



**Please note: This policy may be revised as the situation develops.**

*Developed by USDA Animal and Plant Health Inspection Service (APHIS) in conjunction with Envirotech Consulting, Oklahoma Department of Agriculture Food & Forestry, Oklahoma State University, Virginia Cooperative Extension, and the Virginia Department of Environmental Quality.*

## INTRODUCTION & PURPOSE

Catastrophic losses of livestock from diseases or natural disasters represent a significant challenge for livestock producers and emergency responders. Animal losses often cause significant financial losses to the farmers who rely on the income from these animals. Compounding the financial impact of these animal losses is the burden of responsibly disposing of the resulting animal carcasses. Improperly managed, animal carcasses have the potential to spread disease and contaminate surface water and groundwater supplies.

Above Ground Burial (AGB) is a hybrid between deep burial and composting. It involves digging a shallow trench, placing one foot of carbonaceous material in the bottom of the trench followed by a layer of carcasses, covering the carcasses with the excavated material, and seeding the mound. AGB was field tested at several locations representing a variety of soil and climatic conditions. These field tests focused on carcass degradation, nutrient migration and pathogen inactivation. In addition, one study monitored scavenger and insect activity. Preliminary findings show effective carcass decomposition for cattle, swine and sheep; other species have not been studied.

*Research investigators recommend that AGB be implemented in coordination with local and State environmental and agricultural officials. This protocol maybe suitable for catastrophic animal mortality emergencies. Other applications should be discussed with subject matter experts and regulatory authorities. This protocol has been shown to inactivate pathogens in pigs in several studies. Contact technical resources listed at the end of this document for more information.*

The purpose of this document is to outline the procedures for implementing the AGB method.

## RECOMMENDED SITE SELECTION CRITERIA

*(or as Directed in Writing by State and Local Environmental Regulation and Authorities):*

Note: State and local requirements take precedence.

- ◆ Permission of site owner.
- ◆ Approved by State environmental agency.
- ◆ Soils considered suitable for AGB based on the National Resource Conservation Service (NRCS) Web Soil Survey.
  - Use caution installing AGB units in low-permeability soils where heavy rainfall may occur over a 1-year period; these conditions can flood the units, preventing proper decomposition.
- ◆ Not prone to flooding or in a low-lying area.

- ◆ At least 2–4 feet of separation from the bottom of the trench and the groundwater table (or as directed by qualified soil scientist).
- ◆ At least 2–4 feet of separation from the bottom of trench and bedrock or restrictive layer (or as directed by qualified soil scientist).
- ◆ At least 200 feet from wells or springs or as directed by qualified soil scientist.
- ◆ At least 100 feet from surface water bodies.
- ◆ At least 100 feet from property lines, sinkholes or rock outcrops, structures, and drain tiles.
- ◆ Sufficient space for staging of carbon and equipment as well as constructing AGB units (see <https://www.aphis.usda.gov/aphis/ourfocus/animalhealth/emergency-management/carcass-management/carcass> for a calculator).

## PERSONNEL, EQUIPMENT, MATERIALS, AND SUPPLIES

- ◆ Site manager to coordinate construction activities.
- ◆ Personnel to monitor contractor compliance (recommended).
- ◆ Health and Safety/Biosecurity personnel.
- ◆ Helpers to prepare carcasses (e.g., open abdomens), guide equipment operators during excavation and manage movement of animals from depopulation/staging area to placement in AGB unit.
- ◆ Heavy equipment with operators for building AGB plots (e.g., skid steer(s), backhoe(s), or other appropriate equipment).
- ◆ Personal Protective Equipment (PPE) as required by job hazard analysis.
- ◆ Carbon source (see USDA calculator at <https://www.aphis.usda.gov/aphis/ourfocus/animalhealth/emergency-management/carcass-management/carcass>) to obtain quantity of carbon needed.
- ◆ Sharp Boning knives (type used at slaughter plants), if opening carcasses.
- ◆ Scabbard, tool belt.
- ◆ Knife sharpeners (steel and stone).
- ◆ Regionally and seasonally appropriate grass seed recommended by Agricultural Extension agent or equivalent.
- ◆ Seed spreader.
- ◆ Mulch/straw or erosion control netting, if needed to protect seed.
- ◆ Rakes, shovels, hay hooks.
- ◆ Responder rest/break station (e.g., tent, water, portable toilet).
- ◆ Provide site and transportation biosecurity as required. For animal disease outbreak response, see the following for guidance: <http://www.aphis.usda.gov/fadprep>.

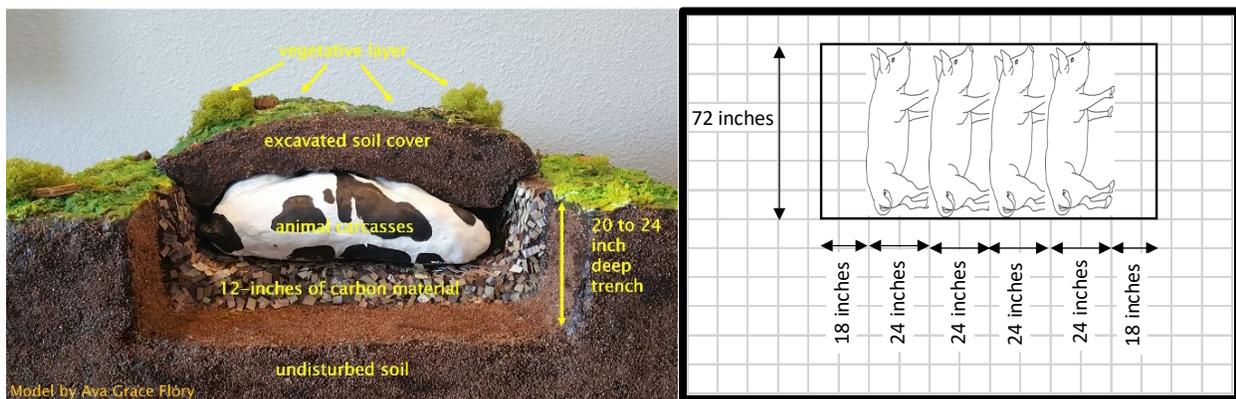
## CONSTRUCTION

1. Don appropriate PPE.
2. Locate and mark utilities.
3. Prepare site (e.g., mobilize equipment, set up break station, stage materials).
4. Mark area to be excavated.
5. Dig a 20- to 24-inch deep trench of sufficient width and length to accommodate

the number and size of animals. If the trench is less than 20 inches deep, there may not be enough soil to completely cover the carcasses. If the trench is more than 24 inches deep, then decomposition will be slowed.

6. Stockpile the excavated soil at the edge of the trench.
7. Place 12 inches of carbonaceous material in the bottom of the trench. The carbon material should have a high carbon to nitrogen ratio such as wood chips, bark mulch, sawdust, chopped corn stalks or straw, silage, or animal bedding with minimal manure.
8. Place the carcasses on the carbon base on their sides in a single layer as close together as possible, preferably facing the same direction (see Figure 1). Ensure the legs and heads can be adequately covered with soil (see Figure 1).
9. For swine larger than 300 pounds, open the abdominal cavity of each animal with a sharp knife from sternum to pelvis along the ventral midline. Consider puncturing the rumen on cattle and other ruminants.
10. Return the excavated soil to the trench to form a minimum one foot thick mounded cover over the carcasses to prevent water from pooling on the mound and to promote drainage. Ensure that the entire trench is filled in and graded to avoid pooling.
11. Seed the mound with a regionally and seasonally appropriate grass seed mix in accordance with the seeding rate on the package.
12. Cover seed with a layer of straw mulch or a biodegradable erosion control netting. Netting should extend beyond the edge of the mound and be secured with soil.

Figure 1. Above Ground Burial Design



## MAINTENANCE

1. Inspect the AGB system weekly for the first month, monthly thereafter and after events such as extreme weather to identify:
  - a. cracks in the soil cover or evidence of animal burrowing,
  - b. poor vegetative cover, and
  - c. excessive water ponding on AGB plots.
2. Correct deficiencies identified during inspection:

- a. Add soil, if needed, to fill cracks and areas where animals may have burrowed.
  - b. Reseed if vegetation is poor.
  - c. Consider regrading around plots to promote drainage if ponding is severe.
3. One year after construction of the AGB plots, verify the carcasses are fully decomposed by uncovering a small area of the plot to be sure no tissue remains on the bones. If soft tissue remains, recover exposed area and monitor monthly until all tissue is degraded. Small pieces of hide on long bones are acceptable.

## SITE RESTORATION

1. Regrade AGB mound to original topography.
2. If any bones are exposed after grading, they should be covered, or collected and disposed of in accordance with State and local regulations.
3. Return area to its original use.

## TECHNICAL RESOURCES

### ◆ General:

- Lori Miller, USDA, [lori.p.miller@usda.gov](mailto:lori.p.miller@usda.gov)
- Rob Miknis, USDA, [Robert.a.miknis@usda.gov](mailto:Robert.a.miknis@usda.gov)

### ◆ AGB Process:

- Gary Flory, Virginia Department of Environmental Quality, [gary.flory@deq.virginia.gov](mailto:gary.flory@deq.virginia.gov)
- Bob Peer, Virginia Department of Environmental Quality, [robert.peer@deq.virginia.gov](mailto:robert.peer@deq.virginia.gov)
- Bobby Clark, Virginia Cooperative Extension, [raclark@vt.edu](mailto:raclark@vt.edu)

### ◆ Virology

- Dr. Fernando Bauermann, Oklahoma State University, Virology, College of Veterinary Medicine, [Fernando.viscosa\\_bauermann@okstate.edu](mailto:Fernando.viscosa_bauermann@okstate.edu)

### ◆ Entomology

- Dr. Justin Talley, Oklahoma State University, Department of Entomology and Plant Pathology, [justin.talley@okstate.edu](mailto:justin.talley@okstate.edu)

### ◆ Environmental

- Caleb Whitcomb, Oklahoma Department of Agriculture, Food & Forestry, [caleb.whitcomb@ag.ok.gov](mailto:caleb.whitcomb@ag.ok.gov)
- Jeremy Seiger, Envirotech Consulting, [jseiger@envirotechconsulting.com](mailto:jseiger@envirotechconsulting.com)