

Acquisition of Lands Downstream from Spillways and Hydrologic Safety Purposes

No. Circular EC 1110-2-183

**Department of the Army
Office of the Chief Engineers**

15 April 1977

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DEPARTMENT OF THE ARMY
Office of the Chief of Engineers
Washington, D.C. 20314

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EXPIRES 31 MARCH 1978
Engineering and Design
ACQUISITION OF LANDS DOWNSTREAM FROM
SPILLWAYS FOR HYDROLOGIC SAFETY PURPOSES

1. Purpose. This circular provides guidance on the acquisition of lands downstream from spillways for the purpose of protecting the public from hazards imposed by spillway discharges.
2. Applicability. This circular is applicable to all OCE elements and all field operating agencies having Civil Works responsibilities.
3. Discussion. A policy of public safety awareness will be adhered to in all phases of design and operation of dam and lake projects to assure adequate security for the general public in areas downstream from spillways. A real estate interest will be required in those areas downstream of a spillway where spillway discharge could create or significantly increase a hazardous condition. The real estate interest will extend downstream to where the spillway discharge would not significantly increase hazards. A real estate interest is not required in areas where flood conditions would clearly be non-hazardous. Appendix A provides guidance regarding the application of the principles outlined in this circular.
4. Criteria. The construction and operation of a dam and spillway may create or aggravate a potential hazard in the spillway discharge area. Therefore, an appropriate solution should be developed in a systematic manner. All pertinent facts need to be considered to assure that the risk to non-Federal interests does not exceed conditions that would prevail without the project. General hydrologic engineering considerations are as follows:
 - a. Probability of spillway use. Pool elevation versus probability of filling relationships can change materially after initial construction. Spillway use may be more frequent than anticipated. The infrequent use of a spillway is not a basis for the lack of adequate downstream real estate interest.

15 Apr 77

b. Changes in project functions. Water resource needs within river basins change and pool levels may be adjusted to provide more conservation storage, particularly when high-level limited-service spillways are provided. Such changes normally increase spillway use and are to be considered.

c. Volume and velocity of spillway flow. The amount of flow and destructive force of the flow from a spillway during floods up to the spillway design flood can vary from insignificant to extremely hazardous magnitudes. The severity and area of hazard associated with spillway discharge will vary depending on specific project site conditions. Therefore, the hazard is to be analyzed on a project-by-project basis.

d. Development within floodway. If development within the floodway downstream from a spillway is not present at the time of project construction, the existence of the reservoir may encourage development. Adverse terrain conditions do not preclude development. Sparse present development is not a basis for lack of real estate acquisition.

e. Debris movement within floodway. The availability of erodible material in a spillway flow area intensifies the hazards of spillway flow. In fact, debris may be transported to downstream areas that otherwise would not be adversely affected. Extreme erosion may result from high velocities and turbulence. Both debris and erosion must be evaluated.

f. Flood warning and response potential. Small projects generally have short time periods available to warn downstream inhabitants and may be unattended prior to spillway use. The ability to convince individuals to leave most of their worldly possessions to the ravages of spillway flow may be severely limited. In some cases flood warning systems may be necessary, however, this subject is beyond the scope of this circular. Warning systems are not an adequate substitute for a real estate interest in lands downstream of spillways.

g. Alternative land uses. In some cases lands downstream from spillways can be effectively used for purposes other than hydrologic safety. Therefore, the entire cost of these lands may not be an additional project cost. For example, the lands downstream of a spillway may be used for wildlife management essential to project purposes in lieu of other lands suitable for similar purposes at another location.

15 Apr 77

h. Location of spillway. Spillways should be located to minimize the hazards associated with their discharge and the total project cost (cost of spillway structure and downstream lands). Spillways, outlet works, stilling basins and outlet channels should be designed to minimize hazards to downstream interest insofar as is engineeringly and economically reasonable.

5. Real estate. The real estate interest required downstream of spillways will be adequate to assure carrying out project purposes and to protect non-Federal interest from hazards created by spillway flows. In general, the real estate interest should exclude all overnight and/or permanent habitation, structures subject to damage by spillway flows and activities that would increase the potential hazards. Such real estate interest will be required in fee or permanent easement. No real estate interest is required for:

a. Areas where the imposed or aggravated flood condition is non-hazardous. Effected interest should be informed of the nature of the imposed non-hazardous flood condition.

b. Areas where the construction and operation of a dam and spillway does not increase or create a hazardous condition.

6. Reporting. Lands to be acquired downstream from spillways and their intended purposes will be identified and the cost included in feasibility reports and real estate design memorandums. Phase I or II general design memorandum will include specific information in support of acquisition including topographic maps, area flooded maps, velocities, erosion and debris areas with and without the project. Real estate boundaries and discussions of items in paragraph 4 will also be included in Phase I or II GDM's.

7. The contents of this circular will be incorporated into a permanent regulation prior to the expiration date.

FOR THE CHIEF OF ENGINEERS:



MARVIN W. REES
Colonel, Corps of Engineers
Executive Director of Civil Works

1 Appendix
App. A - Guidance

15 Apr 77

APPENDIX A

GUIDANCE

1. For various flood magnitudes up to the probable maximum flood determine the with and without project conditions downstream of a dam spillway for:

Flood depth
Flood duration
Velocities
Debris and erosion

2. Determine the critical flood conditions that could be the most hazardous and/or result in the greatest increase from without to with project flood conditions.

3. For the selected critical flood conditions determine extent of the area where the project could increase and/or create (impose) one or more of the flood conditions.

4. For the selected areas determine where the imposed critical flood conditions would be hazardous and non-hazardous. Non-hazardous areas are defined as those areas where:

Flood depths are a maximum of 2 feet in urban and rural areas.

Flood depths are essentially non-damaging to urban property.

Flood durations are a maximum of 3 hours in urban areas and 24 hours in agricultural areas.

Velocities do not exceed 4 feet/per second.

Debris and erosion potentials are minimal.

Imposed flood conditions would be infrequent. That is, exceedence frequency should be less than 1%.

Hazardous areas are those where any of the above criteria are exceeded.

5. Based upon the information developed above and the principles outlined in paragraphs 3, 4 and 5 of the circular, decide on the extent of area and estate required for hydrologic safety purposes.

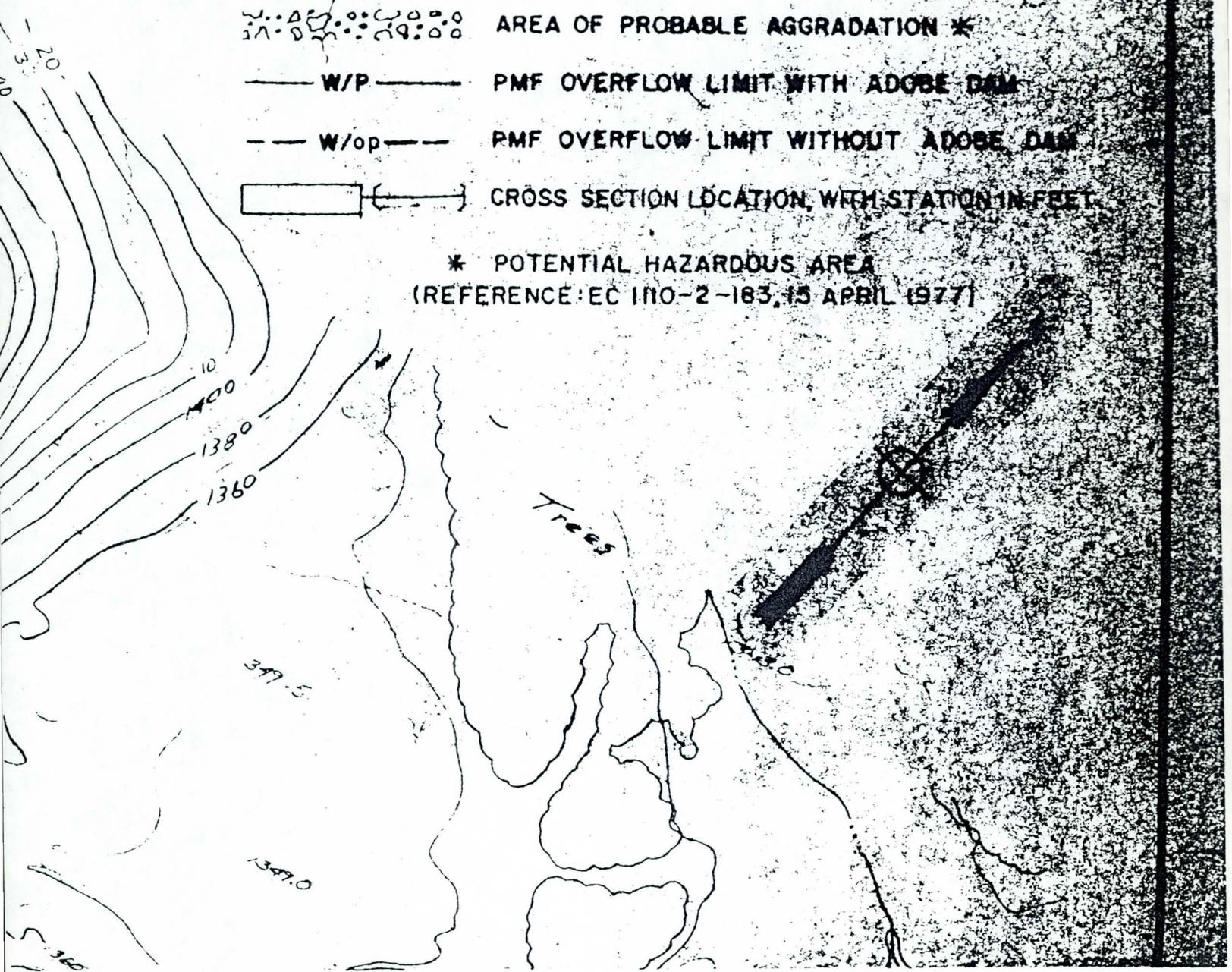
6. Explain decisions and the rationale leading to decisions. Present data in support of the decisions and rationale using maps, charts and tables along with explanations of the data and assumptions.

7. The guidance in this appendix is general in nature and is subject to review and interpretation on a project-by-project basis.

LEGEND

-  VELOCITY GREATER THAN 4 F.P.S. *
-  DEPTH GREATER THAN 2 FEET *
-  AREA OF PROBABLE EROSION *
-  AREA OF PROBABLE AGGRADATION *
-  PMF OVERFLOW LIMIT WITH ADOBE DAM
-  PMF OVERFLOW LIMIT WITHOUT ADOBE DAM
-  CROSS SECTION LOCATION, WITH STATION IN FEET

* POTENTIAL HAZARDOUS AREA
(REFERENCE: EC 110-2-163, 15 APRIL 1977)



When recorded, return to
Flood Control District of
Maricopa County
3335 West Durango Street
Phoenix, Arizona 85009

EASEMENT AND AGREEMENT FOR FLOOD CONTROL PURPOSES

Project _____

Item _____

Assessor Parcel _____

_____, Grantor(s),
FOR AND IN CONSIDERATION of the sum _____ and other valuable
considerations, the receipt and sufficiency of which are hereby
acknowledged, do(es) hereby grant and convey to the FLOOD CONTROL
DISTRICT OF MARICOPA COUNTY, a municipal corporation and political
subdivision of the State of Arizona, its successors and assigns,
Grantee,

THE perpetual and assignable right, power, privilege and easement
occasionally to overflow, flood and submerge (and to maintain mosquito
control) in connection with the operation and maintenance of a flood
control project, the land described as follows:

TOGETHER with all right, title and interest in and to the structures
and improvements now situated on the land, except _____

PROVIDED that no structures for human habitation shall be constructed
or maintained on the land; and provided further that no other
structures shall be constructed or maintained on the land except as may
be approved in writing by the Grantee, and that no excavation shall be
conducted and no landfill placed on the land without such approval as
to the location and method of excavation and/or placement of landfill;

SAID INTERESTS ARE GRANTED SUBJECT, however, to existing esements for
public roads and highways, public utilities, railroads and pipelines,
and the following: _____;

RESERVING, however, to the Grantor(s), their heirs, and assigns, such
rights and privileges as may be used and enjoyed without interfering
with or abridging the rights and easement hereby granted; provided that
any use of the land by the Grantor(s), their heirs, and assigns shall
be subject to Federal, State and local laws and ordinances with respect
to pollution and land use.

TO HAVE AND TO HOLD the said rights and easement unto the Grantee, its
successors and assigns, FOREVER.

