United States Department of Agriculture

NRCS Natural Resources Conservation Service

Iowa Job Sheet (554): *Drainage Water Management*

Iowa – July 2010

Drainage Water Management Plan

Landowner/Operator: _____ Cost Share Program: _____

Location: Section _____ T _____ N R _____ ***W*** Prepared By: _____ Date: _____

County: _____ Reviewed with Landowner/Operator: _____ Date: _____

Farm: _____ Tract: _____ Field: _____ Acres: _____ Acres planned for DWM: _____

Attach contour map of field with label and location of each structure and control zones.

PLANNED TARGETS FOR TIMING AND DEPTH BELOW GROUND (ft)		
FALL LEVEL RAISING DATE (within 30 days after harvest): _____		WINTER DEPTH: _____
SPRING DRAWDOWN DATE (no earlier than 30 days before planting): _____		SUMMER DEPTH: _____
VARY TIMING AND SUMMER DEPTH BASED ON WEATHER, CROP, SOIL TYPE, AND STAGE OF GROWTH		
LEVEL FOR MANURE APPLICATION	DAYS BEFORE: _____ DAYS AFTER: _____	DEPTH: _____

STRUCTURE DETAIL AND PLANNED LEVEL CONTROL							
STRUCTURE DETAIL				ELEVATIONS		WEIR SETTING BELOW STRUCTURE RIM (ft)	
ID	Size (in)	Height (ft)	Impacted Area (ac)	Structure Rim	Control (ground)	Winter	Summer

Note: Control elevation is the elevation of the soil surface at the lowest spot in the control zone.

Benchmark Description: _____

Benchmark Elevation: _____

IMPACTS OF DWM

Drainage water management, compared to unmanaged drainage, reduces the amount of water passing through the tile which proportionately decreases the amount of nitrate that flows to drainage ditches and streams.

Raising the water table may also increase the amount of surface runoff, leading to increased soil erosion and transport of sediment-adsorbed and soluble phosphorous. The soil erosion and resulting sediment transport can be controlled with residue management, buffers, grassed waterways and other conservation practices.

Partially raising the water table after crops are established can conserve soil moisture and may enable a crop to be more productive in the years where there is an extended dry period during the growing season.

WINTER CONTROL

As soon as harvest is complete, raise the water levels in the structure close to the ground surface. Depending on the slope of the ground that the structure is controlling, the recommended elevation should be around 6 inches from the surface.

Soils rarely freeze at the depth of the tile, and are less likely to do so when the water table is raised. Freezing of the control structure itself could be an issue, and lowering of water levels can not occur until the structure thaws. However, there have been no reports of control structures being frozen in the spring at the recommended time for lowering the water table.

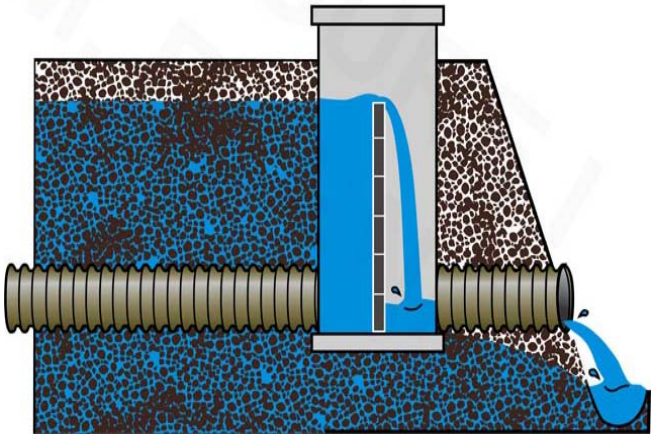

Figure 1: The outlet is raised after harvest to reduce nitrate delivery.

SPRING PLANTING

The water table should be lowered in the spring early enough for the field to be accessible for seedbed preparation, planting, and other field operations. In general, 14 days prior to the first field work is sufficient time to achieve good trafficablilty.

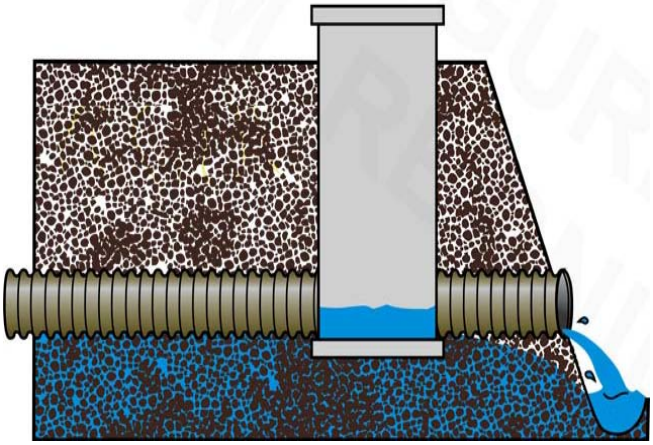

Figure 2: The outlet is lowered a few weeks before planting and harvest to allow the field to drain.

MANURE APPLICATION

Manure cannot be applied when the water table is near the soil surface because of trafficability and soil compaction problems. However, raising the subsurface drain outlets on dry soils can prevent liquid manure from leaking directly into drainage tile from macropores caused by roots, earthworms, cracks or accidental over-applications.

In most years, there is a comfortable time window in the fall for manure application between when the outlets are raised and sufficient rainfall occurs to raise the water table. Because of an increased potential for surface runoff after the water table has been raised for drainage water management, manure should be injected or incorporated into the soil.

Manure application in the spring is not compatible with drainage water management as it may require lowering the water table earlier in the spring, therefore negating much of the nitrogen reduction benefit of drainage water management.

MANAGING LEVELS FOR CROPS

After planting, the water table can be raised to conserve soil moisture for use by the crop during extended dry periods. Begin with the structure adjusted to the bottom of the drainage outlet. If growing season management is anticipated, an outlet depth of two or more feet below the field surface is suggested. The goal is to provide enough drainage for good aeration and root development but to capture some of the water that would otherwise drain out under conventional systems. Until experience is gained and the crop response to the system can be observed, one strategy is to raise the level of the structure incrementally about 6 inches every 7 to 14 days in order to reach the final desired elevation in early- to mid-June.

Once the crop is established, evapotranspiration will often be sufficient to remove excess water from the root zone. It may be necessary to lower the water table during extended wet periods. Careful attention to drainage water management for water conservation may increase yields, particularly in dry years.

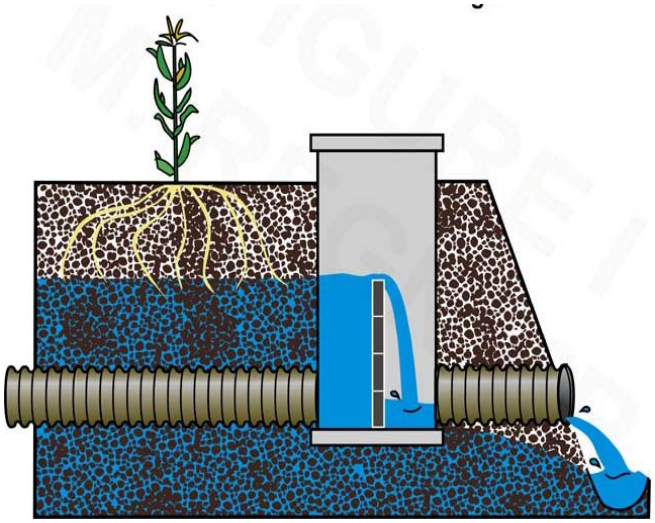

Figure 3: The outlet is raised after planting to potentially store water for crops.

OPERATION AND MAINTENANCE

The operation of the structures will follow that outlined in the table on the front of this job sheet.

The level of management required depends on whether the structures will be used to raise the system outlet during the fallow season, the growing season, or both. During the fallow season, the only management required is to raise the outlet after harvest and field operations in the fall, and lower it two weeks before the start of field operations. During the growing season, management may involve temporarily lowering the outlet level to increase the drainage intensity during periods of heavy rain, or sustained wet periods.

It is important during the first seasons of operation to closely monitor precipitation and water table levels in at least at two different locations in the field and compare these observations with the weir settings at the water control structure. This information will tell how quickly the system responds and will help manage the system in future years.

Observation wells can be installed at several locations in the field to monitor the position of the water table. These wells should be located midway between the drain lines. At least for the first season of operation, and thereafter as required, maintain records of rainfall, water table level, control structure weir level, and crop performance. Record observations at least weekly during the growing season and monthly during the non-growing season. Record additional observations following important precipitation events.

The owner/operator will also perform maintenance of the system, to include but not limited to:

1. Routine monitoring of water levels in structures to assure no leaking, clogging or breakage has occurred.
2. Monitoring of runoff and erosion during winter and adjustment of water levels to reduce surface ponding and runoff where erosion occurs.
3. Prompt repair of any damage to structures.

References:

WQ44 - Questions and Answers about Drainage Water Management for the Midwest, Purdue Extension. http://www.ces.purdue.edu/extmedia/WQ/WQ-44.pdf. Accessed June 28, 2010.

Evans, Robert, and Wayne Skaggs. 1996. Operating controlled drainage and subirrigation systems. North Carolina Cooperative Extension Service Publication number AG356. http://www.bae.ncsu.edu/programs/extension/evans/ag356.html. Accessed June 24, 2010.

USDA-NRCS. 2008. Indiana Job Sheet (554): Drainage Water Management. http://efotg.nrcs.usda.gov/references/public/IN/JS554_Drainage_Water_Management.doc. Accessed June 28, 2010.

Drainage Water Management
Record of Observations

Producer ______________________________ Farm __________ Field _________

Date of first field operation ____________ Crop _________

Planting Date _______________________ Harvest Date ___________________

Date of last spring operation ___________ Date of last field operation _________

Structure ID ____________ Well #1 ID ________ Well #2 ID __________

Rim Elevation __________ Rim Elevation _____ Rim Elevation _______

		Structure Data			Observation well data			
		Measured below rim			Measured below rim			
	Rainfall	Weir	Water level		Water level #1		Water level #2	
Date	(in)	(in)	(in)	Elevation	(in)	Elevation	(in)	Elevation

Duplicate as needed