

## Chapter 18 Real Estate and Right-of-Way Studies

### 18-1. Introduction

*a. General.* This chapter provides guidance on the application of hydrologic engineering principles to determine real estate acquisition requirements for reservoir projects. Topics include selection of the analysis method, potential problems, evaluation criteria, and references associated with the acquisition of real estate for reservoir projects developed by the Corps of Engineers.

*b. Related documents.* Real estate reporting requirements associated with feasibility reports, General Design Memoranda, and Real Estate Design Memoranda are set forth in ER 405-1-12. Real estate reporting requirements associated with the acquisition of lands downstream from spillways are set forth in ER 1110-2-1451, paragraph 9.

### 18-2. Definition of Terms

A list of terms and definitions used in this chapter is as follows:

*a. Project design sediment.* The volume and distribution of sediment deposited in a reservoir over the life of the project.

*b. Land acquisition flood.* A hypothetical or recorded flood event used to determine requirements for real estate acquisition.

*c. Full pool.* The maximum reservoir elevation for storing water for allocated project purposes.

*d. Induced surcharge.* Storage created in a reservoir above the top of flood control pool by regulating outflows during flood events.

*e. Envelope curve.* A curve which connects the high points of intersection of preproject and postproject water-surface profiles.

*f. Guide taking line.* A contour line used as a guide for land acquisition in the reservoir area. (Also referred to as the guide contour line or guide acquisition line.)

### 18-3. Real Estate Acquisition Policies for Reservoirs

*a. Basic policies.* Basic policies and procedures related to the acquisition of lands for reservoirs are presented in ER 405-1-12. Paragraph 2-12 of ER 405-1-12 states that, "Under the Joint Policy the Corps will take an adequate interest in lands, including areas required for public access, to accomplish all the authorized purposes of the project and thereby obtain maximum public benefits therefrom." Paragraph 2-12.a(2) further states that land to be acquired in fee shall include, "lands below a guide contour line...established with a reasonable freeboard allowance above the top pool elevation for storing water for flood control, navigation, power, irrigation, and other purposes, referred to in this paragraph as "full pool" elevation. In nonurban areas generally, this freeboard allowance will be established to include allowances for induced surcharge operations plus a reasonable additional freeboard to provide for adverse effects of saturation, wave action and bank erosion."

*b. Considering factors.* Factors such as estimated frequency of occurrence, probable accuracy of estimates, and relocation costs will be taken into consideration. Where freeboard does not provide a minimum of 300 ft horizontally from the conservation pool, defined as the top of all planned storage not devoted exclusively to flood-control storage, then the guide acquisition line will be increased to that extent. In the vicinity of urban communities or other areas of highly concentrated developments, the total freeboard allowance between the full pool elevation and the acquisition line may be greater than prescribed for nonurban areas generally. Also, there should be sufficient distance to assure that major hazards to life or unusually severe property damages would not result from floods up to the magnitude of the SPF. In such circumstances, however, consideration may be given to easements rather than fee acquisition for select sections if found to be in the public interest. However, when the project design provides a high level spillway, the crest of which for economy of construction is considerably higher than the storage elevation required to regulate the reservoir design flood, the upper level of fee acquisition will normally be at least equal to the top elevation of spillway gates or crest elevation of ungated spillway, and may exceed this elevation if necessary to conform with other criteria prescribed.

#### 18-4. Hydrologic Evaluations

*a. Development of land acquisition flood.* To establish a reasonable surcharge allowance above the top pool elevation, a land acquisition flood, which includes the effects of any upstream reservoirs, should be selected and routed through the project to determine the impact on the establishment of the guide acquisition line.

*b. Nonurban areas.* In nonurban areas, the land acquisition flood should be selected from an evaluation of a range of floods with various frequencies of occurrence. The impact of induced surcharge operations on existing and future developments, hazards to life, land use, and relocations must be evaluated. The land acquisition flood will be chosen based on an evaluation of the risk and uncertainty associated with each of these frequency events. Basic considerations to be addressed during the land acquisition flood selection process should include the credibility of the analysis, identification and significance of risk, costs and benefits, and legal, social, and political ramifications.

*c. Urban areas.* In urban areas or other areas with highly concentrated areas of development, the SPF will be used for the land acquisition flood.

*d. Project design sedimentation volume.* Project capacity data should be adjusted for projected sediment volumes when routing the land acquisition flood. Project design sediment should be based on appropriate rates of sedimentation for the project area for the life of the project.

#### 18-5. Water Surface Profile Computations

*a. Backwater model development.* A basic backwater model should be developed for the project area from the proposed flat pool area through the headwater area where impacts of the proposed reservoir are expected to be significant. The model should reflect appropriate cross-sectional data and include parameters based on historical flood discharges and high water marks. EM 1110-2-1416 presents the model requirements and calibration procedures.

*b. Preproject profiles.* A series of preproject water surface profiles should be developed utilizing preproject cross-section geometry, calibrated Manning's "n" values, and appropriate starting water surface elevations for the initial cross section. Flow rates used in the water surface profile computations should be selected from the peak and recession side of the land acquisition flood hydrograph.

*c. Postproject profiles.* A series of water surface profiles shall be developed utilizing the postproject cross sections which are adjusted to reflect project design sedimentation over the life of the project. Manning's roughness coefficients are based on adjusted preproject roughness coefficients to account for factors such as vegetation and land use changes which decrease hydraulic conveyance. Agricultural lands existing in the headwater areas prior to land purchases will likely revert to forested areas some years after the reservoir is filled. Preproject flow rates and coincident reservoir pool elevations from land acquisition flood routing should be used to compute postproject profiles.

*d. Project design sedimentation distribution.* Post-project cross-section geometry must be adjusted to reflect the impacts of sedimentation over the life of the project. Sedimentation problems associated with reservoir projects and methods of analysis to address sediment volumes and distributions are given in Chapter 5 of EM 1110-2-4000.

#### 18-6. Development of an Envelope Curve

The development of an envelope curve is based on pre-project and postproject water-surface profiles. A selected discharge from the land acquisition flood is used to compute a preproject and a postproject profile. A point of intersection is established where the profiles are within 1 ft of each other. The point of intersection is placed at the elevation of the higher of the two profiles. A series of points of intersection are derived from water-surface profile computations utilizing a range of selected discharges from the land acquisition flood. A curve is drawn through the series of points of intersection to establish the envelope curve.

#### 18-7. Evaluations to Determine Guide Taking Lines (GTL)

*a. Land acquisition flat pool.* The land acquisition flat pool of a reservoir project is established by the maximum pool elevation designated for storing water for allocated project purposes to include induced surcharge storage and is not impacted by the backwater effects of main stream or tributary inflows. In flat pool areas, the elevations of the GTL are based on the flat pool elevation and a freeboard allowance to account for adverse effects of saturation, bank erosion, and wave action.

*b. Headwater areas.* In headwater areas, the GTL may be based on the envelope curve elevations and appropriate allowances to prevent damages associated with saturation, bank erosion, and wave action.

c. *Flood-control projects.* The selection of an appropriate land acquisition flood for flood-control projects located in rural areas should be based on an elevation of a range of frequency flood events. The land acquisition flood selection for flood-control projects in rural locations must include regulation by upstream reservoirs and reflect postproject conditions which minimize adverse impacts within the project area resulting from induced flood elevations and duration of flooding. In highly developed areas along the perimeter of flood-control projects, the SPF should be used for land acquisition. An envelope curve can be developed from the land acquisition flood routings and water-surface profile computations for preproject and postproject conditions. The land acquisition GTL may be established from the envelope curve and appropriate allowances for reservoir disturbances.

d. *Nonflood-control projects.* Nonflood control projects may be any combination of purposes such as water supply, hydropower, recreation, navigation and irrigation. The land acquisition flood selection process for nonflood-control projects located in rural areas is based on an evaluation of a range of frequency floods and is used to determine postproject flood elevations and duration of flooding in the project area. As with flood-control projects, regulation of flows by upstream reservoirs must be incorporated in the development process. The land acquisition flood used to evaluate real estate acquisitions in rural areas should reflect postproject conditions which minimize adverse impacts. The land acquisition flood for developed areas should be the SPF. The maximum pool elevation designed for storing water for allocated project purposes is used in the development of the land acquisition flood routing. An envelope curve based on preproject and postproject water-surface profiles utilizing project design sedimentation and distribution should be developed. The envelope curve and appropriate allowances for reservoir disturbances may be used to establish the land acquisition GTL.

### **18-8. Acquisitions of Lands for Reservoir Projects**

Land acquisition policies of the Department of the Army governing acquisition of land for reservoir projects is published in ER 405-1-12, Change 6, dated 2 January 1979. Paragraph is as follows:

*Joint Land Acquisition Policy for Reservoir Projects.*  
*The joint policies of the Department of the Interior and Department of the Army, governing the acquisition of land for reservoir projects, are published in the Federal*

*Register, dated 22 February 1962, Volume 27, page 1734. On July 1966, the Joint Policy was again published in 31, F.R. 9108, as follows:*

#### **JOINT POLICIES OF THE DEPARTMENTS OF THE INTERIOR AND OF THE ARMY RELATIVE TO RESERVOIR PROJECT LANDS**

*“A joint policy statement of the Department of the Interior and the Department of the Army was inadvertently issued as a notice in 27 F.R. 1734. Publication should have been made as a final rule replacing regulations then appearing in 43 CFR part 8. The policy as it appears in 27 F.R. 1734 has been the policy of the Department of the Interior and the Department of the Army since its publication as a Notice and is now codified as set forth below.*

#### Section

- 8.0 *Acquisition of lands for reservoir projects*
- 8.1 *Lands for reservoir construction and operation*
- 8.2 *Additional lands for correlative purposes*
- 8.3 *Easements*
- 8.4 *Blocking out*
- 8.5 *Mineral rights*
- 8.6 *Building*

*Authority: The provisions of this Part 8 issued under Sec. 7, 32 Stat., 389, Sec. 14, 53 Stat. 1197, 43 U.S.C. 421, 389.*

*8.0 Acquisition of Lands for Reservoir Projects.*  
*Insofar as permitted by law, it is the policy of the Departments of the Interior and of the Army to acquire, as a part of reservoir project construction, adequate interest in lands necessary for the realization of optimum values for all purposes including additional land areas to assure full realization of optimum present and future outdoor recreational and fish and wildlife potentials of each reservoir.*

*8.1 Lands for Reservoir Construction and Operation.*  
*The fee title will be acquired to the following:*

a) *Lands necessary for permanent structures.*

b) *Lands below the maximum flowage line of the reservoir including lands below a selected freeboard where necessary to safeguard against the effects of saturation, wave action, and bank erosion and to permit induced surcharge operation.*

c) *Lands needed to provide for public access to the maximum flowage line, as described in Paragraph 1b, or for operation and maintenance of the project.*

8.2 Additional Lands for Correlative Purposes. *The fee title will be acquired for the following:*

a) *Such lands as are needed to meet present and future requirements for fish and wildlife as are determined pursuant to the Fish and Wildlife Coordination Act.*

b) *Such lands as are needed to meet present and future public requirements for outdoor recreation, as may be authorized by Congress.*

8.3 Easements. *Easements in lieu of fee title may be taken only for lands that meet all of the following conditions:*

a) *Lands lying above the storage pool,*

b) *Lands in remote portions of the project area,*

c) *Lands determined to be of no substantial value for protection or enhancement of fish and wildlife resources, or for public outdoor recreation,*

d) *It is to the financial advantage of the Government to take easements in lieu of fee title.*

8.4 Blocking Out. *Blocking out will be accomplished in accordance with sound real estate practices, for example, on minor sectional subdivision lines: and normally, land will not be acquired to avoid severance damage if the owner will waive such damage.*

8.5 Mineral Rights. *Mineral, oil and gas rights will not be acquired except where the development thereof would interfere with project purposes, but mineral rights not acquired will be subordinated to the Government's right to regulate their development in a manner that will not interfere with the primary purposes of the project, including public access.*

8.6 Buildings. *Buildings for human occupancy as well as other structures which would interfere with the operation of the project for any project purpose will be prohibited on reservoir project lands."*

## **18-9. Acquisition of Lands Downstream from Spillways for Hydrologic Safety Purposes**

a. *General.* A real estate interest will be acquired downstream of dam and lake projects to assure adequate security for the general public in areas downstream from spillways. Real estate interests must be obtained for downstream areas where spillway discharges create or significantly increase a hazardous condition.

b. *Evaluation criteria.* Combinations of flood events and flood conditions which result in a hazardous condition or increase the hazard from the preproject to postproject flood conditions are determined for areas downstream from the spillway. These combinations of flood events and flood conditions are identified as critical conditions.

c. *Flood events and conditions.* Flood events up to the magnitude of the spillway design flood are evaluated for preproject and postproject conditions for areas downstream from the spillway. Flood conditions to be analyzed include flooded area, depth of flooding, duration, velocities, debris, and erosion.

d. *Hazardous and nonhazardous conditions.* The imposed critical conditions are analyzed to determine if these conditions are hazardous or nonhazardous. Non-hazardous areas are characterized by the following criteria:

(1) Flood depths do not exceed 2 ft in urban and rural areas.

(2) Flood depths are essentially nondamaging to urban property.

(3) Flood durations do not exceed 3 hr in urban areas and 24 hr in agricultural areas.

(4) Velocities do not exceed 4 fps.

(5) Debris and erosion potential are minimal.

(6) Imposed flood conditions would be infrequent. The exceedance frequency should be less than 1 percent.