PIMA COUNTY REGIONAL FLOOD CONTROL DISTRICT
TECHNICAL PROCEDURE

PROCEDURE NO.: Technical Procedure, TECH-101 EFFECTIVE DATE: January 25, 2006
REVISED: October 11, 2011

PROCEDURE TITLE: Determining Base Flood Elevations in Regulatory Floodplains with Detailed Studies

PURPOSE: An internal procedure for ensuring consistent and uniform determination of the Base Flood Elevation (BFE) in regulatory floodplains mapped with HEC-RAS or FLO-2D analyses for the purpose of establishing the Regulatory Flood Elevation (RFE).

PROCEDURE:

This procedure shall be used by the District to determine the BFE in FEMA Special Flood Hazard Area Zones AE and AH and other floodplains mapped with HEC-RAS or FLO-2D. The methodology for determining the BFE varies between HEC-RAS and other one dimensional models and FLO-2D, as the nature of two-dimensional modeling does not generate straight cross-section lines.

METHOD 1: BFE Determination for Floodplains Mapped with HEC-RAS or other Backwater Analyses (see Exhibit A)

Utilize the appropriate upstream and downstream cross-sections as identified in the Flood Insurance Study (FIS) or Special Study. Make copies of the relevant FIS or Special Study information and create an appropriately scaled image of the subject property from the RFCD MapGuide site with the following information:

A. Aerial photo coverage, to-scale, with scale represented,
B. Relevant cross-sections, with labels,
C. Property boundary, if property is large sufficient info to determine proposed use location

Floodplains included in the FIS study will have data that won't be available in local floodplains from Special Studies, so determining the BFE in AE and AH Zones requires extra steps to be taken, as noted below. Using the information compiled above, determine the BFE through the following method (see Exhibit A):

1) Draw a perpendicular line from the downstream cross-section, through the most upstream portion of the proposed use, to the upstream cross-section.
2) Draw a perpendicular line from the upstream cross-section, through the most upstream portion of the proposed use, to the downstream cross-section.
3) On each cross-section line locate the point that is equidistant between the intersections of the two lines that have been drawn between the cross-sections.
4) Connect these two new points with a third line through the most upstream portion of the proposed use. This is the "Line to Measure Profile"
5) Using the water surface elevations from the cross-sections, interpolate the BFE using the ratio of the distances for each of the lines drawn.

The following additional steps apply to Zones AE and AH,

6) The final BFE shall be compared to the FIS profile in order to ensure that BFE, determined by the method above, is at least as restrictive as the profile elevation.
7) Should the watercourse have additional information, (e.g Upper Canada Del Oro Wash Special Study Area), repeat steps 1 through 5 using the special study elevations.
8) The most restrictive elevations determined by steps 5 through 7 shall be used as the BFE for permitting purposes.

METHOD 2: BFE Determination in Floodplains Mapped with FLO-2D (see Exhibits B and C)

The Technical Data Notebook for each floodplain that is mapped using FLO-2D will have a work map that shows detailed BFE contours. These lines will also be shown on intranet MapGuide applications. This information shall be used to calculate the BFE using the method below.

Make copies of the relevant FIS or Special Study information and create an appropriately scaled image of the subject property from the RFCD MapGuide site with the following information:

A. Aerial photo coverage to-scale, with scale represented,
B. Relevant BFE contours,
C. Property boundary, if property is large sufficient info to determine proposed use location

Floodplains included in the FIS study will have data that won't be available in local floodplains from Special Studies, so determining the BFE in AE and AH Zones requires extra steps to be taken, as noted below. Using the information compiled above, determine the BFE through the following method (see Exhibits B and C):

1) On a work map, draw one or more lines parallel to the general direction of flow from the upstream BFE line through the most upstream portion of the proposed use, to the downstream BFE line. The general direction of flow should be determined by looking at the water surface contours within several hundred feet of the structure, though it may be necessary to determine the general direction of flow from a smaller or larger area depending on local conditions. Higher preference should be given to flow contours upstream from the structure.
    a. If the upstream most portion of the structure is an edge roughly perpendicular to flow, draw three lines, two at the corners and one in the center of the wall.
    b. If the upstream most portion of the structure is a building corner instead of a building side, a single line may be appropriate to determine the BFE.
2) Locate points on the line(s) that touch the upstream portion of the proposed use.
3) Using the point(s), interpolate the base flood elevation(s) using the ratio of the distances for the upstream and downstream BFE lines.
4) Use the highest interpolated elevation as BFE for the proposed use.

The following additional steps apply to Zones AE and AH,

5) The final BFE shall be compared to the FIS profile in order to ensure that BFE, determined by the method above, is at least as restrictive as the profile elevation.
6) The most restrictive elevations determined by steps 4 or 5 shall be used as the BFE for permitting purposes.

After the most conservative BFE is determined from the methods above, add one foot to establish the RFE. The Elevation Certificate must list the most conservative BFE.

The final calculation documents are to be dated and initialed by the person performing the calculation and placed into the permit file. The final documents must be of professional quality (no sticky notes or unlabeled, unsigned calculations).

Upon completion of this determination, all information pertinent to the calculation shall be saved in the permit file for review and concurrence by the permit reviewer prior to permit issuance. In the event that the permit writer and permit reviewer come to different conclusions regarding the BFE determination, the final determination shall be made by the Division Manager.

APPROVED BY:

Suzanne Shields Oct. 11, 2011

Suzanne Shields
Director Date

Original Policy Approved:
Date(s) Revised:

Original Technical Procedure approved: January 25, 2006
Revision dates:

EXHIBIT A

HEC-RAS TYPE CROSS-SECTIONS

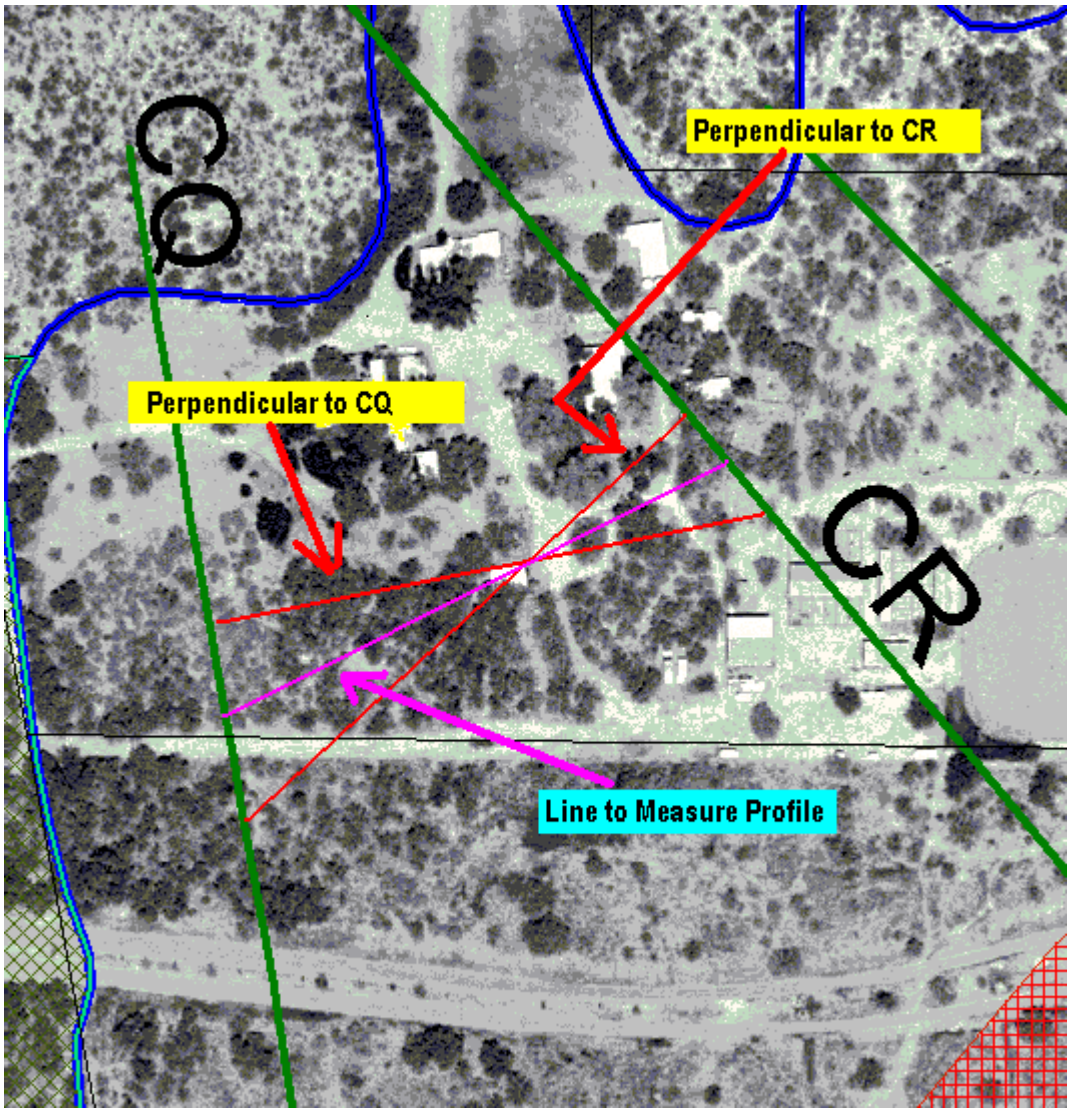

EXHIBIT B

FLO-2D WATER SURFACE CONTOURS

Edge of Structure is Upstream-most Portion of Structure

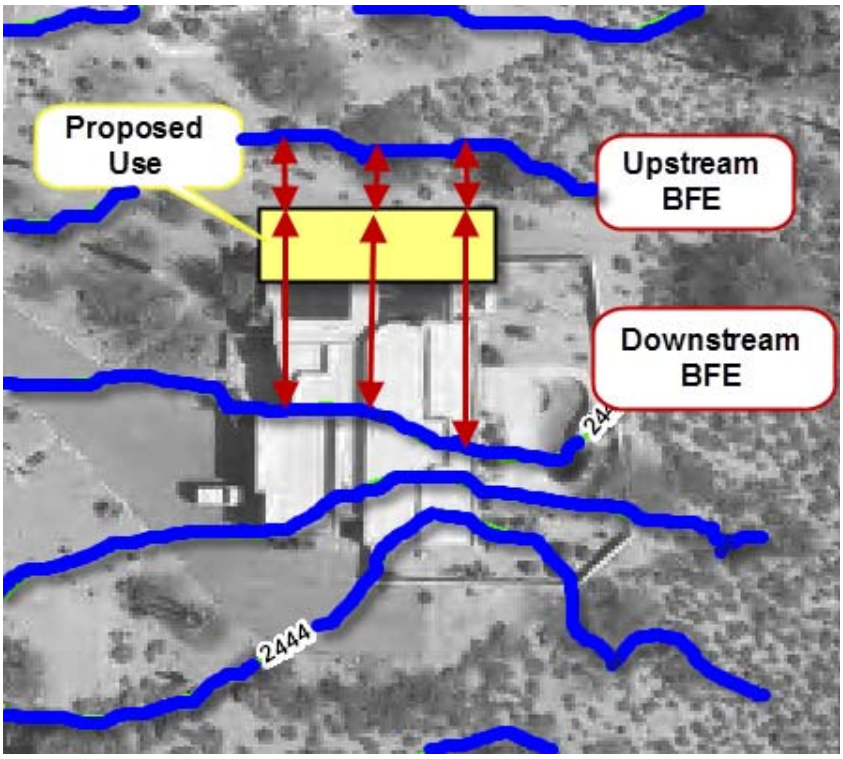

EXHIBIT C

FLO-2D WATER SURFACE CONTOURS

Corner of Structure as Upstream-most Portion of Structure