Pacific Advanced Civil Engineering, Inc., "Memorandum Regarding Buried Soil Cement Evaluation After 2004/05 Winter Storms" (May 8, 2007)

PACIFIC ADVANCED CIVIL ENGINEERING, INC.

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MEMORANDUM

DATE: May 8, 2007

TO: Glenn Adamick/Newhall Land

FROM: Mark Krebs, P.E.
David Jaffe, P.E.

RE: Buried Soil Cement Evaluation after 2004/05 Winter Storms

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Bank protection on the Santa Clara River and main tributaries of the river constructed by Newhall Land since 1999 has primarily utilized a buried soil cement technique. Soil cement bank protection uses 89 to 94% native soil material excavated within the project area and introduces 6 to 11% cement. With a small amount of moisture, mixing and compaction of the processed soil material, a non-erodible bank protection in produced. In most cases the soil cement is placed on a 1 to 1 or 1.5 to 1 slope face. This slope face is then "buried" or backfilled with native soils at a slope between 3 to 1 to 5 to 1. This soil backfill is then planted with native plant species. The native plantings and gradual slope of the soil in these areas will encourage river bank stabilization and resist most frequent river flow events.

The majority of the river bank protection construction in this method includes a horizontal location of the bank protection that is located outside of or adjacent to the existing riparian edge. The placement of the bank protection outside of the existing river corridor substantially decreases the likelihood that the river scour will remove the buried soil & vegetation placed over the soil cement bank protection. As noted above, the majority of the bank protection is located outside of the existing riparian corridor where areas will typically experience velocities much less than the main channel creek velocities (typically velocities of 2-8 fps along the banks while velocities >15 fps in the main channel occur adjacent to these locations during the 100-year discharge). Lower, non-erosive, velocities in the areas along the buried bank stabilization indicate that it is unlikely that all or part of the buried bank stabilization will become exposed.

A real world example was provided in winter 2004/2005. The 2004/2005 winter rainy season proved to be one of the wettest years on record and produced an approximate 50 year flood in the Santa Clara River at the LA/Ventura County line. River flows at this location have been estimated by LA County at 49,800 cfs, the second highest on record.

The 2004/2005 storm runoff and river/tributary flows provided a good test for the buried soil cement bank protection. Figures #1 and #2 show the Santa Clara River between Bouquet Canyon Creek and San Francisquito Creek along the Bridgeport project. The Bridgeport soil cement bank protection was constructed in 1999 and has substantial revegetation growth in the backfilled area. As shown in the photos the 2004/2005 storms cleared vegetation in the active channel (riverbed) but no damage occurred in the revegetated Bridgeport area.

Several buried soil cement bank protection projects were constructed along San Francisquito Creek in 2003. These projects include West Creek, Creekside and Hidden Creek which are located between Copper Hill Road and Newhall Ranch Road. Though not revegetated at the

time of the photo, Figures #3 and #4 of the San Francisquito Creek show the major flooding did not expose any of the buried soil cement.

Figure #5 shows the limit of the 2004/2005 flooding of the Santa Clara River in the proposed Newhall Ranch development. The proposed project bank protection is shown as overlay on the aerial photo and it indicates that if the bank protection had been in place during these heavy flow events very little, if any, would have become exposed.

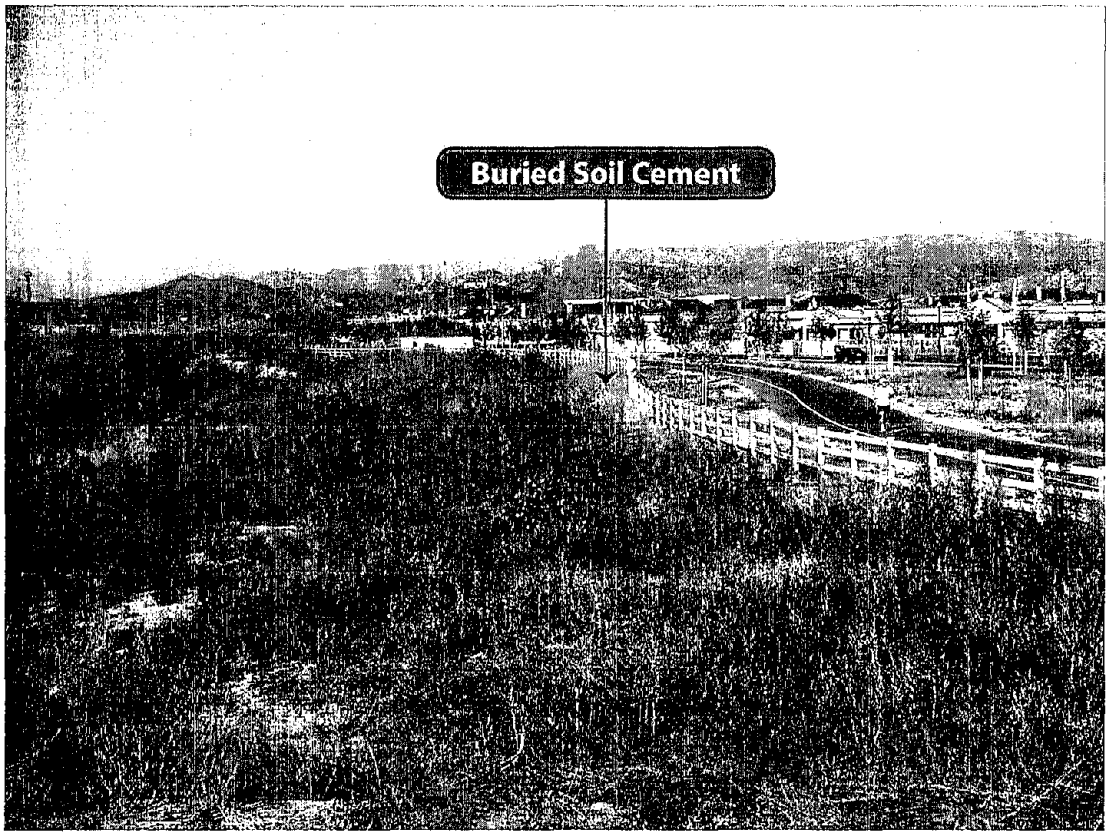

Figure 1: Existing buried and revegetated soil cement bank protection along Santa Clara River at Bridgeport.

Figure 2: Buried soil cement at Bridgeport after 2004/05 storms

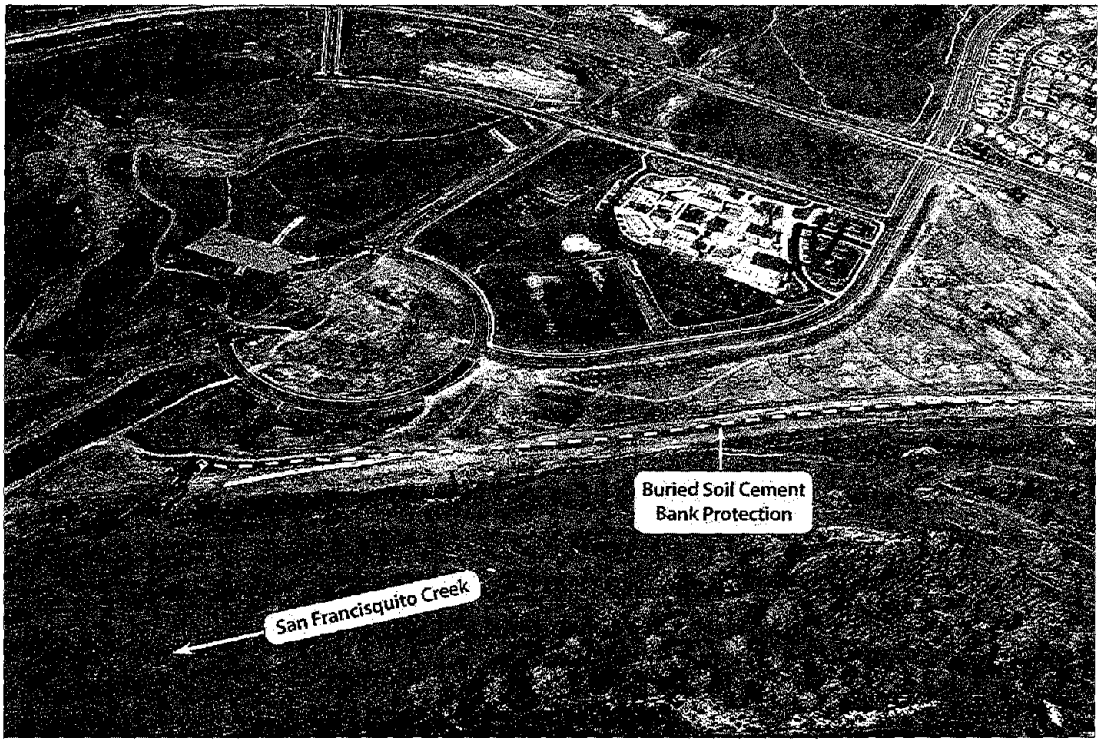

Figure 3: Aerial photograph of buried soil cement bank protection on San Francisquito Creek near Copper Hill Road following the 2004/2005 winter high flow events.

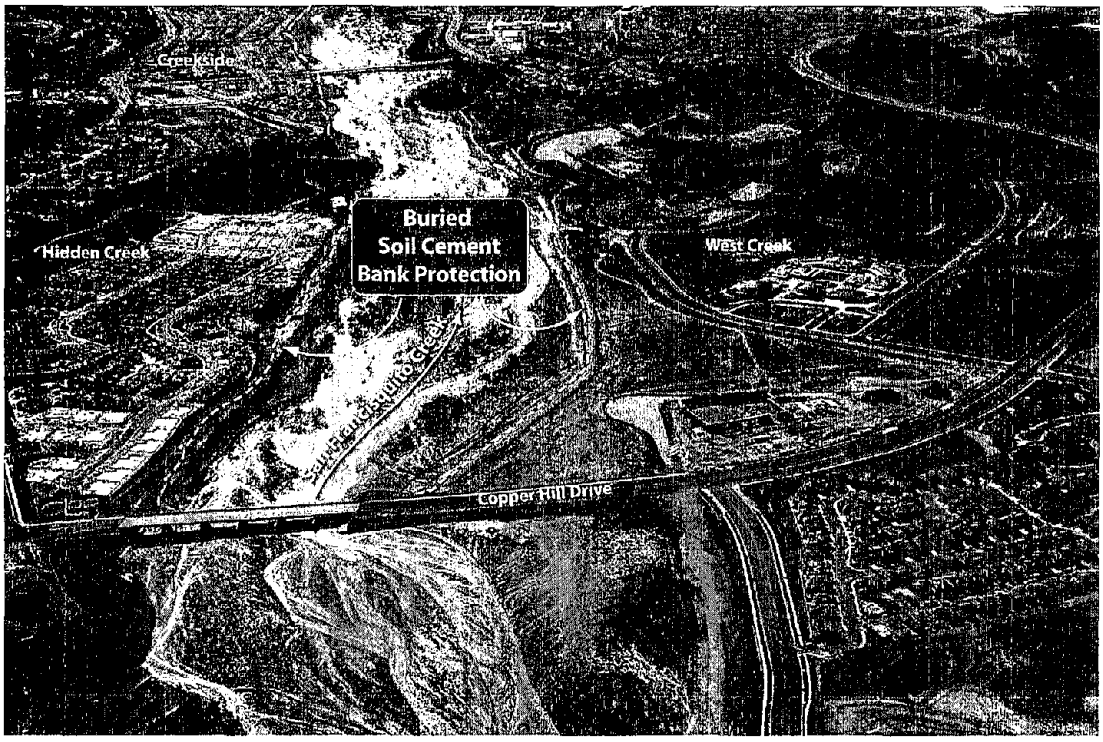

Figure 4: San Francisquito Creek after 2004/05 winter high flow event