Box 264 Clinton, MS 39060–0264 d **Phone 601-925-4092** d **FAX 601-925-4093**

MOBILE BOUNDARY HYDRAULICS, PLLC

8 December 2009

To: Scott E. Stonestreet
CESPK-ED-DH
1325 J Street
Sacramento, CA 95814-2922

SUBJECT: Lower Walnut Creek GRR,
Contra Costa County, California

Report on Field Observations 17-19 November 2009
Recommendations for Sample Analysis and Model Boundary Limits

1. This letter report documents observations from a field reconnaissance and bed material sampling effort for the Lower Walnut Creek Sedimentation Study being conducted by Mobile Boundary Hydraulics for the Sacramento District. We received a project briefing on 17 Nov 09 by Mr. Paul Detjens of the Contra Costa Flood Control District, who also was our guide for the field reconnaissance and the sediment sample collection effort. This letter report also provides recommendations on the extent of laboratory analyses required for the samples collected and for the upstream limits of the numerical model.

2. **Sediment Delivery from the Tributaries.** The tributaries to Walnut Creek were found to be threshold streams. Alluvial deposits identified during the field reconnaissance were found to be moving over hard cohesive beds. Sediment transport through threshold streams is determined by the sediment yield and not the hydraulic characteristics of the stream. We could not find an alluvial reach on any of the tributaries where bed material sediment inflow could be calculated. Samples were collected from middle bars and point bars to determine the sediment size classes in transport. It was found that a wide range of size classes, from very fine sand to cobbles, are transported.

Due to the lack of alluvial supply reaches it is not necessary to extend the HEC-6T model long distances up the tributaries. Sediment inflow will be determined in the HEC-6T

model using USGS measurements adjusted to match surveyed deposition in Walnut Creek.

3. Pacheco Creek. We visited the channel just upstream from Arthur Road. The channel was small, and constricted on both sides by residential or commercial development. Very fine sand had deposited on a bench adjacent to the low flow channel. A mixture of sediment sizes, including scattered riprap, was found in the bed. No obvious alluvial deposit was located and no bed sample was collected. The next downstream site visited was at the end of Central Avenue. Here the channel had a form similar to the lower reaches of Walnut Creek with a low flow channel and a berm covered with tules. We collected samples from the channel berm at three locations between the end of Central Avenue and the confluence with Walnut Creek. The deposited material was cohesive with little or no sands present. We did not visit Pacheco Creek between Central Avenue and Arthur Road, but aerial photos from *Google Earth* show that Pacheco Creek dumps into a marsh after passing under Interstate Highway 680. There appears to be no well defined channel through this marsh and bed material sediment is not likely to pass through to the channel at the end of Central Avenue. This observation needs to be confirmed by field reconnaissance or survey data. It is proposed that the upstream limit of the HEC-6T model be located at the end of Central Avenue.

4. Grayson Creek. We collected samples from the channel berm at three locations on Grayson Creek: 1) upstream from Highway 4, 2) upstream from Pacheco Blvd. and 3) upstream from Chilpancingo Parkway. The channel form in this reach is similar to lower Walnut Creek. The channel berm consists of very fine sand and silt. At the site upstream from Highway 4, where the channel was constructed on an alignment different from the original watercourse and a low flow channel was not included in the original design, a low flow channel has developed. The low flow channel has been formed by erosion into the original cohesive ground material and deposition of alluvial sediment on the berm. The channel was desilted in the late 1980's. The reach upstream from Pacheco Blvd. was desilted in 2006. In the reach upstream from Chilpancingo Parkway very fine sand and silt has deposited on top of grouted riprap bank protection. It is proposed that the upstream limit of the HEC-6T model be located near Viking Drive where a concrete channel begins. Sediment inflow to this reach will be determined by calibration to surveyed deposition.

5. Clayton Valley Drain. The lower reach of Clayton Valley Drain has a form similar to Walnut Creek with a low flow channel and a channel berm deposited on both sides. We took a sample from the berm about 800 ft upstream from Solano Way. In the low flow channel, we observed a 1 to 2 inch thick layer of black alluvial material over gray clay. Upstream from the drop structure at the end of the Flood Control ROW, we found the closest thing to an equilibrium supply reach that we were to find during the field trip. Unfortunately, there is no survey data available in this reach to determine cross section dimensions or channel slope. A composite sample was collected from the bed. Much of the sediment collected was black, which caused us to question its source. It is proposed that the upstream limit of the HEC-6T model be located at the drop structure upstream

from Solano Way. Sediment inflow to this reach will be determined by calibration to surveyed deposition.

An unlined reach of Clayton Valley Drain, upstream of Port Chicago Highway, had an alluvial bar in the bed that appeared to consist of sand. Access was denied by fencing so no sample was collected.

6. Pine Creek. Pine Creek is a significant runoff source for Walnut Creek. However, upstream from the concrete channel reach, between San Miguel Road and Lane Drive we found no evidence of alluvial deposits. The earth channel was grass lined and the invert slope was controlled by a drop structure at the downstream end. Aerial photos from *Google Earth* show a series a drop structures continuing upstream. Visual inspection of the bed sample collected from Pine Creek suggests a cohesive bed that may be original ground.

A composite sediment sample was collected from the channel bench on Pine Creek about 500 ft upstream from its confluence with Walnut Creek. It is proposed that the upstream limit of the HEC-6T model on Pine Creek be located at Highway 242 where a concrete channel begins. Sediment inflow to this reach will be determined by calibration to surveyed deposition and deposit gradation.

7. Galindo Creek is a tributary of Pine Creek. We observed the channel at the Contra Costa Canal crossing. The bed was lined with riprap to protect the bed under a bridge. The reach was characterized by a variety of homemade bank erosion features. Further upstream at Cowell Road we collected a sample from an armored bar just upstream from a culvert. The deposit confirmed the availability of coarse sand and gravel. However, just upstream from the culvert, the channel had cut through clay deposits with large root masses exposed, confirming the threshold nature of the stream.

8. Las Trampas Creek. We collected a composite sample from a middle bar just downstream from California Blvd.

9. San Ramon Creek. The first sample site was about 1200 ft downstream from Livorna Road in a constructed reach of the channel. A sample was collected from a middle bar. The alluvial deposit was 1 to 2 inches thick on top of original ground. A second sample was collected from a bar that had formed on the right bank. This reach was widened with riprap bank protection in 1997. Previous improvements that were constructed in the 1960's included grade control.

Further upstream, at Community Gardens, samples were collected from both a middle bar and just upstream at a point bar. Four samples were collected up the point bar, including a sample in the thalweg and up at the highest point in the point bar. These samples included a range all the way from small cobbles to very fine sand.

10. Walnut Creek. Samples were collected from Walnut Creek at Civic Park near the location of the old USGS gage. Samples were collected from a middle bar and across a

point bar deposit. These samples provided information on available sediment sizes, but this reach is not an equilibrium supply reach.

11. It is proposed that the upstream limit of the HEC-6T model on Walnut Creek be located downstream from Monument Blvd where a concrete channel begins. We understand that this is the limit of the existing HEC-RAS model. We propose to translocate the USGS data from the discontinued gages to Monument Blvd.

12. **Deposits in Walnut Creek.** Generally, it was found that the low flow channel had cut into original ground, or had a thin layer of alluvial material over original ground. Some samples were collected from the low flow channel in the upper reaches of Walnut Creek, but generally the sampling was conducted to identify the downstream fining characteristics of the sediment that had deposited in the channel benches on both sides of the low flow channel.

Samples were collected from a middle bar about 2500 ft upstream from Monument Blvd. A sample was also collected from the bank deposit. This was a constructed reach.

Samples were collected upstream from Highway 242 from the bank deposits.

Samples were collected from bench deposits at Waterworld. The upstream portion of this reach was desilted in 1995 and the lower portion in 2006. Samples were collected from both areas.

Samples were collected from the deposited bench at two sites adjacent to the airport and just upstream from Highway 4. We will rely on the push core samples for gradations in the lower reaches of Walnut Creek.

13. **Required Laboratory Analyses.** Visual inspection of the sediment samples collected from Walnut Creek indicated that a significant portion of the deposits consist of silt size classes. HEC-6T can make sedimentation calculations for the coarse silt size classes using the Laursen-Madden or Laursen-Copeland sediment transport functions. It is anticipated that one of these functions will be used for the Walnut Creek study. It is recommended that laboratory size class analyses be conducted for the silt size classes. This can be accomplished using the hydrometer or pipet methods.

14. **HEC-6T Calibration.** Due to the lack of equilibrium supply reaches, it will be necessary to use sediment inflow as a calibration parameter in the HEC-6T model. The USGS data collected between 1957 and 1962 will be used as a starting point. Sediment inflow will be adjusted to duplicate both surveyed deposition quantities and measured gradations. This makes it necessary to have accurate survey and desilting records.

15. **Required Data.** We need the USACE HEC-RAS model of Walnut Creek to continue making progress on the study. Roughness coefficients will need to be determined for the range of applicable discharges. This will require stage rating curves at

gages. We expect the HEC-RAS geometry to represent 1965 conditions. Eventually, we will need 1973 geometry.

Although not originally part of the study plan, we would like to investigate the possible formation of an equilibrium or regime channel in Walnut Creek. This will require more recent survey data. Stable channel geometry is important in setting movable bed limits in the HEC-6T model.

Ronald R. Copeland, Ph.D., P.E.
Principal Engineer
Mobile Boundary Hydraulics