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February 22, 2016

Jennifer Tanner
Dignity Health
10901 Gold Center Drive, #300
Rancho Cordova, CA 95670

Re: Sacramento River Flood Study

Dear Ms Tanner:

Pacific Hydrologic Incorporated has completed a formal analysis identifying potential flood risk impacts associated with development of the anticipated Dignity Health Wellness Center facilities in the City of Redding. The analysis and results are described in the following paragraphs.

Background:

Dignity Health anticipates development of the Wellness Center, a health services center, on land located immediately south of Cypress Avenue and east of the Sacramento River in Redding. The anticipated facilities include a parking lot on fill encroaching within the 100-year floodplain. The magnitude of encroachment represented by the fill is very small when compared to the total conveyance area of the Sacramento River during a 100-year flood event. Nevertheless, the City of Redding has a "no rise" policy requiring that new development not encroach within the 100-year floodplain or that the developer demonstrate that the new encroachment will not increase the water surface elevation during the most probable 100-year flood using an appropriate engineering study and mitigation if needed. A formal flood study using the Corps of Engineers' HEC-RAS backwater program has been deemed appropriate for evaluation of the project.

Data:

- Backwater model prepared in support of the Cypress Avenue bridge project
- Additional local cross-section data cut from 1-foot site topography
- Detailed site topography from a recent ground survey
- Delineation of the Concept 5 parking area

Existing Condition Backwater Model Run:

The existing condition backwater model run was prepared to establish a basis of comparison with which to evaluate potential flood risk impacts associated development of the Wellness Center. This model run consists of the "proposed condition" run in the backwater model prepared in support of replacing the Cypress Avenue bridge (representing the now constructed bridge) with added detail. The added detail included interpolated cross-sections sufficient to characterize the channel and overbanks in the area where the Wellness Center is proposed. Within the area of new detailed site topography, cross-section data were replaced with new, more accurate cross-section data cut from the topographic map. Bank stations and Manning's roughness coefficients were then adjusted within reason such that the model is able to reasonably reproduce the current effective FEMA Base Flood water surface profile.

Project Condition Backwater Model Run:

The project condition backwater model was prepared to assess potential project related flood risk impacts. In a copy of the current condition backwater model, data for cross-sections 73448 and 73730.7 near the downstream end and middle of the parking lot respectively, were modified to reflect the parking lot being removed from the floodplain. The detailed topographic map showing the location of cross-sections and the edge of parking lot are shown on Figure 1. Cross-sections 73448 and 73730.7 showing the blocked area representing the parking lot encroachment are shown on Figures 2 and 3.

Results:

Base Flood water surface elevations at FEMA cross-sections from the backwater models are summarized in Table 1.

Table 1: Base Flood Water Surface Elevations (NAVD88)

Cross-section	Existing Condition	Project Condition	Difference Pr. - Ex
73266	470.82	470.82	0
73448	471.18	471.16	-0.02[2]
73730.7	471.17	471.15	-0.02[2]
74013.5	471.64	471.64	0
74579[1]	471.83	471.83	0

Notes: 1) Located immediately downstream of Cypress Avenue Bridge
2) Reduction due to increased efficiency of flow (flow displaced to channel where roughness is lower)

Conclusions:

Construction of the parking lot as presently anticipated will not increase the water surface elevation or the extent of inundation during the most probable 100-year flood.

Recommendations:

Although this analysis indicates no increase in water surface elevation during the most probable 100-year flood, a substantial portion of the parking lot is identified within the FEMA designated floodway, an area reserved to convey the FEMA Base Flood (FEMA estimate of the most probable 100-year flood). As such the City of Redding will not allow new encroachment. However, it is well known that the current delineation of the FEMA floodway is incorrect. Based on a test model, if the floodway were delineated correctly, the parking lot will be entirely in the floodway fringe, that area between the floodway and the flood limit, rather than within the floodway. The floodway will need to be corrected before the City of Redding will issue a grading permit for the parking lot. The process for correcting the floodway delineation consists of preparing a Letter of Map Revision meeting the study and mapping requirements of FEMA. If Dignity Health is interested in placing the parking lot on fill, the LOMR is recommended.

Additionally, placement of fill will change the extent of inundation during the FEMA Base Flood. Specifically, the parking lot itself will be out of the floodplain after placement of fill. The City of Redding requires that the developer obtain a Conditional Letter of Map Revision based on Fill (CLOMR-F) prior to issuing a grading permit for fill in the floodway fringe. If Dignity Health is interested in placing the parking lot on fill, the CLOMR-F is recommended. It is further recommended that the CLOMR-F be prepared after the LOMR to correct the floodway delineation has been processed. Because the proposed fill is located within the incorrectly delineated designated floodway, attempting to correct the floodway delineation and address the flood limit correction concurrently will be confusing and problematic for the FEMA review.

Please let me know if you have any questions regarding this analysis or if Pacific Hydrologic Incorporated can be of further assistance.

Sincerely,

Norman S. Braithwaite, P.E. President
Pacific Hydrologic Incorporated

Figure 1: Detailed Site Topography and Location of Cross-sections

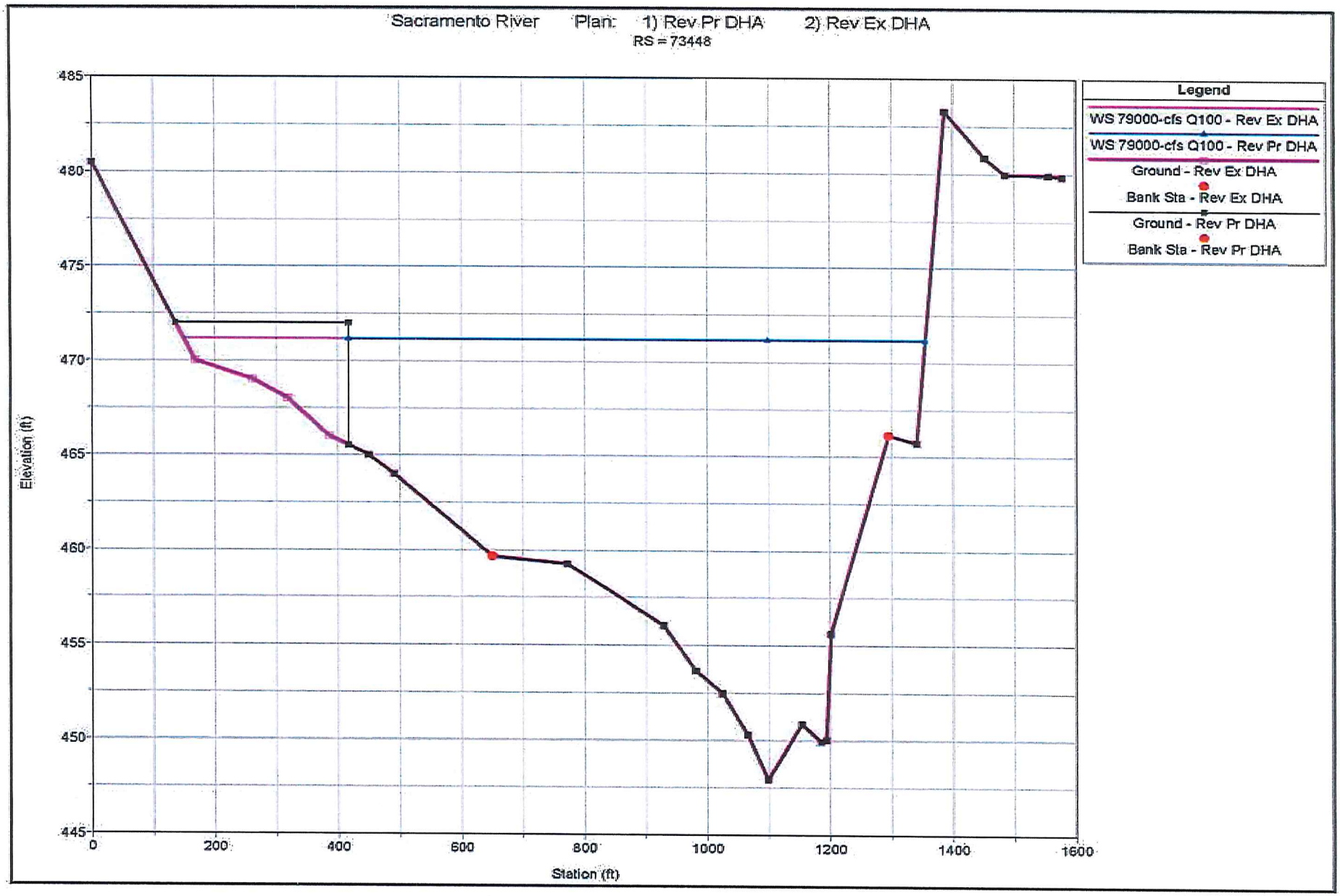

Figure 2: Cross-section 73448

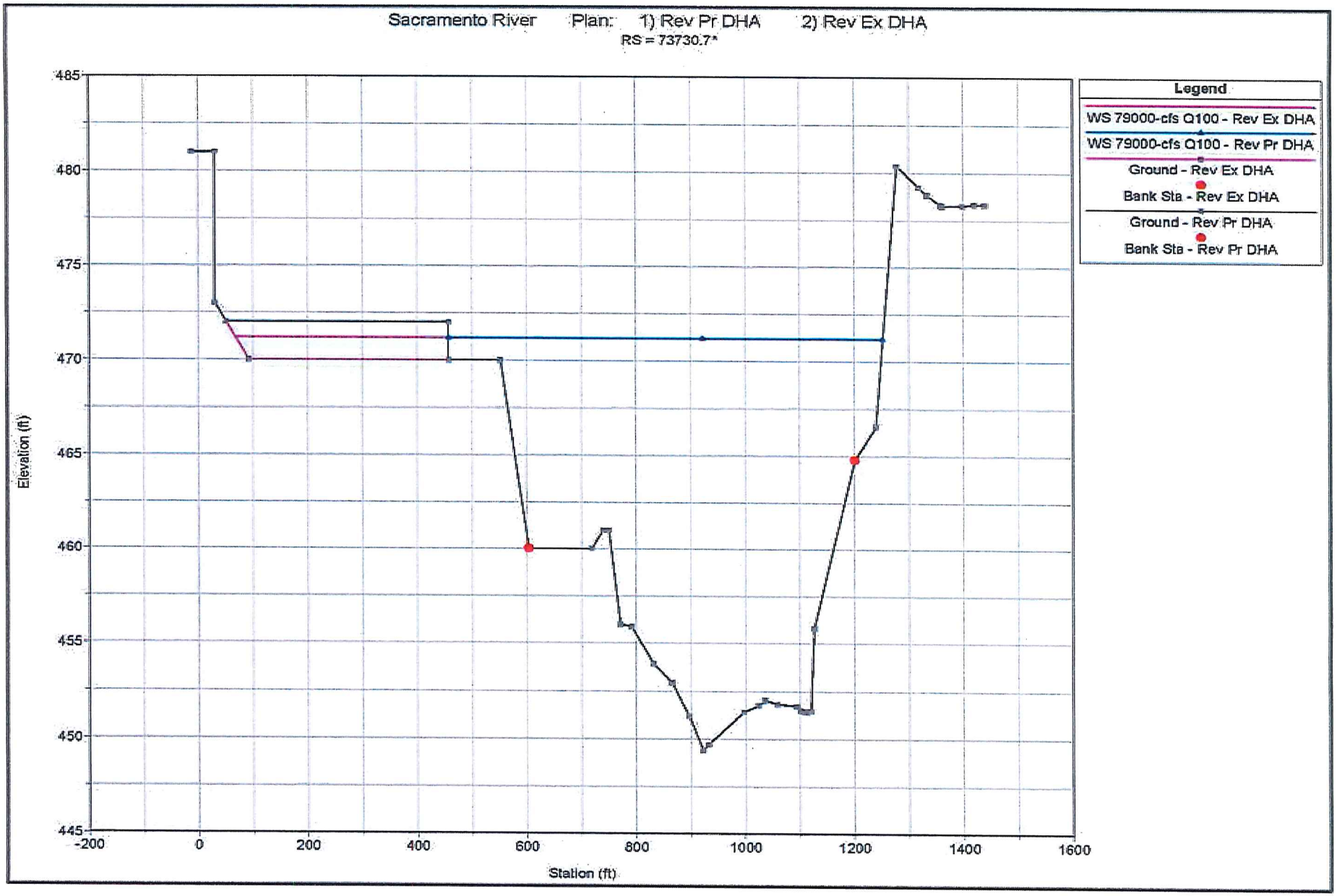

Figure 3: Cross-section 73730.7