NATURAL RESOURCES CONSERVATION SERVICE
VIRGINIA ENGINEERING DESIGN NOTE #554 (DN-554)
DRAINAGE WATER MANAGEMENT

Drainage water management is the process of managing water discharges from surface and/or subsurface agricultural drainage systems. This is accomplished through restricting drainage flows. The practice is applicable to agricultural lands with surface or subsurface agricultural drainage systems with manageable drainage discharges. Agricultural drainage system flows may be restricted during periods in which the resultant elevated water table will not damage crops, interfere with farming operations, or adversely impact neighboring properties. The managed area is that portion of the field in which the water table is elevated to the design elevation. The effectiveness is based on the length of time and the season during which the water table is elevated at or near the soil surface.

The practice does not apply to the management of irrigation water supplied through a subsurface drainage system.

Benefits

Agricultural drainage water contains constituents such as nitrates that can affect downstream water quality. Research shows that drainage water management reduces the volume of drainage outflow with a proportional reduction in nitrate loading. Additional benefits include: increased time for break-down of constituents such as pesticides; reduced oxidation of soil organic matter; and, improved seasonal habitat for waterfowl where surface ponding results.

Designs of critical components shall be in accordance with pertinent Virginia Conservation Practice Standards, including *Structure for Water Control (Code 587)*, and *Subsurface Drainage (Code 606).*

Drainage Water Management Plans

The implementation of a drainage management plan should include a map of the influenced area at each control elevation for each water control structure with a record of planned and actual water table control elevations. The plan should be based on soils, topography, and crops to be in the influenced area. The plan should show the location, elevations, spacing, size, and grade of all conduits, water control structures, and outlet channels.

To reduce nitrate losses and maximize water quality benefits, the water level shall be maintained as high as feasible, without pumping, in accordance with O&M plan prepared for the site. For

most agricultural sites, the water level should vary during the season based upon crop stage and rooting depth; but should generally be maintained no greater than 30 to 36 inches from the ground surface. Water level during the winter months may be set at 12 to 18 inches from the ground surface. Short term adjustments may be made to accommodate field access and unusually high rainfall. Prolonged saturation of the root zone must not occur. The ground water may be raised within 12 inches of the ground surface for very shallow rooted crops until the surface layer of the soil reaches its water-holding capacity. The water table may then recede by evapo-transpiration to some predetermined level until the crop needs to be irrigated. Repeating this cycle allows air to move into the soil and plant root zone for optimum root development.

For deeper rooted crops, the water level may be maintained at predetermined levels for the various crop stages, thus, variations in the water table will result only from rainfall and differing consumptive use rates during any particular crop stage.

In order to properly set the elevations of flashboards, it is necessary to know the respective levels of the water table in the various parts of the field served by the water control structure. This can be accomplished by installing small, open, perforated pipes (wells) about 4.0’ deep in several selected locations of the field. Once the relationship of the water level at the structure and the water table levels at key locations in the field are established (under both wet and dry conditions), only a single indicator pipe well may be needed. This indicator well can then be effectively used to manage the flashboards throughout the growing season.

Prior to tillage, harvest, and other field operations, the water table should be at a depth to provide trafficability throughout the field.

The recommended depth from ground surface to water level in the chart below may be followed.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Corn	12 – 18”		24 – 36”		18 – 24”				24 – 36”		18 – 24”	
Wheat	12 -24”	24 – 36”		18 – 24”			24 – 36”					
Soybeans						24 – 36”		18 – 24”			24 – 36”	

Design Aids

Drainage Water Management for the Midwest, WQ-44, Questions and Answers About Drainage Water Management for the Midwest, Jane Frankenberger, Eileen Kladivko, Gary Sands, Dan Jaynes, Norm Fausey, Matt Helmers, Richard Cooke, Jeff Strock, Kelly Nelson, Larry Brown http://www.ces.purdue.edu/extmedia/WQ/WQ-44.pdf

USDA-Natural Resources Conservation Service. National Engineering Handbook, Part 624, Sec. 16, Drainage of Agricultural Land.

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.

USDA-Natural Resources Conservation Service. National Engineering Handbook - Part 624, Chapter 10, Water Table Control.