NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD

IRRIGATION SYSTEM, TAILWATER RECOVERY

(No.)

Code 447

DEFINITION

A planned irrigation system in which all facilities utilized for the collection, storage, and transportation of irrigation tailwater and/or rainfall runoff for reuse have been installed.

PURPOSE

This practice may be applied as part of a conservation management system to support one or more of the following:

- Conserve irrigation water supplies.
- Improve offsite water quality.
- Reduce energy use.

CONDITIONS WHERE PRACTICE APPLIES

Tailwater recovery systems are suitable for use on lands and facilities served by a properly designed and installed irrigation system where recoverable irrigation runoff and/or rainfall runoff flows can be anticipated under current or expected management practices.

This standard applies to the planning and functional design of irrigation tailwater recovery systems including, but not limited to, pickup ditches, sumps, collecting basins or reservoirs, pumping plants, and pipelines. It does not apply to detailed design criteria or construction specifications for individual structures or components of the recovery system.

CRITERIA

General Criteria Applicable To All Purposes

The installation and operation of a tailwater recovery system shall comply with all Federal, state and local laws, rules and regulations.

Impact to cultural resources, wetlands and Federal and state protected species shall be evaluated and avoided or minimized to the extent practicable during planning, design and implementation of this conservation practice in accordance with established National and Florida policy, General Manual (GM) Title 420-Part 401; Title 450-Part 401, Title 190-Parts 410.22 and 410.26, National Planning Procedures Handbook (NPPH) Florida Supplements to Parts 600.1 and 600.6, National Cultural Resources Procedures Handbook (NCRPH), National Food Security Act Manual (NFSAM), and the National Environmental Compliance Handbook (NECH).

Design and construct facilities needed for a tailwater recovery system according to appropriate Florida NRCS standards and specifications. The criteria for the design of components not addressed in a Florida NRCS conservation practice standard shall be consistent with sound engineering principles and practices.

Collection facilities. Facilities for the collection of irrigation tailwater can be an integral part of irrigation systems covered by Florida NRCS conservation practice standards Irrigation System, Sprinkler, Code 442 and Irrigation System, Surface and Subsurface, Code 443. These facilities may include, but are not limited to ditches, culverts, pipelines, water control

and/or grade stabilization structures or other erosion control measures, as needed.

Storage facilities. Facilities are needed to store the collected water until it is redistributed in the irrigation system. Runoff volume and rate, as well as the required level of water control at the point where the tailwater is returned to the irrigation system should be considered in determining the size of the storage facility.

Small sumps with frequently cycling pumping plants may be used for systems where tailwater is discharged into a collecting basin or irrigation reservoir (Florida NRCS conservation practice standard Irrigation Reservoir, Code 436), or into a pipeline having facilities for regulating fluctuating flows (i.e. a float valve). For systems unable to regulate flows, size tailwater sumps or reservoirs large enough to provide the regulation needed to permit efficient use of the water.

When energy sources for tailwater systems are subject to interruption, safe emergency bypass areas cannot be provided, or tailwater discharges violate local or state regulations, tailwater storage requirements shall, as a minimum, include a volume adequate to store the entire runoff from a single irrigation cycle.

Sumps, collecting basins, and reservoirs with inlets designed to protect the side slopes and the collection facilities from erosion. Provide a dike, ditch, water control structure or other structure if needed, to limit the entrance of rainfall runoff into the designed inlet. Install sediment traps as needed.

SPAW computer program will be used to size the storage facility (collection basins and irrigation reservoirs) based on the water budget (expected runoff volumes and rates, expected crops water needs, precipitation, evapotranspiration and seepage losses).

Document the adequacy of pit type ponds based on water budgets, long term water table depths, soil survey data, and experience.

Conveyance facilities. All tailwater recovery systems require facilities to convey reuse water from the storage facility to a point of entry back into the irrigation system. These facilities may consist of a pumping plant and pipeline to return the water to the upper end of the field, or a gravity outlet having a ditch or pipeline to convey the water to a lower elevation in the irrigation system. Other components or combinations of components may be necessary as determined by an on site-specific investigation.

Determine the capacity of conveyance facilities by an analysis of the expected runoff rate, the planned collecting basin or irrigation regulating reservoir storage capacity, and the anticipated irrigation application. If the return flow is used as an independent irrigation supply rather than as a supplement to the primary irrigation water supply, the rate and volume of flow must be adequate for the method(s) of water application employed.

Foundation, embankment, and spillway. Design earthen dams, embankments, pits and appurtenant structures to meet the appropriate criteria in Florida NRCS conservation practice standard for Dam, Code 402, or Pond, Code 378.

Seepage. Porous or highly permeable soils are often exposed when clayey or impermeable soils are removed from the impoundment area for use as fill material in the embankment. The resulting seepage creates an unsatisfactory irrigation reservoir (embankment or pit).

Adequate soils, foundation, and borrow area geologic investigations and design precautions shall be taken to prevent exposure of permeable soils, excessive seepage, water loss from the impoundment area, and/or through the embankment foundation. If necessary use of an appropriate method of sealing or lining to prevent excessive seepage losses.

Additional Criteria Applicable to Improving Water Quality

Storage facilities. Where additional storage is required to provide adequate retention time for the breakdown, of chemicals in the runoff waters, size storage facility sized accordingly. Allowable retention times shall be site specific to the particular chemical used.

Size storage facilities accordingly, where additional storage is required for sediment deposition. Allowable retention times shall be site specific to the particular soil type(s).

Control seepage from a storage facility to the extent possible when the storage facility is expected to receive chemical-laden waters. Control may be in the form of natural soil liners, soil additives, commercial liners, or other approved methods.

Additional Criteria Applicable to Reduce Energy Use

Provide analysis to demonstrate reduction of energy use from practice implementation.

Reduction of energy use is calculated as average annual or seasonal energy reduction compared to previous operating conditions.

CONSIDERATIONS

Water Quantity

- Design irrigation systems to limit tailwater volumes that are needed for effective operation. This reduces the need for and/or minimizes the required size and capacity of collection, storage, and transportation facilities.
- Changes in irrigation water management activities may be necessary to optimize the use of return flows.
- Downstream flows or aquifer recharge volumes dependent on runoff will be reduced and could cause undesirable environmental, social, or economic benefits. Existing wetland hydrology could be impacted by this practice.

Water Quality

- Plan nutrient and pest management measures to limit nutrient or chemical-laden tailwater as much as practical. Effects on surface and groundwater quality by the movement of sediment and soluble and sediment – attached substances should be considered. Nutrient or chemical-laden water can create a potential hazard to wildlife, especially waterfowl that are drawn to ponded water.
- Give consideration to monitoring of irrigation reuse water for weed seed, harmful bacteria, salinity, and disease. Take necessary steps to prevent spreading of these problems
- Consider protection of system components from storm events and excessive sedimentation.

Other Considerations

- Effects on the visual quality of water resources should also be considered.

PLANS AND SPECIFICATIONS

Prepare plans and specifications for irrigation tailwater recovery systems for specific field sites in accordance with this standard and describe the requirements for applying the practice to achieve its intended purpose. As a minimum, the plans and specifications shall include, but not limited to, the following items:

- Site plan layout of the tailwater recovery pond and associated structures.
- Cross sections and profiles of sumps, storage facilities and other components.
- Type, quality, and quantity of the various system components.
- Location of utilities and notification requirements.
- Methods of seepage control, if necessary.

OPERATION AND MAINTENANCE

Prepare an operation and maintenance (O&M) plan specific to the irrigation tailwater recovery facilities for use by the landowner or operator responsible for the operation and maintenance. The O&M plan shall provide specific instructions for operating and maintaining facilities to ensure they function properly. The O&M plan shall include, but not limited to, the following items and others as appropriate.

- Periodic cleaning and re-grading of collection facilities to maintain proper flow lines and functionality.
- Periodic checks and removal of debris as necessary from trash racks and structures to assure proper operation.
- Periodic removal of sediment from traps and/or storage facilities to maintain design capacity and efficiency.
- Prevent and if necessary remove all crop residue and foreign debris from entering system.
- Inspection of pumps, structures, ponds, and other conveyance systems to ensure they are in operating as planned and maintained in accordance with manufacturer's recommendations for each component.
- Inspection or testing of all pipeline and pumping plant components and appurtenances, as applicable.

- Eradicate or otherwise remove all rodents or burrowing animals. Immediately repair any damage caused by their activity. (If threatened species are involved, follow policy on endangered or threatened species.)
- Routine maintenance of all mechanical components in accordance with the manufacturer's recommendations.

REFERENCES

Florida NRCS Conservation Practice Standards
Dam, Code 402
Irrigation Reservoir, Code 436
Irrigation System, Sprinkler, Code 442
Irrigation System, Surface and Subsurface, Code 443
Pond, Code 378
Pumping Plant, Code 533

General Manual Title 420-Part 401
Title 450-Part 401
Title 190-Parts 410.22 and 410.26
Title 420-Part 401
Title 450-Part 401
Title 190-Parts 410.22 and 410.26

National Cultural Resources Procedures Handbook

National Environmental Compliance Handbook

National Food Security Act Manual

National Planning Procedures Handbook Florida Supplements to Parts 600.1 and 600.6

NEH, Part 652, Irrigation Guide