

**SOUTH
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TECHNICAL NOTE

Subject: WATERSHED PLANNING

Series No.: 1701

Reference: Planning Multiple-Purpose Reservoirs

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RE: Planning Multiple-Purpose Reservoirs

Multiple-purpose reservoirs are often the most desirable means of satisfying component needs for flood control, municipal and industrial water supply, irrigation, recreation, fish and wildlife development, and other types of water management in watershed projects. The inclusion of multiple-purpose structures in watershed projects requires coordinated effort on the part of the Soil Conservation Service (SCS) and the local sponsors. Early understanding of the responsibilities of all parties is necessary for efficient use of planning resources, to assist sponsors and other publics in making planning decisions concerning the proposed reservoir, and to insure that sponsors are adequately prepared to meet financial obligations for their share of project costs.

Studies conducted during the planning of multi-purpose reservoirs must be in the detail necessary to insure that the requirements of all federal, state, and local laws and regulations are met. Cost estimates, land rights, and relocation requirements should be developed in sufficient detail so that significant changes will not be required during the operations stage. This requires that structure proportioning and site planning to include spillway and embankment layout, reservoir design elevations, and the location of borrow areas, recreation areas, pumping plants or other water supply outlets, onsite treatment plants, and access roads be finalized during plan development.

TSC staff input is encouraged on studies for multiple-purpose sites before estimates of cost, land rights requirements, and expected benefits are discussed with sponsors. State conservation engineers and planning staff leaders working closely with the TSC staff and with consultants hired by the sponsors helps to insure the adequacy of studies and resulting proposals for multiple-purpose structures. TSC concurrence should be obtained as soon as sufficient studies have been made to evaluate the proposal.

Cost sharing and other responsibilities for multiple-purpose structures vary depending on the specific purposes for which storage is provided. The sponsors are responsible for developing those features of the plan relating to storage for municipal and industrial (M&I) water supply or water for other nonagricultural water management purposes, excluding recreation and fish and wildlife. Studies for these purposes are made by the sponsors' staff or by consultants. Technical studies required for developing plan features relating to flood prevention, agricultural water management, recreation, and fish and wildlife may be accomplished by SCS. Studies made by SCS to plan cost shared water storage should be made available to the sponsors for their use in determining site suitability and other factors pertaining to M&I and other non-cost shared storage. The SCS planning staff will normally prepare alternative watershed plans using the results of studies done by both SCS and the sponsors.

The appendices to this Technical Note were developed to assist SCS planning staffs, project sponsors, and consultants in planning multiple-purpose reservoirs. Appendices A and B outline the specific responsibilities of the SCS and the sponsors for planning structures containing M&I water. They are generally applicable to planning storage for other non-cost shared purposes. Appendix C is an outline of the technical studies needed to plan a structure with beneficial permanent water storage.

Attached as part of this Technical Note:

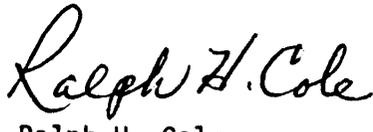
Appendix A - Sponsors' Responsibilities for Planning Structures Containing Municipal and Industrial Water Storage

Appendix B - SCS Responsibilities for Planning Structures Containing Municipal and Industrial Water Storage

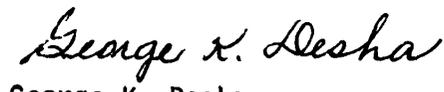
Appendix C - Supporting Data for Multiple-Purpose Structures Containing Water Storage for Beneficial Use


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Attachments (3)

APPENDIX A - SPONSOR'S RESPONSIBILITIES FOR PLANNING STRUCTURES
CONTAINING MUNICIPAL AND INDUSTRIAL WATER STORAGE

In order that measures for municipal or industrial water supply be eligible for inclusion in SCS assisted projects, the sponsoring local organization must provide the data and services listed below. The planning stage at which these items will be required may vary depending on the complexity of the site.

1. Provide, without reimbursement by SCS, professional engineers or other technical specialists as required by the Soil Conservation Service to develop the features of a watershed plan relating to municipal or industrial water supply.
2. Present satisfactory evidence that the proposed water supply will be adequate in quantity and quality to meet the anticipated needs, and that the site has the ability to hold water. This evidence should be based on investigations which include the following:
 - a. Capability of the reservoir to hold water. Sufficient geological investigations and soil analyses are to be made to determine the expected seepage losses. Strata or zones of permeable, cavernous, soluble (e.g., gypsum), and fractured or jointed materials are to be identified, mapped, and tested, and their effects on the functioning of the reservoir evaluated.
 - b. Reliability of the water supply. A water budget or reservoir operation study usually is required. Yield, evaporation, downstream release requirements, seepage losses, and demand are some of the factors that must be evaluated.
 - c. Quality of the water. Studies of the drainage area and of contributing or potentially contributing ground and surface water sources may be required to be sure that the quality of the water stored is suitable for the planned purposes.
3. Evaluate the monetary benefits and present satisfactory evidence in support of the evaluation. Show that there is no less expensive alternative for meeting the water supply needs. Consideration of all induced, installation, operation, and maintenance costs must be included.
4. Present satisfactory evidence that rights are held or can be obtained for the quantity, seasonal use, and storage of water to supply the contemplated needs.

5. Present satisfactory assurances that the owners of water rights are agreeable to such changes, exchanges, waivers, or modifications of their rights as may be required for the effective functioning of the contemplated improvements.
6. Present satisfactory assurances that it has the funds available or financial capacity to meet its share of the installation costs for the contemplated improvements or to repay a loan for such costs.
7. Furnish a written statement for inclusion in the plan that they intend to make use of any water provided for future use within the life period of the reservoir, when applicable.
8. Present satisfactory assurances that 50 percent of the land above each retention reservoir, involving storage of municipal or industrial water supply, will be covered by conservation agreements.
9. Participate with SCS in preparing preliminary designs and cost estimates for the structure. Agreements on designs and cost estimates should be in writing. Recommendations will be made for all features of the reservoir and dam, along with cost estimates for all features included specifically for M&I water, such as raw water intakes, pipelines, and treatment plants.
10. Evaluate environmental impacts associated with water supply aspects of the proposed project.

APPENDIX B - SCS RESPONSIBILITIES FOR PLANNING STRUCTURES
CONTAINING MUNICIPAL AND INDUSTRIAL WATER STORAGE

In carrying out joint studies of proposed municipal and industrial water supply sites, the Soil Conservation Service will provide the data and services listed below. The planning stage at which these items will be required may vary depending on the complexity of the site.

1. Make sufficient surveys, investigations, and analyses to determine if a safe dam can be constructed at a reasonable cost.
2. Make a topographic map of the entire reservoir area, including the emergency spillway and damsite.
3. Prepare the area-capacity curve for the reservoir.
4. Determine the capacity needed to store the sediment that will accumulate in the reservoir during the design life.
5. Determine the capacity needed for temporary storage of floodwater or other cost-shared purposes.
6. Acquaint the sponsors or their consultants with all elements of the work they are to perform and Service policy regarding project formulation and feasibility.
7. Make available to the sponsor or consultant all basic data collected. This will include any reports, boring logs, preliminary designs, cost estimates, and environmental assessments compiled by the Service during its investigation of the site. When such data are used by the consultant, he is responsible for recommendations based wholly or in part on SCS data.
8. Work with the sponsors or their consultants to insure maximum exchange of procedural information and data.
9. Review the completed work of the consultant and concur in the reasonableness of the conclusions reached.
10. Combine the studies made by the sponsors with the information developed by SCS for inclusion in a preliminary investigation report. This will include preparation of preliminary designs and cost estimates for the structure with municipal and industrial water storage included. After selection of an alternative containing the proposed structure, proceed with the preparation of the draft plan.

11. Make the environmental assessment and environmental impact statement when required. Information relating to the M&I purpose will be furnished by the sponsors.
12. Prepare a land rights work map for the selected structure.

APPENDIX C - DATA FOR PLANNING MULTIPLE-PURPOSE
STRUCTURES WITH STORAGE FOR BENEFICIAL USE

This outline will serve as a general guide for data needed for planning multiple-purpose reservoirs. It covers that information not routinely gathered by SCS for single purpose floodwater retarding sites and should be modified to fit the planning situation at each site. Studies should be made as required to provide a basis for making planning decisions and to satisfy policy and legal requirements.

The sponsors are responsible for making all studies relating to M&I or other non-cost shared storage while SCS is responsible for all planning studies for storage for cost shared purposes. The studies will be made as needed during the planning process. Extensive data collection and analysis should take place only after a component need for beneficial water storage has been established and after there appears to be suitable sponsorship.

I. Data Requirements - Geology

- A. A geologic map, with representative geologic sections of the structure and spillway foundations and the reservoir basin. The map should illustrate the location of different geologic materials, ground water tables, and pervious conditions conducive to reservoir seepage losses.
- B. Descriptions of geologic materials, ground water tables, and other pervious conditions with logs of test holes and permeabilities of seepage zones within the structure's foundation and reservoir below the top elevation of the water supply impoundment.
- C. Evaluation of water losses (seepage) and the resulting impacts on reservoir stage and area per day, week, or month.
- D. Evaluation of changed ground water conditions and the resulting impacts on land, cultural and structural works, or natural features within the area of influence around and under the proposed impoundment.
- E. Descriptions of evaluation methods, records of computations, and data used as a basis for conclusions.

II. Data Requirements - Engineering

(See Engineering Memo 80 for policy with respect to determining site suitability for storing permanent water).

- A. Seepage rates without treatment and after treatment, if appropriate.

- B. Water - budgets. When site studies are done by SCS, the SCS Reservoir Operation Study (RESOP) program described in the SCS ADP users guide will be used. This program is available for use by the sponsors or consultants when they are responsible for the water budget study.
- C. Plans for supporting facilities for the use of stored water. Such plans should be in sufficient detail to support plan formulation and the estimates of landrights, construction, and operation and maintenance costs for measures cost shared under PL-566. Examples of support facilities which may be applicable are:

Cost Shared Purposes

- Recreation facilities
- Fish and Wildlife facilities
- Irrigation facilities
 - pumping plants
 - withdrawal works
 - transmission & distribution systems

M&I (Non-Cost Shared)

- Withdrawal system
- Raw Water transmission lines
- Treatment plants, distribution lines, and storage facilities required to handle water from the new source.

- D. Installation and OM&R cost estimates. Level of detail will vary depending on the planning stage and the use to be made of the estimates. Cost estimates needed for the allocation of costs to purpose are covered in Section V of this outline.
 - 1. Preliminary feasibility studies are usually made during the preliminary investigation stage of planning to determine (a) if storage in a multi-purpose reservoir is the most desirable method of meeting a water need and (b) whether the expected cost is reasonable for the expected use. Cost estimates for feasibility studies usually can be developed utilizing existing data, experience on similar projects, and general knowledge of the area.
 - 2. Detailed cost estimates are made during the detailed planning stage for the selected alternative or for those several alternatives showing greatest promise for selection. Estimates should be of the degree of accuracy necessary to avoid significant changes in final design.

III. Data Requirements - Water Quality

(See Environmental Memorandum 16 and Technical Release Number 58 for guidance in water quality assessment for multi-purpose structures).

- A. Map of the reservoir drainage area showing...
 - 1. Structure location
 - 2. Pool area

3. Potential pollutant sources
 4. Water quality sampling locations
 - B. Applicable water quality regulations.
 - C. Tabulation of water quality data.
 - D. Pertinent observations made during water quality sampling and analysis.
 - E. Technical reference for laboratory and field procedures used to analyze water quality parameters.
 - F. A copy of any agreement or contract used to secure water quality data from sources outside SCS.
 - G. All calculations, plots, and other applicable analyses.
 - H. Conclusions.
 - I. Recommendations (e.g. - pollution control techniques to protect the impounded water).
- IV. Data Requirements - Waste Management
(Applicable when waste sources have been identified which have the potential of adversely impacting water quality).
- A. Off-site waste sources
 1. Location of waste source on a map of the drainage area of the reservoir.
 2. Description of the type and magnitude of the waste source.
 3. Alternatives considered to reduce the waste load to the reservoir.
 4. Methodology and calculations used to evaluate water quality impacts of the waste management alternatives.
 5. Agreements between SCS and the sponsors or others with respect to reducing the waste load to the reservoir.
 - B. On-site waste sources (e.g. - basic recreation facilities)
 1. Source, quantity, and quality of wastes.
 2. Calculations, including cost analysis, used in the formulation of a waste management plan.
 3. Copies of appropriate regulations, correspondence or other documentation of the concurrence by the state regulatory agency in the waste management plan.

V. Data Requirements - Economics

A. M&I Water (See Chapter 8 of Economics Guide).

1. From Sponsors

- a. Water Supply Needs - Analysis of future needs based on population and water use projections.
- b. Benefit evaluation for M&I. Usually based on least costly single purpose alternative, including construction engineering, land rights, relocation payments, and operations, maintenance and relocation costs.
- c. Cost estimates of single purpose, for M&I water, features of the multiple-purpose structure, i.e., water release facility including tower and outlet pipe.
- d. Land rights and administration cost estimates of multiple-purpose structure.

2. From SCS

- a. Estimated cost of the multiple-purpose structure.
- b. Estimated cost of the multiple-purpose structure with each purpose omitted.
- c. Benefit evaluations for flood prevention, agricultural water management, and recreation purposes as applicable.
- d. Cost allocations.
- e. Administration costs for project.

B. Recreation or Fish & Wildlife (See Chapter 9 of Economics Guide)

1. From Sponsors

- a. Land rights cost estimates for multiple purpose structure.
- b. Administration costs for project.
- c. Recreation or Fish and Wildlife facilities plan if applicable.

2. From SCS

- a. Estimated cost of the multiple-purpose structure.
- b. Estimated cost of the multiple-purpose structure with each purpose omitted.

- c. Benefit evaluations for flood prevention, agricultural water management, and recreation.
 - d. Estimated cost of least costly single purpose alternative.
 - e. Cost allocations.
 - f. Administration cost for project.
 - g. Recreation demand or need.
 - h. Recreation or Fish and Wildlife facilities plan if applicable.
- C. Agricultural Water Management (See Chapter 6 and 7 of Economics Guide).
- 1. From Sponsors
 - a. Land rights costs for multiple-purpose structure.
 - b. Administration costs for project.
 - 2. From SCS
 - a. Estimated cost of the multiple-purpose structure.
 - b. Estimated cost of the multiple-purpose structure with each purpose omitted.
 - c. Benefit evaluation for flood prevention, agricultural water management, and other cost shared purposes.
 - d. Estimated cost of least costly single purpose alternative.
 - e. Cost allocations.

VI. Other Studies (Examples)

- A. Induced population shifts or changes attributable to water supply features. This may include potential for new industry moving into an underdeveloped area and the resulting shift of work force.
- B. Expected changes in water and air quality resulting from new industry developed as a result of an increased water supply.
- C. Inventory of environmental effects due to installation of water supply features such as pipelines, pumping plants, and treatment facilities and a description of any planned measures to minimize adverse effects.