

NATURAL RESOURCES CONSERVATION SERVICE  
VIRGINIA CONSERVATION PRACTICE STANDARD

**DRAINAGE WATER MANAGEMENT**

(Ac.)

CODE 554

**DEFINITION**

The process of managing water discharges from surface and/or subsurface agricultural drainage systems.

**PURPOSE**

The purpose of this practice is:

- Reduce nutrient, pathogen, and/or pesticide loading from drainage systems into downstream receiving waters
- Improve productivity, health, and vigor of plants
- Reduce oxidation of organic matter in soils
- Reduce wind erosion or particulate matter (dust) emissions
- Provide seasonal wildlife habitat

**CONDITIONS WHERE PRACTICE APPLIES**

This practice is applicable to agricultural lands with surface or subsurface agricultural drainage systems that are adapted to allow management of drainage discharges.

The practice may not apply where saline or sodic soil conditions require special considerations.

This practice does not apply to the management of irrigation water supplied through a subsurface drainage system. For that purpose, use Virginia Conservation Practice Standard *Irrigation Water Management (Code 449)*.

**CRITERIA**

**General Criteria Applicable to All Purposes**

Accomplish the management of gravity drained outlets by adjusting the elevation of the drainage outlet.

Accomplish the management of pumped drainage outlets by adjusting the on-off elevations for pump cycling.

Locate structures and pumps where they are convenient to operate and maintain.

Raising the outlet elevation of the flowing drain must cause an elevated free water surface within the soil profile.

Water control structures must not restrict the flow of the drainage system, when operated in free drainage mode.

Manage drainage discharges and water levels in a manner that does not cause adverse impacts to other properties or drainage systems.

Release water from control structures in surface drainage system components with flow velocities below acceptable velocities prescribed by Virginia Conservation Practice Standard *Surface Drainage, Main or Lateral (Code 608)*.

Release water from control structures at rates that will maintain subsurface drain flow velocities below those prescribed by Virginia Conservation Practice Standard *Subsurface Drain (Code 606)*.

**Drainage Water Management Plan.** Develop a Drainage Water Management Plan to assist the irrigator or decision-maker in the proper management and application of drainage water. At a minimum,

include the following in the plan:

- a. A plan map of the managed site, including treatment areas.
- b. Purpose of drainage water management plan and appropriate scheduling requirements.
- c. A description of the overall drainage system, including location, spacing, elevations, size, and grade of all conduits, water control structures, and outlet channels.
- d. Record of planned and actual water table control elevations.
- e. Erosion and runoff management.
- f. System maintenance requirements, where applicable.
- g. Any additional information necessary to properly manage the system.

**Additional Criteria to Reduce Nutrient, Pathogen, and/or Pesticide Loading**

During non-cropped periods, operate the system in managed drainage mode within 30 days after the season's final field operation, until at least 30 days before commencement of the next season's field operations, except during system maintenance periods, or to provide trafficability when field operations are necessary.

Raise the drain outlet prior to and during liquid manure applications to prevent direct leakage of manure into drainage pipes through soil macro pores (cracks, worm holes, root channels).

Apply manure applications in accordance with Virginia Conservation Practice Standards *Nutrient Management (Code 590) and Waste Utilization (Code 633)*.

**Additional Criteria to Improve Productivity, Health, and Vigor of Plants**

When managing drainage outflow to maintain water in the soil profile for use by crops or other vegetation, base the elevation at which the outlet is set on root depth and soil type.

If this practice is used to control rodents, apply in conjunction with Virginia Conservation

Practice Standard *Pest Management (Code 595)*.

**Additional Criteria to Reduce Oxidation of Organic Matter in Soils**

Minimize the drainage beyond that necessary to provide an adequate root zone for the crop.

To reduce oxidation of organic matter, set the outlet elevation to enable the water table to rise to the ground surface, or to a designated maximum elevation, for sufficient time to create anaerobic soil conditions. The implementation of this practice must result in a reduced average annual thickness of the aerated layer of the soil.

**Additional Criteria to Reduce Wind Erosion or Particulate Matter (Dust) Emissions**

Provide a moist field soil surface, either by ponding or through capillary action, when the elevated water table is at the design elevation.

**Additional Criteria to Provide Seasonal Wildlife Habitat**

During the non-cropped season, manage the elevation of the drainage outlet in a manner consistent with a habitat evaluation procedure that addresses targeted species.

**CONSIDERATIONS**

In-field water table elevation monitoring devices can be used to improve water table management.

Reducing mineralization of organic soils may decrease the release of soluble phosphorus, but water table management may increase the release of soluble phosphorus from mineral soils.

Elevated water tables may increase the runoff portion of outflow from fields. Consider conservation measures that control sediment loss and associated nutrient discharge to waterways.

Consider manure application setbacks from streams, flowing drain lines, and sinkholes, to reduce risk of contamination.

Maintain proper root zone development and aeration by lowering the drainage outlet control

elevation, especially following significant rainfall events.

Monitoring of root zone development may be necessary if the free water surface in the soil profile is raised during the growing season.

### PLANS AND SPECIFICATIONS

Prepare plans and specifications in accordance with the criteria of this standard and describe the requirements for applying the practice to achieve its intended purpose(s).

Record all required information in an engineer field book, on a plan sheet or design computation sheet, or in another appropriate location.

#### DESIGN DATA

1. Completed Environmental Evaluation (Form VA-EE-1) and subsequent requirements.
2. Survey and plot data: profile, cross-sections, topography, sketch of managed area, as needed.
3. Design computations, design flow rates, drainage coefficient.
4. Elevations of devices to maintain planned water levels.
5. Drainage Water Management Plan.
6. Standard Cover Sheet (VA-SO-100A).
7. Materials and quantities needed.
8. Supplemental practices required.
9. Virginia Conservation Practice Specifications (700 Series).
10. Operation and Maintenance Plan.

#### CHECK DATA

1. As-built plans including dimensions, types and quantities of materials installed, and variations from design. Include justification for variations.
2. Locations of appurtenant practices.
3. Complete as-built section of Cover Sheet.

### OPERATION AND MAINTENANCE

Provide an Operation and Maintenance plan that identifies the intended purpose of the practice, practice life safety requirements, and water table elevations and periods of operation necessary to meet the intended purpose. If in-field water table observation points are not used, then provide the relationship of the control elevation settings relative to critical field water table depths in the operation plan.

Include instructions for operation and maintenance of critical components of the drainage management system, with instructions necessary to maintain flow velocities within allowable limits when lowering water tables, in the Operation and Maintenance Plan.

Specify (in the plan) the elevation of the raised drainage outlet and the number of days prior to and after the application that a raised outlet elevation will be maintained to prevent leakage of liquid manure applications into drain pipes.

Replace warped flashboards that cause structure leakage.

### REFERENCES

USDA-Natural Resources Conservation Service. National Engineering Handbook, Part 624, Sec. 16, Drainage of Agricultural Land and Chapter 10, Water Table Control.

USDA, Natural Resources Conservation Service. National Engineering Handbook, Part 650, Engineering Field Handbook, Chapter 14, Water Management (Drainage).

USDA-Natural Resources Conservation Service. Electronic Field Office Technical Guide (eFOTG), Section IV [Online]. Available at <http://www.nrcs.usda.gov/technical/eFOTG>.

USDA-Natural Resources Conservation Service. Virginia 700 Series Construction Specifications. [On-line]. Available at <http://www.nrcs.usda.gov/technical/eFOTG>.

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