at breeding sites (Ibis Environmental, Inc. 2003).

Foothill yellow-legged frogs occur in small to moderate-sized streams with a moderate gradient and at least some cobble-sized substrate (Hayes and Jennings 1988; Jennings 1988). Adults are often found in pools with submerged cover. Breeding typically occurs in spring (March-early June) in open canopy areas along rocky shorelines in shallow water (Storer 1925; Fitch 1936, Zweifel 1955), which also provides foraging and refuge habitat for tadpoles and metamorphs (Hayes and Jennings 1988; Jennings 1988). Females attach egg masses on the downstream side of cobbles and boulders (Storer 1925; Fitch 1936; Zweifel 1955; Kupferberg 1996).

#### Occurrence in the Program Area

In 2018, Sonoma Water completed the *Foothill Yellow-legged Frog Habitat Evaluation for the Stream Maintenance Program*, an assessment of foothill yellow-legged frog occurrences as well as a summary of habitat conditions of the 428 reaches within the SMP area (Cook 2018). The foothill yellow-legged frog habitat evaluation identified 330 SMP reaches as unsuitable habitat, 55 reaches with marginal habitat, and 43 reaches with potential habitat. Unsuitable habitat reaches were typically low gradient streams located in lowland valleys, which were generally channelized and in urban areas. Other reaches identified as unsuitable were small creek with very seasonal water that likely dry soon after rainfall (Cook 2018).

A search of the CNDDB provided 156 reported occurrences of foothill yellow-legged frog in Sonoma County (CDFW 2019) (Figure D-4). There is occurrence data for Laguna de Santa Rosa watershed (Zone 1A), Petaluma River watershed (Zone 2A), Sonoma Creek watershed (Zone 3A), Russian River watershed (Zones 4A and 5A), and scattered occurrences in Zones 7A and 8A. Foothill yellow-legged frogs are likely distributed throughout the county in natural foothill and mountain streams with moderate gradient and permanent or semi-permanent water. Natural channels provide the highest quality habitat for this species though the species could occur in modified and engineered channels. Most engineered channels are located in low gradient sections of creeks in urban areas that provide limited habitat for this species. Foothill yellow-legged frogs have been observed in natural channels that have been excluded from the SMP (Green Valley, Salmon, Dutch Bill, Sheephouse, and Mark West Creek) (CDFW 2019). Foothill yellow-legged frog have also been recently observed in engineered portions of Copeland and Adobe creeks, as well as historically observed in a modified section of Lichau Creek (CDFW 2019; Cook 2018).

### Stream Maintenance Considerations

The potential impact on the foothill yellow-legged frog, although present, is low due to the geographic separation of this frog and most SMP maintenance activities. Foothill yellow-legged frog occurs primarily in natural moderate-gradient streams in mountainous areas, while SMP activities are usually in low-gradient channels in lowland urban areas. However, vegetation management and sediment removal in natural moderate-gradient channels have the potential to affect foothill yellow-legged frogs.

The SMP has incorporated several BMPs to avoid and minimize impacts to foothill yellow-legged frogs. These conservation measures are implemented before and during annual maintenance activities. Habitat evaluations of project areas are conducted annually. Pre-maintenance surveys are conducted in areas with potential or marginal frog habitat. A biological monitor is onsite during maintenance work. If foothill yellow-legged frogs are present they are relocated outside of the work area. Regulatory agencies are regularly notified of findings.

## *California Giant Salamander*

The California giant salamander (*Dicamptodon ensatus*) is a California species of special concern. The California giant salamander occurs in the Coast Range Mountains from Mendocino County south to Monterey County and east to Napa County. This larger salamander is associated with coastal forests and cold-water streams.

### Natural History

Adult California giant salamanders are terrestrial and inhabit moist refuges in forests, such as beneath logs, rocks, and debris. California giant salamanders eat invertebrates and small prey such as lizards, mice, and shrews (Thomson et al. 2016). Adults migrate to streams to breed in the spring. Larvae may require one or more years to metamorphose and some larvae are neotenic (sexually mature in their larval life stage).

### Occurrence in the Program Area

The California giant salamander has 85 reported occurrences in Sonoma County (CDFW 2019). The majority of these records occur in coniferous and riparian forest communities in mountainous regions of the county. There are few reports of this salamander within the program area due largely because the program area generally lacks the mountainous conditions that they inhabit. One record from 1911 is from the vicinity of Sonoma Creek in Zone 3A. One report occurs along Oakmont Creek within the program area. A larval California giant salamander was recently found along Fife Creek in Zone 5A.

### Stream Maintenance Considerations

The potential impact on the California giant salamander is low due to the geographic separation of this species and most SMP activities. California giant salamander occurs primarily in natural permanent and semi-permanent streams in coastal mountainous areas, while SMP activities are usually in low-gradient channels in lowland urban areas. However, vegetation management and sediment removal in moderate-gradient channels have the potential to affect California giant salamander.

Overall the temporary or permanent removal of vegetative cover and in-stream sediment may reduce the habitat quality for this species in reaches where maintenance activities occur. The SMP has incorporated several BMPs to avoid and minimize impacts to California giant salamanders. These conservation measures are implemented before and during annual maintenance activities. Habitat evaluations of project areas are conducted annually. Pre-maintenance surveys are conducted in areas with potential or marginal habitat. A biological monitor is onsite during maintenance work. If California giant salamanders are present, they are relocated outside of the work area. Regulatory agencies are regularly notified of findings.

## *Red-bellied Newt*

The red-bellied newt (*Taricha rivularis*) is a California species of special concern. The red-bellied newt occurs in mountains forest and cold-water streams (Thomson et al. 2016). This newt has a limited range and is only found in Sonoma, Lake, Mendocino, and southern Humboldt counties.

### Natural History

Adult red-bellied newts are terrestrial and are usually found on the forest floor under cover near streams. Breeding occurs during spring and preferred habitat is cold, clear moderate gradient creeks with a rocky substrate (Thomson et al. 2016).

### Occurrence in the Program Area

Red-bellied newt records are distributed mainly in the mountainous northern area of Sonoma County. A search of the CNDDB provided 58 occurrences in the county (CDFW 2019). This newt occurs in SMP Zones 1A, 3A, and likely 5A. Also, there is a record from Petaluma (Zone 2A); however, this record has no specific date or location. There are several records along Mark West Creek in Zone 1A and Sonoma Valley in Zone 3A.

### Stream Maintenance Considerations

The potential impact on the red-bellied newt is low due to the geographic separation of this species and most SMP activities. Red-bellied newt occurs primarily in natural permanent and semi-permanent streams in coastal mountainous areas, while SMP activities are usually in low-gradient channels in lowland urban areas. However, vegetation management and sediment removal in moderate-gradient channels have the potential to affect this newt.

Overall the temporary or permanent removal of vegetative cover and in-stream sediment may reduce the habitat quality for this species in reaches where maintenance activities occur. The SMP has incorporated several BMPs to avoid and minimize impacts to red-bellied newts. These conservation measures are implemented before and during annual maintenance activities. Habitat evaluations of project areas are conducted annually. Pre-maintenance surveys are conducted in areas with suitable habitat. A biological monitor is onsite during maintenance work. If red-bellied newt are present they are relocated outside of the work area. Regulatory agencies are regularly notified of findings.

# Reptiles

## *Western Pond Turtle*

The western pond turtle (*Actinemys marmorata*) is a California species of special concern. Historically, the western pond turtle occurs from Washington (Slater 1962) to northern Baja California, Mexico. In California, the turtle's range consists of most Pacific slope drainages between Oregon and Mexican (Jones & Stokes 2004). Western pond turtles occur in natural and artificial aquatic habitats.

### Natural History

Western pond turtles are found in rivers, streams, lakes, ponds, wetlands, reservoirs, and brackish estuarine waters (Holland 1994; Jennings and Hayes 1994). Western pond turtles will utilize various components of a stream. They are often observed basking on logs, rocks, and woody debris within a waterbody or on open portions of a streambank. Both adult and juvenile turtles favor aquatic habitats with access to areas of deep, slow water with underwater cover. Hatchlings tend to seek areas with shallow, warm water, free of aquatic predators with aquatic vegetation (Reese 1996; Holland 1994; Jones & Stokes 2004).

Upland habitats are used for nesting. Nesting has been reported to occur up to 1,390 feet away from water (Jennings and Hayes 1994) but is usually closer, averaging 92 feet from aquatic habitat (Rathbun et al. 2002). Females generally dig nests in friable soils with an open canopy and southern exposure (CDFW 2005). Nest are constructed typically in June in Sonoma County. Eggs hatch in fall, but hatchings may remain in the nest until the following spring.

### Occurrence in the Program Area

In 2008, Sonoma Water completed the *Foothill Yellow-legged Frog and Western Pond Turtle Habitat Evaluation for the Stream Maintenance Program*, an assessment of documented western pond turtle occurrences as well as a summary of a detailed habitat assessment conducted at 189 sites (102 unique streams) within the SMP Area (Cook 2008c). Approximately 89 of these creeks were channelized and usually located within urban areas. The remaining 100 creeks were natural and are generally located in rural, undeveloped areas.

Western pond turtle records are widely distributed throughout Sonoma County. A search of the CNDDB provided 85 reported occurrences of western pond turtle in Sonoma County (CDFW 2019). There are records from Santa Rosa Creek and Laguna de Santa Rosa watersheds (Zone 1A), Petaluma River watershed (Zone 2A), Sonoma Creek watershed (Zone 3A), Russian River watershed (Zones 4A and 5A), and a tributary of Salmon Creek (Zone 8A). Documented aquatic habitats include the Russian River, small and large creeks, constructed ponds and lakes, flood control channels, marshes, wastewater treatment ponds, and tidal sloughs and estuaries. Most SMP natural, modified, and engineered channels provide marginal or potential habitat for this turtle.

### Stream Maintenance Considerations

SMP maintenance activities have the potential to affect western pond turtles. Sediment removal and bank repair that require dewatering of a creek or waterbody may disturb turtles. Ground disturbance work along the upper banks of creeks and road shoulders may impact turtle nests, although the chance of encountering a nest is very low. Western pond turtles may benefit from sediment removal in high sediment-loaded urban creeks where deep, open water habitat is limited.

The SMP has incorporated several BMPs to avoid and minimize impacts to western pond turtles. These conservation measures are implemented before and during annual maintenance activities. Habitat evaluations of project areas are conducted annually. Pre-maintenance surveys are conducted in areas with potential or marginal habitat. A biological monitor is onsite during maintenance work. If western pond turtles are present, they are relocated outside of the work area. Regulatory agencies are regularly notified of findings.

# Mammals

## *American Badger*

The American badger (*Taxidea taxus)* is a California species of special concern. It ranges throughout the western United States north into the western provinces of Canada and east to Ohio, Michigan, and Ontario, Canada (Long 1972). Within California, it occurs throughout the state except for the extreme northwestern coastal area (Zeiner et al. 1990).

### Natural History

American badgers are generally associated with dry, open, treeless regions; prairies and grasslands; low-intensity agriculture (e.g., pasture and dryland crops); drier open shrublands and forest; parklands; and cold desert areas (Long 1972; Zeiner et al. 1990). They prey on burrowing rodents including ground squirrels and gophers, but will consume a variety of species ranging from insects, birds, and reptiles (Williams 1986).

### Occurrence in the Program Area

American badger records are widely distributed throughout Sonoma County. A search of the CNDDB provided 21 reported occurrences of American badger in Sonoma County (CDFW 2019. There are reports from Santa Rosa Creek watershed (Zone 1A), Petaluma River watershed (Zone 2A) and other less urban parts of the county (CDFW 2019). Documented habitats include non-native grassland, oak woodland, and agricultural land or grazing areas.

### Stream Maintenance Considerations

Stream maintenance activities have a very low potential to affect American badger, as this species inhabits dry, open, treeless areas. Since the majority of stream maintenance activities are limited to the stream channel and banks, no substantial impacts to American badger are expected.

## *Pallid Bat*

The pallid bat (*Antrozous pallidus)* is a California species of special concern. The pallid bat is widespread throughout the western United States; southern British Columbia, Canada; and mainland and Baja California, Mexico (Hermanson and O'Shea 1983; Hall 1981). It occurs throughout California, except at the highest elevations of the Sierra Nevada range.

### Natural History

The pallid bat prefers rocky outcrops, cliffs, and crevices for roosting (Hermanson and O'Shea 1983). Foraging habitats for pallid bats are varied and include grasslands, oak savannahs and woodlands, riparian woodland, open pine forests, talus slopes, and agricultural areas. They predominantly prey upon a wide variety of insects (Zeiner et al. 1990).

### Occurrence in the Program Area

The pallid bat has been recorded throughout Sonoma County, including 19 CNDDB occurrences (CDFW 2019). There are occurrence records near Petaluma River (Zone 2A), Sonoma Creek (Zone 3A) and other less urban parts of the county (CDFW 2019). Documented habitats include cattle grazing areas, vacated barns, vineyards adjacent to riparian habitat, and non-native grasslands.

### Stream Maintenance Considerations

Stream maintenance activities that have potential to impact pallid bat include vegetation management (e.g., trimming and mowing) and bank stabilization activities. Although pallid bats prefer to roost in rocky outcrops, cliffs, and crevices, tree trimming may result in the loss of potential roost sites or abandonment of roosts. Additionally, noise and vibration from mowing and bank stabilization activities could lead to disturbance, resulting in abandonment of roosts. As described in BMP VEG-1, vegetation management emphasizes the preservation of mature trees, which are the trees that may provide suitable roosting habitat for this species.

## *Townsend's Big-eared Bat*

The Townsend's big eared bat (*Coryhorhinus townsendii*) is a California species of special concern. In the United States, it occurs in a continuous distribution in all of the western states and east into western South Dakota, northwestern Nebraska, southwestern Kansas, western Oklahoma, and western Texas (Piaggio et al. 2009). Townsend's big-eared bat range is throughout California in a variety of habitats.

### Natural History

Townsend's big-eared bat diet consists mostly of moths and other relatively slow-moving flying insects. The species hunts using echolocation. This species is known to roost in caves, mines, tunnels, abandoned buildings and other structures, but is extremely sensitive to human disturbance and may desert roosts following a single human visit (CDFG 2000). Males are often solitary during the spring and summer while the females remain in maternity colonies of fewer than 100 individuals (CDFG 2000). This species hibernates individually or in groups less than a few dozen. This species is found in all but subalpine and alpine habitats and is most abundant in coniferous and deciduous forests and riparian communities (CDFG 2000).

### Occurrence in the Program Area

Within Sonoma County 12 documented occurrences were recorded for Townsend's big-eared bat from a CNDDB search (CDFW 2019). The most recent observation was from 2014 along the coast at Bodega Head and most occurrences were located in vicinity of riparian areas. One occurrence was recorded in Petaluma (Zone 2A) in 1938. No other records occur for Townsend's big-eared bats in the program area.

### Stream Maintenance Considerations

Townsend's big-eared bat roost sites occur within caves and mines, but may roost in hollow trees. Stream maintenance activities that have potential to impact this species include vegetation management (e.g., trimming and mowing) and bank stabilization activities. Tree trimming may result in the loss of potential roost sites or abandonment of roosts. Additionally, noise and vibration from mowing and bank stabilization activities could lead to disturbance, resulting in abandonment of roosts. As described in BMP VEG-1, vegetation management emphasizes the preservation of mature trees, which are the trees that may provide suitable roosting habitat for this species.

## *Western Red Bat*

The western red bat (*Lasurus blossevillii*) is a California species of special concern. It occurs in the western United States, Mexico, Central Mexico, and possibly South America (Cryan 2003; Pierson et al. 2006). In California, the western red bat occurs from Shasta County to the Mexican border, west of the Sierra Nevada. Although this species has a wide range, relatively few records for the western red bat exist outside of California (Pierson et al. 2006).

### Natural History

The western red bat is a medium-sized bat with adults weighing 0.2-0.5 ounces. Adults are reddish in color and have short, broad, and rounded ears with a short, plain nose. While in flight, a relatively long tail extends straight out giving the western red bat a distinctive silhouette against the sky as compared to other species (Barbour and Davis 1969).

Western red bats prefer to roost in forests and woodlands from sea level up through mixed conifer forests (CDFG 2000), roosting anywhere from 2-40 feet in trees near riparian corridors fields, or urban areas. Roosting is typically in tree foliage (Pierson et al. 2006). Adults feed on a variety of insects, specifically moths, crickets, beetles, and cicadas, foraging over a variety of habitats, including grasslands, shrublands, open woodlands and forests, and croplands.

In California, most of the records are from the Central Valley. About 83% of the breeding records for western red bat in California are from the Sacramento and San Joaquin river areas, with other breeding records from the San Diego, Santa Ana, and Los Angeles rivers (Pierson et al. 2006). The northern extent of the species' summer range in California appears to be Humboldt County.

### Occurrence in the Program Area

Three occurrences of the western red bat were recorded from a CNDDB search of Sonoma County (CDFW 2019). All of these records occurred along riparian corridors outside of urban areas. One occurrence was recorded just north of Bloomfield Creek (Zone 8A) in 2015 during bioacoustics monitoring (CDFW 2019). One occurrence recorded near Cloverdale (Zone 4A) in 1954. Another occurrence recorded just east of Green Valley Creek (Zone 5A) in 2003.

#### Stream Maintenance Considerations

Stream maintenance activities that have potential to impact western red bat include vegetation management (e.g., trimming and mowing) and bank stabilization activities. Tree trimming may result in the loss of potential roost sites or abandonment of roosts. As described in BMP VEG-1, vegetation management emphasizes the preservation of mature trees, which are the trees that may provide suitable roosting habitat for this species.

## Birds

### *Western yellow billed cuckoo*

The western DPS of yellow-billed cuckoo (*Coccyzus americanus*) was listed as federally threatened on October 3, 2014 (79 FR 59992) and is listed as endangered in California (CDFG 1999). Its distribution ranges throughout much of the U.S., Canada, and Mexico and have been found in Alaska, Western Europe and South America (Hughes 2015).

#### Natural History

The yellow-billed cuckoo is a medium-sized bird measuring 10-12 inches in length. It has a long tail characterized by large white spots. Typically, these birds are light brown dorsally with a cream-colored white underside, and rufous colored wings. Additionally, the upper mandible of the bill is black and the lower mandible is yellow (Hughes 2015). Breeding often coincides with the appearance of massive numbers of cicadas, caterpillars, or other large insects. Clutch size is one to five (commonly two to three). Incubation lasts 9-11 weeks.

Nest sites are associated with large and wide patches of riparian habitat in willow thickets, often mixed with cottonwoods, with an understory of blackberry, nettles, or wild grape (CDFG 1999). The California breeding range of western yellow-billed cuckoo is restricted to the Sacramento Valley, the South Fork of the Kern River, the lower Colorado River Valley, and sometimes the Prado Basin in Riverside and San Bernardino counties (Gaines and Laymon 1984, CDFG 1999).

#### Occurrence in the Program Area

Three occurrences of the yellow-billed cuckoo were returned from a CNDDB search in Sonoma County (CDFW 2019). Two occurrences have been recorded in Zone 1A with nests along ponds near Laguna de Santa Rosa Creek in 1972 and 1975. One occurrence recorded in riparian areas near Salmon Creek (Zone 8A) in 1996.

#### Stream Maintenance Considerations

Riparian habitats throughout the program area provide suitable nesting and foraging habitat. Maintenance activities such as vegetation management, sediment removal, and bank stabilization have the potential to disturb suitable habitat and nesting activities. This may cause nesting failure or reduced fitness, which could result in a significant impact. Although Sonoma County is excluded from the breeding range for western yellow-billed cuckoo, SMP activities will incorporate measures to reduce potential impacts to this species per BMP BR-8.

### *Tricolored blackbird*

The tricolored blackbird (*Agelaius tricolor*) is listed as threatened in California and is a Species of Special Concern for nesting colonies (CDFG 1992). The tricolored blackbird is nearly restricted to

California, where 99% of the species' population occurs (Beedy and Hamilton 1999). Its breeding range extends from the Modoc Plateau of northeastern California south through the lowlands of California west of the Sierra Nevada to northwestern Baja (Beedy and Hamilton 1999). Tricolored blackbird yearlong range includes the southern half of Sonoma County.

#### Natural History

Tricolored blackbird is sexually dimorphic with males being larger, possessing red, white, and black plumage; while the smaller female possesses dark brown coloring dorsally with a white streaked chin and throat (Beedy and Hamilton 1999). Tricolored blackbirds are not migratory, but are nomadic and highly colonial (Orians 1960). Large flocks may suddenly appear in areas where they have been absent for months, nest, and then quickly leave.

Tricolored blackbirds typically nest in freshwater marshes with dense growths of emergent vegetation dominated by cattails (*Typha* spp.) or bulrushes (*Schoenoplectus* spp.), but have also established colonies in willows (*Salix* spp.), blackberries (*Rubus* spp.), thistles (*Cirsium* and *Centaurea* spp.), and nettles (*Urtica* sp.). Tricolored blackbird forages in open vegetation communities and land covers, including grassland, woodland, and cropland (Beedy and Hamilton 1999).

#### Occurrence in the Program Area

Five occurrences of tricolored blackbird were returned from a CNDDB search in Sonoma County (CDFW 2019). One occurrence recorded in Zone 1A is along Copeland Creek. A nesting colony was observed near Lakeville Road in Zone 9A. Another breeding colony (approximately 500-700 birds) was observed east of Atascadero Creek (Zone 1A). One occurrence recorded in riparian areas near Salmon Creek (Zone 8A).

#### Stream Maintenance Considerations

Riparian habitats throughout the program area provide suitable nesting and foraging habitat. Maintenance activities such as vegetation management, sediment removal, and bank stabilization have the potential to disturb suitable habitat and nesting activities. This may cause nesting failure or reduced fitness, which could result in a significant impact. Stream maintenance activities will incorporate measures to reduce potential impacts to this species per BMP BR-8.

### *Burrowing Owl*

The burrowing owl (*Athene cunicularia*) is a species of special concern in California and occurs from southcentral Canada to Central America, spanning from California to the southern Gulf of Mexico and portions of Florida. In California, the species ranges throughout lowland areas, but are absent from southern coastal portions of the state.

#### Natural History

Burrowing owl is a small owl that lives in burrows created by ground squirrels and pocket gophers. This species forages over grassland, open areas, and low vegetation for small mammals, insects, and lizards and is most active at dawn and dusk (Polite and Kiff 1999). The population in California consists of year-round residents and seasonal migrants (Shuford and Gardali 2008).

Burrowing owl use primarily ground squirrel burrows for nesting and roosting, so they are only present where such burrows occur, but are known to use pipes, culverts and nest boxes where burrows are scarce (Polite and Kiff 1999). They are known to nest on open, dry grassland and desert habitats. Historic breeding range extended into much of the southeastern portion of Sonoma County, but is currently confined to the San Pablo Bay margins and up the Sonoma Valley (Shuford and Gardali 2008).

#### Occurrence in the Program Area

Only non-breeding burrowing owls are thought to currently occur in Sonoma County, as breeding populations have been extirpated (Rosenberg et al. 2007). Thirteen (13) occurrences of burrowing owl were returned from a CNDDB search in Sonoma County, none of which occurred in the SMP maintenance areas (CDFW 2019).

#### Stream Maintenance Considerations

Suitable foraging habitat for burrowing owl is absent from areas where SMP activities would occur; however, pipes and culverts present in and along the stream channel provide potential nesting habitat for this species. SMP activities occurring in or near culverts and pipes may disturb nest sites through noise and vibrations. These activities may lead to direct loss of nests or nest abandonment. SMP activities will incorporate measures to reduce potential impacts to burrowing owl per BMP BR-8. As stated above, burrowing owls are not currently known to breed in Sonoma County, reducing the potential that breeding burrowing owls would be impacted by the SMP.

### *Salt Marsh Common Yellowthroat*

Salt marsh common yellowthroat (*Geothlypis trichas sinuosa*) is endemic to the greater San Francisco Bay region and are found in fresh and salt water marshes (Shuford and Gardali 2008). Adult males are bright yellow below, with a sharp black face mask and olive upperparts. Immature males show traces of the full mask of adult males. Females are a plain olive brown, usually with yellow brightening the throat and under the tail and do not have a black mask (Cornell Lab of Ornithology 2019).

#### Occurrence in the Program Area

The breeding range of the salt marsh common yellowthroat includes the tidal marshlands of southern Sonoma County associated with San Pablo Bay (Shuford and Gardali 2008). Twenty occurrences have been recorded for the species, mainly occurring within tidal marsh habitats in Zone 9A in southern Sonoma Valley. One breeding pair was recorded along the Petaluma marshlands in Zone 2A (CDFW 2019).

#### Stream Maintenance Considerations

This species may nest in marshes in the southern portion of the program area. However, there is low potential for SMP activities to impact this species, as the majority of maintenance activities occur in stream channels in Zones 1A, 2A, and 3A and outside of tidal marshlands. Stream maintenance activities will incorporate measures to reduce potential impacts to salt marsh common yellowthroat in areas that may provide potential nesting habitat per BMP BR-8; however, there is low potential for this species to be present near areas where SMP activities would occur.

### *San Pablo Sparrow*

San Pablo sparrow (*Melospiza melodia samuelis*) is a species of special concern in California. The species is endemic to California and restricted to the tidal salt marshes along the San Pablo Bay (Grinnell and Miller 1944).

#### Natural History

This subspecies of song sparrow (*Melospiza melodia*) is similar in appearance with a white chest and dark-brown back with dark stripes along its head, back and chest. San Pablo sparrow occur in all tidal salt marshes within San Pablo Bay and require dense vegetation for breeding, perching, and cover (Marshall 1948). Typical vegetation occurring in San Pablo Bay include pickleweed (*Salicornia sp.*), California cord grass (*Spartina foliosa*), and gumplant (*Grindelia sp.*). The species prefers to nest in high marsh areas (Grenier 2004). Diet of San Pablo sparrow include terrestrial invertebrates and foraging occurs in the exposed ground areas of salt marshes (Shuford and Gardali 2008).

#### Occurrence in the Program Area

San Pablo sparrow have been documented in Second Napa Slough and Petaluma marshlands that are tidal wetlands associated with San Pablo Bay, Sonoma County (Shuford and Gardali 2008). Fourteen occurrences of San Pablo sparrow have been recorded in Sonoma County, majority occurring in southern Sonoma Valley in Zone 9A and from the vicinity of Petaluma in Zone 2A (CDFW 2019).

#### Stream Maintenance Considerations

San Pablo sparrow prefer to nest in salt marsh habitat in southern Sonoma County. There is low potential for SMP activities to impact this species, as the majority of maintenance activities occur in stream channels in Zones 1A, 2A, and 3A and outside of tidal wetlands. Stream maintenance activities will incorporate measures to reduce potential impacts to San Pablo sparrow in areas that may provide potentially suitable nesting habitat per BMP BR-8; however, there is low potential for this species to be present near areas where stream maintenance activities would occur.

### *Yellow-breasted Chat*

Yellow-breasted chat (*Icteria virens*) is a species of special concern in California. This species has olive upper parts with white bellies and bright yellow throats and breasts. Yellow-breasted chat is a summer resident in California and inhabits riparian thickets of willow and other brushy tangles near watercourses.

#### Occurrence in the Program Area

This species has been observed in Laguna de Santa Rosa and along Santa Rosa Creek (Shuford and Gardali 2008). However, there are no CNDDB occurrence records for yellow-breasted chat in Sonoma County (CDFW 2019).

#### Stream Maintenance Considerations

Riparian habitats throughout the program area provide suitable nesting and foraging habitat. SMP activities such as vegetation management, sediment removal, and bank stabilization have the potential to disturb suitable habitat and nesting activities. This may cause nesting failure or reduced fitness. Although there are no CNDDB occurrence records for yellow-breasted chat in Sonoma County, SMP activities will incorporate measures to reduce potential impacts to this species per BMP BR-8.

### *Yellow Rail*

Yellow rail (*Coturnicops noveboracensis*) is a species of special concern in California. The species occurs in the boreal zone range of Canada, northern Montana east across to Maine, and along the northern Gulf of Mexico coastline. In California, it is confined to isolated wintering populations in the Suisun Marsh area and breeding populations in the northeastern interior (Grinnell and Miller 1944).

#### Natural History

Yellow rail is a small marsh bird with a dark back with yellow stripes and yellowish chest. It is considered a very secretive bird, as it rarely flies and conceals itself within dense vegetation. Nesting occurs in moist soil within sedge marsh or meadow habitat (Bookhout 1995). Diet of yellow rail consists of aquatic insects, snails, and seeds (Bookhout 1995).

#### Occurrence in the Program Area

Two CNDDB occurrences have been recorded for yellow rail in Sonoma County (CDFW 2019). In 1912, an individual was collected east of Santa Rosa (Zone 1A) near the Bush Creek and Austin Creek confluence. Another individual was collected in salt grass habitat within Fryer Creek and Nathanson Creek (Zone 3A) in 1898.

#### Stream Maintenance Considerations

Yellow rail occur near the program area as wintering populations in the Suisun Marsh area. There is low potential for activities to impact this species, as the majority of stream maintenance activities occur in stream channels in Zones 1A, 2A, and 3A outside of Suisun Marsh. SMP activities will incorporate measures to reduce potential impacts to yellow rail in areas that may provide potentially suitable nesting habitat per BMP BR-8; however, there is low potential for this species to be present near areas where stream maintenance activities would occur.

### *Yellow Warbler*

Yellow warbler (*Setophaga petechia*) is a species of special concern in California. This species occupies wooded riparian habitats along the coast, on both eastern and western slopes of the Sierra Nevada, and throughout the northern portion of California (Heath 2008). Yellow warblers construct open-cup nests in upright forks of shrubs or trees in dense willow thickets or other dense vegetation (Lowther et al. 1999).

#### Occurrence in the Program Area

The yellow warbler is an abundant migrant during the spring and fall and has been observed in low numbers throughout Sonoma County and the program area (Shuford and Gardali 2008). However, there are no CNDDB occurrences for this species in Sonoma County and it is considered an uncommon breeder in the SMP area (CDFW 2019).

Stream Maintenance Considerations

Riparian habitats throughout the program area provide suitable nesting and foraging habitat. SMP activities such as vegetation management, sediment removal, and bank stabilization have the potential to disturb suitable habitat and nesting activities. This may cause nesting failure or reduced fitness. Although there are no CNDDB occurrence records for yellow-breasted chat in Sonoma County, stream maintenance activities will incorporate measures to reduce potential impacts to this species per BMP BR-8.

## *Migratory Birds and Raptors*

The Migratory Bird Treaty Act and California Fish and Game Code (F&G Code) Section 3503 protect migratory birds, their nests and eggs from disturbance and destruction. F&G Code Section 3503 prohibits the take, possession, or needless destruction of the nest or eggs of any bird; §3503.5 prohibits the take, possession, or needless destruction of any nests, eggs or birds in the orders Falconiformes (new world vultures, hawks, eagles, ospreys and falcons, among others) or Strigiformes (owls); §3511 prohibits the take or possession of fully protected birds; and §3513 prohibits the take or possession of any migratory nongame bird or part thereof as designated in the Migratory Bird Treaty Act.

Migratory birds utilize any and all habitats for nesting during the spring and early summer months. These habitats can range from natural (e.g., grasslands, riparian forest) to man-made (e.g., bridges, buildings), so the likelihood that migratory bird nesting habitat is present within Sonoma Water flood control channels is high.

The Bald and Golden Eagle Protection Act prohibits the taking or possession of and commerce in bald and golden eagles, with limited exceptions (16 United States Code [USC] 668). Under the Bald and Golden Eagle Protection Act, it is a violation to "…take, possess, sell, purchase, barter, offer to sell, transport, export or import, at any time or in any manner, any bald eagle commonly known as the American eagle, or golden eagle, alive or dead, or any part, nest or egg, thereof…". "Take" is defined to include pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, destroy, molest, and disturb. "Disturb" is further defined in 50 Code of Federal Regulations (CFR) Part 22.3 as "to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available (1) injury to an eagle, (2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or (3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior."

Occurrence in the Program Area

Sonoma Water has conducted extensive migratory bird and bird nest studies. Pre-construction bird nest searches of flood control channels from 2002 to 2003 were used to determine habitats for special status bird species. During 2006 and 2007, flood control facilities within Zones 1A, 2A, 3A, 4A, 5A, 6A, and 8A were surveyed for nesting migratory bird species and potential habitats that may support nesting special status bird species (Martini-Lamb 2007). Similar bird nest surveys have been conducted annually since 2007 Overall, approximately 80 bird species were observed including four special-status species: double-crested cormorant (*Phalacrocorax auritus*), Vaux's swift (*Chaetura vauxi*), white-tailed kite (*Elanus leucurus*), and yellow warbler. No signs of these species nesting in the channels were observed. A more detailed account of the surveys and the results, including a species list and a characterization of migratory bird nesting habitat along each reach, can be found in Martini-Lamb (2007). Bald eagles (*Haliaeetus leucocephalus*) have been observed in the vicinity of Sonoma Water's flood control channels and creeks in the CDFW Wildlife Area north of Occidental Road (Laguna de Santa Rosa Foundation 2006).

## Stream Maintenance Considerations

Most stream maintenance activities, if conducted during the breeding season, have the potential to impact nesting migratory birds. This is due to the widespread nature of migratory bird breeding habitat. Any activities that require ground excavation or vegetation removal have the potential to remove or disturb migratory bird nests during the breeding season. Other activities, particularly those that require mobilizing large equipment, have the potential to disturb nesting birds due to excessive noise.

Sonoma Water has been working to avoid impacts to nesting birds during SMP activities by providing training to employees, scheduling maintenance activities outside of the nesting season (typically March to July) whenever possible, performing pre-construction surveys for active nests during the nesting season, establishing procedures to avoid impacts to active nests including establishing no work buffers around active nests, and consulting with CDFW.

# Sonoma County Water Agency

## Stream Maintenance Program (SMP)

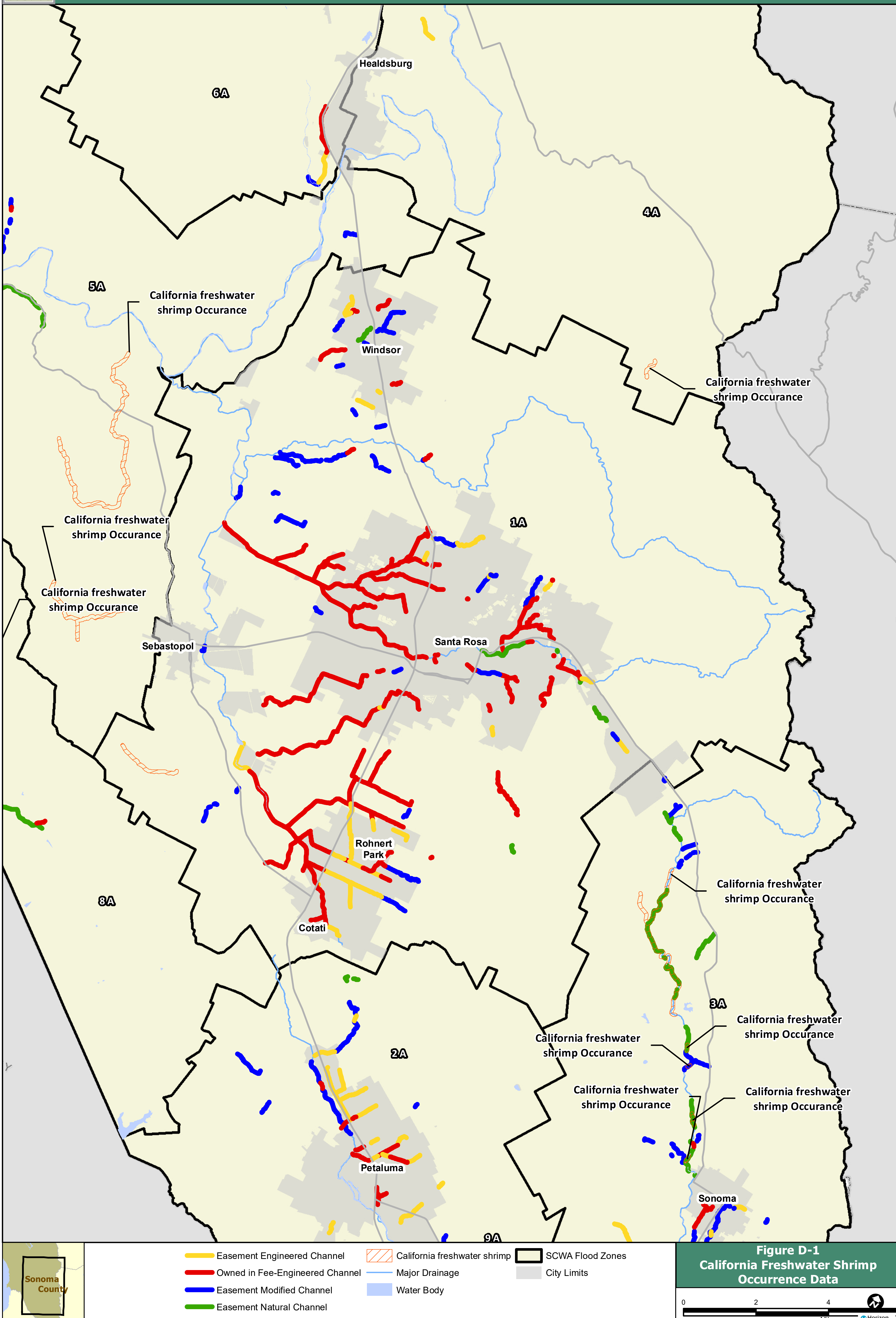


**Figure D-1**
**California Freshwater Shrimp Occurrence Data**

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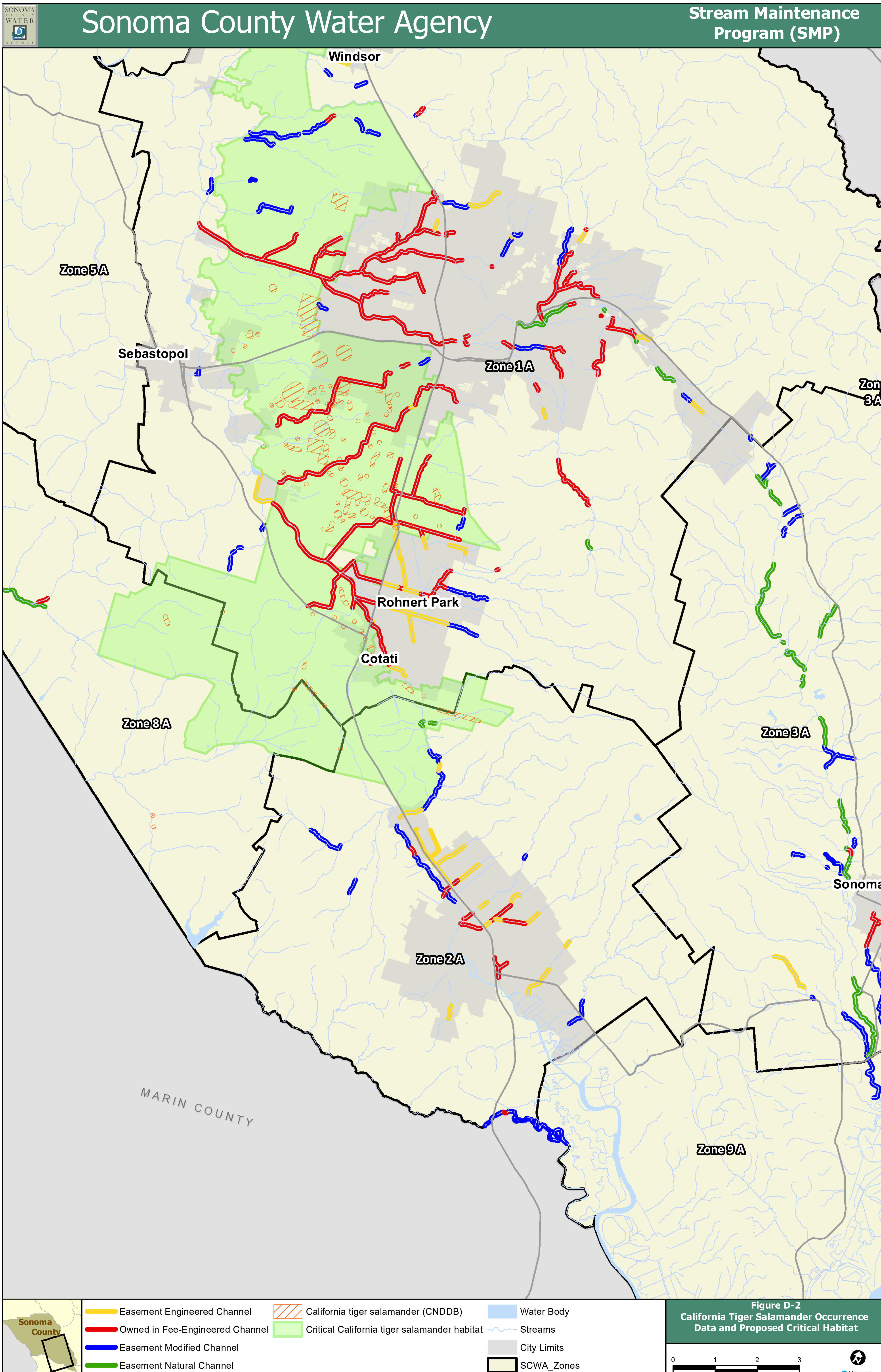


Figure D-2
California Tiger Salamander Occurrence Data and Proposed Critical Habitat

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Sonoma County Water Agency

Stream Maintenance Program (SMP)

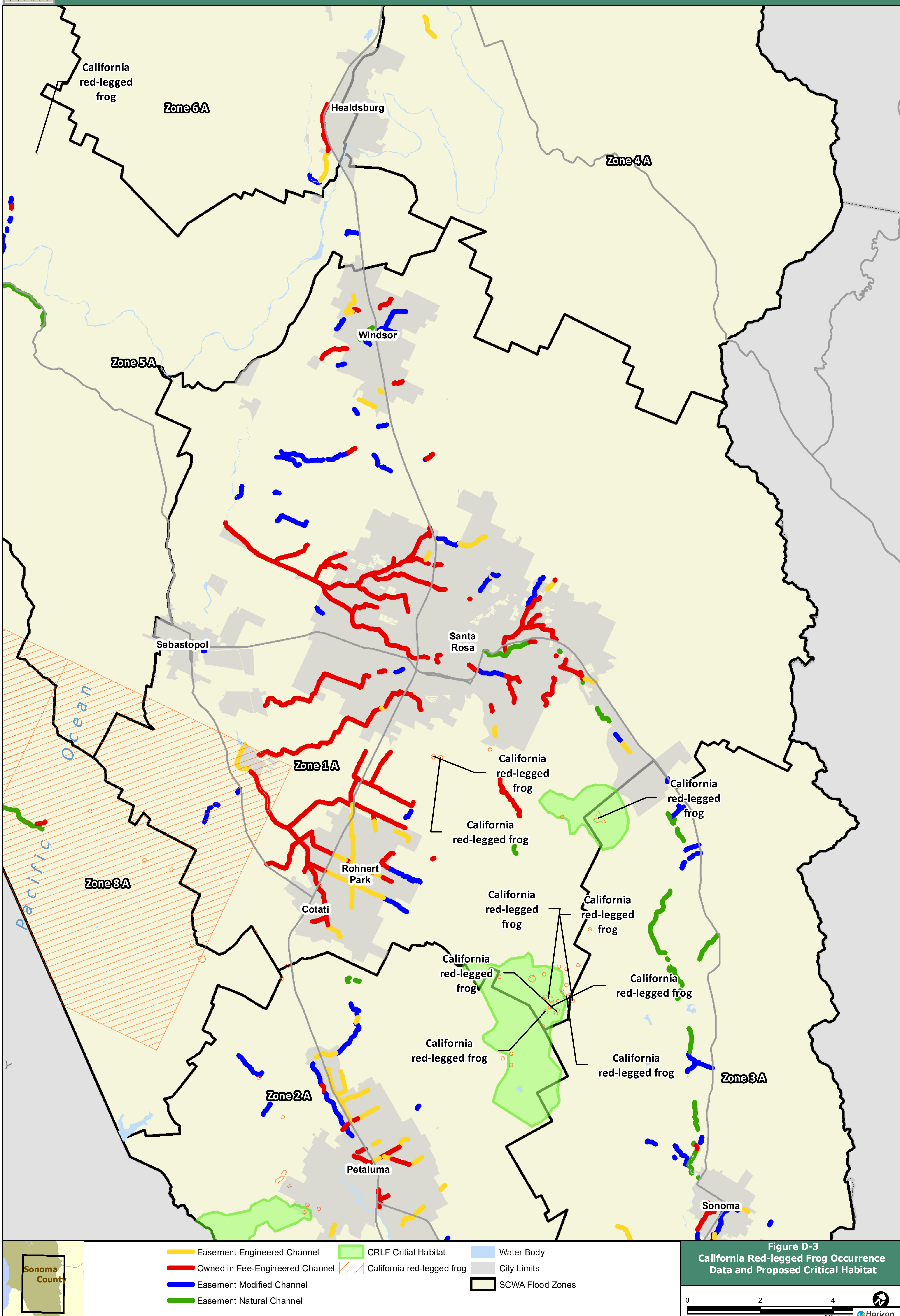


Figure D-3
California Red-legged Frog Occurrence Data and Proposed Critical Habitat

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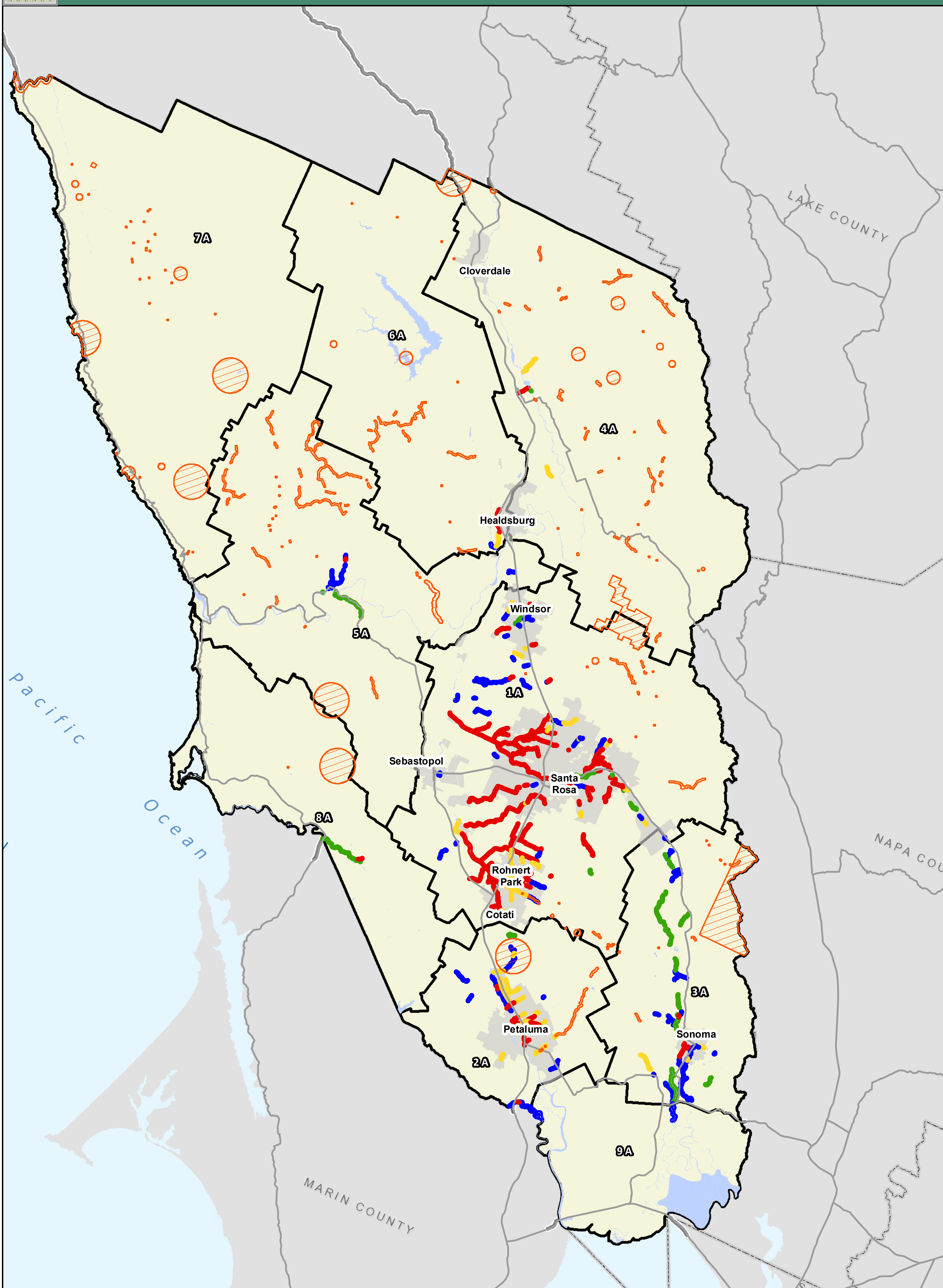
# Sonoma County Water Agency

**Stream Maintenance Program (SMP)**




Easement Engineered Channel
Owned in Fee-Engineered Channel
Easement Modified Channel
Easement Natural Channel
foothill yellow-legged frog
Water Body
City Limits
SCWA_Zones

Sources: Sonoma County Water Agency; Sonoma County GIS; CNDDB, September 2019

**Figure D-4**
**Foothill Yellow-legged Frog Occurrence Data**

0 2 4 6 8
Miles

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**PERSONAL COMMUNICATION**

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# Appendix E.
## SONOMA COUNTY WATER AGENCY 4-YEAR SUMMARY OF STREAM MAINTENANCE PROGRAM, 2009-2013

SONOMA
COUNTY
WATER
AGENCY

CF/15-0-9 STREAM MAINTENANCE PROGRAM (ID 683)

April 29, 2014

Adam McKannay
Department of Fish and Wildlife
Central Coast Region
7329 Silverado Trail
Napa, CA 94558

**RE: Sonoma County Water Agency 4-year Summary of Stream Maintenance Program, 2009-2013**
**Prepared for CDFW Master Streambed Alteration Agreement**

Dear Mr. McKannay:

This summary is intended to provide an evaluation of the Stream Maintenance Program (SMP), with a focus on determining which elements and aspects of the program have worked effectively to date and which aspects might be modified to provide better long-term stability and sustainability to the program.

**Background**

The Sonoma County Water Agency (Water Agency) was created as a special district in 1949 by the California Legislature to provide flood protection and water supply services to portions of Sonoma and Marin counties. Legislation enacted in 1995 added the treatment and disposal of wastewater to the Water Agency's responsibilities. Today, the Water Agency is a multi-objective and integrated water resources agency providing many services that integrate natural resource management including providing water supply, flood protection services, treatment of wastewater and distribution of recycled water, and recreational opportunities in conjunction with Water Agency facilities.

In 2009, the Water Agency began implementation of its SMP based on a Stream Maintenance Manual (SMP Manual), and supporting Environmental Impact Report (SMP EIR), with programmatic permit approvals from the North Coast Regional Water Quality Control Board (NCRWQCB), the U.S. Army Corps of Engineers (USACE, for Flood Zone 1A), National Marine Fisheries Service (NMFS, for Flood Zone 1A) and the California

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Department of Fish and Wildlife (CDFW). Further permits for the program were obtained in 2010 from the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (for Flood Zones 2A/3A). Lastly in 2011, permits from the San Francisco Bay Regional Water Quality Control Board (SFRWQCB) and the U.S. Army Corps of Engineers (for Flood Zones 2A/3A) were obtained.

**Programmatic Permits**

All of the SMP permits contain built-in time limits and/or require a five-year status review of the program. Specifically, each permit is identified as to term and timing for review:

- NCRWQCB 401/WDR (10 years) review 401 certification in 2014
- USACE Individual Permit, Zone 1A (10 years) review in 2014
- CDFW Streambed Alteration Agreement (15 years) review in 2014
- NMFS Biological Opinion, Zone 1A- review in 2015 (per SMP Manual)
- NMFS Biological Opinion, Zones 2A/3A- review in 2015 (per SMP Manual)
- USFWS Biological Opinion review in 2015(per SMP Manual)
- USACE Individual Permit, Zones 2A/3A (10 years) review in 2015
- SFRWQCB 401/WDR (5 years) review in 2015

The CDFW Master Streambed Alteration Agreement (MSAA) requires preparation of a 4 year summary that evaluates the program to date and provides recommendations for future implementation and management of the SMP. Specifically, as written in the MSAA, the Summary Report shall include:

- A copy of the original Agreement ;
- A description of the status of covered activities;
- An evaluation of success measures in agreement to protect fish and wildlife resources; and
- A discussion of any factors that could increase predicted adverse impacts on fish and wildlife resources and a description of the resources that may be adversely impacted.

This Summary Report is intended to address the MSAA requirement. A copy of the original agreement is provided as Attachment A. The following sections describe the status of the SMP and evaluates the program approach to permitted activities (sediment removal, bank repairs, vegetation management, restoration, facility maintenance), the status of compensatory mitigation, and recommended modifications to improve future SMP implementation.

**Status of Permitted Activities**

Permitted activities and locations are described in the original agreement (Attachment A). The MSAA authorizes activities described in the SMP program documents that are subject to Fish and Game Code section 1600, *et seq.* Specifically, the MSAA authorizes sediment removal, bank repair, facility maintenance, vegetation management, and restoration work, as defined and described in the SMP Manual. In the four years since implementation of the SMP began, the Water Agency has adaptively managed how flood control maintance activities are accomplished to meet the purposes of the programmatic permits, address ongoing work sustainably, and provide flood protection. The two primary goals of the SMP are to provide sufficient hydraulic capacity to reduce flood risk through urban areas and to improve riparian and in-stream habitat for fish, wildlife and plant life. These goals have been implemented by supporting the assumption that developing a riparian canopy improves water quality conditions and reduces in-stream density of undesirable recruiting vegetation, such as cattails (*Typha* spp.), arroyo willow (*Salix lasiolepis*), and Himalayan blackberry (*Rubus discolor*); that reducing in-stream density reduces sedimentation and delays the need for inevitable removals; that mitigation planting and vegetation management mimics a natural successional process; and that conducting smaller, focused sediment removal actions at bridgeheads in chronically affected stream reaches delays the time between larger, more impactful, sediment removals.

Inevitably, in straightened flood control channels located in depositional areas, sedimentation will occur following significant rain events. Sedimentation invariably forms lateral shelves that support native trees that have been retained (following SMP vegetation management procedures) at the toe of the stream. These trees are retained until sediment accumulation and vegetation density triggers the need to restore flood capacity. Given the inevitable need to remove sediment periodically, from an ecological standpoint (given streams are dynamic systems heavily affected by periodic large disturbing events, and allowing habitat to persist as long as possible is a primary goal) the most beneficial way to manage these systems is to extend the time between large, maintenance events. The SMP focuses on accomplishing this time extension by establishing canopy to reduce in-stream vegetation density (and corresponding sediment accumulation), capturing sediment and periodically removing it from in-stream sediment basins) and through the strategic planting of native species capable of competing effectively with sediment-trapping vegetation such as cattails, Himalayan blackberry, and arroyo willow. To effectively integrate these objectives the SMP has focused on managing (through direct planting and selective vegetation management) fast-growing riparian trees in-channel to develop canopy over the water surface to improve aquatic habitat conditions, preserving and planting upper bank trees to further develop long-term canopy, and designating and conducting small-scale sediment removal projects in focused locations to minimize the need for large-scale sediment removal projects.

**Status of Sediment Removal and Bank Repairs**

Between 2009 and 2013, over 79,600 feet (15 miles) and 37 acres of engineered, flood control channels have been directly managed for sediment removal and Tier 1 mitigation plantings have been installed. Since 2009, only six bank repair projects totaling less than 450 feet were implemented. In comparison to in-stream basins, localized and reach-level sediment removal, bank repairs are a minor part of the SMP.

In 2010 a restoration approach was developed and integrated into Tier 1 mitigation efforts to specifically address bank repair restoration needs. Through direct restoration and/or the Watershed Partnership Program (WPP), over 5,000 native trees have been installed and have provided roughly 1 tree for every 300 square feet of restoration area affected. Significantly, in concert with tree retention and plantings, extensive in-stream planting efforts have introduced effective native in-stream competitors to cattails and Himalayan blackberry directly to the flood control channels maintained. This has been observed to have a synergistic effect downstream simply by providing sources of appropriate propagules. In an effort to convert non-native grassland into a more native plant community, strategic upper bank and side bank plantings of creeping wild ryegrass (*Leymus triticoides*), wild blue rye (*Elymus glaucus*), and California fescue

(*Festuca californica*) have also been conducted to introduce effective competitors to this pervasive habitat type.

SMP programmatic permits allow a 1:1 distance replacement contingent on installing additional plants to account for the 1:1.5 restoration area need. Toe tree plantings are a very important consideration as their installation allows for program flexibility and provides the largest habitat benefit in the shortest amount of time. The ecological gain toe tree plantings provide includes water quality and habitat improvements through rapid riparian shading and diversifying habitat structure, filtering nutrients, cooling water surface and surroundings, and velocity breaks for fish during high flows. Toe trees provide these benefits almost immediately (within the first three years) and these trees can be installed at high densities and be allowed to persist inside a prescribed success requirement, then thinned in later years once trees have matured and developed connected overhead canopies, to a sustainable climax community arrangement.

The SMP Manual (Chapters 5 and 6) describes creation of two-stage, low flow channels and retention of in-channel bars or features that enhance aquatic habitat. Over the last four seasons opportunities to retain sediment in-channel to preserve habitat has been found to conflict with maintaining adequate hydraulic capacity or not observed to provide any sustainable benefit in perennially pooled sections of channel. Built up sediment blocks street outfalls and significantly reduces channel capacity. In many channels sedimentation is only a problem around culverts, where installation of a two-stage channel is impractical as these are prime spots to manage accumulating sediment with an in-stream sediment basin. By definition in-stream sediment basins are disturbed annually or biannually to minimize larger clearance efforts. Since an overarching goal of the SMP is to delay the need for repeated maintenance in the same channel reach long enough to allow canopy to develop, retaining sediment in-stream inherently shortens the allowable delay, working exactly opposite to this goal of the SMP. A large percentage of engineered channels are relatively stable, as they are neither incising nor accumulating sediment. These creeks often accumulate sediment at road crossings. Routine removal efforts are limited to approximately 100 feet upstream and downstream of the crossing.

The Water Agency would like to develop and implement a process where efforts to preserve aquatic habitat can be selected from an array of strategies that fit each given situation. These alternatives could include developing a "V" shaped channel, incorporating a "notch" in the design on the south side that flips from side to side as the channel changes aspect, digging deeper pools at strategic locations, as well as creating a two-stage channel where feasible. Depending on the hydrology, geomorphic shape and relative stability of the channel, one or more aquatic habitat strategies could be employed. While not the solution in every flood channel, for effective implementation, removing sediment below as-built design may be needed to create these two-stage features. It is important to note that these features are also only suitable in places where the benefits of such morphology can be realized. In some cases since the work zone is saturated silt and clay, equipment has difficulty accessing and constructing these low-flow channels while still retaining beneficial trees. In other cases, the two-stage morphology would be under the summer water level. Finally, many flood control channels are narrow and deep and simply do not have the physical space to support side bank shelves as well as a low-flow channel with dimensions approximating the "bankfull" need.

Generally, sediment removal efforts have been unable to retain existing in-stream habitat features such as steep-banked sediment shelves with undercuts and meandering thalwegs. Existing pools that have naturally cut below as-built design have been retained where present. Effort has been made to create pools and low flow channels where feasible, but to effectively implement the objective of retaining or enhancing aquatic habitat, additional consideration should be given to what can be implemented that maximizes habitat features specific to each particular channel reach or type.

Currently there is limited data on the loss of flood control capacity resulting from retaining sediment strategically or what is lost by allowing in-channel riparian trees. Representative modeling based on channel form, allowable vegetation densities, and sustainable design is planned for certain areas in 2014-15. The Water Agency intends to use modeling results to develop strategies that address incremental capacity issues that change as sediment deposits and vegetation develops.

**Status of Restoration**

Mitigation for the SMP is provided both on-site (Tier 1) and offsite (Tier 3). Tier 1 restoration is described below. Tier 3 riparian and wetland area is provided through a "Watershed Partnership Program." Tier 3 mitigation funding is provided by applying a minimum of ten percent of overall sediment removal and bank repair maintenance costs to non-governmental project partners for implementation of riparian restoration, bank stabilization, and cattle exclusion projects. Area restored is required to be a minimum of ten percent of actual area maintained each given season to offset "temporal impacts" (time needed for habitat function to be restored following disturbance) of the SMP. In general, the SMP has funded and banked up to ten times the needed area in advance of actual sediment removal and bank repair projects, effectively addressing the time it takes for habitat to recover on a regional scale. This program has proven to be a highly successful method to address impacts associated with in-stream sediment removals and bank repairs. This program has been invaluable in locations where Tier 1 plantings cannot be applied because a separate entity is already responsible for enhancing or restoring a given section of creek.

Restoration for the SMP followed a similar methodology used to develop canopy during vegetation management (tree selective retention and removal) over the past four years. In other words, many small trees were managed along the toe, as they grew these were thinned to a few dominants. This was contemplated in the SMP Manual as "Managing for Incremental Ecological Improvements" or using natural successional processes as a guide to drive clearance methodologies. This approach has increased the riparian canopy along most of the creeks managed under the SMP. Some channels do not have a native "headwater" or source for recruiting native trees. These creeks have been utilized as places to plant riparian trees as part of the requirement in the MSAA to mitigate for native tree removals. At this point in management of the SMP, few creeks have space for (or have the need) to plant additional trees. Under the management regime affected by SMP vegetation management, canopy cover is increasing in most creeks and is developing into an arrangement that can be considered "climax" or "permanent" (places trees can be predicted to be allowed to remain into the future). To aid in managing the planting and/or vegetation thinning, vegetation templates have been developed based on channel size and form to guide the maintenance process and field efforts. These Draft

Channel Form Planning Exhibits were included with the 2013 Annual Monitoring Report and are included here as Attachment B.

SMP Tier 1 planting strategies follow (or mimic) the approach applied to canopy development during the past ten years of vegetation management and vastly simplifies management and maintenance needs. This approach provides for the installation of toe trees that require minimal care (they are self watering) at spacings that can be maintained through the time frame of the permit (five to six years) because as managed (single trunk, limbed up out of only the highest flows) they do not create enough roughness to reduce the capacity of the flood channel significantly enough to preclude their presence. They immediately start to shade the in-stream portion of the channel, reducing the proliferation of cattails and other sediment and debris accumulating in-channel vegetation (including the recruitment of arroyo willows). Additionally, these young trees provide the majority of mid-canopy understory for larger trees, as is typical in most native species-dominated riparian zones. Once canopies start to overlap among the toe trees, they are strategically thinned to climax locations over the next few years. Side benefits are that while they were growing in place they provided habitat for wildlife, provided shade that reduced in-stream cattails and cooled the water, provided velocity breaks for migrating salmon, created complexity for aquatic species use, and puts the correct species of native tree in the right locations for long-term retention. Depending on the results of modeling this approach could be modified to allow a percentage to be removed earlier based on real or modeled measurements and defined capacity lost.

Over the next few years the SMP will determine how large or old the trees can be, and at what spacing they should be managed at to preserve the desired flow capacity of the flood channel. Recent LIDAR flights of the channels are anticipated to be useful in determining current forest metrics of SMP channels and correlating stem densities and basal areas with a measured value for channel roughness (Manning's "n"). Forest metrics including stem diameter per acre (basal area) will be used to evaluate allowable levels of mature trees that can be retained in-channel.

**Status of Vegetation Management**

As described for restoration/mitigation above, vegetation management has proved to be a worthy tool in developing riparian canopy along Water Agency-managed flood control channels. Over the past four years the SMP has effectively managed fast-growing riparian trees at the toe for rapid canopy development as well as retaining and allowing the establishment of upper bank trees for long-term canopy. Currently, 90 percent of 75 miles of engineered channels in flood control zones 1A, 2A, and 3A support a well-developing riparian canopy supplied by fast growing trees at the toe. Riparian canopy provided by five to fifteen year old in-channel trees along most major creeks has developed to the point where it could be predicted to "hold steady" at the current level. Largely, vegetation management has been overwhelmingly successful as is evident in the representative aerial photographs shown in Figures 1-6 below. In Santa Rosa Creek these pictures illustrate that larger trees are retained and are increasing in canopy individually and that as a whole the riparian cover is increasing or will hold steady. In Corona Creek the pictures clearly illustrate the development of the riparian corridor along that reach.

Now that this goal has been achieved in many creek reaches, further analysis is required to evaluate hydraulic capacity remaining at different seral stages of riparian development as well as the allowable diameter (how much water they displace and the roughness represented) of retained trees.

To fully accomplish the goals and principles identified above additional data and modeling will be performed to evaluate loss of hydraulic capacity associated with canopy development and sediment accumulation.

Figure 1. Santa Rosa Creek Reach 4 (between Dutton Ave and Pierson Ave) 2007

Figure 2. Santa Rosa Creek Reach 4 (between Dutton Ave and Pierson Ave) 2010

Figure 3. Santa Rosa Creek Reach 4 (between Dutton Ave and Pierson Ave) 2012


Figure 4. Corona Creek Reach 3 (between Wellington Ave and Sonoma Mountain Parkway) 2007


Figure 5. Corona Creek Reach 3 (between Wellington Ave and Sonoma Mountain Parkway) 2010

Figure 6. Corona Creek Reach 3 (between Wellington Ave and Sonoma Mountain Parkway) 2012


## Program Modifications to Date

The SMP has incorporated a number of adaptive strategies that have changed how certain elements of the program are implemented. These include most notably, distance limits associated with vegetation management in specific salmonid streams, use of woody shrubs in mitigation along flood control channels, and success criteria applied to the SMP. These adaptive strategies have been presented and implemented through the annual notification and reporting process. Generally, these changes were implemented only if the effects of the change were minor to the overall application of the SMP goals and objectives and did not affect the significance of program impacts as considered under CEQA. These recommendations and why modifications were needed and incorporated into the annual notification and reporting process are summarized below.

## Distance Worked in Salmonid Supporting Creeks

The SMP tracks maintenance in creeks that have annual or cumulative maintenance limits (for the term of the permit). Multi-year tracking of cumulative program activities is important to demonstrate compliance with the SMP's programmatic permits (such as the Russian River Biological Opinion (Biological Opinion) conditions). These permit conditions are intended to reduce the overall level of impacts and the associated frequency of disturbance. When these limits were first considered, the level of impact associated with vegetation management was assumed to be similar to historic levels. In the Russian River Biological Opinion (NMFS 2008, which covers Zone 1A), it was assumed that vegetation clearance would occur at three levels of removal (25, 50, and 75 percent). These removal levels were associated with sedimentation levels, with the higher percentages being associated with areas requiring frequent sediment removal because of their location in the watershed (depositional/erosional/balanced). These percentages imply that in a given reach between 25 and 75 percent of the existing vegetative cover is routinely removed. Given the central tenant of the SMP program to retain and encourage canopy, these levels of removal are generally not realized as a regular part of stream maintenance. The process of implementing SMP vegetation maintenance on most stream channels has established and is vastly expanding riparian canopy cover on all of the creeks that have permit limits (e.g. Windsor, Santa Rosa, Copeland, and Laguna de Santa Rosa). In general, once a tree location has been set (on the toe or upper bank), future management efforts are focused on retaining that tree and expanding the canopy it contributes to the channel, as discussed above under "Vegetation Management." In general, vegetation maintenance involves removing only between 10-20 percent of canopy contributing to hydraulic constrictions. This is generally accomplished by removing "suckers" and lower limbs, rather than whole trees or major branches providing shade to the stream bottom.

Necessarily, a "frequent but light approach" has created a process that is not only functionally restoring canopy to flood control channels but has also created a need to be out doing this work each year to avoid more extensive and disruptive removals in the future. It is feasible to measure specific areas worked along these channels rather than entire reaches. As previously described, vegetation management is conducted in discrete groupings where there is a priority thinning or removal action needed, but the process skips areas that are not presenting a hydraulic problem. Using this approach to measure distance of stream channel worked can be complicated given that there are two banks in a flood control channel, often with deliberately established groupings of trees that alternate with groupings retained on the alternate side. Therefore, based on BO requirements, the entire length must be reported as being worked when functionally less than 25 percent of the existing riparian canopy is actually removed. Note that this estimate is lower than the lowest anticipated level of removal envisioned in the BO. Taken as a whole and in the context of the central goal of establishing riparian canopy along flood channels it would be safe to acknowledge that approximately 10-20 percent of the canopy is worked during vegetation management (unless a large scale sediment removal action is planned, then percentages of vegetation removal can vary depending on what has been retained on accumulated sediment). The majority of the vegetation management work is removing new sprouting "suckers," removing hydraulic blockages (downed trees or debris accumulations in the middle of the channel), and thinning and limbing existing trees, not the removal of entire trees on the lower toe and banks.

**<u>Woody Shrubs use (especially below Top of Bank)</u>**

Installing shrubs along flood control channels can be at cross purpose with maintaining hydraulic capacity in ways that riparian trees are not. Basic ecological principles and standard restoration theory points at establishing distinctive canopy layers (annual herbaceous, perennial herbaceous, shrub, vine, understory tree, and overstory tree) made up of diverse native species adapted to the habitat conditions. Some of the problems that surface as this theory is applied to urban stream flood control management include:

- Minimizing shrub profile is difficult- often shrubs exacerbate sedimentation during high flows
- Large shrubs planted below the top of bank significantly affect flow direction
- Shrubs planted along upper bank create access issues
- Shrubs planted along upper bank increase public hazards
- Dense shrub plantings reduce the visual appeal of pathways by obscuring the view shed
- Dense shrub plantings exacerbate inappropriate use of pathways and encourage encampments that bring trash and debris into the channel

Given the problems and lack of success associated with side channel plantings, restoration efforts focus more on aggressive native transitional perennial grasses and herbaceous perennials and less on shrubs. Where feasible and appropriate (less dense urban areas, open grassland areas with low existing shrub densities, etc) shrub plantings will be focused in allowable zones (along fence lines, in wider portions of Water Agency easements). Shrubs will be established to provide patches of shrub habitat associated with and adjacent to established riparian habitat but not necessarily along the upper bank. This approach is in agreement with the conceptual planting approach identified in the SMP Manual, which has low profile side banks dominated by perennial grasses and herbaceous perennial dicots. Following sediment removal, future Tier 1 restoration planting will primarily involve shrub and tree plantings on the upper channel bank where appropriate (based on hydraulic, maintenance access, public safety, and ecological principals), shrubs planted in discrete patches (if upper bank not feasible), riparian trees along the toe (on both sides if feasible based on channel capacity), and installation of strongly competitive in-stream aquatic species.

## Success Criteria and Tree Budgets by Reach

As discussed above, the SMP approach focuses on moving the successional stage of riparian vegetation from an early seral stage to a climax stage. These stages vary between reaches and different creeks but can be clearly differentiated by age and size of the vegetation. Essentially, restoration following sediment removal brings a channel back into an early successional stage. Early seral vegetation is generally composed of numerous young willows, at a relatively high density. In the early stages, general habitat function (wildlife habitat, geomorphic interactions, leaf input, shading, etc) is provided by numerous small saplings. As these saplings grow, they naturally thin to a lesser, more sustainable, number (based on available resources). Basically, early on, many small plants are providing the "equivalent" habitat value of a few large plants. But as vegetation grows, is thinned, and appropriate locations for retention are established, not all the initially installed plants can be retained because of "roughness" considerations (hydraulic capacity as affected by vegetation). During vegetation management the central tendency is to move vegetation along our flood channels from an early stage to a later stage with a denser canopy cover over the channel. This necessarily means needing to remove plants that were initially installed to provide early seral habitat.

Strict success criteria based on initial plants installed does not reflect this natural tendency and may result in challenges to reaching the SMP goals for denser canopy. Generally the SMP Tier 1 mitigation program overplants as a matter of course to account for inevitable losses but sets a planting density appropriate for an early seral stage, not for a climax state. This leaves the dilemma of what to do with trees initially established as mitigation in the past but are presently causing a hydraulic problem. The Water Agency has developed illustrated planting standards for different-sized channels that identifies initial plantings levels but takes succession into account by building in appropriate target densities.

These standards will direct how and which restoration principles and strategies are applied in a given stream and will provide standard and predictable approaches. Tree target densities and planting templates will be applied to each stream reach during the restoration planning process to determine the allowable number of trees, the appropriate species, and their arrangement, for both in-stream and along the top of bank.

## Sediment Sampling and Analysis Program Updates

The SMP sediment sampling and analysis program was developed in 2008 with the intention that the program would be adapted over time based on an increased understanding of sediment quality characteristics in the maintenance program area through sediment quality analysis required by discharge permits issued by the Regional Water Quality Control Boards (RWQCBs) (North Coast and San Francisco Bay regions). The Water Agency began implementing this program in 2008 and has collected sediment quality data over a wide range of stream maintenance sites. The original test requirements included in the permits were fairly stringent due to the lack of data on freshwater sediment quality in the area. The costs and schedule delays associated with collection and analysis of sediment samples to meet the permit requirements were very high, so the Water Agency sought to improve the program in consultation with the resource agencies.

Since 2008, the Water Agency has worked closely with the North Coast RWQCB to refine the sediment analyte list based on results from the previous year. Each year, the Water Agency proposed to cease testing for analytes that were not appropriate indicators of potential contaminants in stream sediment or modify the test methods to produce results indicative of contamination and not natural background conditions. Reasons for modifications to the sampling program included lack of detection in samples after 1-3 years of testing (organophosphorus pesticides, polychlorinated byphenyls [PCBs], arsenic, asbestos, fluoride, nonylphenol, and volatile organic compounds), lack of pollutant sources based on surrounding undeveloped sediment source areas (a tiered testing program was established to factor in surrounding land uses), or detection of contaminants in concentrations that reflect regional aerial fallout concentrations and not direct contaminant sources (dioxin). Additionally, repeat annual testing at sediment removal sites maintained annually (such as in-stream sediment basins) is not required; repeat sediment tests has been defined as required following 5 years of no maintenance activity. Sediment test refinement proposals were presented to the North Coast RWQCB for review and discussion, and were approved each year.

By 2010, the analyte list had changed substantially so the Water Agency worked closely with the North Coast RWQCB to update the Sediment Sampling and Analysis Guidelines in Appendix B of the SMP Manual. The Water Agency's Monitoring and Reporting Program (MRP) permit requirements (MRP No. R1-2009-0049) were updated in 2010 to reflect the SMP Manual revisions. The updates improved the sampling methods, laboratory analytes, and test result evaluation guidelines to document the refinements made during the first few years of program implementation.

One of the Water Agency's goals is to have as much consistency between the two RWQCB permits as possible. The Water Agency has collaborated with the San Francisco Bay RWQCB on sediment quality monitoring requirements for maintenance activities in Zones 2A and 3A. San Francisco Bay RWQCB staff were informed of the sampling program modifications conducted in collaboration with the North Coast RWQCB. The analyte table included in the discharge permit issued by the San Francisco Bay RWQCB in 2011 (Order No. R2-2011-0020) included in the 2010 sampling program developed with the North Coast RWQCB. The San Francisco Bay RWQCB included an updated version of SMP Manual Appendix B to reflect even more refinements to sampling methods, laboratory analytes, and test result evaluation guidelines. Key differences in the San Francisco Bay RWQCB permit that are not part of the North Coast RWQCB permit are: all sediment removal sites are tested for the full suite of analytes, testing for PCBs is required, and a longer history of testing is required before an annually maintained site does not have to be re-tested. After the San Francisco Bay RWQCB issued the Water Agency's permit in 2011, additional refinements were made in to the MRP and SMP Manual Appendix B in December 2012. These refinements were shared with and approved by the North Coast RWQCB as well.

SMP Manual Appendix B was updated again in May 2013 in coordination with the San Francisco Bay RWQCB. The updates relate to the test methods for organochlorine pesticides, polyaromatic hydrocarbons (PAHs), and aliphatics; updates to the Zone 1A analyte list to be consistent with the Zone 2A/3A analyte list. The current version of SMP Manual Appendix B (May 2013) is included in this submittal as Attachment C.

## Evaluation of Approach to Date and Program Challenges

The SMP has addressed most program challenges and requirements since 2009 with the notable exception of consistently developing in-stream fisheries features (retaining sediment to develop engineered two-stage channels). It has been found to be difficult to retain any sediment in-channel- to meet fisheries need while providing adequate hydraulic capacity. Effort has been made to install pools and low flow channels where feasible, but to effectively implement two-stage channels in certain locations without retaining excessive volumes of existing sediment, excavation would be required beyond as-built design which is not permitted under the SMPs current permits, nor is the appropriate solution in many cases. Further program enhancements to design and implement site specific solutions for retaining and enhancing aquatic habitat are proposed and further clarification will be included in SMP Manual updates. The program challenges have included systematic approach to data collection and maintenance of reach sheets, continued need for staff training of key program elements and approach, a changing work force supplied by county jail crews and summer youth, and a need for completion of accurate modeling or measurement of actual compared to estimated roughness integrated with sediment removal designs.

Vegetation management has been accomplished largely meeting the expectation of the SMP Manual and permits. Through the process of selective removal and retention canopy and riparian habitat has developed exponentially over most creeks that have an upstream supply of native propagules that establish naturally. Templates developed to guide vegetation management incorporate successional process as well as final arrangement for placement of trees. Further modeling will be conducted to evaluate their allowable basal area and stature as related to incremental sedimentation.

## Recommended Changes to Program Requirements and Approach

The Water Agency supports the adaptive changes that have been implemented to date, and will assume that largely they have been accepted by SMP regulators as suitable and appropriate. The following paragraphs summarize several SMP elements that should be adaptively modified to improve data collection, define program limits and success criteria, and provide for appropriate levels of program mitigation.

## SMP Database Development and Reach Sheets

Reach Sheets summarize site conditions, management concerns and work history. Currently, having these sheets as Word® documents in the SMP Manual is not integrated with the daily data being collected while crews conduct work. The Water Agency is currently working to integrate field data collection across our various databases (Assessment, Pre-construction, Construction, Vegetation Management, Sonoma County Youth Ecology Corps (SCYEC), Bird Surveys, and Restoration) to automatically update the information contained in the SMP Chapter 4 Channel Characterization Reach Sheets. Currently, the data included in these sheets is relevant and useful to a point, and the only annual updates to these sheets are to the maintenance history table. While the maintenance history is important, setting up a process that captures the changing canopy and geomorphic conditions over the years is key to the effective long-term management of these systems. Reach Sheets have not been uniformly updated since program inception because of the extremely limited utility of having this information contained in a static Word® document. The Water Agency anticipates having a suitable process in place to update reach data on a real–time basis by the end of the 2015 field season.

## New Easements- New Mapping

The Water Agency has recently completed an evaluation of current property ownership, easements and other holdings as part of a Geographical Information System (GIS) project. The project resulted in discovery of additional engineered, modified and natural stream easements where the Water Agency manages flood capacity. Additionally the project resulted in new and changed reach names where modified and natural creeks easements bordered engineered easements and a consecutive naming approach has been applied. Many of these areas have been locations adjacent to existing easements where ownership or management was disputed or under litigation. The effect of these "new easements" on the SMP is negligible in terms of "new work areas" (as most are located in places where an easement already exists above and below a section of creek and where the change extends the work zone to the bottom of the next consecutive reach). The Water Agency proposes to provide new maps of SMP easements with the 2014 Annual Notification. These will be provided as an insert for the copy of 2009 SMP Manual for each of the Interagency Workgroup (IAWG) members. Where needed, (in particular if sediment removal is planned for any of these "new" reaches) additional characterization work would be completed per SMP permit requirements (wetland delineations, habitat assessments, addition to Table 7-3 Listed Species by SMP Reach, BMPs by Reach, etc.) to provide the needed background and baseline level of information as required under the SMP.

## Target Density and Success Criteria

For the 2013 season, the SMP Annual Report introduces draft Planting Plan Exhibits. Please find these in Attachment B. These exhibits introduce two new terms, "Permanent Trees" and "Temporary Trees," and are discussed in great detail in Sections 3 and 4 of the 2013 Annual Monitoring Report (AMR). These exhibits identify the target density numbers for upper bank and in-channel riparian toe trees (Permanent Trees) used for restoration (see 2013 AMR Chapters 3 and 4). For the in-stream portion of a channel, these densities are developed and maintained based on an assessment of the channel roughness created by the different tree arrangements in different channel forms. The arrangement of the trees is dictated by channel size and capacity. In general, woody species create the greatest roughness in the channel, so in-stream trees are the prime species targeted to be managed at sustainable densities. The Water Agency proposes to continue to manage restoration planting as a successional process (installing more than what will be needed, or Temporary Trees, phased thinning over a few years, while balancing leaf area) but will utilize the developed target densities (based on the draft Planting Plan Exhibits) for Tier 1 restoration sites that will provide the maximum goals for mature riparian and upland Permanent Trees at the toe and along the upper bank. These draft Planting Plan Exhibits will establish the baseline standards for the SMP for allowable vegetation (particularly in-channel toe trees) from initial planting through maturity. The draft Planting Plan Exhibits identify densities for Permanent Trees and for Temporary Trees. Because a successional process is incorporated (reflected as higher install numbers then what will be allowed at maturity) each project can have multiple success rates (e.g. success of how many target trees are in place versus temporal trees). In general, final (permanent or climax) spacing for trees will vary from 30 to 50 feet on center depending on the creek, it's capacity, morphology, needed access points, utilities and infrastructure. For restoration, initial spacing will vary between 15 and 25 feet. These target densities for trees will be used to measure success of the project over time.

The draft Planting Plan Exhibits will be implemented beginning in the 2013 restoration season and will be integrated into the evaluation of success presented for past projects. The draft Planting Plan Exhibits will be used to direct both Tier 1 Restoration as well as vegetation management. The ultimate allowable spacing has not yet been integrated into re-planting and management needs for past Tier 1 restoration projects. In some cases the new draft Planting Plan exhibits will change the long term allowable spacing of toe trees in smaller sized channels and may be different than what was initially installed for a given Tier 1 site. These areas will not be immediately thinned to meet the new draft standards. Efforts to establish allowable roughness will be phased in over time during annual vegetation management following established practices that have been shown to be increasing canopy over time. Following discussions with the IAWG, formal changes to the reporting templates and the way data is presented in future Reports will be made based on IAWG guidance.

**Native Tree Mitigation Requirement**

The intent of the native tree mitigation requirement is to develop canopy and manage in-stream habitat to the benefit of water quality, aquatic habitats and wildlife. The requirement is included as an additional mitigation need identified in the CDFW MSAA, *Notification Number 1600-2006-0254-3*. Several challenges have been identified with the native tree mitigation requirement. First is the added cost, planning, and effort required to provide this benefit beyond SMP Tier 1 restoration standards. Second is finding currently treeless areas of sufficient size that are suitable for the installation of toe trees. Third is the difficulty the Water Agency has had in consistently implementing this requirement in the face of areas where many large diameter trees (greater than 8 inches) have established at densities (occurring on five to ten foot centers) beyond allowable levels and needed to have these densities thinned to provide for hydraulic capacity. Recent examples include reaches on Copeland Creek and the upper Laguna De Santa Rosa that support high densities (5-10 feet on center) of native red and Pacific willow trees. These legacy areas support tree densities that are well beyond the allowable roughness and are thinned over time (over two to three seasons) per standards presented in the draft Planting Plan Exhibits to provide hydraulic capacity. Many of the channels under the SMP vegetation management regime currently support abundant canopy, and these areas are now subject to additional scrutiny related to allowable roughness under the new draft Channel Form-Planting Plan Exhibits.

Overall, native tree mitigation has been difficult to implement, account for and retain given the ever-changing conditions present in the SMP flood channels. In 2013, the majority of trees installed as mitigation for previous years work had to be removed during sediment removal actions on Colgan Creek. Many of the bare channels present at the start of the SMP are no longer available for installing trees as they have been developing canopy as part of the vegetation management process. Few if any large bare channels are available that need or can support this kind of tree installations. The SMP approach to mitigation and restoration should be fully integrated with vegetation management techniques. Planting will be accomplished utilizing the same methodology applied to canopy development during the first four years of the SMP. In other words, many small trees were managed along the toe, as they grew these were thinned to a few dominants. This approach allowed many creeks to continue a successional process that increased canopy and has developed into a "climax" (places trees can be predicted to be allowed to remain into the future) arrangement of toe trees. Now that this goal has been achieved in many creek reaches, further analysis is required to evaluate hydraulic capacity remaining at different seral stages of riparian development as well as the allowable diameter (how much water they displace and the roughness represented) of retained trees.

The Water Agency recommends using an alternative method to judge success that stresses "function" versus plant number. Examples could include developing a sensible California Rapid Assessment Method (CRAM) for urban stream channels, or assessing success by developing agreed upon success criteria based on measurable and observable functional aspects of the streams (e.g. toe trees at allowable spacing, native in-stream vegetation in place, side bank grasses and shrub analogs installed, canopy increasing or holding steady, etc). Ultimate success accounting should be based on a Permanent Tree arrangement, and existing in-channel trees beyond those needed as permanent considered as Temporary Trees. The Water Agency proposes addressing the native tree mitigation requirement by incorporating the effort into Tier 1 restoration. Based on the draft Planting Plan Exhibits, Temporary Trees installed could be applied to the mitigation need. Existing trees on the upper and side banks retained beyond the standard templates allowed on stream reaches could also be used to offset this requirement.

For the 2013/14 season, the Water Agency will install mitigation trees at 2013 Tier 1 sites, and along several channels that currently support poor or incomplete riparian canopies, including Wilfred 1, Wilfred Extension 1, Bellevue-Wilfred reaches 1 through 4, College 1, Roseland reaches 1 through 3, and Washoe 1. Utilizing this approach the Water Agency anticipates being able to install all of the needed mitigation trees tallied up (1,273 + 937=2,210) to this point while still providing a surplus of 90 trees (2013 Annual Report, Table 4-6). Following discussions with CDFW, formal changes to the reporting templates and how native tree mitigation is accounted would be made based on CDFW guidance.

**Sediment Sampling and Analysis Program Updates**

SMP Manual Appendix B, Sediment Sampling and Analysis Guidelines was updated in May 2013. The updates relate to the test methods for organochlorine pesticides, polyaromatic hydrocarbons (PAHs), and aliphatics; updates to the Zone 1A analyte list to be consistent with the Zone 2A/3A analyte list. The current version of SMP Manual Appendix B (May 2013) is included in this submittal and is part of the Water Agency's 2014 SMP Manual Update.

## Conclusion

The past four years marks an important accomplishment in the management of urban streams in Sonoma County. The SMP has developed a model approach to managing riparian habitats and protecting water quality while also providing for flood water capacity. Overall habitat conditions supporting wildlife and aquatic resources have improved regionally along all channels maintained under the SMP. The experience gained implementing the SMP reveals that certain objectives will be more difficult to realize that others, and some are unsustainable (native tree mitigation, shrub planting below the top of bank, retaining sediment for low-flow channels). More work is needed to improve the overall efficiency of the SMP work cycle; including data collection methods (move to a real-time process), mapping updates and continued development of the SMP database and GIS (integrating the Microsoft Access database with GIS data structure), refinement and integration of hydraulic models and vegetation templates, and defining realistic expectations about what kinds of aquatic habitat can be sustainable maintained in urban flood control channels.

In closing we appreciate the continued support and regulatory coordination that Department of Fish and Wildlife has provided to the Water Agency for the SMP. Working together we can improve channel maintenance provide fold protection and also protect natural resources. Please feel free to contact me at (kfoster@scwa.ca.gov or (707) 5471941 with any questions.

Sincerely,

Keenan Foster

Keenan Foster
Principal Environmental Specialist

Attachments

Kaete King
North Coast Regional Water Quality Control Board

Stephen Bargsten
North Coast Regional Water Quality Control Board

Ben Livsey
San Francisco Bay Regional Water Quality Control Board

Jessica Martini-Lamb, Jon Niehaus, Mike Thompson, Sonoma County Water Agency

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State of California – The Natural Resources Agency ARNOLD SCHWARZENEGGER, Governor
DEPARTMENT OF FISH AND GAME
Bay Delta Region
Post Office Box 47
Yountville, California 94599
(707) 944-5520
www.dfg.ca.gov

COPY

ORIGINAL DOCUMENT
SONOMA COUNTY WATER AGENCY
To FOSTER
MAY 20 2010
CF/15-0-9 Stream Maintenance Program (2010)

May 18, 2010

Keenan Foster
Sonoma County Water Agency
Post Office Box 11628
Santa Rosa, CA 95406

Subject: Final Lake or Streambed Alteration Agreement
Notification No. 1600-2009-0399-R3
Stream Maintenance Program, Sonoma County

Dear Mr. Foster:

Enclosed is the final Master Streambed Alteration Agreement ("Agreement") for the Stream Maintenance Program ("Project"). Before the Department may issue an Agreement, it must comply with the California Environmental Quality Act ("CEQA"). In this case, the Department, acting as a responsible agency, filed a notice of determination ("NOD") on May 18, 2010 based on information contained in the final Environmental Impact Report the lead agency prepared for the Project.

Under CEQA, filing a NOD starts a 30-day period within which a party may challenge the filing agency's approval of the project. You may begin your project before the 30-day period expires if you have obtained all necessary local, state, and federal permits or other authorizations. However, if you elect to do so, it will be at your own risk.

If you have any questions regarding this matter, please contact Richard Fitzgerald, Coastal Habitat Conservation Supervisor at (707)944-5568 or rfitzgerald@dfg.ca.gov.

Sincerely,

Scott Wilson

Scott Wilson
Environmental Program Manager
Bay Delta Region

cc: Richard Fitzgerald,
Adam McKannay
Lieutenant Riske

*Conserving California's Wildlife Since 1870*

COPY

CALIFORNIA DEPARTMENT OF FISH AND GAME
BAY DELTA REGION
POST OFFICE BOX 47
YOUNTVILLE, CALIFORNIA 94599
(707) 944-5520
WWW.DFG.CA.GOV

**STREAMBED ALTERATION AGREEMENT**
NOTIFICATION NO. 1600-2009-0399-R3

SONOMA COUNTY WATER AGENCY
STREAM MAINTENANCE PROGRAM

This Master Streambed Alteration Agreement (Agreement) is entered into between the California Department of Fish and Game (DFG) and the Sonoma County Water Agency (Permittee) as represented by Grant Davis.

## RECITALS

WHEREAS, pursuant to Fish and Game Code (FGC) section 1602, Permittee notified DFG on November 30, 2009 that Permittee intends to complete the project described herein.

WHEREAS, pursuant to FGC section 1603, DFG has determined that the project could substantially adversely affect existing fish or wildlife resources and has included measures in the Agreement necessary to protect those resources.

WHEREAS, Permittee has reviewed the Agreement and accepts its terms and conditions, including the measures to protect fish and wildlife resources.

NOW THEREFORE, Permittee agrees to complete the project in accordance with the Agreement

## PROJECT LOCATION

This Agreement is applicable to the Covered Activities described herein, but only in those areas and channel reaches owned or maintained by the Applicant and included in the SMP Program Area. These reaches are shown in Exhibit A, Figures 1-2, 1-3, 1-4, 1-5, 1-6, 1-7, 1-8, and 1-9. Covered channels include:

- Laguna de Santa Rosa Watershed:
  - Windsor Creek Subbasin:
    - Airport Creek, Faught Creek, Jensen Creek, Pool Creek, Redwood Creek, Starr Creek, unnamed Starr Creek Tributary, East Windsor Creek, unnamed Windsor Creek tributary.

Mark West Creek Subbasin:
Fulton Creek, Mark West Creek, Woolsey Creek, Wikiup Creek
Santa Rosa Creek Subbasin:
Abramson Creek, Austin Creek, Brush Creek, Coffey Creek, College Creek, Ducker Creek, Forestview Creek, Fountaingrove Creek, Indian Creek, Irwin Creek, Lorna Dell Creek, South Fork Matanzas Creek, Middle Fork Brush Creek, Oakmont Creek, Olivet Creek, Paulin Creek, Peterson Creek, Piner Creek, Rincon Creek, Russell Creek, Santa Rosa Creek, Santa Rosa Creek Diversion, Sierra Park Creek, Spring Creek, Steele Creek.
Roseland and Colgan Subbasin:
Calder Creek, Colgan Creek, Kawana Springs Creek, Laguna de Santa Rosa, Roseland Creek.
Upper Laguna Subbasin:
Bellevue Wilfred Channel, Burton Avenue Ditch, Coleman Creek, Cook Creek, Copeland Creek, Cotati Creek, Crane Creek, Five Creek, Gossage Creek, Hinebaugh Creek, Hunter Creek, Laguna de Santa Rosa, South Fork Copeland Creek, Todd Creek, Warrington Creek, Washoe Creek, Wilfred Creek, Wilfred Extension.
Petaluma River Watershed:
Petaluma Subbasin:
Adobe Creek, Capri Creek, Corona Creek, East Fork McDowell Creek, East Washington Creek, Ellis Creek, Jessie Lane Creek, Lichau Creek, Lynch Creek, McDowell Creek, Owens Creek, Petaluma River, Thompson Creek, Washington Creek Wiggans Hill Creek, Willow Brook Creek, Wilson Creek.
Sonoma Creek Watershed:
Sonoma Subbasin:
Arroyo Seco, Calabazas Creek, Dowdall Creek, Fisher Creek, Fowler Creek, Fryer Creek, Hoff Creek, Lawndale Creek, Holly Creek, Hooker Creek, Lilley Creek, Lower East Fork Fryer Creek, Kenwood Creek, Mount Hood Creek, O'Brien Creek, Rogers Creek, Schell Creek, Sonoma Creek, Verano Creek, Nathanson Creek.
Central Russian River:
Russian River Subbasin:
Gird Creek
Lower Russian River:
Russian River Subbasin:
Hubert Creek, Mayes Canyon Creek, Pocket Canyon Creek, Fife Creek
Dry Creek:
Vinces Creek, West Slough
Southern Coast:
American Creek

## PROJECT DESCRIPTION

This Agreement covers those activities described in the SMP Program Documents that are subject to Fish and Game Code section 1600, *et seq*. Within the project location, the following Covered Activities are authorized to occur:

1. Sediment Management
    a. Reach Scale Sediment Removal
    b. Smaller Localized Sediment Removal
    c. Intermediate Scale Sediment Removal
    d. Sediment Management at Other Facilities
        i. In-Channel Engineered Structures
        ii. Reservoirs
2. Vegetation Management
    a. Management in Engineered Channels
        i. Willow thinning and removal
        ii. Blackberry thinning and removal
        iii. Cattail removal
        iv. Ludwigia removal
        v. Tree pruning
        vi. Exotics removal
        vii. Tree removal and relocation
        viii. Mowing
        ix. Tree Planting
    b. Removal at Other Facilities
        i. In-Channel Engineered Structures
        ii. Reservoirs
    c. Access and Staging
    d. Herbicide Use
3. Bank Stabilization
    a. Treatment Design – Bioengineering
    b. Treatment Design- Compacted Soil
    c. Treatment Design- Rip-Rap at Toe of Slope
    d. Treatment Design- Culvert Repair
4. Other Activities
    a. Maintaining channel access roads
    b. Maintaining proper drainage along channel access roads
    c. V-ditch Culvert Repair/Replacement
    d. Culvert Repair and Installation
        i. Drop-Inlet Culverts
        ii. Road Crossing Culverts
    e. Debris Removal
5. Activities in Modified and Natural Channels
    a. Debris removal

b. Vegetation management

Activities under this Agreement do not include:

- activities on areas and reaches other than those identified in Exhibit A, Table 4.1.
- activities on the main stems of the Russian River and Dry Creek
- activities on streams outside of SCWA authority
- capital improvement projects
- emergency activities and procedures as defined in Public Resources Code §21060.3
- activities which would increase the designed flood conveyance capacity of a channel
- activities on the following streams that are known to provide habitat for Central California Coast coho (*Oncorhynchus kisutch)* and/or California freshwater shrimp (*Syncaris pacifica*): Blucher Creek, Willow Creek, Sheephouse Creek, Dutch Bill Creek, Green Valley Creek, Jonive Creek, and Salmon Creek (However, this Agreement covers activities on Mark West Creek and its tributaries which are known to provide habitat for coho salmon and Sonoma Creek which is known to provide habitat for California freshwater shrimp)
- activities not subject to Fish and Game Code Section 1600, *et seq.*

## PROJECT IMPACTS

Existing fish or wildlife resources the project could substantially adversely affect include: Baker's navarretia, Burke's goldfields, California beaked-rush, deceiving sedge, dwarf downingia, legenere, many-flowered navarretia, Sebastopol meadowfoam, Sonoma alopecurus, Sonoma sunshine, Sonoma white sedge, swamp harebell, saline clover, California freshwater shrimp, California tiger salamander, California red-legged frog, foothill yellow-legged frog, western pond turtle, migratory birds and raptors, steelhead, chinook salmon, hardhead, Pacific lamprey, river lamprey, and Russian River tule perch.

The adverse effects the project could have on the fish or wildlife resources identified above include:

- disturbance, degradation, or dewatering of aquatic habitat
- disturbance or degradation of riparian and streamside terrestrial habitat
- loss of habitat and adverse fluvial effects of placing hardened materials on streambanks
- removal of riparian and streamside vegetation
- increased erosion
- channel constriction or alteration
- migration barriers
- injury or mortality to sensitive species
- pollution of stream water

## MEASURES TO PROTECT FISH AND WILDLIFE RESOURCES

### 1. Administrative Measures

Permittee shall meet each administrative requirement described below.

1.1 Documentation at Project Site. Permittee shall make the Agreement, any extensions and amendments to the Agreement, and all related notification materials and California Environmental Quality Act (CEQA) documents, readily available at the project site at all times and shall be presented to DFG personnel, or personnel from another state, federal, or local agency upon request.

1.2 Providing Agreement to Persons at Project Site. Permittee shall provide copies of the Agreement and any extensions and amendments to the Agreement to all persons who will be working on the project at the project site on behalf of Permittee, including but not limited to contractors, subcontractors, inspectors, and monitors.

1.3 Notification of Conflicting Provisions. Permittee shall notify DFG if Permittee determines or learns that a provision in the Agreement might conflict with a provision imposed on the project by another local, state, or federal agency. In that event, DFG shall contact Permittee to resolve any conflict.

1.4 Project Site Entry. Permittee agrees that DFG personnel may enter the project site at any time to verify compliance with the Agreement.

1.5 Definitions. The following definitions apply to this Agreement.

"Annual Workplan Notification packet," means the materials specified to be submitted to regulatory agencies described under SMP Manual Table 9-1 and Chapter 9.6

"Applicant" means the Sonoma County Water Agency

"Bioengineering" is the application of the principles of engineering and natural sciences to flood control maintenance. Methods include, but are not limited to, willow wattling, post and wire revetment, revegetation with native plants, seeding, installation of rootballs, brush layering, brush matting, trench packing, interplanting rip-rap, plantings and combinations of these methods.

"Department" means the California Department of Fish and Game

"Project" means any of those activities described under "Project Description" above. For purposes of notification and reporting, projects shall be aggregated by the following:

- reach-scale sediment removal projects occur throughout the length of the reach
- intermediate-scale sediment removal projects may include activities for a length of up to 750 feet along a specific reach
- localized sediment removal projects occur within 250 feet of channel length and are typically associated with hardened stream crossings
- bank stabilization, repair, or erosion control projects will vary in spatial extent
- vegetation management activities on a single named stream may be treated as a single project

"Program Documents" means all of:

- September 2009 Stream Maintenance Program Manual
- January 2009 Stream Maintenance Program Draft Environmental Impact Report
- June 2009 Stream Maintenance Program Final Environmental Impact Report
- Updates and revisions to the above approved by the Department for use under this Agreement

"SCWA" means the Sonoma County Water Agency

"SMP" means the Sonoma County Water Agency's Stream Maintenance Program as described in the Program Documents

"SMP DEIR" means the Sonoma County Water Agency's January 2009 Stream Maintenance Program Draft Environmental Impact Report

"SMP EIR" means the Sonoma County Water Agency's June 2009 Stream Maintenance Program Final Environmental Impact Report

"SMP Manual" means Sonoma County Water Agency's the September 2009 Stream Maintenance Program Manual.

"Vegetation Management Addendum" means materials submitted to the Department after the submission of the Annual Workplan Notification Packet for the review and authorization of vegetation management activities.

"Workplan" means the materials specified to be submitted to regulatory agencies described under SMP Manual Table 9-1 and Chapter 9.6 (see "Annual Workplan Notification packet")

1.6 Fees. The Fees below are based on the current Lake and Streambed Alteration Program fee schedule in the California Code of Regulations, Title 14, Section 699.5. SCWA shall pay the appropriate fee from the fee schedule existing at the time the specific fee is due. Failure to pay fees by the dates specified may result in suspension of this Agreement.

Base Fee – SCWA has submitted a base fee of $30,000 to the Department with notification for this Agreement.

Annual Fee –By May 15th of each year that this Agreement is in effect, SCWA shall submit the annual fee. At the time of the execution of this Agreement, the annual fee amount is $2,801.50.

Project Fees – Prior to December 31st of each year that this Agreement is in effect, SCWA shall submit a fee based on the number of covered projects implemented under this Agreement that year. At the time of the execution of this Agreement, this amount is $280.25 for each project.

1.7 Annual Workplan Notification. No activities covered by this Agreement shall be conducted unless the Department has approved those activities as described in this condition.

By May 15th of each year that this Agreement is in effect and at least 60 calendar days prior to initiating any activities covered under this Agreement, SCWA will conduct a pre-implementation field tour and meeting on a date acceptable to the Department. The Department may waive this obligation at its sole discretion.

By May 15th of each year that this Agreement is in effect and at least 60 calendar days prior to initiating any activities covered under this Agreement, SCWA shall submit:

- 1600 Notification Form
- Check for Annual Fee
- Annual Workplan Notification Completeness Checklist

- Annual Workplan Notification Packet in the same form as Exhibit D

The Department shall review the Annual Workplan Notification packet and make a determination of whether it is consistent with the Program Documents and this Agreement. The Department shall notify SCWA in writing within 30 calendar days of receiving the Annual Workplan Notification packet of the Department's completeness determination. An Annual Workplan Notification packet shall be deemed complete if it contains the relevant information described on the Annual Workplan Notification form (Exhibit D) and required by the conditions of this Agreement, as detailed on the Annual Workplan Notification Completeness Checklist. In the event of an incompleteness determination, the Department shall provide a detailed list of additional information needed to make the submittal complete. The review period described below will begin after the Department deems the submittal complete. If the Department does not respond within the 30 calendar day time period described above, the Annual Workplan Notification packet shall be automatically deemed complete at that time, and the review period described below will begin.

After the Annual Workplan Notification packet is deemed complete, the Department shall review it and make a determination of whether the Annual Workplan Notification packet conforms to the Program Documents and this Agreement and includes adequate mitigation measures for potential significant effects to fish and wildlife.

If the Department determines that all of the projects subject to this Agreement in the Annual Workplan Notification packet meet the above criteria, then the Department shall so notify SCWA in writing. Upon receipt of such findings, SCWA may proceed with conducting all of the covered activities described in the Annual Workplan Notification packet.

If the Department determines that any of the projects subject to this Agreement in the Annual Workplan Notification packet do not meet the above criteria, then the Department shall so notify SCWA in writing with the basis for its determination. SCWA may not conduct the particular project unless authorized in writing by the Department. SCWA may submit additions or revisions to the Annual Workplan Notification packet. However, such additions or revisions shall not include new projects that are not described in the submitted Annual Workplan Notification. Upon receipt of additions or revisions to the Annual Workplan Notification packet, the Department has 30 calendar days to conduct an additional Project review. SCWA may proceed with those projects which are not identified as failing to conform with the above criteria.

If the Department does not respond to the Annual Workplan Notification packet within 30 calendar days from the date that the Annual Workplan Notification packet is deemed complete, or a revised Annual Notification packet is received, then the Annual Workplan Notification packet shall be automatically determined to conform to the Program Documents and this Agreement and include adequate mitigation measures for potential significant effects to fish and wildlife. SCWA may begin the projects subject to this Agreement described in the Annual Workplan Notification Packet, provided that SCWA complies with the protective measures described in the Program Documents and this Agreement in completing the projects. This "no response approach" shall be confirmed in writing by SCWA and submitted to the Department prior to the start of work. Exercise of this option is at the discretion of SCWA and does not obviate any other responsibilities or requirements of the Program Documents, this Agreement, or the associated permits, conditions, or mitigation measures.

SCWA shall reasonably accommodate the Department's requests for site visits.

1.8 Vegetation Management Addendum. SCWA may supplement the Annual Workplan Notification with a Vegetation Management Addendum to add additional vegetation management projects. However, the projects in the Vegetation Management Addendum shall be limited to vegetation management only.

No activities covered by this Agreement and described in the Vegetation Management Addendum shall be conducted until the Department has approved those activities as described in this condition.

When submitting an Vegetation Management Addendum, SCWA shall submit:

- 1600 Notification Form
- Vegetation Management Addendum in the same form as Exhibit F

The Department shall review the Vegetation Management Addendum and make a determination of whether it is consistent with the Program Documents and this Agreement. The Department shall notify SCWA in writing within 15 calendar days of receiving the

Vegetation Management Addendum of the Department's completeness determination. In the event of an incompleteness determination, the Department shall provide a detailed list of additional information needed to make the submittal complete. The review period described below will begin after the Department deems the submittal complete. If the Department does not respond within the 15 calendar day time period described above, the Vegetation Management Addendum shall be automatically deemed complete at that time, and the review period described below will begin.

After the Vegetation Management Addendum is deemed complete, the Department shall review it and make a determination of whether the Vegetation Management Addendum conforms to the Program Documents and this Agreement and includes adequate mitigation measures for potential significant effects to fish and wildlife.

If the Department determines that all of the projects subject to this Agreement in the Vegetation Management Addendum meet the above criteria, then the Department shall so notify SCWA in writing. Upon receipt of such findings, SCWA may proceed with conducting all of the covered activities described in the Vegetation Management Addendum.

If the Department determines that any of the projects subject to this Agreement in the Vegetation Management Addendum do not meet the above criteria, then the Department shall so notify SCWA in writing with the basis for its determination. SCWA may not conduct this particular project unless authorized in writing by the Department. SCWA may submit additions or revisions to the Vegetation Management Addendum. However, such additions or revisions shall not include new projects that are not described in the submitted Vegetation Management Addendum. Upon receipt of additions or revisions to the Vegetation Management Addendum, the Department has 15 calendar days to conduct an additional Project review. SCWA may proceed with those projects which are not identified as failing to conform with the above criteria.

If the Department does not respond to the Vegetation Management Addendum within 15 calendar days from the date that the Vegetation Management Addendum is deemed complete, or a revised Vegetation Management Addendum is received, then the Vegetation Management Addendum shall be automatically determined to conform to the Program Documents and this Agreement and include adequate mitigation measures for potential significant effects to fish and wildlife. SCWA may begin the projects subject to this Agreement described in the Vegetation Management Addendum, provided that

SCWA complies with the protective measures described in the Program Documents and this Agreement in completing the projects. This "no response approach" shall be confirmed in writing by SCWA and submitted to the Department prior to the start of work. Exercise of this option is at the discretion of SCWA and does not obviate any other responsibilities or requirements of the Program Documents this Agreement, or the associated permits, conditions, or mitigation measures.

SCWA shall accommodate the Department's requests for site visits.

1.9 Compliance with Agreement and Dispute Resolution. In the event that an individual project is determined by the Department to be conducted in a manner which does not conform to this Agreement, the work for that individual project shall cease upon written notice by the Department to SCWA until the Department determines that the project conforms to this Agreement.

If SCWA's an individual project deviates from the Program Documents or conditions of this Agreement, this Agreement is no longer valid as it relates to that individual project. SCWA shall submit a separate standard notification to the Department if that individual project is to be pursued.

1.10 Changes to Program. If changes to the Program Documents are made that pertain to activities subject to this Agreement, SCWA shall inform the Department in writing and submit a Request to Amend this Agreement in the form specified by the Department.

If SCWA seeks any other modification to this Agreement, SCWA shall inform the Department in writing and submit a Request to Amend this Agreement in the form specified by the Department.

If at any time the Department determines that the measures in this Agreement no longer protect the fish and wildlife resources that are being substantially adversely affected by the Covered Activities, the Department shall notify SCWA of necessary additional conditions and impose one or more new conditions to protect the fish and wildlife resources affected by the activity. The Department shall inform SCWA of the basis upon which it determined the Agreement no longer protects the affected fish and wildlife resources. If SCWA disagrees with one or more of the new measures, within seven days of receiving the new measures, it shall notify the Department in writing of the disagreement. SCWA and the Department shall consult regarding the disagreement within seven days of the Department receiving the notice.

SCWA shall incorporate conditions specified in this Agreement or any future conditions determined by the Department to be necessary to protect affected fish and wildlife resources into the SMP Program Documents.

1.11 Termination. This Master Agreement may be terminated by either party at any time with 60 days prior written notification.

## 2. Avoidance and Minimization Measures

To avoid or minimize adverse impacts to fish and wildlife resources identified above, Permittee shall implement each measure listed below.

2.1 Incorporation of Program BMPs and Mitigation. Except as otherwise specified by the Department, projects shall be designed and implemented consistent with the avoidance and minimization measures specified in Exhibit A, Table 7.1 and the mitigation measures described in Exhibit A, Chapter 8.

2.2 Stream Crossings and Drainage Facilities. Except as specifically authorized by the Department, new or replacement culverts and stream crossing facilities shall be of sufficient dimension to either 1) allow maximum water flows generated during 100-year high intensity storms to pass beneath unrestricted or 2) allow the maximum water flows conveyable by the channel. This condition does not apply to low water crossings designed to pass storm flows over an armored road surface.

2.3 Coho Salmon and Steelhead. Activities conducted in steelhead bearing streams shall comply with the following:

Activities in the Mark West Creek mainstem or tributaries upstream from the confluence with the Laguna de Santa Rosa shall be limited to those which do not require stream dewatering, disturbance of the stream bed or banks, or contact with water. Such activities shall be limited to vegetation management and other non-earth disturbing activities along the channel banks and access roads.

SCWA shall isolate work areas located in aquatic habitat from the flowing stream and relocate native species prior to proceeding with in-channel work.

A qualified biologist shall be onsite during all dewatering events.

All captured salmonids will be properly cared for.

SCWA shall construct a low-flow channel at sediment removal sites to provide enhanced migration conditions.

2.4 Bank Stabilization – Bioengineering Alternatives. To the extent feasible, bank stabilization projects shall utilize bioengineering techniques. If bioengineering techniques alone are insufficient, other methods may be used. Installation of rip rap or other hardened artificial materials shall be considered only after bioengineering techniques have been determined to be insufficient.

2.5 Fish and amphibian relocation. All native fish and amphibians captured prior to and during dewatering activities shall be released to the stream outside of exclusion barriers.

2.6 Species Listed under the California Endangered Species Act. This Agreement does not authorize take of species listed under the California Endangered Species Act. No activities which may result in the take of species listed under the California Endangered Species Act shall be conducted except as separately authorized by the Department.

2.7 Sonoma Creek and California Freshwater Shrimp. Activities occurring within channels supporting California freshwater shrimp shall be limited to vegetation management and debris removal above the water level. Vegetation or debris overhanging into pools or glides within the natural reaches of the channel shall not be removed or altered.

## 3. Compensatory Measures

To compensate for adverse impacts to fish and wildlife resources identified above that cannot be avoided or minimized, Permittee shall implement each measure listed below.

3.1 Planting and Revegetation After Soil Disturbance. For removal or disturbance of Class 1 vegetation (as calculated by measuring dripline), revegetation shall occur at a minimum ratio of area replanted to area disturbed of 4:1 following standard planting techniques as detailed in the SMP manual.

## 4. Reporting Measures

Permittee shall meet each reporting requirement described below.

4.1 Annual Summary Report. No later than January 31st of each year that this Agreement is in effect, SCWA shall submit an Annual

Summary Report describing the covered activities conducted during the prior calendar year. This report shall be in the same form as Exhibit G.

4.2 Annual Summary Meeting. By January 31st of each year that this Agreement is in effect, SCWA will invite the Department to an annual summary review meeting to discuss the events, covered activities, and lessons learned during the prior work period on a date acceptable to the Department. This meeting will be held prior to March 1st of the following calendar year. The Department may waive this obligation at its discretion.

4.3 Four-year summary report. SCWA shall provide a program summary report prior to January 31st at the end of each four-year period that this Agreement is in effect. The summary report shall include:

- a copy of original agreement
- a description of the status of covered activities
- an evaluation of success of measures in agreement to protect fish and wildlife resources
- a discussion of any factors that could increase predicted adverse impacts on fish and wildlife resources and a description of the resources that may be adversely affected.

## CONTACT INFORMATION

Any communication that Permittee or DFG submits to the other shall be in writing and any communication or documentation shall be delivered to the address below by U.S. mail, fax, or email, or to such other address as Permittee or DFG specifies by written notice to the other.

To Permittee:

Mr. Grant Davis
Sonoma County Water Agency
P.O. Box 11628
Santa Rosa, CA 95406

To DFG:

Department of Fish and Game
Bay Delta Region
Post Office Box 47
Yountville, California 94599

Attn: Lake and Streambed Alteration Program – Adam McKannay
Notification #1600-2010-0399-R3
Fax (707) 944-5553
amckannay@dfg.ca.gov

## LIABILITY

Permittee shall be solely liable for any violations of the Agreement, whether committed by Permittee or any person acting on behalf of Permittee, including its officers, employees, representatives, agents or contractors and subcontractors, to complete the project or any activity related to it that the Agreement authorizes.

This Agreement does not constitute DFG's endorsement of, or require Permittee to proceed with the project. The decision to proceed with the project is Permittee's alone.

## SUSPENSION AND REVOCATION

DFG may suspend or revoke in its entirety the Agreement if it determines that Permittee or any person acting on behalf of Permittee, including its officers, employees, representatives, agents, or contractors and subcontractors, is not in compliance with the Agreement.

Before DFG suspends or revokes the Agreement, it shall provide Permittee written notice by certified or registered mail that it intends to suspend or revoke. The notice shall state the reason(s) for the proposed suspension or revocation, provide Permittee an opportunity to correct any deficiency before DFG suspends or revokes the Agreement, and include instructions to Permittee, if necessary, including but not limited to a directive to immediately cease the specific activity or activities that caused DFG to issue the notice.

## ENFORCEMENT

Nothing in the Agreement precludes DFG from pursuing an enforcement action against Permittee instead of, or in addition to, suspending or revoking the Agreement.

Nothing in the Agreement limits or otherwise affects DFG's enforcement authority or that of its enforcement personnel.

## OTHER LEGAL OBLIGATIONS

This Agreement does not relieve Permittee or any person acting on behalf of Permittee, including its officers, employees, representatives, agents, or contractors and subcontractors, from obtaining any other permits or authorizations that might be required under other federal, state, or local laws or regulations before beginning the project or an activity related to it.

This Agreement does not relieve Permittee or any person acting on behalf of Permittee, including its officers, employees, representatives, agents, or contractors and subcontractors, from complying with other applicable statutes in the FGC including, but not limited to, FGC sections 2050 et seq. (threatened and endangered species), 3503 (bird nests and eggs), 3503.5 (birds of prey), 5650 (water pollution), 5652 (refuse disposal into water), 5901 (fish passage), 5937 (sufficient water for fish), and 5948 (obstruction of stream).

Nothing in the Agreement authorizes Permittee or any person acting on behalf of Permittee, including its officers, employees, representatives, agents, or contractors and subcontractors, to trespass.

**AMENDMENT**

DFG may amend the Agreement at any time during its term if DFG determines the amendment is necessary to protect an existing fish or wildlife resource.

Permittee may amend the Agreement at any time during its term, provided the amendment is mutually agreed to in writing by DFG and Permittee. To request an amendment, Permittee shall submit to DFG a completed DFG "Request to Amend Lake or Streambed Alteration" form and include with the completed form payment of the corresponding amendment fee identified in DFG's current fee schedule (see Cal. Code Regs., tit. 14, § 699.5).

**TRANSFER AND ASSIGNMENT**

This Agreement may not be transferred or assigned to another entity, and any purported transfer or assignment of the Agreement to another entity shall not be valid or effective, unless the transfer or assignment is requested by Permittee in writing, as specified below, and thereafter DFG approves the transfer or assignment in writing.

The transfer or assignment of the Agreement to another entity shall constitute a minor amendment, and therefore to request a transfer or assignment, Permittee shall submit to DFG a completed DFG "Request to Amend Lake or Streambed Alteration" form and include with the completed form payment of the minor amendment fee identified in DFG's current fee schedule (see Cal. Code Regs., tit. 14, § 699.5).

**EXTENSIONS**

If Permittee fails to submit a request to extend the Agreement prior to its expiration, Permittee must submit a new notification and notification fee before beginning or continuing the project the Agreement covers (Fish & G. Code, § 1605, subd. (f)).

**EFFECTIVE DATE**

The Agreement becomes effective on the date of DFG's signature, which shall be: 1) after Permittee's signature; 2) after DFG complies with all applicable requirements under the California Environmental Quality Act (CEQA); and 3) after payment of the applicable FGC section 711.4 filing fee listed at http://www.dfg.ca.gov/habcon/ceqa/ceqa_changes.html.

**TERM**

This Agreement shall expire on December 31, 2025, unless it is terminated or extended before then. All provisions in the Agreement shall remain in force throughout its term. Permittee shall remain responsible for implementing any provisions specified herein to protect fish and wildlife resources after the Agreement expires or is terminated, as FGC section 1605(a)(2) requires.

**EXHIBITS**

The documents listed below are included as exhibits to the Agreement and incorporated herein by reference.

A. The Sonoma County Water Agency's September 2009 Stream Maintenance Program Manual
B. The Sonoma County Water Agency's January 2009 Stream Maintenance Program Draft Environmental Impact Report
C. The Sonoma County Water Agency's June 2009 Stream Maintenance Program Final Environmental Impact Report
D. Annual Workplan Notification Packet Outline
E. Annual Workplan Notification packet Completeness Checklist
F. Vegetation Management Addendum Sample
G. Annual Summary Report Outline

**AUTHORITY**

If the person signing the Agreement (signatory) is doing so as a representative of Permittee, the signatory hereby acknowledges that he or she is doing so on Permittee's behalf and represents and warrants that he or she has the authority to legally bind Permittee to the provisions herein.

**AUTHORIZATION**

This Agreement authorizes only the project described herein. If Permittee begins or completes a project different from the project the Agreement authorizes, Permittee may be subject to civil or criminal prosecution for failing to notify DFG in accordance with FGC section 1602.

**CONCURRENCE**

The undersigned accepts and agrees to comply with all provisions contained herein.

**FOR SONOMA COUNTY WATER AGENCY** MAY 7 2010

5-7-2010

Grant Davis Date
Interim General Manager

**FOR DEPARTMENT OF FISH AND GAME**

Scott Wilson 5/18/10

Scott Wilson Date
Environmental Program Manager

Prepared by: Richard Fitzgerald
Coastal Habitat Conservation Supervisor

Date Prepared: April 21, 2010

| FOR DEPARTMENT USE ONLY | | | | |
|---|---|---|---|---|
| Date Received | Amount Received | Amount Due | Date Complete | Notification No. |
| 11/30/09 | $ 30,000.00 | $ | | 1600-2009-0399-3 |

Ck# 1098365
Co. of Sonoma
Recv'd 2/3/10

STATE OF CALIFORNIA
Fitzgerald
DEPARTMENT OF FISH AND GAME
Riske

# NOTIFICATION OF LAKE OR STREAMBED ALTERATION

**Complete EACH field, unless otherwise indicated, following the enclosed instructions and submit ALL required enclosures. Attach additional pages, if necessary.**

Fish & Game
NOV 30 2009
Yountville

## 1. APPLICANT PROPOSING PROJECT

| | | | |
|---|---|---|---|
| Name | Keenan Foster | | |
| Business/Agency | Sonoma County Water Agency | | |
| Street Address | 404 Aviation Blvd | | |
| City, State, Zip | Santa Rosa, Ca 94506 | | |
| Telephone | (707) 547-1941 | Fax | (707) 524-3782 |
| Email | kfoster@scwa.ca.gov | | |

## 2. CONTACT PERSON (*Complete only if different from applicant*)

| | | | |
|---|---|---|---|
| Name | Jim Robins | | |
| Street Address | Alnus Ecological | | |
| City, State, Zip | Oakland, Ca, 94602 | | |
| Telephone | (510) 322-9895 | Fax | (510) 280-9214 |
| Email | jrobins@alnus-eco.com | | |

## 3. PROPERTY OWNER (*Complete only if different from applicant*)

| | | | |
|---|---|---|---|
| Name | | | |
| Street Address | | | |
| City, State, Zip | | | |
| Telephone | | Fax | |
| Email | | | |

## 4. PROJECT NAME AND AGREEMENT TERM

| | |
|---|---|
| A. Project Name | Stream Maintenance Program |
| B. Agreement Term Requested | ☐ Regular (*5 years or less*)<br>☑ Long-term (*greater than 5 years*) |

| C. Project Term | | D. Seasonal Work Period | | E. Number of Work Days |
|---|---|---|---|---|
| Beginning (*year*) | Ending (*year*) | Start Date (*month/day*) | End Date (*month/day*) | |
| 2010 | 2025 | 06/15 | 10/31 | |

NOTIFICATION OF LAKE OR STREAMBED ALTERATION

## 5. AGREEMENT TYPE

| Check the applicable box. If box B, C, D, or E is checked, complete the specified attachment. | |
|---|---|
| A. | ☐ Standard *(Most construction projects, excluding the categories listed below)* |
| B. | ☐ Gravel/Sand/Rock Extraction (*Attachment A*) *Mine I.D. Number:* ______ |
| C. | ☐ Timber Harvesting (*Attachment B*) THP *Number:* ______ |
| D. | ☐ Water Diversion/Extraction/Impoundment (*Attachment C*) *SWRCB Number:* ______ |
| E. | ☐ Routine Maintenance (*Attachment D*) |
| F. | ☐ DFG Fisheries Restoration Grant Program (FRGP) *FRGP Contract Number:* ______ |
| G. | ☑ Master |
| H. | ☐ Master Timber Harvesting |

## 6. FEES

Please see the current fee schedule to determine the appropriate notification fee. Itemize each project's estimated cost and corresponding fee. ***Note: The Department may not process this notification until the correct fee has been received.***

| | A. Project | B. Project Cost | C. Project Fee |
|---|---|---|---|
| 1 | (FEES TO BE PAID WHEN PERMIT IS FINALIZED) | | |
| 2 | | | |
| 3 | | | |
| 4 | | | |
| 5 | | | |
| | | D. Base Fee *(if applicable)* | $30,000.00 |
| | | **E. TOTAL FEE ENCLOSED** | $0.00 |

## 7. PRIOR NOTIFICATION OR ORDER

A. Has a notification previously been submitted to, or a Lake or Streambed Alteration Agreement previously been issued by, the Department for the project described in this notification?

☑ Yes (*Provide the information below*) ☐ No

Applicant: Sonoma County Water Agency Notification Number: 1600-2006-0254-3 Date: 08/25/09

B. Is this notification being submitted in response to an order, notice, or other directive ("order") by a court or administrative agency (including the Department)?

☑ No ☐ Yes (*Enclose a copy of the order, notice, or other directive. If the directive is not in writing, identify the person who directed the applicant to submit this notification and the agency he or she represents, and describe the circumstances relating to the order.*)

☐ *Continued on additional page(s)*

NOTIFICATION OF LAKE OR STREAMBED ALTERATION

## 8. PROJECT LOCATION

A. Address or description of project location.

*(Include a map that marks the location of the project with a reference to the nearest city or town, and provide driving directions from a major road or highway)*

This application covers the entire geography described in Exhibit A: September 2009 Stream Maintenance Program Manual (Chapter 1). A listing of all channels covered under the SMP is provided in Exhibit E: SMP Covered Streams.

☑ *Continued on additional page(s)*

| | |
|---|---|
| B. River, stream, or lake affected by the project. | Multiple channels maintained by Sonoma County Water Agency |
| C. What water body is the river, stream, or lake tributary to? | Laguna de Santa Rosa, Pacific Ocean, & SF Bay |
| D. Is the river or stream segment affected by the project listed in the state or federal Wild and Scenic Rivers Acts? | ☐ Yes ☑ No ☐ Unknown |
| E. County | Sonoma County |

| F. USGS 7.5 Minute Quad Map Name | G. Township | H. Range | I. Section | J. ¼ Section |
|---|---|---|---|---|
| Info to be provided with annual notification | | | | |
| | | | | |
| | | | | |
| | | | | |

☐ *Continued on additional page(s)*

K. Meridian (*check one*) ☐ Humboldt ☑ Mt. Diablo ☐ San Bernardino

L. Assessor's Parcel Number(s)

Multiple; parcel numbers for specific maintenance actions will be provided annually in the annual notification packet.

☐ *Continued on additional page(s)*

M. Coordinates (*If available, provide at least latitude/longitude or UTM coordinates and check appropriate boxes)*

| | | | | |
|---|---|---|---|---|
| Latitude/Longitude | *Latitude:* 38°20'53.34"N | | *Longitude:* 122°42'45.92"W | |
| | ☑ Degrees/Minutes/Seconds | | ☐ Decimal Degrees | ☐ Decimal Minutes |
| UTM | *Easting:* | *Northing:* | | ☐ Zone 10 ☐ Zone 11 |
| Datum used for Latitude/Longitude or UTM | | ☐ NAD 27 | | ☑ NAD 83 or WGS 84 |

**9. PROJECT CATEGORY AND WORK TYPE** *(Check each box that applies)*

| PROJECT CATEGORY | NEW CONSTRUCTION | REPLACE EXISTING STRUCTURE | REPAIR/MAINTAIN EXISTING STRUCTURE |
|---|---|---|---|
| Bank stabilization – bioengineering/recontouring | ☐ | ☐ | ☑ |
| Bank stabilization – rip-rap/retaining wall/gabion | ☐ | ☐ | ☑ |
| Boat dock/pier | ☐ | ☐ | ☐ |
| Boat ramp | ☐ | ☐ | ☐ |
| Bridge | ☐ | ☐ | ☐ |
| Channel clearing/vegetation management | ☐ | ☐ | ☑ |
| Culvert | ☐ | ☐ | ☑ |
| Debris basin | ☐ | ☐ | ☑ |
| Dam | ☐ | ☐ | ☐ |
| Diversion structure – weir or pump intake | ☐ | ☐ | ☐ |
| Filling of wetland, river, stream, or lake | ☐ | ☐ | ☐ |
| Geotechnical survey | ☐ | ☐ | ☐ |
| Habitat enhancement – revegetation/mitigation | ☑ | ☐ | ☑ |
| Levee | ☐ | ☐ | ☑ |
| Low water crossing | ☐ | ☑ | ☑ |
| Road/trail | ☐ | ☐ | ☑ |
| Sediment removal – pond, stream, or marina | ☐ | ☐ | ☑ |
| Storm drain outfall structure | ☐ | ☑ | ☑ |
| Temporary stream crossing | ☐ | ☑ | ☑ |
| Utility crossing : Horizontal Directional Drilling | ☐ | ☐ | ☐ |
| Jack/bore | ☐ | ☐ | ☐ |
| Open trench | ☐ | ☐ | ☐ |
| **Other** *(specify)*: | ☐ | ☐ | ☐ |

## 10. PROJECT DESCRIPTION

A. Describe the project in detail. Photographs of the project location and immediate surrounding area should be included.

- Include any structures (e.g., rip-rap, culverts, or channel clearing) that will be placed, built, or completed in or near the stream, river, or lake.
- Specify the type and volume of materials that will be used.
- If water will be diverted or drafted, specify the purpose or use.

Enclose diagrams, drawings, plans, and/or maps that provide all of the following: site specific construction details; the dimensions of each structure and/or extent of each activity in the bed, channel, bank or floodplain; an overview of the entire project area (i.e., "bird's-eye view") showing the location of each structure and/or activity, significant area features, and where the equipment/machinery will enter and exit the project area.

Please refer to Exhibit A: September 2009 Stream Maintenance Program Manual (Chapter 1, Sections 1.1-1.7 for program overview and Chapter 6 for detailed descriptions of projects covered under this program). Also refer to Exhibit D. SMP Covered Activities for a summary of all activities covered under this program.

☑ *Continued on additional page(s)*

B. Specify the equipment and machinery that will be used to complete the project.

Please refer to Exhibit A: September 2009 Stream Maintenance Program Manual (Chapter 1, Sections 1.1-1.7 for program overview and Chapter 6 for detailed descriptions of projects covered under this program). Also refer to Exhibit D. SMP Covered Activities for a summary of all activities covered under this program.

☑ *Continued on additional page(s)*

| | |
|---|---|
| C. Will water be present during the proposed work period (specified in box 4.D) in the stream, river, or lake (specified in box 8.B). | ☑ Yes ☑ No (*Skip to box 11*) |
| D. Will the proposed project require work in the wetted portion of the channel? | ☑ Yes (*Enclose a plan to divert water around work site*)<br>☐ No |

## 11. PROJECT IMPACTS

A. Describe impacts to the bed, channel, and bank of the river, stream, or lake, and the associated riparian habitat. Specify the dimensions of the modifications in length (linear feet) and area (square feet or acres) and the type and volume of material (cubic yards) that will be moved, displaced, or otherwise disturbed, if applicable.

Specific impacts will be calculated and presented for each year's SMP projects annually. Please see Exhibits: H. Annual Workplan Notification packet template and I. Annual Workplan Notification packet Completeness Checklist for details on how impacts will be calculated and presented. In addition, refer to Exhibit: M for specifics on impacts related to reach scale sediment removal projects.

☑ *Continued on additional page(s)*

B. Will the project affect any vegetation? ☑ Yes (*Complete the tables below*) ☐ No

| Vegetation Type | Temporary Impact | Permanent Impact |
|---|---|---|
| Annual notification will contain relevant info for specific impacts | Linear feet: ______<br>Total area: ______ | Linear feet: ______<br>Total area: ______ |
| | Linear feet: ______<br>Total area: ______ | Linear feet: ______<br>Total area: ______ |

| Tree Species | Number of Trees to be Removed | Trunk Diameter (range) |
|---|---|---|
| Annual notification will contain relevant info for | | |
| specific impacts | | |
| | | |

☐ *Continued on additional page(s)*

C. Are any special status animal or plant species, or habitat that could support such species, known to be present on or near the project site?

☑ Yes *(List each species and/or describe the habitat below)* ☐ No ☐ Unknown

See Exhibit A: September 2007 SMP Manual (Chapter 3) for detailed info on special status species and habitats. Also see Exhibit G: SMP Manual Table 7-3.

☑ *Continued on additional page(s)*

D. Identify the source(s) of information that supports a "yes" or "no" answer above in Box 11.C.

CNDDB, CalFlora, Sonoma County Water Agency reports , survey data, and Routine Maintenance Habitat Evaluations, personal communications with DFG staff (Bill Cox) and SCWA biologist (Dave Cook).

☐ *Continued on additional page(s)*

E. Has a biological study been completed for the project site?

☑ Yes (*Enclose the biological study*) ☐ No

*Note: A biological assessment or study may be required to evaluate potential project impacts on biological resources.*

F. Has a hydrological study been completed for the project or project site?

☑ Yes (*Enclose the hydrological study*) ☐ No

*Note: A hydrological study or other information on site hydraulics (e.g., flows, channel characteristics, and/or flood recurrence intervals) may be required to evaluate potential project impacts on hydrology.*

## 12. MEASURES TO PROTECT FISH, WILDIFE, AND PLANT RESOURCES

A. Describe the techniques that will be used to prevent sediment from entering watercourses during and after construction.

For a detailed discussion of impacts, avoidance, minimization, and mitigation see Exhibit A: September 2009 Stream Maintenance Program Manual (Chapter 3: Environmental Setting; Chapter 5: Pre-Maintenance Planning Approach and Impact Avoidance; and Chapter 7: Impact Reduction, Minimization Measures, and Best Management Practices). Also see Exhibit F : SMP Manual Table 7-1 for a summary of all measures.

☑ *Continued on additional page(s)*

B. Describe project avoidance and/or minimization measures to protect fish, wildlife, and plant resources.

For a detailed discussion of impacts, avoidance, and minimization, see Exhibit A: September 2009 Stream Maintenance Program Manual (Chapter 3: Environmental Setting; Chapter 5: Pre-Maintenance Planning Approach and Impact Avoidance; and Chapter 7: Impact Reduction, Minimization Measures and Best Management Practices). Also so Exhibit F: SMP Manual Table 7-1 for a summary of all measures; Exhibit L: Pre-construction Survey Protocols for SMP Projects and Exhibit N: SMP Appendix E: Vegetation Management Plan.

☑ *Continued on additional page(s)*

C: Describe any project mitigation and/or compensation measures to protect fish, wildlife, and plant resources.

For a detailed discussion of mitigation see Exhibit A: September 2009 Stream Maintenance Program Manual (Chapter 3: Environmental Setting and Chapter 8: Program Mitigation) and Exhibits B and C (The Sonoma County Water Agency's January 2009 Stream Maintenance Program Draft Environmental Impact Report and June 2009 Stream Maintenance Program Final Environmental Impact Report).

☑ *Continued on additional page(s)*

## 13. PERMITS

List any local, state, and federal permits required for the project and check the corresponding box(es). Enclose a copy of each permit that has been issued.

A. RWQCB Programmatic 401 (North Coast and Bay Regions) ☑ Applied ☑ Issued

B. Army Corps of Engineers Individual Permit ☑ Applied ☐ Issued

C. BO's from FWS and NMFS (1 for RR watershed and 2 for Bay watersheds) ☑ Applied ☑ Issued

D. Unknown whether ☐ local, ☐ state, or ☐ federal permit is needed for the project. (*Check each box that applies*)

☐ *Continued on additional page(s)*

## 14. ENVIRONMENTAL REVIEW

A. Has a draft or final document been prepared for the project pursuant to the California Environmental Quality Act (CEQA), National Environmental Protection Act (NEPA), California Endangered Species Act (CESA) and/or federal Endangered Species Act (ESA)?

☑ Yes *(Check the box for each CEQA, NEPA, CESA, and ESA document that has been prepared and enclose a copy of each)*

☐ No *(Check the box for each CEQA, NEPA, CESA, and ESA document listed below that will be or is being prepared)*

| | | |
|---|---|---|
| ☐ Notice of Exemption | ☐ Mitigated Negative Declaration | ☐ NEPA document (*type*): |
| ☐ Initial Study | ☑ Environmental Impact Report | ☐ CESA document (*type*): |
| ☐ Negative Declaration | ☐ Notice of Determination *(Enclose)* | ☑ ESA document (*type*): BO's |
| ☐ THP/ NTMP | ☐ Mitigation, Monitoring, Reporting Plan | |

| | | | |
|---|---|---|---|
| B. State Clearinghouse Number (*if applicable*) | 2005-082131 | | |
| C. Has a CEQA lead agency been determined? | ☑ Yes (*Complete boxes D, E, and F*) | ☐ No (*Skip to box 14.G*) | |
| D. CEQA Lead Agency | Sonoma County Water Agency | | |
| E. Contact Person | Keenan Foster | F. Telephone Number | (707) 547-1941 |

G. If the project described in this notification is part of a larger project or plan, briefly describe that larger project or plan.

This application is for the entire Stream Maintenance Program and the CEQA document covers the entire program as well.

☐ *Continued on additional page(s)*

H. Has an environmental filing fee (Fish and Game Code section 711.4) been paid?

☑ Yes (*Enclose proof of payment*)　　☐ No (*Briefly explain below the reason a filing fee has not been paid)*

*Note: If a filing fee is required, the Department may not finalize a Lake or Streambed Alteration Agreement until the filing fee is paid.*

## 15. SITE INSPECTION

Check one box only.

☐ In the event the Department determines that a site inspection is necessary, I hereby authorize a Department representative to enter the property where the project described in this notification will take place at any reasonable time, and hereby certify that I am authorized to grant the Department such entry.

☑ I request the Department to first contact (*insert name*) Keenan Foster at (*insert telephone number*) (707) 547-1941 to schedule a date and time to enter the property where the project described in this notification will take place. I understand that this may delay the Department's determination as to whether a Lake or Streambed Alteration Agreement is required and/or the Department's issuance of a draft agreement pursuant to this notification.

## 16. DIGITAL FORMAT

Is any of the information included as part of the notification available in digital format (i.e., CD, DVD, etc.)?

☑ Yes (Please enclose the information via digital media with the completed notification form)

☐ No

## 17. SIGNATURE

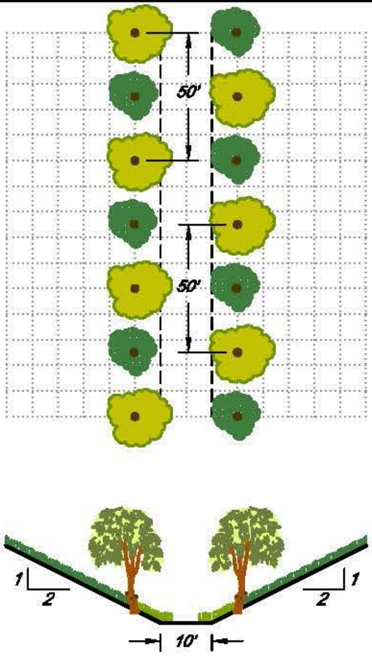
I hereby certify that to the best of my knowledge the information in this notification is true and correct and that I am authorized to sign this notification as, or on behalf of, the applicant. I understand that if any information in this notification is found to be untrue or incorrect, the Department may suspend processing this notification or suspend or revoke any draft or final Lake or Streambed Alteration Agreement issued pursuant to this notification. I understand also that if any information in this notification is found to be untrue or incorrect and the project described in this notification has already begun, I and/or the applicant may be subject to civil or criminal prosecution. I understand that this notification applies only to the project(s) described herein and that I and/or the applicant may be subject to civil or criminal prosecution for undertaking any project not described herein unless the Department has been separately notified of that project in accordance with Fish and Game Code section 1602 or 1611.

[signature] 11/24/09

Signature of Applicant or Applicant's Authorized Representative — Date

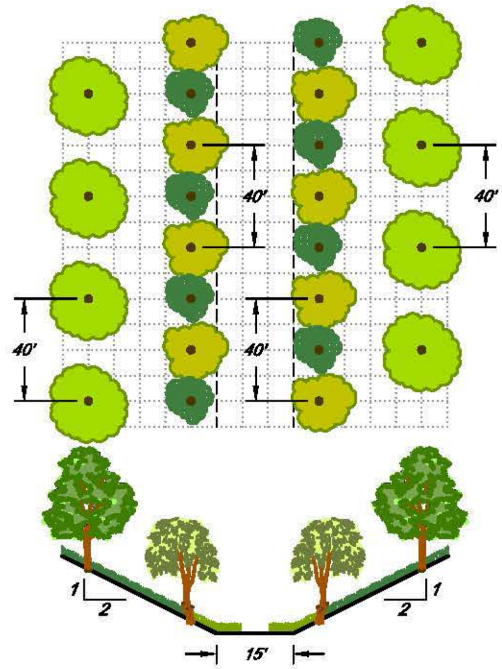
Randy Poole

Print Name



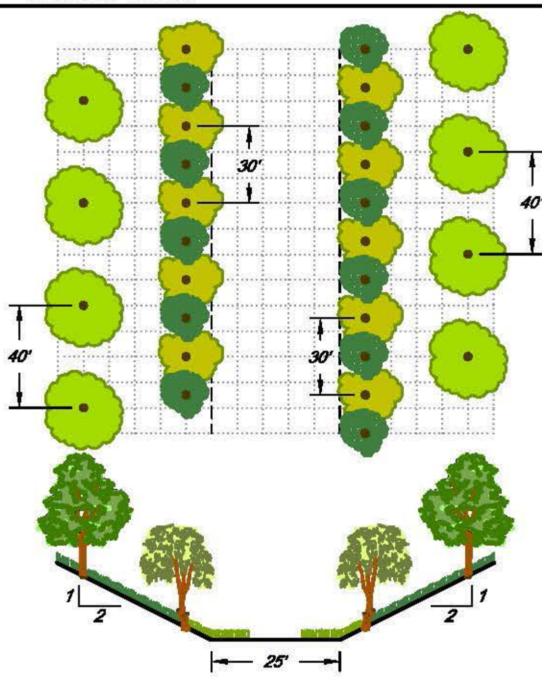

CHANNEL FORM 1A

- PERMANENT TOE TREES AT 50' SPACING.
- TEMPORARY TOE TREES AT 25' SPACING.
- ALTERNATELY, HAVE UPPER BANK TREES AT 40' SPACING.
- ALTERNATELY, PLANT TOE TREES ON ONE SIDE OF CHANNEL AT INCREASED SPACING.



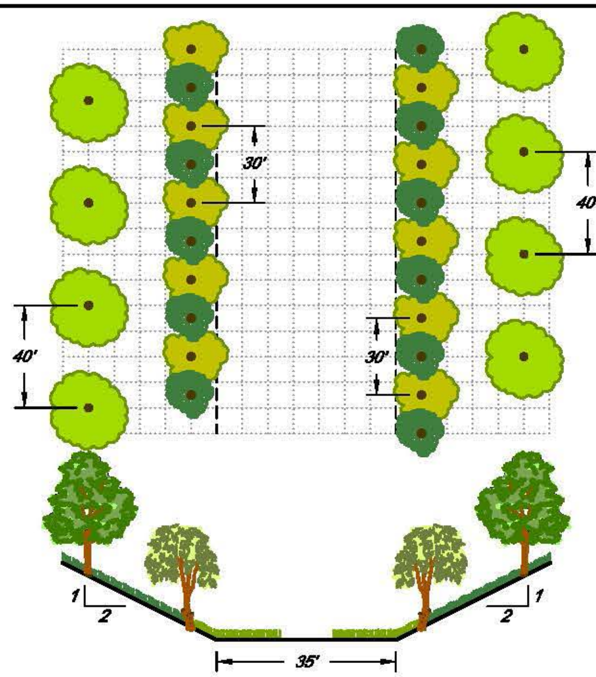

CHANNEL FORM 1B

- PERMANENT TOE TREES AT 40' SPACING.
- TEMPORARY TOE TREES AT 20' SPACING.




CHANNEL FORM 1C

- PERMANENT TOE TREES AT 30' SPACING.
- TEMPORARY TOE TREES AT 15' SPACING.




CHANNEL FORM 1D

- PERMANENT TOE TREES AT 30' SPACING.
- TEMPORARY TOE TREES AT 15' SPACING.
- TREES MAY BE IN THE BOTTOM OF THE CHANNEL DEPENDING UPON WIDTH.

- ALTER TREE SPACING AND LOCATION BASED ON THE SLOPE OF BANKS, EXISTING RIPARIAN HABITAT, OR SITE CONDITIONS.
- LOCATE UPPER BANK TREES 3' TO 4' BELOW TOP OF BANK FOR MOWING.

*CHANNEL FORM 1*

| FORM IDENTIFIER | BOTTOM WIDTH | TOE TREES SPACING | | TOP TREES SPACING |
|---|---|---|---|---|
| | | TEMPORARY 1–7 YEARS | PERMANENT 7–15 YEARS | |
| 1A | 10' OR LESS | 25' | 50' | SEE NOTES |
| 1B | 15' OR LESS | 20' | 40' | 40' |
| 1C | 25' OR LESS | 15' | 30' | 40' |
| 1D | 25' OR GREATER | 15' | 30' | 40' |

LEGEND

- TOP TREES
- TOE TREES (PERMANENT)
- TOE TREES (TEMPORARY)
- SIDE BANK VEGETATION
- IN-STREAM VEGETATION

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CHANNEL FORM 1
PLANTING PLAN EXHIBIT

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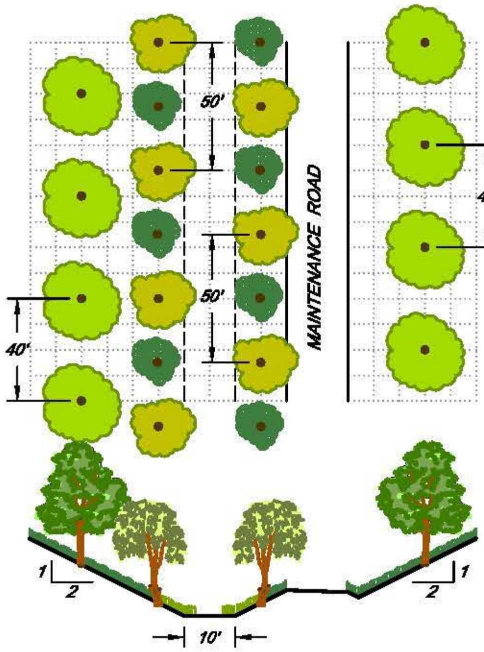
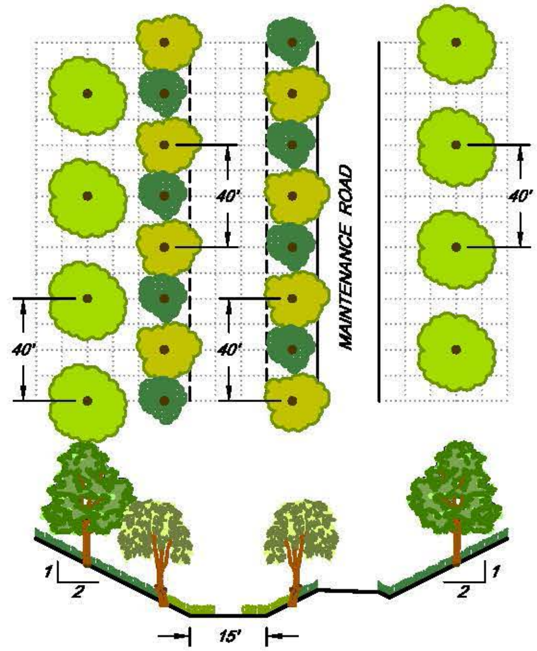


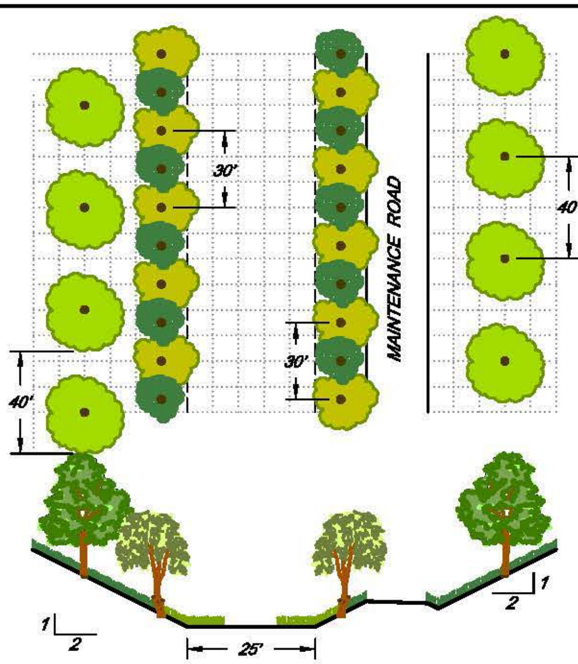

CHANNEL FORM 2A

- PERMANENT TOE TREES AT 50' SPACING.
- TEMPORARY TOE TREES AT 25' SPACING.



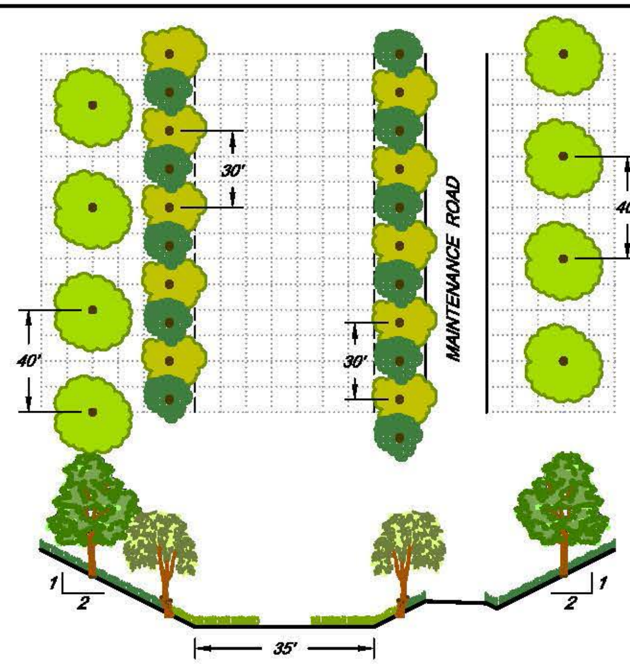

CHANNEL FORM 2B

- PERMANENT TOE TREES AT 40' SPACING.
- TEMPORARY TOE TREES AT 20' SPACING.




CHANNEL FORM 2C

- PERMANENT TOE TREES AT 30' SPACING.
- TEMPORARY TOE TREES AT 15' SPACING.




CHANNEL FORM 2D

- PERMANENT TOE TREES AT 30' SPACING.
- TEMPORARY TOE TREES AT 15' SPACING.
- TREES MAY BE IN THE BOTTOM OF THE CHANNEL DEPENDING UPON WIDTH.

- ALTER TREE SPACING AND LOCATION BASED ON THE SLOPE OF BANKS, EXISTING RIPARIAN HABITAT, OR SITE CONDITIONS.
- LOCATE UPPER BANK TREES 3' TO 4' BELOW TOP OF BANK FOR MOWING.

*CHANNEL FORM 2*

| FORM IDENTIFIER | BOTTOM WIDTH | TOE TREES SPACING | | TOP TREES SPACING |
|---|---|---|---|---|
| | | TEMPORARY 1-7 YEARS | PERMANENT 7-15 YEARS | |
| 2A | 10' OR LESS | 25' | 50' | 40' |
| 2B | 15' OR LESS | 20' | 40' | 40' |
| 2C | 25' OR LESS | 15' | 30' | 40' |
| 2D | 25' OR GREATER | 15' | 30' | 40' |

LEGEND

- TOP TREES
- TOE TREES (PERMANENT)
- TOE TREES (TEMPORARY)
- SIDE BANK VEGETATION
- IN-STREAM VEGETATION

**DRAFT**
**CHANNEL FORM 2**
**PLANTING PLAN EXHIBIT**

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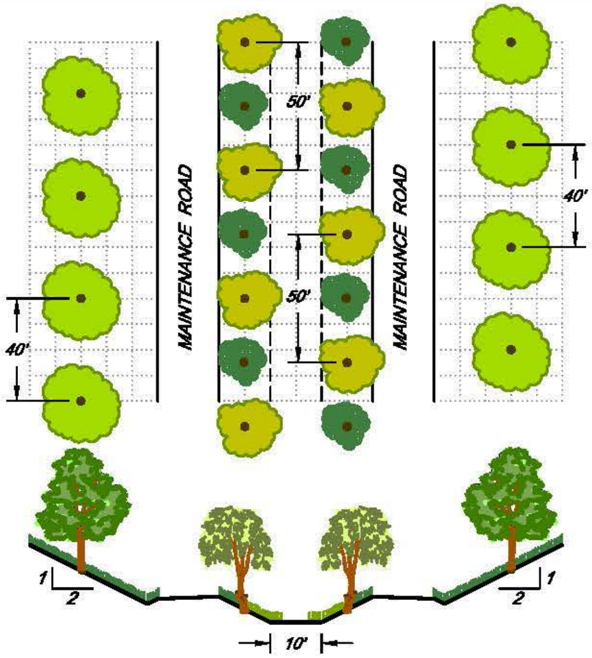
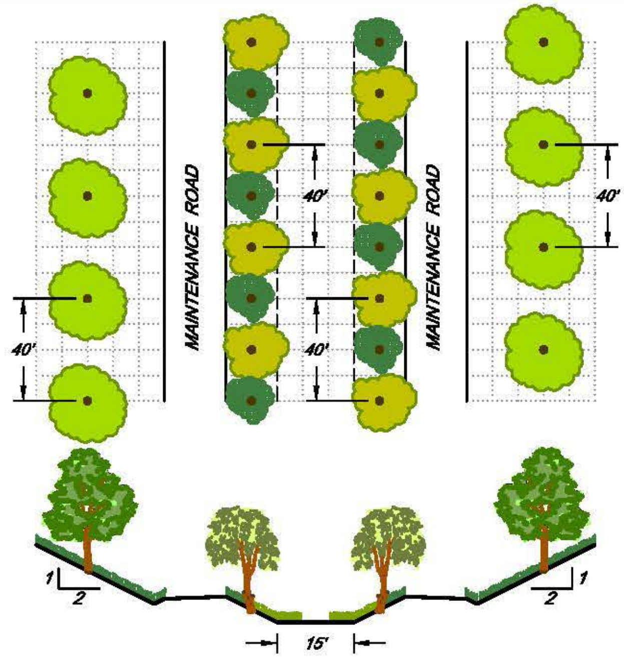


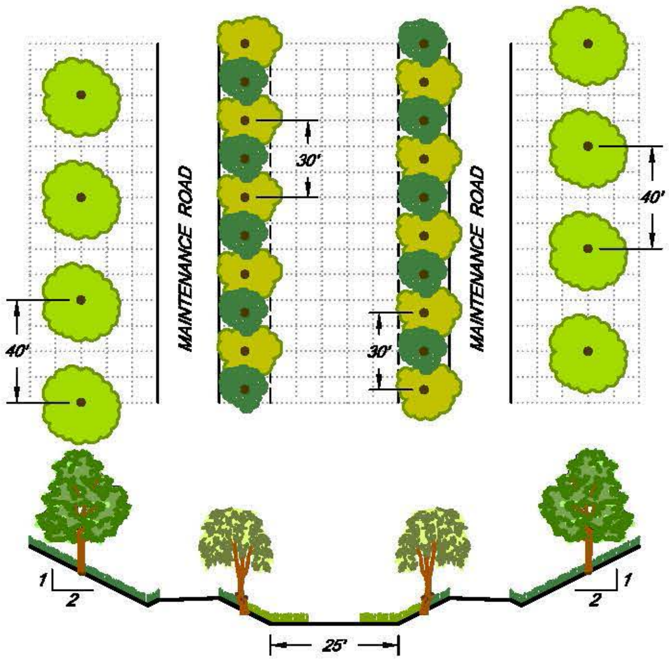

CHANNEL FORM 3A

- PERMANENT TOE TREES AT 50' SPACING.
- TEMPORARY TOE TREES AT 25' SPACING.



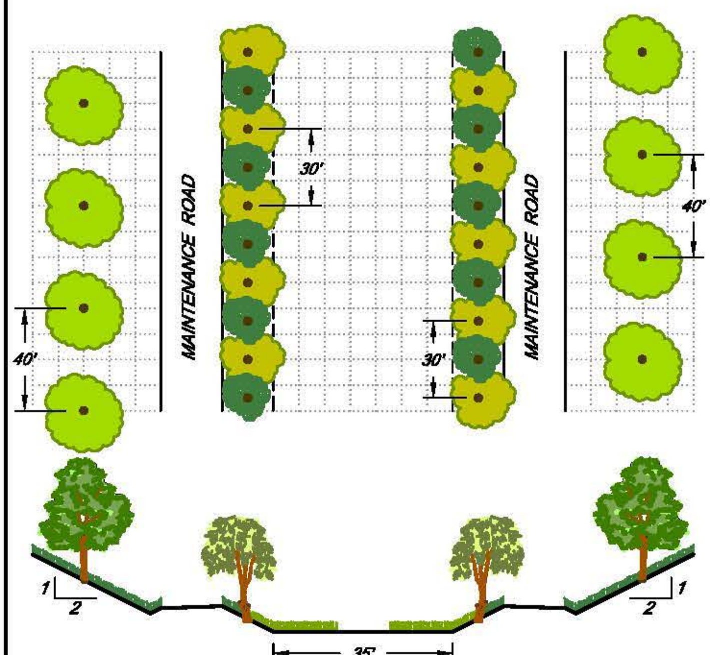

CHANNEL FORM 3B

- PERMANENT TOE TREES AT 40' SPACING.
- TEMPORARY TOE TREES AT 20' SPACING.




CHANNEL FORM 3C

- PERMANENT TOE TREES AT 30' SPACING.
- TEMPORARY TOE TREES AT 15' SPACING.




CHANNEL FORM 3D

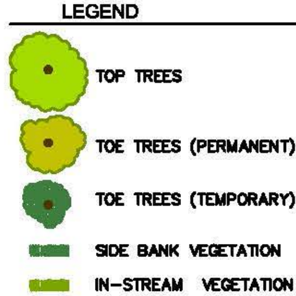
- PERMANENT TOE TREES AT 30' SPACING.
- TEMPORARY TOE TREES AT 15' SPACING.
- TREES MAY BE IN THE BOTTOM OF THE CHANNEL DEPENDING UPON WIDTH.

- ALTER TREE SPACING AND LOCATION BASED ON THE SLOPE OF BANKS, EXISTING RIPARIAN HABITAT, OR SITE CONDITIONS.
- LOCATE UPPER BANK TREES 3' TO 4' BELOW TOP OF BANK FOR MOWING.

*CHANNEL FORM 3*

| FORM IDENTIFIER | BOTTOM WIDTH | TOE TREES SPACING | | TOP TREES SPACING |
|---|---|---|---|---|
| | | TEMPORARY 1–7 YEARS | PERMANENT 7–15 YEARS | |
| 3A | 10' OR LESS | 25' | 50' | 40' |
| 3B | 15' OR LESS | 20' | 40' | 40' |
| 3C | 25' OR LESS | 15' | 30' | 40' |
| 3D | 25' OR GREATER | 15' | 30' | 40' |

LEGEND




**DRAFT**
**CHANNEL FORM 3**
**PLANTING PLAN EXHIBIT**

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# Appendix B: Sediment Sampling and Analysis Guidelines

Amended May 2013

## Introduction

These sediment sampling and analysis guidelines expand upon the description of sediment disposal in Chapter 5 of the Stream Maintenance Program (SMP) Manual, and identify disposal options based on the chemical quality of the sediment. Guidance is provided for identifying sediment sampling frequency, sampling methodology, sediment analysis, and other sediment characterization activities. Sediment sampling, disposal, monitoring, and reporting conditions issued by the North Coast Regional Water Quality Control Board (NCRWQCB) under *Order No. R1-2009-0049 Waste Discharge Requirements and 401 Water Quality Certification* and by the San Francisco Bay Regional Water Quality Control Board (SFBRWQCB) under *Order No. R2-2011-0020* are included by reference. The sediment sampling and disposal process will be coordinated annually between the RWQCBs and SCWA as part of the review and approval process for annual SMP maintenance and disposal activities.

## Sediment Disposal

Sediment disposal sites will be proposed to the RWQCBs Executive Officers for approval on an annual basis. The conditions for site approval will be based on analytical results from sediment sampling at the channels to be maintained and at the proposed disposal site(s). The conditions for approval will evolve as the RWQCB and SCWA become familiarized with the characteristics of sediment removed as part of maintenance activities and with sediment disposal and reuse conditions. The preference is to select disposal and reuse options with the lowest potential for detrimental environmental effects.

Beginning in 2012, SCWA has committed to only dispose of excavated sediment at upland agricultural or commercial reuse sites outside of aquatic environments, in a manner to minimize the risk of disposed sediments entering stream channels or other water bodies. Based on testing conducted since 2009, sediments in Sonoma County streams would generally meet criteria for reuse in aquatic/wetland environments. However, to support SCWA's commitment to environmental protection, all sediment excavated as part of the SMP will be reused or disposed only at upland sites. Excavated sediment will be used as construction fill, such as road bases or filling pits or leveling land, or at agricultural properties where the soil would not be used for crop production (e.g., the soil could be used for cattle bedding, but not spread on a field to grow corn or other food crops.)

Per federal and state requirements, if test results indicate that sediment quality is not suitable for reuse as construction fill, SCWA will dispose of sediment at local landfills or at a hazardous waste facility. For reuse as cover material at an approved and operating landfill, the soil would have to meet the landfill's soil quality criteria. The nearest operating landfill is the Redwood Landfill in Novato, California. If stream sediments contain hazardous levels of contaminants, the excavated soil will be disposed at an appropriate hazardous waste facility. The nearest hazardous waste landfill is located in Kettleman City, California.

Annually, specific disposal sites will be identified as part of annual and long-term stream maintenance planning for approval by the RWQCBs Executive Officers.

### Sediment Sampling and Analysis Approach

As required by the current conditions of the RWQCB Waste Discharge Requirements (Monitoring and Reporting Program - Order Nos. R1-2009-0049 and R2-2011-0020), all sediment samples will be analyzed for the parameters/analytes listed in **Table 1** for sites located in Zone 1A (Laguna de Santa Rosa watershed within the NCRWQCB) and **Table 2** for sites located in Zones 2A and 3A (Petaluma River and Sonoma Creek watersheds located within the SFBRWQCB). Sampling parameters/analytes listed in Tables 1 and 2 may be modified after a history of sampling is obtained. This may result in not requiring monitoring for some of these contaminants under certain situations or at certain locations, or the addition of more parameters/analytes if deemed necessary by the RWQCBs. A Sampling and Analysis Plan acceptable to the Water Board Executive Officer shall be submitted annually.

### Sampling Frequency and Locations

- For localized sediment removal projects and bank stabilization projects that involve the removal and disposal of less than 250 cubic yards of sediment, one sample will be collected and analyzed. Details on the methodology used to collect and composite samples are described below.

- For sediment removal or bank stabilization projects that require the removal and disposal of more than 250 cubic yards of sediment, one sample will be collected for every increment of 500 cubic yards of sediment to be removed. Details on the methodology used to collect and composite samples are described below.

- For project sites that require more than one sample, sampling locations will be selected to represent overall reach conditions. Sampling sites will be selected to target conditions at the upstream and downstream ends of the project zone. Sampling sites will also specifically target conditions downstream of culvert crossings, culvert outfalls, and key stream confluences.

- There may be situations, where for long channel reaches that are not particularly wide or deep with sediment, it will be preferable to take sediment samples for every 1,000 feet of project length rather than per 500 cubic yards of sediment removal. SCWA shall use whichever approach results in requiring more samples. It is expected that most often, the 500 cubic yard requirement will result in more sampling, but for certain projects the 1,000 ft length requirement will require more sampling and provide better representation.

## Sediment Sampling Methodology

This guidance applies to discrete (single) samples and composite samples. All samples shall be collected by means of a hand trowel, a hand auger, or another sampling method approved by the regulatory agencies. The individual collecting the sample will have the discretion of choosing the sampling method which is the most efficient to perform.

Sampling will be conducted in accordance with the methods described below:

### Equipment Decontamination Procedure

Due to the sensitive nature of the chemical analyses to be performed, every precaution will be taken to eliminate potential sources of cross-contamination, or unnecessary loss or degradation of contaminants during sediment sampling activities. All field personnel performing sample collection shall be trained prior to sample collection.

Start of Work Day: Clean and decontaminate all sampling equipment that will contact sediment at the start of each work day as follows:

1) Set up in an area away from gasoline, exhaust fumes, oil/grease. Lay out plastic sheets (flat garbage bags will due) and place sampling equipment on the plastic.
2) Wear latex-free gloves throughout the cleaning procedure.
3) Rinse sampling core/auger, mixing bowl/pan, spoons/knives, cleaning brush, wash buckets, and sieve with distilled/deionized water to remove visible sediment.
4) Using a brush, wash with dilute non-detergent cleaner (e.g., Alconox soap solution). Use a wash bucket to store soapy water.
5) Rinse with distilled/deionized water.
6) Rinse with Ethyl rubbing alcohol (you can find this at CVS). If you can't find Ethyl rubbing alcohol, Isopropyl rubbing alcohol may be used.
7) Lay equipment on plastic sheeting (garbage bags) and allow to air dry completely.
8) Once dry, keep all clean equipment covered inside a clean plastic garbage bag until you reach the sampling site.

Decontamination between Creek Sites: When moving to a different creek to collect samples, clean the equipment prior to arriving at the next creek site, as follows. When sampling from locations within the same creek, the equipment does not need to be washed.

1) Clean/Decontaminate equipment immediately prior to arriving at a new creek site:
    a. Rinse all sampling and mixing equipment with distilled/deionized water
    b. Using a brush, wash with dilute non-detergent (e.g., Alconox) cleaner (soap bucket)
    c. Rinse with distilled/deionized water (capture rinse water in second bucket)
    d. Shake off excess water and store equipment in a clean garbage bag until arrival at the next creek site.
2) Collect samples from the upstream end of the site, then work downstream.
3) Collect sub-samples for compositing (mixing) at least 10 feet apart. Target the bulk of sediment to be removed.
4) Ensure that the sampling equipment is never deployed or recovered through organic slicks (sheens) observed on the surface of the water or soil.
5) Keep sampling equipment covered and away from gasoline, oils, exhaust fumes when not being used or cleaned.

**Hand Trowel Procedure**

1. Remove vegetation and woody debris from the ground surface.
2. If collecting a subsurface sample, use a shovel to dig down to the desired sampling interval.
3. Use a stainless steel hand trowel to collect soil.
4. Place soil in an appropriate sampling container.
5. Replace all excavated soils to their original location (i.e., backfill the sampling hole).

**Hand Auger Procedure**

1. Remove vegetation and woody debris from the ground surface.
2. Use the hand auger to advance down to the top of the sampling interval.

3. Use a hand auger to collect soil from the desired depth.
4. Use a clean (decontaminated) tool to scoop the soil out of the auger and place in an appropriate sampling container.
5. Replace all excavated soils to their original location (i.e., backfill the sampling hole).
6. If hand auger refusal is encountered, sample will be collected from an alternate location.

**Composite Sediment Sampling**

Where identified in the annual sampling plan, discrete sediment samples (cores) from different locations within the same stream reach using a hand auger. Sample cores shall be composited in the field prior to filling sample containers. Laboratory analyses shall be performed on the composite sample. Discrete samples shall be preserved along with the composite sample until the analytical results are available in order to identify the specific location of any detected contamination if necessary.

**Sampling Depth**

The sampling depth will be determined in the field. At each sampling location, the staff collecting the samples shall make an estimate of the depth of the sediment using visual clues and/or existing data. Sediment samples shall be collected at the surface and at 1 ft. intervals down to a maximum 4 ft level. In the event that the depth of the sediment is less than 1 foot, then the sample shall be collected at the surface. Samples will be collected up to a maximum depth of 4 feet because collection of samples below that depth is prohibitively difficult due to the finite strength of the individual collecting the sample, and the wet properties of the sediment, which may cause a borehole to collapse. In some locations it may even be infeasible to collect a sample at 3 or 4 feet deep due to the wet, unstable nature of the sediments. In the event that it is infeasible to collect a sample at the depth interval specified, the sample shall be collected at the deepest interval possible (using 1 foot increments). Also note that the maximum depth at the majority of sediment removal sites is not greater than 4 feet because sediment is removed at this threshold due to the significant reduction in channel conveyance capacity which occurs when sediment is accumulated higher than 4 feet.

## Other Sediment Sampling Details

In general, samples will be taken from the finest sediments at a sampling site and every attempt will be made to collect sediments that are representative of the materials to be removed. Most contaminants are associated with fine-grained sediment, and it is therefore important that some of the samples contain the finest sediment that is present at a given project site. For SMP channels, fine sediments include mud, silts, and finer sandy materials. A suitable field test for grain size is to rub sediments between the fingers: finer sediments will feel smooth, whereas coarser sediments will be gritty (SWRCB 2008). In Sonoma County channels, the grain size of accumulated sediments is generally in the large sand and small gravel ranges, which have lower surface area and therefore a lower capacity to adsorb contaminants.

As described above, sub-samples will be collected at each sampling site with the sub-samples composited into a single representative sample. Every attempt will be made to collect representative samples, i.e. samples will be collected at least 10 feet apart from one another. As described above, sampling will target key locations such as culvert outfalls and stream confluences as actual site conditions dictate.

SCWA will maintain records of field sampling methods, locations, depths, analysis, and results.

## Reporting of Sediment Sampling Results

Laboratory results will be reviewed and compared to the most current federal and state sediment quality guidelines and objectives. These may include threshold values for freshwater sediment published in NOAA Quick Screening Reference Tables (aka SQuiRT) (NOAA 2008), guidance in the *Beneficial Reuse of Dredged Materials: Sediment Screening and Testing Guidelines* (SFBRWQCB 2000), RWQCB Basin Plan Water Quality Objectives, the *Water Quality Control Plan for Enclosed Bays and Estuaries – Part I Sediment Quality* (SWRCB 2009), and guidelines from the state Office of Environmental Health Hazard Assessment (OEHHA 2010).

SCWA will submit the complete set of laboratory reports to the RWQCBs, along with a narrative report interpreting the results in comparison with the guidelines referenced above and any other guidance provided by the RWQCBs. The test results will be reviewed in conjunction with review of the annual stream maintenance notification report.

## Observed Contamination and Results That Exceed Water Quality Criteria

For all projects, any observed contamination as evidenced by chemical-like odors, oily sheens, or irregularly colored sediment would be immediately reported to the local fire department's hazardous materials team and the appropriate RWQCB staff person in the Cleanups and Investigations Unit. These agencies will direct SCWA on how to handle and remove potentially hazardous sediment.

In addition, if results are found to exceed selected water quality criteria, SCWA will coordinate with the appropriate RWQCB to develop a contingency sampling plan. In this event, additional samples will be taken to determine the extent of contamination and pinpoint potential contamination sources. Under the guidance of the RWQCB, selection of the number and location of additional samples will be determined based on potential contamination sources such as parking lots, automotive service centers, and dry cleaners. All excavated materials will be stockpiled separately on heavy plastic, covered, and stored until an appropriate disposal location is determined. Additional sampling results will then be compared to the Total Threshold Limit Concentrations (TTLCs) and STLCs specified in CCR Title 22 Chapter 11 for hazardous waste identification. Sediments not meeting the TTLC and/or STLC criteria will be disposed of at an appropriate treatment, storage, and/or disposal, facility.

## Sediment Disposal Best Management Practices

Sediment Disposal Best Management Practices are discussed in Chapter 7 of the SMP Manual.

## References Cited

California State Water Resources Control Board (SWRCB). 2008. *SWAMP Statewide Stream Contaminant Trend Monitoring at Integrator Sites*. Available: (http://www.swrcb.ca.gov/water_issues/programs/swamp/docs/workplans/statewide_stream_contaminants_trend_montoring_plan.pdf)

California State Water Resources Control Board (SWRCB). 2009. Water Quality Control Plan for Enclosed Bays and Estuaries – Part I Sediment Quality. Issued by California SWRCB and RWQCBs, effective August 25, 2009.

National Oceanic and Atmospheric Administration (NOAA) 2008. SQuirT – Screening Quick Reference Tables. NOAA Office of Response and Restoration. Report 08-1. (34T34T34T34Thttp://response.restoration.noaa.gov/environmental-restoration/environmental-assessment-tools/squirt-cards.html34T34T34T34T)

Office of Environmental Health Hazard Assessment, California Environmental Protection Agency (OEHHA). 2010. Human-Exposure-Based Screening Numbers for Contaminated Soil. January 23, 2010. (34T34T34T34Thttp://oehha.ca.gov/risk/chhsltable.html34T34T34T34T)

San Francisco Bay Regional Water Quality Control Board (SFBRWQCB). 2007. Water Quality Control Plan (Basin Plan) for the San Francisco Bay Basin (Region 2). Oakland, CA. Available: 34T34T34T34Thttp://www.waterboards.ca.gov/sanfranciscobay/basin_planning.shtml34T

San Francisco Bay Regional Water Quality Control Board (RWQCB). 2000. *Beneficial Reuse of dredged materials: sediment screening and testing guidelines. Draft Staff Report*. Available: (34T34T34T34Thttp://www.waterboards.ca.gov/sanfranciscobay/water_issues/available_documents/benreuse.pdf34T34T34T34T)

## Table 1: Sediment Sample Analyte List for Zone 1A

| EPA Test Method[1] | Analyte | Reporting Limit for Soil (dry weight mg/kg) | Analyte | Reporting Limit for Soil (mg/kg) |
|---|---|---|---|---|
| | **Conventional Parameters** | | | |
| | Grain Size (%) | 0.1 | | |
| **9060** | Total organic carbon (TOC) (%) | 0.1 | | |
| | Total solids (%) | 0.1 | | |
| **6020** | **Total Metals** | | | |
| | Arsenic | 0.1 | Mercury (total) | 0.02 |
| | Cadmium (total) | 0.1 | Nickel (total) | 0.1 |
| | Chromium (total) | 0.1 | Selenium (total) | 0.1 |
| | Copper (total) | 0.1 | Silver (total) | 0.1 |
| | Lead (total) | 0.1 | Zinc (total) | 1 |
| **8081 or 8082A** | **Organochlorine Pesticides** | | | |
| | Aldrin | 0.02 | 4,4'-DDT | 0.02 |
| | α-HCH (hexachlorocyclohexane) | 0.02 | Total DDT | NA |
| | β-HCH | 0.02 | Dieldrin | 0.02 |
| | γ-HCH (Lindane) | 0.02 | Endosulfan I | 0.02 |
| | δ-HCH | 0.02 | Endosulfan II | 0.02 |
| | Chlordane (tech) | 0.02 | Endosulfan sulfate | 0.02 |
| | 2,4'-DDD | 0.02 | Endrin | 0.02 |
| | 4,4'-DDD | 0.02 | Endrin aldehyde | 0.02 |
| | 2,4'-DDE | 0.02 | Heptachlor | 0.02 |
| | 4,4'-DDE | 0.02 | Heptachlor epoxide | 0.02 |
| | 2,4'-DDT | 0.02 | Toxaphene | 0.02 |
| **8270C Modified or 8270D[2]** | **Poly Aromatic Hydrocarbons (PAHs)** | | | |
| | 2-Methylnaphthalene | 0.2 | Fluoranthene | 0.2 |
| | Acenaphthene | 0.2 | Fluorene | 0.2 |
| | Acenaphthylene | 0.2 | Indeno(1,2,3-cd)pyrene | 0.2 |
| | Anthracene | 0.2 | Naphthalene | 0.2 |
| | Benz(a)anthracene | 0.2 | Perylene | 0.2 |
| | Benzo(a)pyrene | 0.2 | Phenanthrene | 0.2 |
| | Benzo(b)fluoranthene | 0.2 | Pyrene | 0.2 |

| EPA Test Method[1] | Analyte | Reporting Limit for Soil (dry weight mg/kg) | Analyte | Reporting Limit for Soil (mg/kg) |
|---|---|---|---|---|
| | Benzo(k)fluoranthene | 0.2 | Low molecular weight PAHs, sum | NA |
| | Chrysene | 0.2 | High molecular weight PAHs, sum | NA |
| | Dibenz(a,h)anthracene | 0.2 | PAHs, total | NA |
| **8015-Modified and 3550A-cleanup[3]** | **Aliphatics (SHC) (aka TPH) (µg/g dry weight)** | | | |
| | Individual *n*-alkanes from $nC_9$ -$nC_{40}$ | 0.05 | TPH as Diesel | 1.0 |
| | Pristane | 0.05 | TPH as Gasoline | 1.0 |
| | Phytane | 0.05 | TPH as Motor Oil | 2.0 |

NOTE: this table is replicated from Table 5 “Routine Parameters and Target Analytes for Evaluation of Dredged Material” (RWQCB 2000)

1 The most recent version of EPA’s Test Methods will be used.

2 Analysis of an extended list of PAHs, including ~40 parent and alkylated PAH homologues, provides information on type of petroleum present, which can help determine if measured PAHs are from aerial fallout or from local potential sources to creek sediment.

3 Analysis of TPHs will be performed using appropriate cleanup methods (e.g., EPA Method 3550A with silica gel and alumina column) to remove naturally occurring biogenic material. In addition, results for individual alkanes, ranging from ~C9-C40 will be reported by the laboratory so that biogenic hydrocarbons can be distinguished from petrogenic (petroleum-related) sources.

## Table 2: Sediment Sample Analyte List for Zone 2A and Zone 3A

| EPA Test Method[1] | Analyte | Reporting Limit for Soil (dry weight mg/kg) | Analyte | Reporting Limit for Soil (mg/kg) |
|---|---|---|---|---|
| | **Conventional Parameters** | | | |
| | Grain Size (%) | 0.1 | | |
| **9060** | Total organic carbon (TOC) (%) | 0.1 | | |
| | Total solids (%) | 0.1 | | |
| **6020** | **Total Metals** | | | |
| | Arsenic | 0.1 | Mercury (total) | 0.02 |
| | Cadmium (total) | 0.1 | Nickel (total) | 0.1 |
| | Chromium (total) | 0.1 | Selenium (total) | 0.1 |
| | Copper (total) | 0.1 | Silver (total) | 0.1 |
| | Lead (total) | 0.1 | Zinc (total) | 1 |
| **8082A** | **Polychlorinated biphenyls (PCBs)** | | | |
| | Aroclor 1016 | 0.20 | Total Aroclors | NA |
| | Aroclor 1221 | 0.20 | | |
| | Aroclor 1232 | 0.20` | | |
| | Aroclor 1242 | 0.20 | | |
| | Aroclor 1248 | 0.20 | | |
| | Aroclor 1254 | 0.20 | | |
| | Aroclor 1260 | 0.20 | | |
| **8081 or 8082A** | **Organochlorine Pesticides** | | | |
| | Aldrin | 0.02 | 4,4'-DDT | 0.02 |
| | α-HCH (hexachlorocyclohexane) | 0.02 | Total DDT | NA |
| | β-HCH | 0.02 | Dieldrin | 0.02 |
| | γ-HCH (Lindane) | 0.02 | Endosulfan I | 0.02 |
| | δ-HCH | 0.02 | Endosulfan II | 0.02 |
| | Chlordane (tech) | 0.02 | Endosulfan sulfate | 0.02 |
| | 2,4'-DDD | 0.02 | Endrin | 0.02 |
| | 4,4'-DDD | 0.02 | Endrin aldehyde | 0.02 |
| | 2,4'-DDE | 0.02 | Heptachlor | 0.02 |
| | 4,4'-DDE | 0.02 | Heptachlor epoxide | 0.02 |
| | 2,4'-DDT | 0.02 | Toxaphene | 0.02 |
| **8270C or 8270D[2]** | **Poly Aromatic Hydrocarbons (PAHs)** | | | |
| | 2-Methylnaphthalene | 0.2 | Fluoranthene | 0.2 |
| | Acenaphthene | 0.2 | Fluorene | 0.2 |
| | Acenaphthylene | 0.2 | Indeno(1,2,3-cd)pyrene | 0.2 |
| | Anthracene | 0.2 | Naphthalene | 0.2 |
| | Benz(a)anthracene | 0.2 | Perylene | 0.2 |
| | Benzo(a)pyrene | 0.2 | Phenanthrene | 0.2 |
| | Benzo(b)fluoranthene | 0.2 | Pyrene | 0.2 |

| **EPA Test Method**[1] | **Analyte** | **Reporting Limit for Soil** (dry weight mg/kg) | **Analyte** | **Reporting Limit for Soil** (mg/kg) |
|---|---|---|---|---|
| | Benzo(k)fluoranthene | 0.2 | Low molecular weight PAHs, sum | NA |
| | Chrysene | 0.2 | High molecular weight PAHs, sum | NA |
| | Dibenz(a,h)anthracene | 0.2 | PAHs, total | NA |
| **8015-Modified and 3550A-cleanup**[3] | **Aliphatics (SHC) (aka TPH) (µg/g dry weight)** | | | |
| | Individual *n*-alkanes from $nC_9$ -$nC_{40}$ | 0.05 | TPH as Diesel | 1.0 |
| | Pristane | 0.05 | TPH as Gasoline | 1.0 |
| | Phytane | 0.05 | TPH as Motor Oil | 2.0 |

NOTE: this table is modified from Table 5 “Routine Parameters and Target Analytes for Evaluation of Dredged Material” (RWQCB 2000)

1 The most recent version of EPA’s Test Methods will be used.

2 Analysis of an extended list of PAHs, including ~40 parent and alkylated PAH homologues, provides information on type of petroleum present, which can help determine if measured PAHs are from aerial fallout or from local potential sources to creek sediment.

3 Analysis of TPHs will be performed using appropriate cleanup methods (e.g., EPA Method 3550A with silica gel and alumina column) to remove naturally occurring biogenic material. In addition, results for individual alkanes, ranging from ~C9-C40 will be reported by the laboratory so that biogenic hydrocarbons can be distinguished from petrogenic (petroleum-related) sources.

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# Appendix F.
# GLOSSARY

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# Glossary

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| **Adaptive management** | A dynamic process by which planning and management strategies are modified as better information becomes available. It is a continuous improvement process whereby monitoring and analysis of the results of past actions are fed back into the current decision-making process. |
| **Alluvial fan** | Found at the base of mountains, alluvial fans represent the accumulation of sediment over many centuries. Historically, these alluvial fans functioned as depositional areas that stored sediments in the topographic transition between higher and steeper mountains and the lower and more gently sloping plains. |
| **Bankfull flow** | A generic term describing a flow magnitude that occurs (in frequency) approximately between the annual and 2-yr flow event. This scale of flow event is often responsible for shaping the active channel form. |
| **Bank stabilization** | Repair and stabilization of eroded or eroding stream or reservoir banks. Bank stabilization activities take place in engineered channels and other facilities, including culvert outlets in streams and the banks around reservoirs. |
| **Best management practices (BMPs)** | Impact avoidance and minimization measures from the SMP, as well as other standard protocols, to ensure that maintenance activities are implemented in a careful manner that protects natural resources of the program area and the Beneficial Uses (established by the San Francisco Bay and North Coast Regional Water Quality Control Boards) of the program's flood control channels. BMPs for the SMP are described in Chapter 10. |
| **Canopy cover** | Canopy cover is the layer formed by the branches and crowns of plants or trees. Canopy cover is measured as the proportion of a fixed area of the ground covered by tree crowns. |
| **Central Sonoma Watershed Project** | Watershed infrastructure project initiated in 1958 by Sonoma County Water Agency to install, operate, and maintain structural improvements within the Laguna de Santa Rosa, Petaluma River, and Sonoma Creek watersheds. |
| **Channel** | A natural stream that conveys water; a ditch or channel excavated for the flow of water. Channels include creeks, ditches, and canals but do not include culverts, pipes, and other closed structures. |

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| **Channel characterization sheets** | Data collection process first developed in 2008-2010 to describe baseline conditions for each engineered channel under the principle of understanding the stream system and its processes. Also known as "reach sheets." |
| **Channel Restoration All-Star** | The most suitable plant species for SMP flood control channels based on ten years (2009-2018) of restoration project monitoring. |
| **Channel type** | Four types of flood control channels are maintained by Sonoma Water in the program area. Zone maps with color designations of the four channel types are presented in **Error! Reference source not found.** through **Error! Reference source not found.**. **Error! Reference source not found.** provides photograph examples of each channel type. A typical cross section of an engineered flood control channel is shown in **Error! Reference source not found.**, illustrating many of the channel features (e.g., top-of-bank, toe-of-slope). |
| **Climax community** | The final stage in ecological succession within a channel. |
| **Culvert** | A structure used to convey surface runoff or a watercourse through an embankment. Culverts, as distinguished from bridges, are usually covered with embankment and composed of structural material around the entire perimeter, although some are supported on spread footings with the streambed serving as the bottom of the culvert. Culverts typically convey a waterway under a road or other area. |
| **Dewatering** | Techniques to remove water from a channel that is conveying water or ponding at the time of maintenance. Typically, a coffer dam, pump, and re-routing pipeline are used together to dewater a short section of channel at a time. |
| **Emergency** | A situation is considered an "emergency" if it is a sudden, unexpected occurrence involving a clear and imminent danger that demands immediate action to prevent or mitigate loss of or damage to life, health, property, or essential public services (Public Resource Code Section 21060.3). |
| **Engineered channel** | Channels that were designed and built to convey a design discharge. In the program area, engineered channels have typically been built with a trapezoidal cross-sectional shape. Most of the engineered channels have earthen banks and streambeds; however, some channels have hardened banks and beds, typically at or near road and culvert crossings. Engineered channels are shown in orange or red in the zone maps of Figure 1-2 through Figure 1-9. |
| **Federal Emergency Management Agency (FEMA)** | The federal agency within the U.S. Department of Homeland Security that is tasked with responding to, planning for, recovering from, and mitigating against human-made and natural disasters. |

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| **Flood** | Defined by the Federal Emergency Management Agency (FEMA) as a general and temporary condition of partial or complete inundation of two or more acres of normally dry land area or of two or more properties from the overflow of inland or tidal waters or the rapid accumulation of runoff of surface waters from any source (FEMA 2019). |
| **Flood control zones** | Nine subdivisions of the SMP program area, Zone 1A – Zone 9A |
| **Flow conveyance targets** | Determined for each maintenance reach by as-built plans and specifications for engineered modified channels and/or the historic flow conveyance or a Federal Emergency Management Agency (FEMA) designated flow rate for non-engineered modified channels. Also known as Level of Service (LOS). |
| **Freeboard** | The vertical distance between the design water surface elevation and the top of the channel (or levee). |
| **Hardscape** | Rock and other non-biological materials (e.g., concrete, rock, gabions, or other permanent hard-surface) used to engineer bank stabilization activities. Refers to designs that utilize predominantly hard structures that are incapable of supporting vegetation. Use of hardscape is discouraged in the SMP. |
| **Hydraulic capacity** | The capacity of a channel to convey flow. |
| **Hydraulic roughness** | Roughness is used to represent the amount of frictional resistance water experiences when flowing. Roughness contributors include bed and bank material, vegetation, transport of sediment, and hydraulic turbulence. |
| **Incremental ecologic improvement** | Maintenance principle emphasizing gradual adjustment of maintenance actions through adaptive management to provide incremental habitat improvement, lifting the reach toward an improved longer-term condition. Also known as “lift.” |
| **Instream sediment basin** | Instream sediment basins are targeted in-stream sediment management areas where sediment is removed more routinely by Sonoma Water. Most of Sonoma Water’s instream sediment basins are located at culverted road crossings. |
| **Integrated pest management (IPM)** | The vegetation management approach of using a variety of control methods, such as pruning, mowing, grazing and herbicide application, to manage problematic vegetation. Typically, herbicides are only applied when necessary and at targeted locations. |
| **Inter-Agency Working Group (IAWG)** | An group comprised of regulatory agency representatives that provides Sonoma Water guidance and regulatory permit coordination for the SMP through an open and transparent forum. |

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| **Lift** | Maintenance principle emphasizing gradual adjustment of maintenance actions through adaptive management to provide incremental habitat improvement, lifting the reach toward an improved longer-term condition. Also known as “incremental ecologic improvement.” |
| **Low-flow channel** | A smaller, designed conveyance channel (designed to approximate bankfull flow level) nested inside the overall channel width. This smaller, nested channel has hydraulic geometry conditions adequate to convey and pass sediments under lower flow conditions, while also maintaining a deeper and cooler channel that provides aquatic resource benefits. |
| **Maintenance principles** | Ecological principles developed as guidelines to avoid and minimize environmental impacts of the program. Maintenance principles for the SMP are described in Chapter 4. |
| **Modified channel** | natural channels with existing earthen beds and banks that have been modified either through vegetation removal, in-channel grading, channel widening or straightening, or debris clearing to improve flow conveyance. Though modified, these channels are not engineered or constructed according to specific design criteria to convey a discharge of a particular magnitude. Modified channels are shown as blue streams in the maps of **Error! Reference source not found.** through **Error! Reference source not found.**. |
| **Nomograph** | A two-dimensional diagram designed to allow the approximate graphical computation of a mathematical function. |
| **Project Specific Notification** | Developed annually to comply with Sonoma Water’s Regional Water Quality Control Board Waste Discharge Requirements Order No. R2-2016-0020 for maintenance activities planned to occur in modified or natural channels (aside from clearing impediments). |
| **Reach sheets** | Data collection process first developed in 2008-2010 to describe baseline conditions for each engineered channel under the principle of understanding the stream system and its processes. Also known as “channel characterization sheets.” |
| **Santa Rosa Plain Conservation Strategy (SRPCS)** | Developed in 2005 by the Santa Rosa Conservation Strategy Team to provide a long-term conservation program to mitigate potential adverse effects on five federally listed species due to future development on the Santa Rosa Plain. The SRPCS study area includes a large portion of the Laguna de Santa Rosa Watershed, within Zone 1A of the SMP program area. |
| **Sediment management** | Removal of excess accumulated sediment from engineered flood control channels and facilities. This accumulated sediment reduces flow capacity and increases the potential for flooding. One of the three primary activities covered in the SMP. |

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| **Succession** | The process by which the structure of a biological community evolves over time. |
| **Targeted sediment management area** | Localized in-stream areas targeted for more routine sediment removal. |
| **Thalweg** | Low point or bottom of a channel; the main channel of a creek.<br>The thalweg is the part of a stream that has the maximum velocity and causes cutbanks and channel migration. |
| **Tier 1 mitigation** | Mitigation implemented on-site at the specific project reach where the maintenance work was conducted. |
| **Tier 2 mitigation** | Mitigation applied at other stream channels and therefore not specifically on-site. Tier 2 mitigation is sought when there are no suitable opportunities for enhancement or restoration on-site at a specific channel reach and the next best opportunity is to pursue in-kind mitigation at a neighboring reach that does afford an opportunity for mitigation. |
| **Tier 3 mitigation** | Off-site mitigation that provides watershed-based functions and values to compensate for program impacts. Tier 3 mitigation addresses residual impacts from SMP activities that are not adequately avoided or minimized on a project-by-project basis or mitigated through Tier 1 and 2 mitigation actions. |
| **Upper bank zone** | The area from the access road down to the mid-point of the channel side bank. |
| **Urban forestry management (UFM)** | Vegetation management approach that seeks to develop a healthy urban forest through managing natural recruitment and planted trees by thinning, pruning, and reducing fuel loads such as ladder fuels. This long-term management approach emphasizes encouraging a diversity of tree ages and species. |
| **V-ditch** | Channel facility typically located above and beyond the top-of-bank zone, on the outer edge of the access road; designed to collect runoff from access roads and adjacent slopes. |
| **Vegetation management** | Trimming, mowing, and removal of vegetation within the flood control channels and other constructed facilities. Vegetation management activities are conducted to maintain flow conveyance capacity, establish a canopy of riparian trees, control invasive vegetation, remove hazardous vegetation, reduce fire fuel, and increase visibility for public safety. One of the three primary activities covered in the SMP. |

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| **Watershed Partnerships Program (WPP)** | Organization formed by Sonoma Water to aid the goal of longer-term reduction in maintenance needs. The group, which includes watershed stakeholders, local non-profit agencies, and Resource Conservation Districts, funds and implements regional projects that improve water quality and restore habitats and ecosystem functions. |