PIMA COUNTY REGIONAL FLOOD CONTROL DISTRICT
TECHNICAL POLICY

POLICY NO.: Technical Policy, TECH-020 **EFFECTIVE DATE: November 16, 2011**

POLICY TITLE: Engineering Analysis Requirements for Determining an Alternative Safe Erosion Hazard Setback Limit

PURPOSE: To clarify Sections 16.28.020 & 16.28.030 of the Ordinance regarding the requirement for an engineering analysis to determine an alternative safe erosion hazard setback limit, in lieu of the default building setback. These Sections establish that the engineering analysis must be prepared by an Arizona-registered civil engineer, must be based on ADWR and/or other applicable engineering methods, and must be reviewed and approved by the District. This policy is intended to explain the content of an acceptable engineering analysis.

BACKGROUND:

In order to standardize the content and quality of the engineering analyses submitted to the District to support a request for an alternative safe erosion hazard setback, the District established minimum submittal criteria in 1994. These criteria have been revised periodically, with the most recent revision occurring on December 22, 2005. On May 4, 2010, the Board approved substantial revisions to the Ordinance. This policy intends to update the criteria to be consistent with current Ordinance requirements as well as to make relevant updates.

POLICY:

An engineering analysis submitted to the District in support of a request for an alternative safe erosion hazard setback shall consist of an evaluation of the factors affecting lateral erosion potential of the subject watercourse. The evaluation shall have a basis in hydraulic as well as geomorphic arguments, and at a minimum, shall include the following items:

1) Site Plan – The analysis shall include a site plan, drawn to a standard engineering scale, showing the property boundaries, magnitude and direction of the base flood peak discharge (Q_{100}), the bank locations and 100-year floodplain limits of the studied watercourse, the proposed location of the structure(s)/improvement(s), the default erosion hazard setback, and the proposed alternative safe erosion hazard setback determined by the analysis. The site plan shall also contain a note that the structure(s)/improvement(s), as proposed, is/are safe from erosion from lateral migration of the watercourse. The site plan shall be sealed by the engineer of record for the analysis.

2) Hydrology - Unless a recent hydrologic study exists which has been accepted by the District, the analysis shall include a determination of the Q_{100}. The Q_{100} shall be determined using the procedures found in *Technical Policy, TECH-015, Acceptable Methods for Determining Peak Discharges.* If a Q_{100} from an existing hydrologic study is used, the engineering analysis shall reaffirm the Q_{100} as an acceptable value to use for purposes of the analysis, after confirming that the design storm characteristics, the watershed characteristics, and the methodology used to develop the existing study are still acceptable.

3) Hydraulics - Unless a hydraulic modeling exists which has been accepted by the District and which is based on acceptable hydrology, the analysis shall include the determination of the 100-year floodplain limits on the property, along with channel and overbank flow depths and velocities at the project location. The hydraulic analysis shall follow the procedures found in *Technical Policy, TECH-016, Acceptable Methods for Floodplain Delineation.*

4) Soils – The analysis shall provide a description of the physical soil characteristics of the channel and overbank area (e.g. soil classification, consolidated vs. unconsolidated, degree of cementation, rock size and amount), as they pertain to stability of the channel bank and resistance to lateral bank migration.

5) Channel Bank Conditions – The analysis shall provide a basic description of the channel characteristics including, but not limited to, natural channel bank slope and the potential for channel migration as evidenced by the presence, density and age of bank and overbank vegetation, channel alignment, curvature, meander pattern and past lateral channel movement. The District maintains aerial photography dating back to the early 1940s to assist in this evaluation.

6) Unusual Conditions – The analysis shall provide a description of unusual conditions that are present at and in the vicinity of the site. Unusual conditions include but may not be limited to the historical meandering of the watercourse, proximity of large excavation pits, poorly defined or poorly consolidated banks, natural channel armoring, proximity to stabilized structures such as bridges or rock outcrops, and changes in the direction, amount, and velocity of flow (i.e. pronounced bends, and confluence areas).

7) Photographs – The analysis shall include at-ground photographs that are representative of the channel, channel bank, and overbank conditions of the site.

8) Erosion Hazard Setback Calculations – The analysis shall incorporate items 1) through 7) into a recommendation for an alternative safe erosion hazard setback, and this setback shall be supported by at least one of the following methods:

   a. Square-Root of the Discharge method, as implemented by Equations 7.7 or 7.8 of the publication titled: *Standards Manual for Drainage Design & Floodplain Management in Tucson, Arizona*, 7/98; or:

   b. Allowable Velocity, Tractive Stress, or Tractive Power Approach, one of which must demonstrate that the channel bank will not erode during passage of the base flood. Application of these approaches is described in Chapter VII of the publications titled: *Standards Manual for Drainage Design & Floodplain Management in Tucson, Arizona,* and: *State Standard for Watercourse System Sediment Balance,* ADWR, 9/96; or:

   c. A Sediment Transport Analysis, which must demonstrate that an adequate supply of sediment is available within the alternative safe erosion setback limit to satisfy the sediment transport capacity deficit of the base flood hydrograph. This analysis shall justify the calculated transport capacity and incoming sediment load of the hydrograph and the shape of the bank erosional feature which results from passage of the base flood and which establishes the alternative safe erosion hazard setback.

   d. An Effective-Flow Limit Analysis, which determines the limits of flow expansion immediately downstream of a stabilized section of the channel. This analysis is appropriate when the base flood is predominantly confined to the upstream stabilized channel section. For subcritical flow, the expansion ratio shall be justified through Table 5.1 of the publication titled: *HEC-RAS River Analysis System Hydraulic Reference Manual*, V4.1, 1/10, or other source approved by the District. For supercritical flow, the expansion ratio shall be justified by comparison with maximum flare angle for a supercritical flow transition, or other source approved by the District.

9) When an alternative safe erosion hazard setback for the property has been previously justified and accepted by the District, the analysis shall address the previous justification and shall support the proposed change in the setback distance. This may include reconciling previous hydrologic and/or hydraulic calculations, soils evaluations and/or channel stability analyses.

APPROVED BY:

Suzanne Shields 11/16/2011

Suzanne Shields — Date
Director

Original Policy Approved: December 22, 2005
Date(s) Revised: