

**NATURAL RESOURCES CONSERVATION SERVICE  
CONSERVATION PRACTICE STANDARD  
CONNECTICUT**

**VEGETATED TREATMENT AREA**

(Ac.)

**CODE 635**

**DEFINITION**

An area of permanent vegetation used for agricultural wastewater treatment.

**PURPOSE**

To improve water quality by reducing loading of sediments and total suspended solids, and other contaminants associated with livestock, poultry, and other agricultural operations.

**CONDITIONS WHERE PRACTICE APPLIES**

Where a Vegetated Treatment Area (VTA) can be constructed, operated and maintained to treat contaminated runoff from such areas as feedlots, composting facilities, barnyards, and other livestock holding areas; or to treat process wastewater from agricultural operations with a system designed using “**the slow rate process**”..

Where the practice is a component of a comprehensive nutrient management plan (CNMP).

Where a reduction of sediments and total suspended solids in runoff or applied wastewater is needed.

Where the maximum contributing uncontrolled drainage area for concentrated livestock areas is 0.5 acres.

Where the maximum number of Animal Units (AU) for agricultural wastewater is 97 (69 dairy cows) or fewer.

Where the maximum capacity for food processing water is 1000 gal/day.

This practice applies:

- Where a VTA can be constructed, operated and maintained without polluting air or water resources
- To the treatment of contaminated runoff from such areas as feedlots, barnyards, and other livestock holding areas
- To the treatment of dilute wastewater such as milk house effluent.

**CONDITIONS WHERE PRACTICE DOES NOT APPLY**

- A VTA as a single component practice will not satisfy Connecticut water quality standards for direct discharge to waters of the state. More stringent pollution abatement measures will be necessary where bacteria, dissolved organic materials and/or dissolved nutrients, can impair receiving water quality.
- This practice does not apply to the management of human waste, silage leachate, or other high strength wastes.
- This practice does not apply below any slow release waste storage facilities including existing “Picket Dams”.

**CRITERIA**

**General Criteria**

**Laws and Regulations.** All federal, state, and local laws, rules, and regulations, including local inland wetland agency regulations, governing the construction and use of this practice as well as setbacks from wells, surface water and property boundaries shall be followed. Planned work shall comply with all

Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact the Natural Resources Conservation Service Connecticut State Office (<http://www.ct.nrcs.usda.gov>), or download it from the Connecticut electronic Field Office Technical Guide (eFOTG) <http://www.nrcs.usda.gov/technical/efotg/>

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federal, state, and local laws and permit conditions and requirements. **The landowner shall obtain all necessary permits prior to construction or any land clearing activities.**

**Safety.** Safety and personal protection features and practices shall be incorporated into the facility and its operation as appropriate to minimize the occurrence of equipment hazards and biological agents during the treatment process. ***Warning signs, fences, ladders, ropes, bars, rails, and other devices shall be provided, as appropriate, to ensure the safety of humans and livestock.***

**Separation Distances.** Separation distances from residences and buildings, property lines, surface water bodies including wetlands, private wells or springs, and/or public wells shall be determined on a case by case basis in consultation with appropriate state or local regulatory agencies.

**Use the following separation distances for preliminary planning purposes only.**

Residences and businesses – Owner-Operator	250 feet
Residences and businesses - Other	500 feet
Property lines	250 feet
Public Roads	250 feet
Drinking Water Supply Lines	150 feet
Surface water bodies	250 feet
Private well or spring	150 feet
Public water supply well	500 feet
Above seasonal high water table	24 in.
Depth to bedrock	48 in.*
<b>* Per CT Health Code. May reduce with DEP concurrence.</b>	

**Location.** Locate this practice considering prevailing winds and landscape elements such as building arrangement, landforms, and vegetation to minimize odors and protect the visual resources.

This practice shall be located so as to meet all local, state and federal setback requirements including those stated in environmental protection, planning and zoning, wetlands, health department, milk inspection, and stream channel encroachment regulations. VTAs shall be located outside of floodplains.

Inflow to VTAs shall be pretreated as appropriate.

Discharge to and through VTAs shall be as sheet flow. Some means, such as a ditch, curb, or gated pipe, shall be provided to disperse concentrated flow and ensure sheet flow across the width (dimension perpendicular to flow length) of the VTA. Land grading and structural components necessary to maintain sheet flow throughout the length (dimension parallel to the flow) of the VTA shall be provided as necessary.

Permanent herbaceous vegetation consisting of a mixture of grasses, legumes and/or other forbs adapted to the soil and climate shall be established in the VTA prior to discharge of any contaminated water. Vegetation shall be able to withstand anticipated wetting and/or submerged conditions.

Clean water shall be diverted from the VTA to the fullest extent possible.

Base the total treatment area for the VTA on the soil's capacity to infiltrate and retain runoff within the root zone and the vegetation's agronomic nutrient requirements. Use the soil's water holding capacity in the root zone, and hydraulic conductivity to determine its ability to absorb and retain runoff. Base the runoff determination on the most restrictive soil layer within the root zone regardless of its thickness.

Divert uncontaminated water from the treatment area to the fullest extent possible unless additional moisture is needed to manage vegetation growth in the treatment area.

Design the VTA based on the need to treat the runoff volume from the 25-year, 24-hour storm event from the agricultural animal management facility. Infiltrate a portion or the entire volume of the design storm, based on management objectives. The portion of the design volume not infiltrated shall be stored for utilization or treatment unless discharge is permitted by applicable regulations.

The VTA design for processed water shall be based on the nutrient contents of the processed water and the VTA's ability to hold and uptake the nutrients.

Nutrient loading of VTAs shall be based on crop removal of the vegetation used in the VTA.

Permanent vegetation consisting of a single species or a mixture of grasses, legumes and/or other forbs adapted to the soil and climate shall be established in the treatment area prior to discharge of any contaminated water. Selected species shall be suited to current site conditions and intended use. Selected species will have the capacity to achieve adequate density, vigor and yield within an appropriate time frame to treat contaminated runoff. Site preparation and seeding shall be done at a time and in a manner that best ensures survival and growth of the selected species *and in accordance with Connecticut NRCS Standard 327, Conservation Cover.*

Vegetation shall be able to withstand anticipated wetting and/or submerged conditions. Harvest VTA as appropriate to encourage dense growth, maintain an upright growth habit, and remove nutrients and other contaminants that are contained in the plant tissue

Exclude livestock access from the VTA.

Discharge into and through treatment areas shall be applied as sheet flow. Where sheet flow is planned, some means, such as a ditch, curb, gated pipe, level spreader or a sprinkler system, shall be provided to disperse concentrated flow and ensure sheet flow across the treatment area. Land grading and structural components necessary to maintain sheet flow throughout the treatment area shall be provided as necessary.

Locate VTAs outside of floodplains. However, if site restrictions require location within a floodplain, they shall be protected from inundation or damage from a 25-year flood event, or larger if required by regulation.

The water table shall be either naturally deep enough (equal to or greater than 2 feet) or artificially lowered so that the infiltrated runoff does not contaminate the ground water at the bottom of the root zone.

Subsurface drainage shall not be provided within the VTA. Subsurface drainage may be used to lower the seasonal high water table to

an acceptable level provided the subsurface drain lines are at least 10 feet away from the VTA.

Infiltration areas shall not be planned where soil features such as "cracking" or "deep cracking" will result in preferential flow paths that transport untreated runoff from the surface to below the root zone, unless the soil moisture can be maintained to prevent drying and cracking.

VTAs must have a minimum flow length of 100 feet. The natural or constructed slope of the VTA shall be 0.3 to 6 percent. The entrance slope to the VTA shall not be flatter than 1 percent.

Suspension of application to VTAs shall be specified in the O&M plan when weather conditions are not favorable for aerobic activity or when soil temperatures are lower than 39° F.

Appropriate reductions in the application rate and increases in the application period while maintaining the hydraulic loading rate shall be specified when soil temperatures are between 39° F and 50° F.

#### **Additional Criteria For Treating Wastewater With The Slow Rate Process**

Designs shall be based on the latest edition of the Environmental Protection Agency Technology Transfer Process Design Manual for Land Treatment of Municipal Wastewater or other technically acceptable reference.

The slow rate process refers to a specific remediation technique involving the application of wastewater to a vegetated surface for treatment as it flows down through the plant-soil matrix.

The design hydraulic loading shall be based on the more restrictive of two limiting conditions – the capacity of the soil profile to transmit water (soil permeability) or in the nitrogen concentration in the water percolating below the root zone. The percolate nitrate-nitrogen concentration leaving the root zone shall not exceed 8 mg/L.

In addition, nutrient loading shall not exceed the vegetation's agronomic critical need for phosphorus expressed as pounds of P<sub>2</sub>O<sub>5</sub> per acre. Typically for grass vegetation managed as hay the agronomic critical need is 60

pounds of P<sub>2</sub>O<sub>5</sub> per acre. The system shall be managed so that Soil test phosphorus levels are optimum or below optimum.

***Storage shall be provided when the amount of available wastewater exceeds the design hydraulic loading rate or for the VTA non-operating periods.***

Wastewater shall be applied to the VTA utilizing a method that will result in an even application of the entire area and a rate that does not exceed the infiltration rate of the soil. Dosing the VTA is the acceptable method of accomplishing this. Wastewater shall not be applied more often than every 3 days.

### **CONSIDERATIONS**

- More than one VTA should be considered to allow for resting, harvesting vegetation, maintenance, and to minimize the potential for overloading.
- Consider pre-treating influent with solid/liquid separation to reduce organic loading, odor generation, and maintenance requirements.

Provide more than one treatment area to allow for resting, harvesting vegetation, maintenance, and to minimize the potential for overloading.

Use warm and cool season species in separate areas to ensure that plants are actively growing to maximize nutrient uptake during different times of the year.

Pre-treat influent with solid/liquid separation to reduce organic loading, odor generation, and nutrients to levels that will be tolerated by the VTA and to prevent excessive accumulation of solids in the treatment area.

Utilize inlet control structures to prevent undesirable debris from entering the VTA, to control the rate and timing of inflow during normal operations and to control inflow as necessary for operation and maintenance.

Supplement water as necessary to maintain plants in a condition suitable for the treatment purpose.

Store seasonal contaminated water upstream of the VTA during excessively wet or cold climatic conditions.

Manage the VTA to maintain effectiveness throughout the growing season. Time the harvest of the VTA plants so vegetation can regrow to a sufficient height to effectively filter effluent late in the growing season.

Effluent from the VTA may be stored for land application, recycled through the wastewater management system, or otherwise used in the agricultural operation.

Fences or other measures may be needed to exclude humans or animals from the VTA. Any exclusion measures shall be installed in accordance with Connecticut NRCS standard 472, Access Control.

### **PLANS AND SPECIFICATIONS**

Plans and specifications shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose. Plans and specifications shall include construction plans, drawings, job sheets or other similar documents. These documents shall as a minimum, specify the requirements for installing the practice and include the kind, quantity and quality of materials to be used.

To the extent practical, specifications shall conform to NRCS National Engineering Handbook Parts 642 and 643 (Section 20).

Prepare plans and specifications in accordance with the criteria of this standard that describe the requirements for applying the practice to achieve its intended use. Include critical construction perimeters, necessary construction sequence, vegetation establishment requirements, and nutrient removal.

Plans and Specifications will include:

- A plan view showing the location of the VTA
- Details of the length, width, and slope of the treatment area to accomplish the planned purpose (length refers to flow length down the slope of the treatment area)
- Herbaceous species, seed selection, and seeding rates to accomplish the planned purpose

- Planting dates, care, and handling of the seed to ensure that planted materials have an acceptable rate of survival
- Site preparation sufficient to establish and grow selected species
- Statement that only viable, certified weed free, high quality, and regionally adapted seed will be used
- Site preparation sufficient to establish and grow selected species

### **AS BUILT DRAWINGS**

As built drawings shall be prepared showing all pertinent element and elevations as actually installed, and a copy shall be provided to the owner/operator upon construction completion.

### **OPERATION AND MAINTENANCE**

An Operation and Maintenance (O&M) plan shall be prepared for, reviewed, and signed by the landowner or operator. The plan shall specify that the treated areas and associated practices are inspected annually and after significant storm events to identify repair and maintenance needs. An operation and maintenance plan shall be developed that is consistent with the purposes of the practice, its intended life, safety requirements, and the criteria for its design. The plan shall require, include, or provide for the following as appropriate:

- Preventing grazing in VTAs.
- Testing the soil every three years to determine soil test phosphorus levels.
- Maintaining records of wastewater applications, dates and results of soil tests, dates and amounts of vegetation harvested and dates and extent of any maintenance performed.
- Harvesting VTA vegetation as appropriate to encourage dense growth, maintain an upright growth habit, and remove nutrients and other contaminants that are contained in the plant tissue.

- Controlling undesired weed species, especially state-listed noxious weeds, and other pests that could inhibit proper functioning of the VTA.
- Inspecting and repairing treatment areas after storm events to fill in gullies, removing flow disrupting sediment accumulation, re-seeding disturbed areas, and taking other measures to prevent concentrated flow.
- Applying lime and any supplemental micro- or trace nutrients as recommended by a soil test to maintain the desired species composition and stand density of herbaceous vegetation.
- Maintain or restore the VTA as necessary by periodically grading when deposition jeopardizes its function, and then reestablishing to herbaceous vegetation.
- Routinely de-thatch and/or aerate VTAs used for treating runoff from livestock holding areas in order to promote infiltration.
- Conducting maintenance activities only when the VTA is dry and the moisture content in the surface soil layer is low enough to avoid compaction.

Treatment areas in arid or semiarid regions that potentially could be affected by high salinity and/or sodium content should be monitored for excessive salt and sodium buildup. If excessive salt or sodium is found, an appropriate corrective action shall be taken.

### **REFERENCES**

USDA/NRCS, National Engineering Handbook, Part 651, Agricultural Waste Management Field Handbook. 1992, Last revised, June 1999.

Koelsch, R., B. Kintzer, and D. Meyer. (ed.) 2006. Vegetated Treatment Systems for Open Lot Runoff - A Collaborative Report. USDA, NRCS.

[www.heartlandwq.iastate.edu/ManureManagement/AlternativeTech/Avtsguidance/](http://www.heartlandwq.iastate.edu/ManureManagement/AlternativeTech/Avtsguidance/)