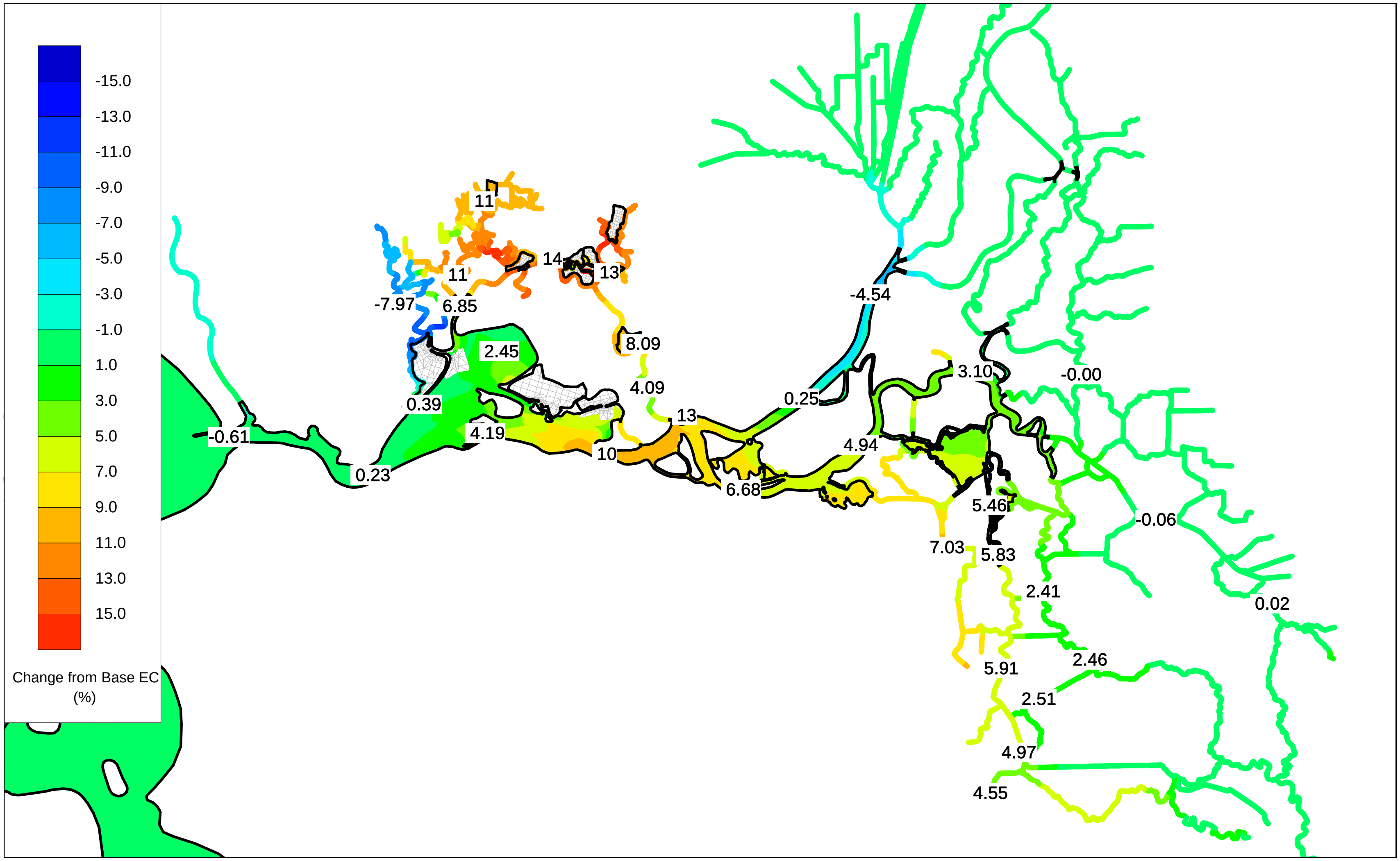

Figure 5-46 Set 2 EC % change from Base case – November 1, 2003.

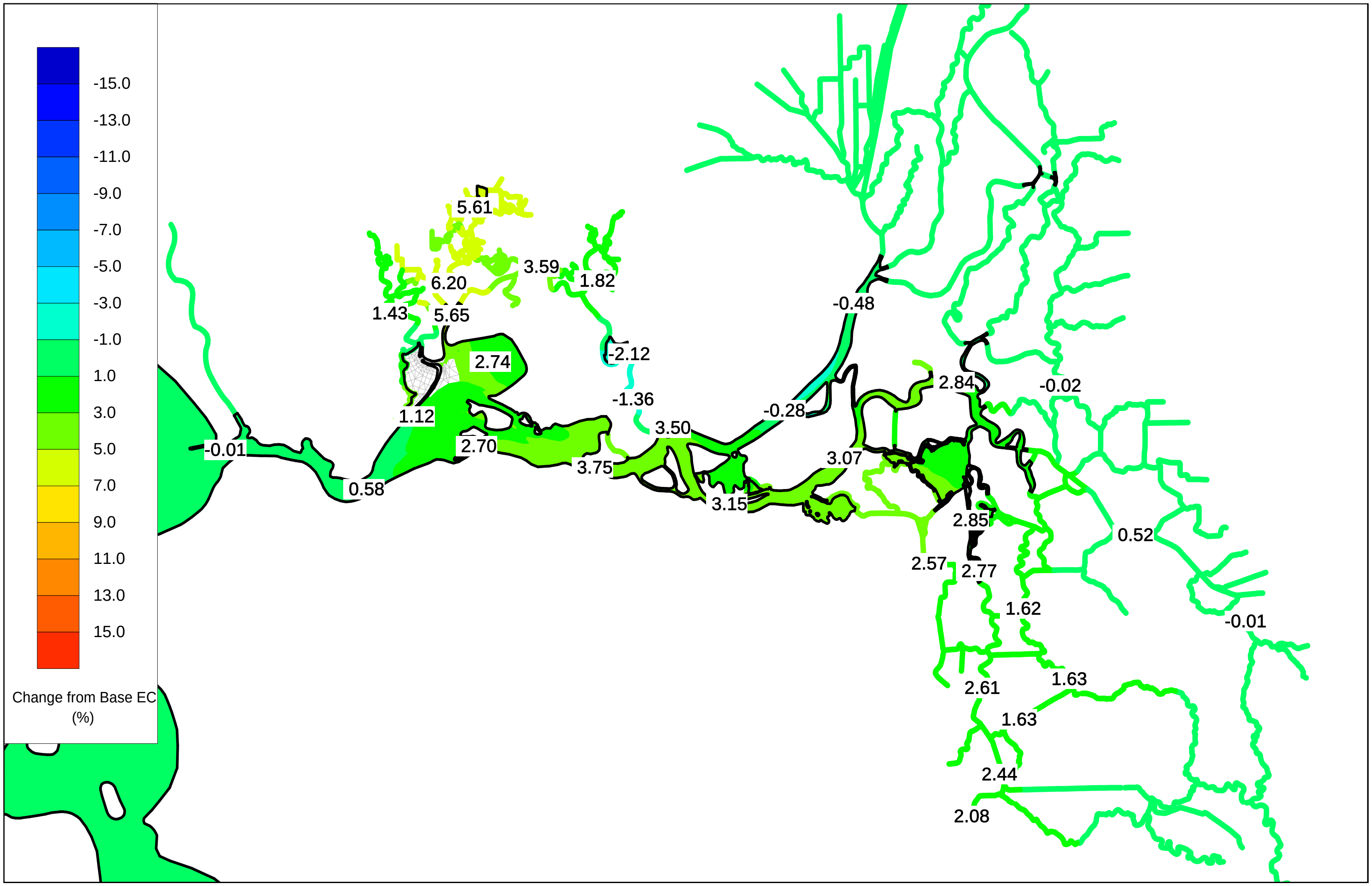

Figure 5-47 Zone 1 EC % change from Base case – September 1, 2002.

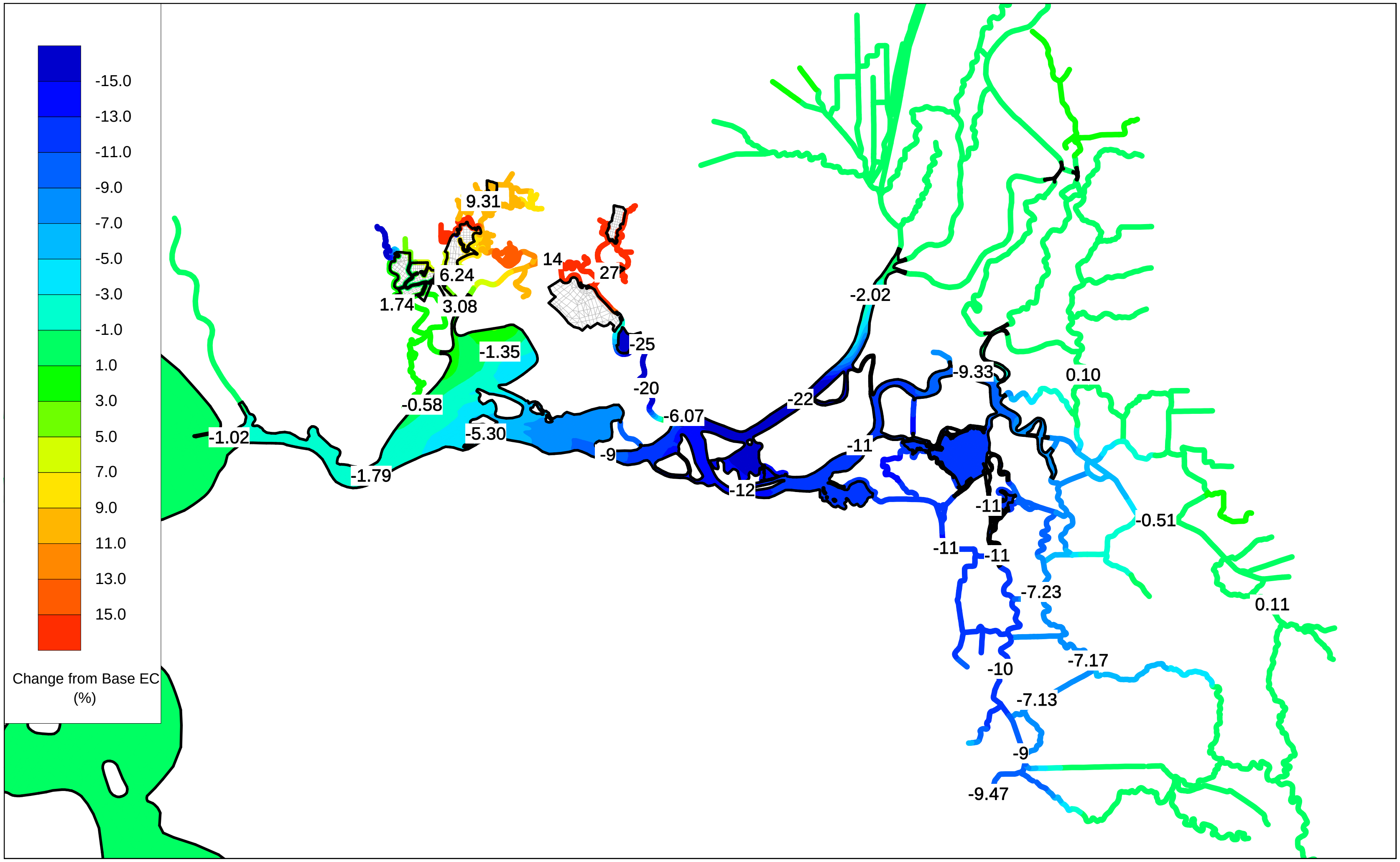

Figure 5-48 Set 1 EC % change from Base case – August 1, 2002.

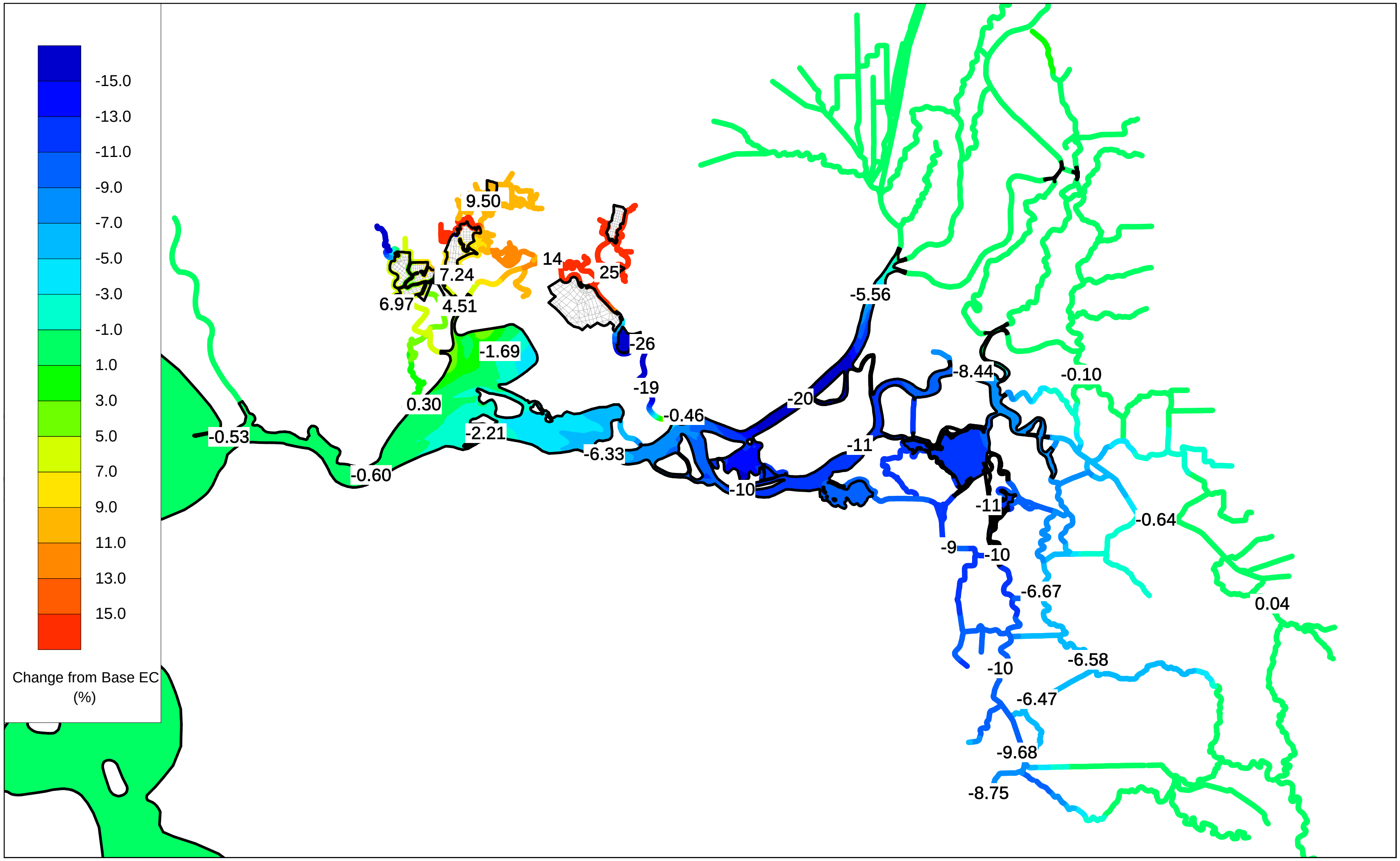

Figure 5-49 Set 1 EC % change from Base case – September 1, 2002.

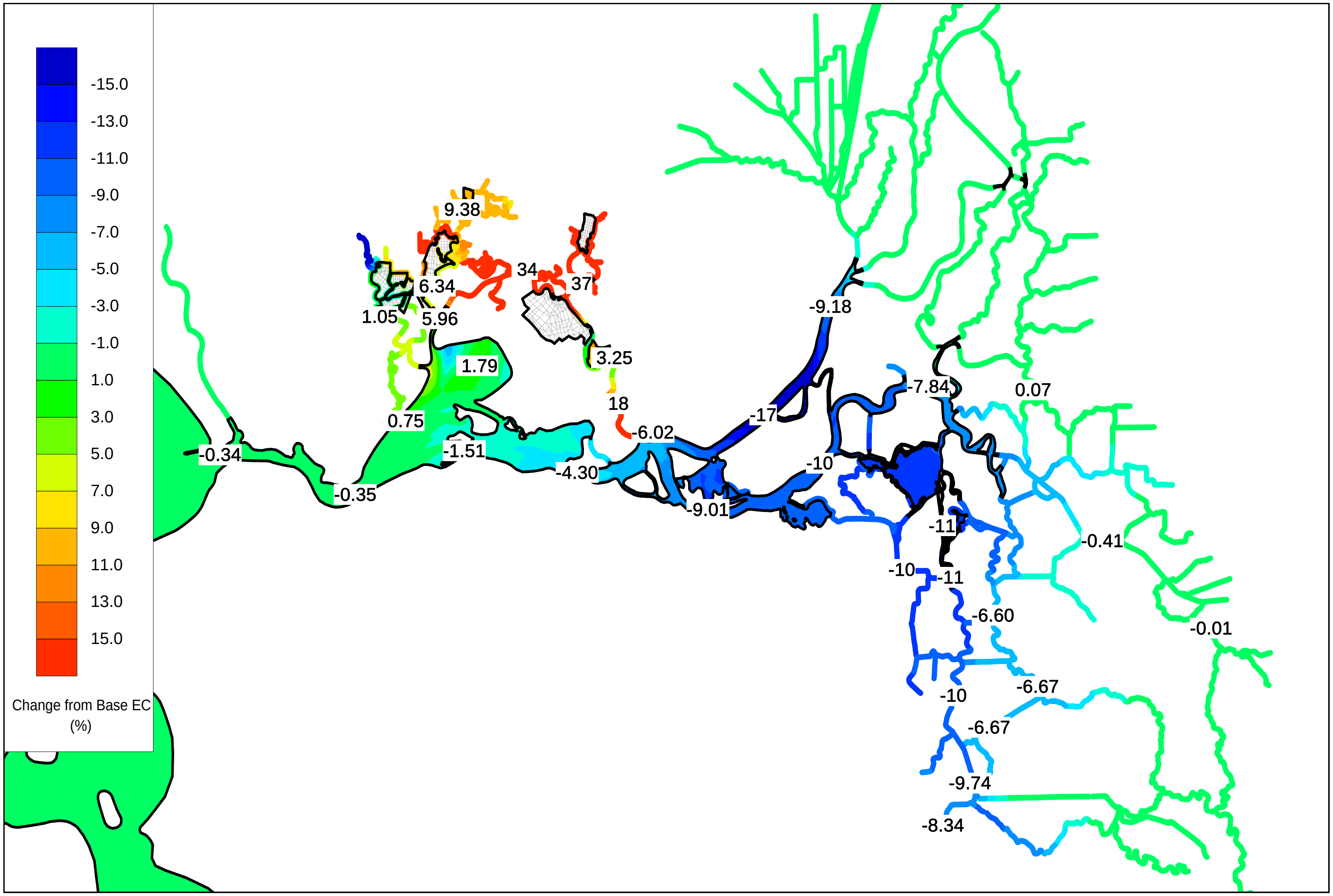

Figure 5-50 Set 1 EC % change from Base case – October 1, 2002.

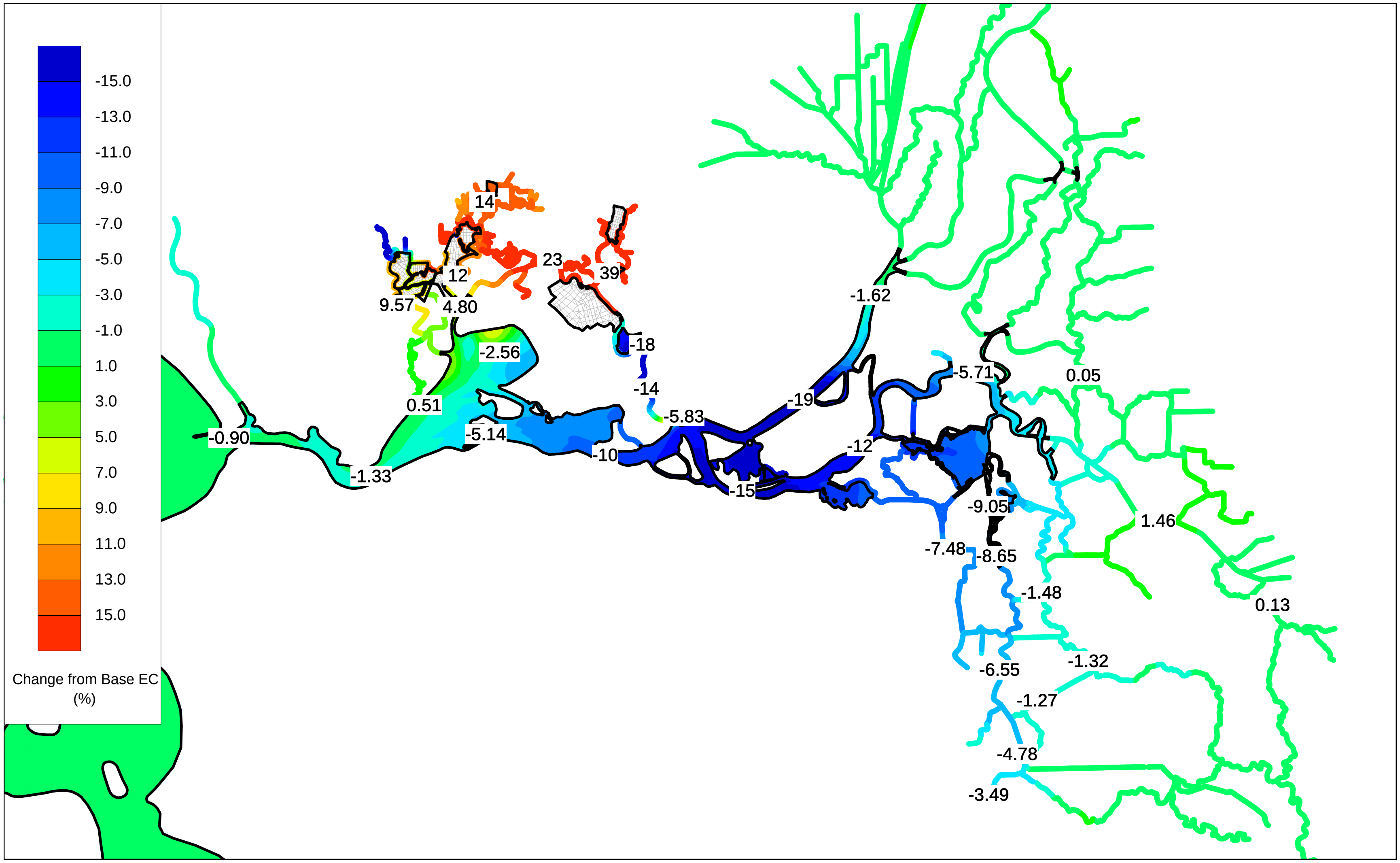

Figure 5-51 Set 1 EC % change from Base case – September 1, 2003.

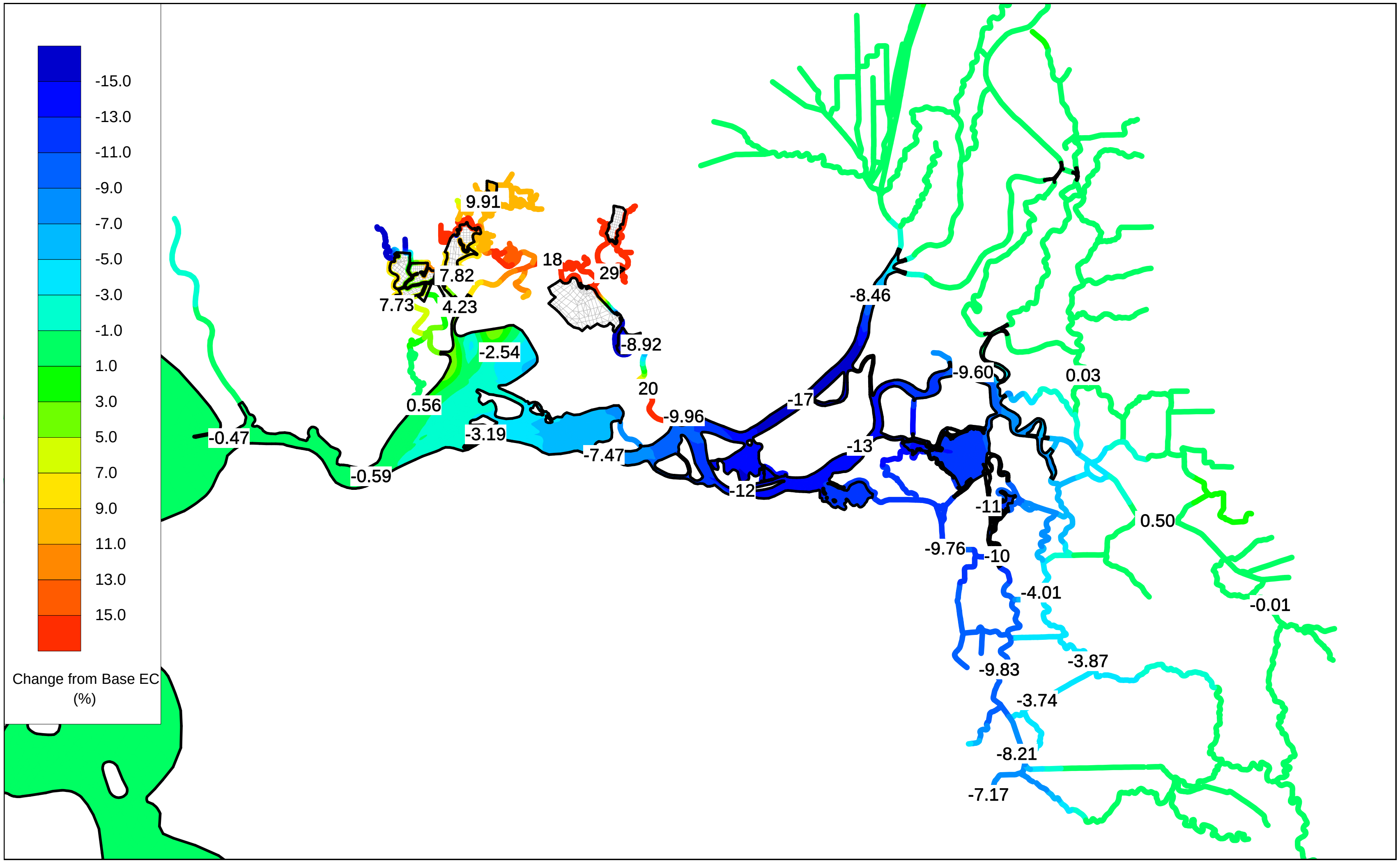

Figure 5-52 Set 1 EC % change from Base case – October 1, 2003.

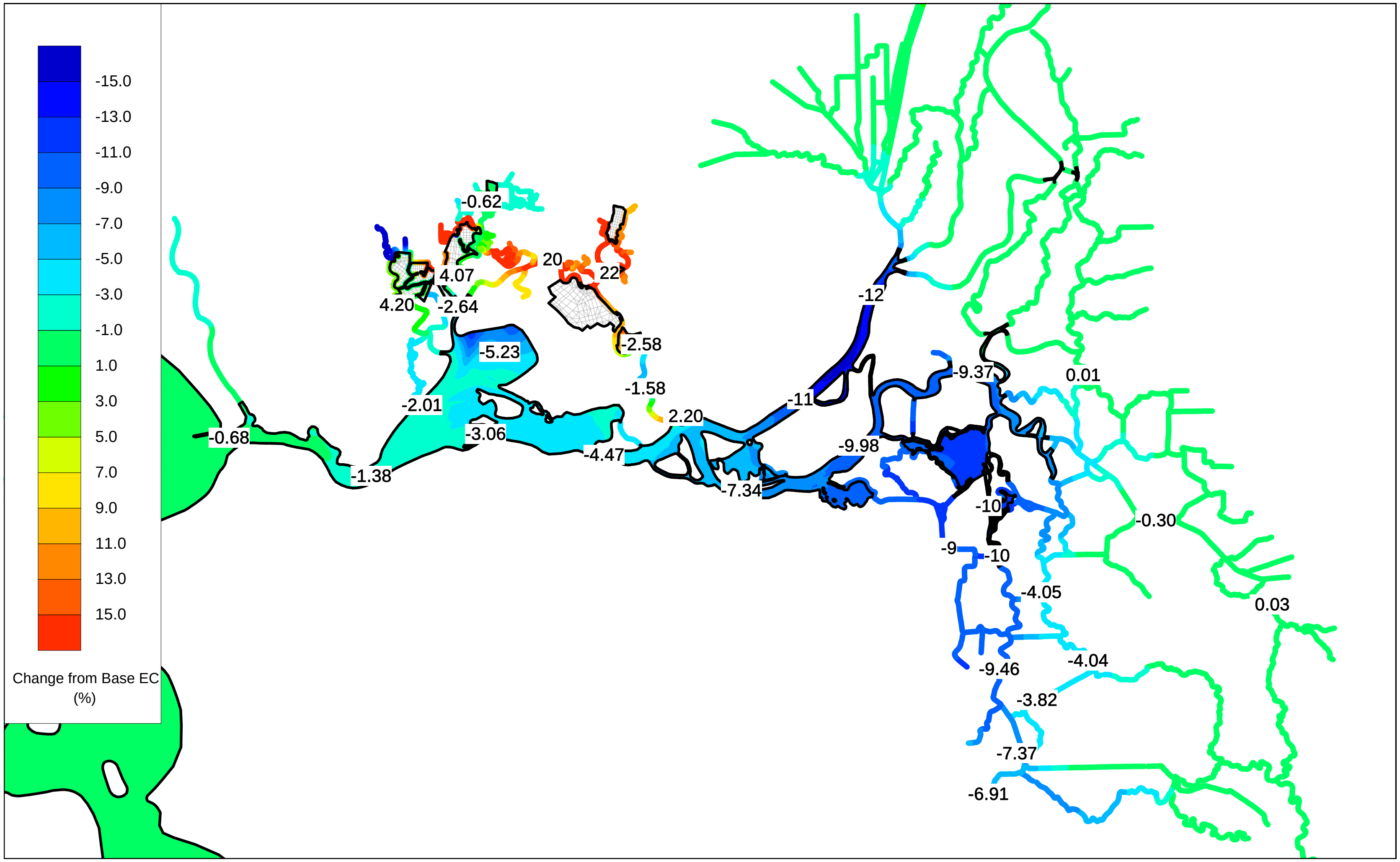

Figure 5-53 Set 1 EC % change from Base case – November 1, 2003.

5.7. Velocity Results – Scour Potential

5.7.1. **Background**

The creation of tidal marsh in restoration areas increased the volume of water flowing through downstream channels in Suisun Marsh each tidal cycle without a change in channel capacity. The result was an increase in velocity in some channels and sloughs and the potential for scour in channels and on banks and subsequent risk of levee failure.

The potential for channel scour and levee failure was evaluated using modeled velocity. Problem locations were identified as places where modeled velocity in the scenarios increased substantially with respect to the Base case during the July 2002 model period, in particular where velocity magnitude exceeded 2.0 ft/sec in the scenario but not in the Base case. Figure 5-54 gives location names for the six areas where potential scour problems were identified. Velocity changes in comparison with the Base case were generally small elsewhere.

Potential effects were assessed using exceedance plots of velocity distribution and magnitude. The velocity distribution plots show velocity versus the percent of time during July 2002 that each velocity was exceeded. Time series plots are also shown at some locations. Specific locations where results were assessed are indicated on velocity contour plots.

Although comparison locations for one and two-dimensional grids were selected at comparable geographical co-ordinates, comparisons between depth-averaged velocity at 2-dimensional *vs.* cross-sectionally averaged velocity at 1-dimensional grid locations should be interpreted with caution.

5.7.2. **Scouring potential for the scenarios**

Six locations were identified where the potential for scouring increased due to the incorporation of restoration area for the scenarios. Four of the six locations where large changes in velocity were identified occurred in channels adjacent to newly flooded areas. The maximum velocity at a given location did not occur at the same time or in the same tidal cycle in each scenario, partly due to shifts in stage timing. Velocity profiles at some problem locations exhibited a large asymmetry in velocity, e.g., the magnitude of the velocity on the incoming tide (negative velocity) increased substantially in comparison to increases on the outgoing tide.

The Set 1 and Set 2 scenarios each had the most extensive flooded areas, but the Zone 4 scenario resulted in the largest increases in channel velocity; it also reduced velocities at some locations in comparison with the Base case.

Figure 5-55 illustrates the magnitude and frequency of velocity changes at Beldon’s Landing in Montezuma Slough for the scenarios. The velocity distributions for the scenarios vary in timing, as the percent of time with negative velocities (incoming tide) ranged from 47 to 49% in July, 2002. The Zone 4 restoration area has the greatest potential to influence sediment movement in Montezuma Slough, as both the Set 1 and

Zone 4 scenario velocities are nearly double the Base case values on both incoming (negative values) and outgoing (positive values) tides. Set 1 and Zone 4 velocity magnitudes were greater than 2.0 ft/sec ~ 25% of the time on both the incoming tide and outgoing tides, and were nearly symmetric with respect to tidal direction. These scenarios also produced the greatest tidal flow in Montezuma Slough (Figure 5-13).

Two points were examined at Hunter Cut: Point 1 at the bank (edge of the grid) and Point 2 in a mid-channel location (Figure 5-56). The Set 1 scenario (Figure 5-58) has the largest velocity effect mid-channel in Hunter Cut, which occurs on the outgoing tide. The large amount of restored area in the western marsh for Set 1 means that Suisun Slough and Hunter Cut contribute heavily to the channel conveyance for filling and draining the large volume of water in that restored area. Zone 1 contributes the greatest potential for scour on the levee bank in Set 2 with a large velocity magnitude on the incoming tide. The Zone 4 restoration area reduced tidal flow through Hunter Cut (Figure 5-13), as well as velocity in comparison with the Base case (Figure 5-58).

The other locations where velocity increases might result in scouring were all at the entrance to breaches at restoration areas within the marsh. Near the breach at Morrow Island (Figure 5-59), velocities are much higher for Set 2 and Zone 1 than the other scenarios (Figure 5-61). Velocities peak on the incoming tide, with the Zone 1 area contributing the majority of the velocity increase. Near the breach location at Meins Landing (Figure 5-62), the Zone 4 and Set 1 scenarios have similar velocity profiles (Figure 5-65), as both incorporate the Zone 4 region off of Montezuma Slough. Velocities on the bank (Point 1) and in mid-channel (Point 2) are very similar, while Point 3 near the entrance to the northern breach for the zone has an asymmetry profile which peaks on the incoming tide (negative velocity).

In the region near the Cross Slough (Figure 5-66), only the Set 2 scenario exhibits scour potential in comparison with the Base case. There are large velocity asymmetries in all three Set 2 points, with the mid-channel point showing the greatest potential for scour (lower right plot, Figure 5-66). Near the breach for the Duck Clubs restoration, the Set 1 scenario (Figure 5-68) has complex velocity profiles (Figure 5-69, lower plot). The modeled velocity profiles at the five points in Set 1 (Figure 5-70 and Figure 5-71) indicate that there is a high potential for scour in the channels and possibly to the levee banks, in some cases on the incoming tide (Points B and C, negative) and in others on the outgoing tide (Point B, positive).

5.7.3. **Summary**

Of the six locations identified as problematic for scouring, only two (Beldon's Landing and Hunter Cut) were located away from breach locations. The other four locations were located directly upstream of the breach. The grid development for channels near breach locations conforms to the existing channel configuration, and breaches were opened at the width of the channel at the location of the breach. Depending on the location in this channel, the increase in velocity magnitude could indicate potential problems with scour leading to failure on a levee bank (i.e., at the edge of the 2-dimensional grid) or scouring of the channel.

Changes to the channels such as deepening or widening could be modeled to assess the ability reduce scour potential both on levees and on levee banks.

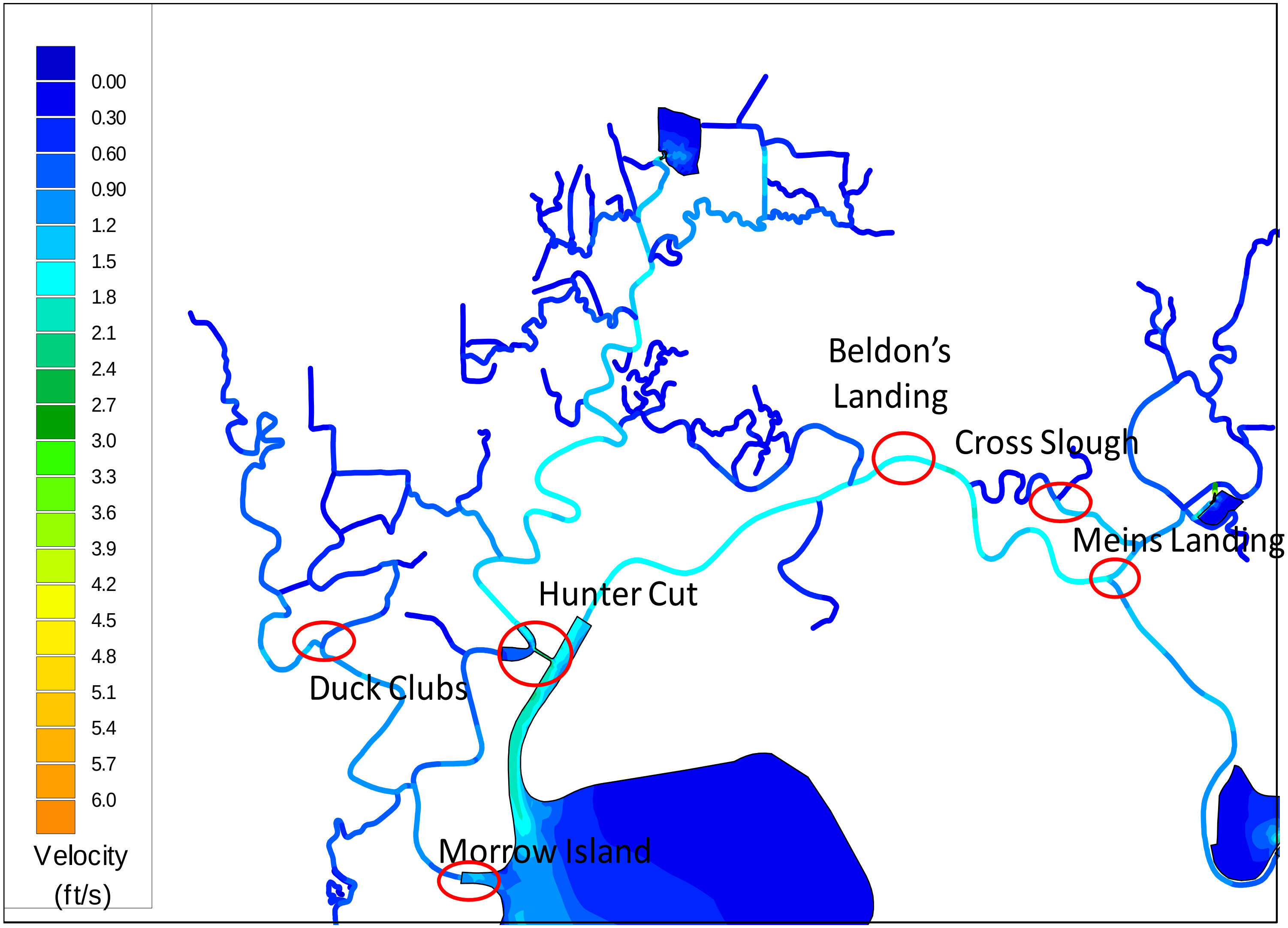

Figure 5-54 Location names for the areas examined for scouring potential.

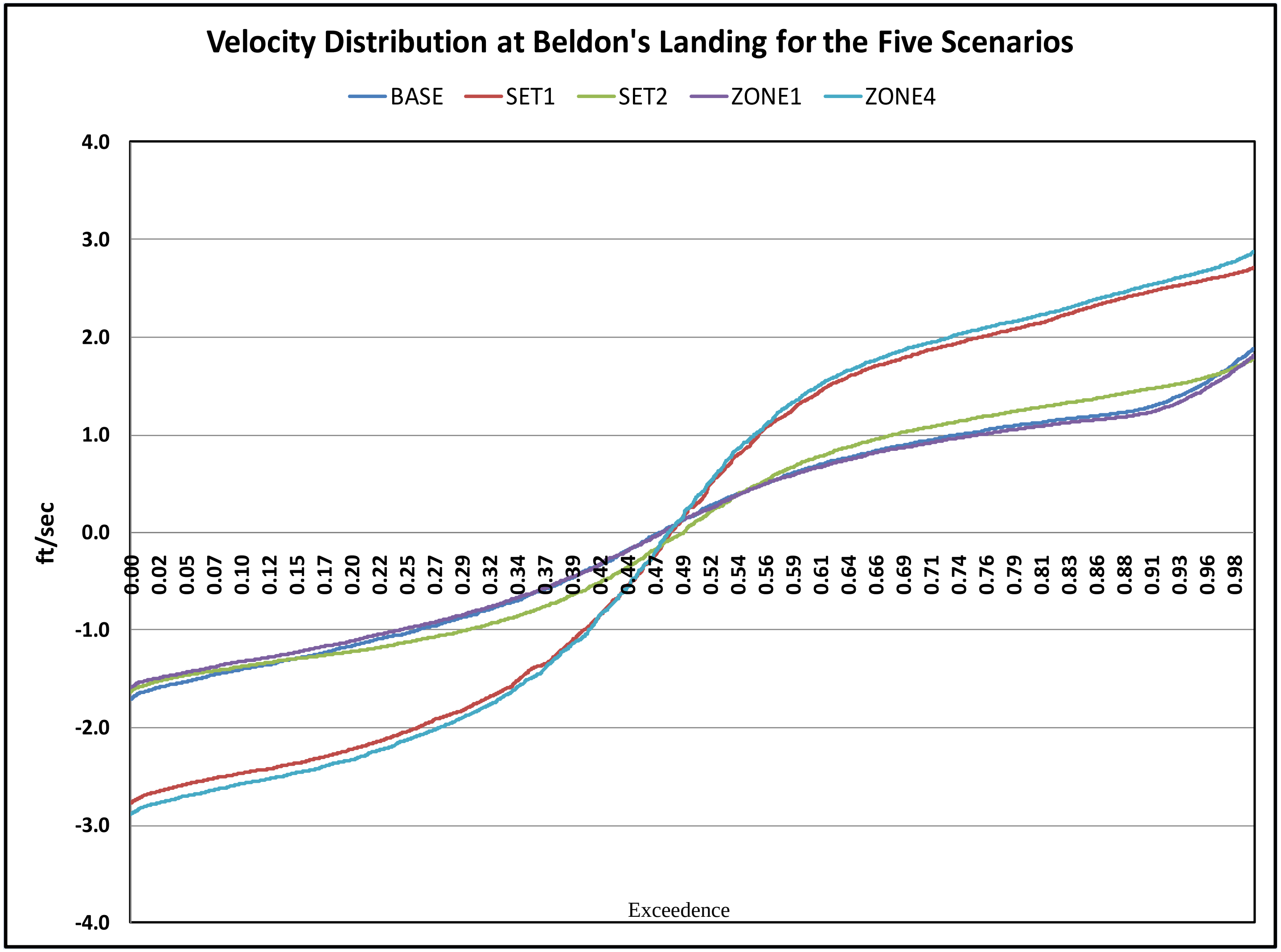

Figure 5-55 Velocity distributions for the five scenarios at Beldon's Landing, July 2002.

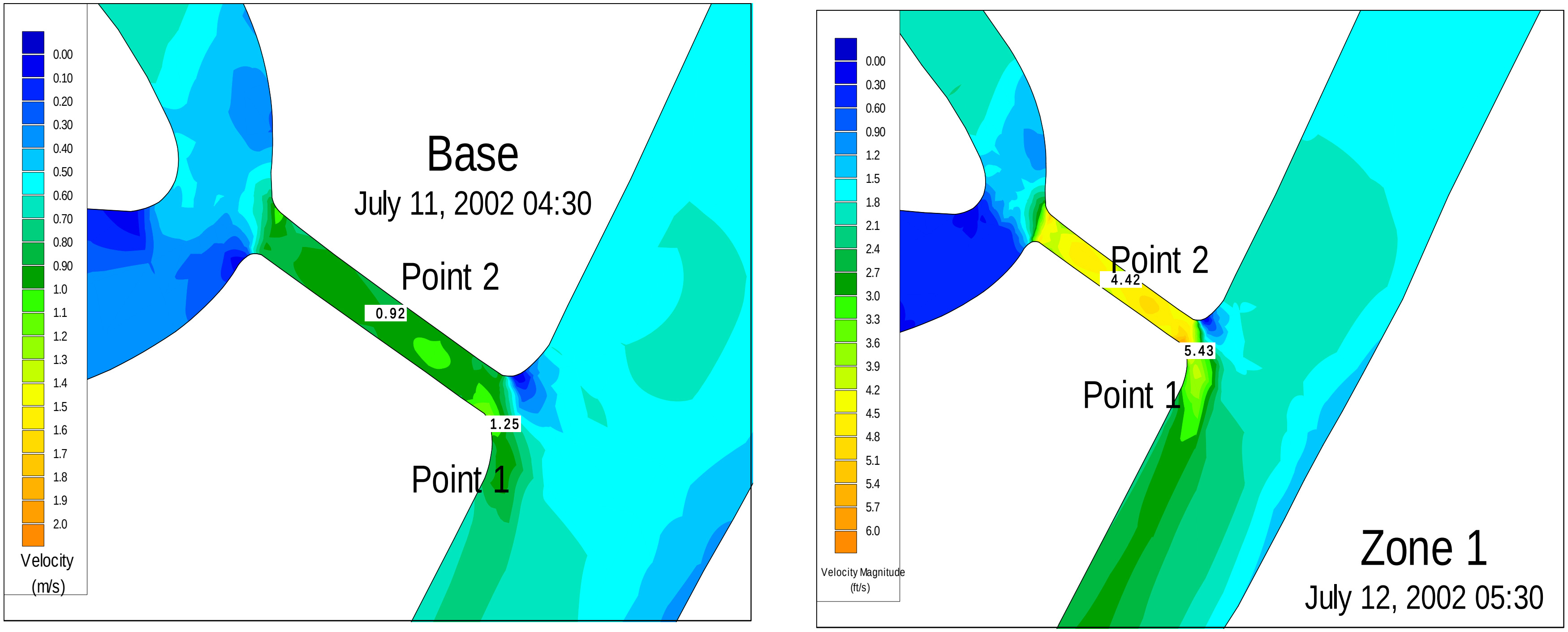

Figure 5-56 Color contour plots of velocity for Base case and Zone 1 at Hunter Cut in July 2002. Points analyzed: Point 1 on bank Point 2 mid-channel.

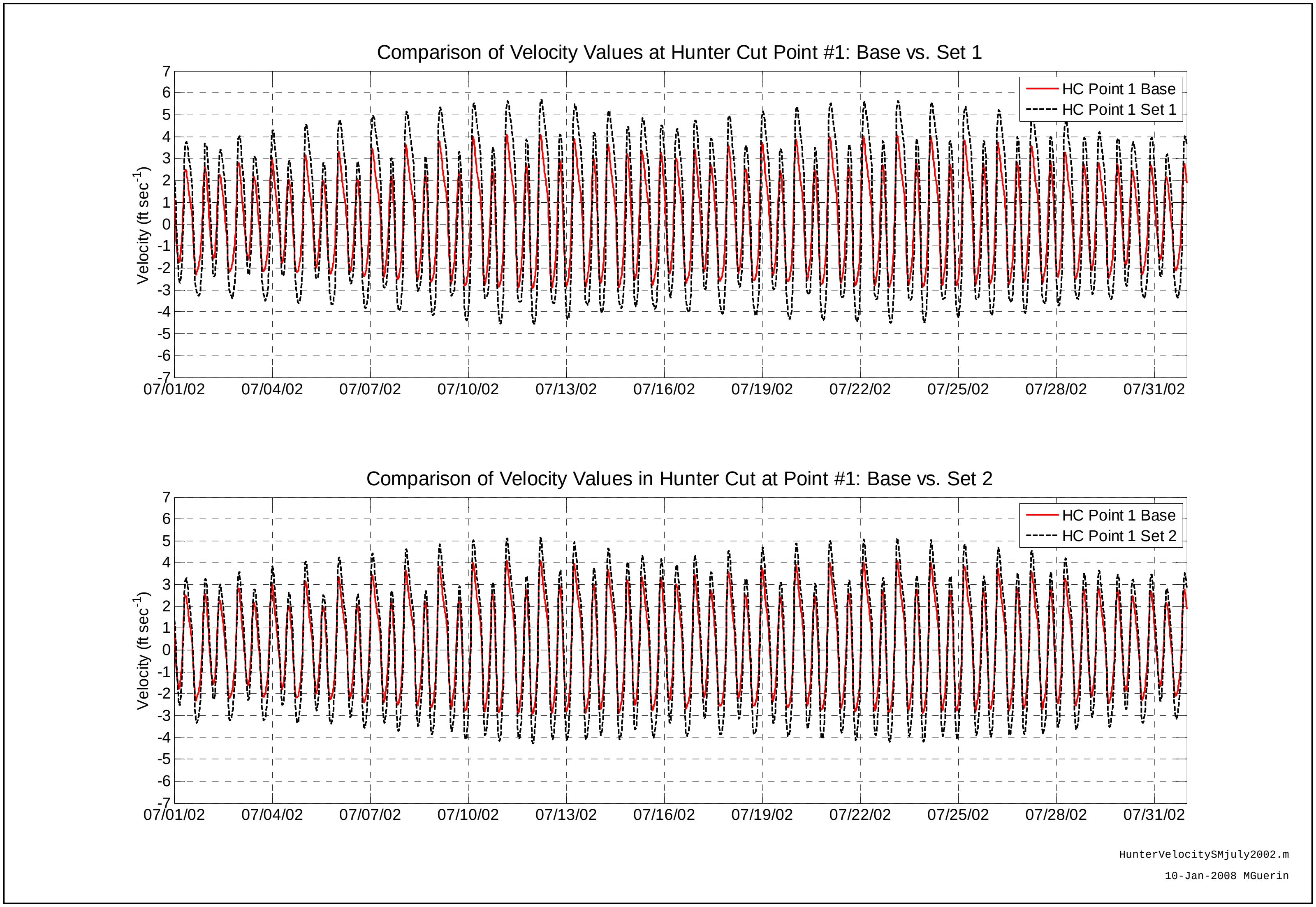

Figure 5-57 Hunter Cut velocity at Point 1 for Sets 1 and 2 in comparison with the Base case.

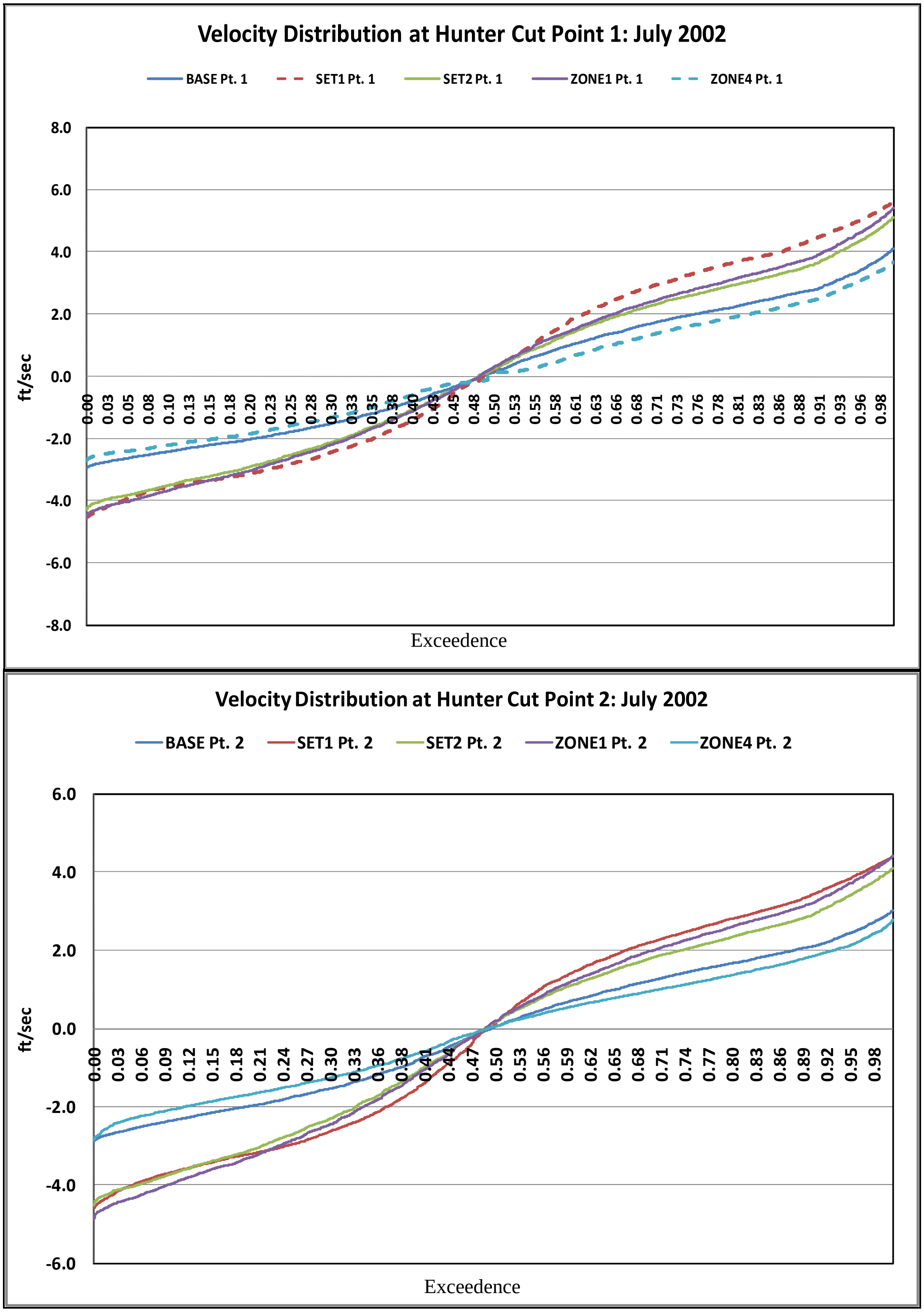

Figure 5-58 Velocity distributions for points 1 (bank) and 2 (mid-channel) at Hunter Cut.