

Siting Considerations for Earthen Impoundments

The use of soils to construct earthen impoundments for manure storage requires investigation and evaluation procedures beyond those that might be used in siting a facility constructed of concrete or steel. To preserve environmental integrity, the variability of soil materials and the need for the soil itself to provide an essentially impermeable barrier requires that an extensive examination be made of the geological characteristics of the proposed site.

Geological investigation

Siting of an earthen manure storage facility should begin with a geological investigation. Such an investigation will assess the surface and subsurface geological characteristics that might negatively impact groundwater. These characteristics may include land slope, topography (i.e., upland, alluvial plain), bedrock, soil types, streams and aquifers, collapse potential, and others deemed pertinent by the investigator. The report will outline any applicable site limitations and may include construction recommendations such as compaction procedures, rock excavation, more detailed soils investigation, or other recommendations. Appendix B contains sample report forms for a geological investigation.

Many states have a Division of Geology and Land Survey staffed by geologists qualified to perform site investigations for manure storage facilities. This service may be available at no cost to the producer. Contact the state regulatory agency for information regarding geologic investigations. Qualified professional geologists or engineers may also perform geologic investigations.

Separation distance requirements

Earthen manure storage impoundments may be subject to regulatory separation distances that might impact a proposed site. Check local and state requirements to ensure that a particular site satisfies separation distance requirements.

Buffer distances. Buffer distances, if required, are usually intended to reduce the impact of a manure storage facility on non-owned dwellings, businesses, and public entities such as parks and churches. The magnitude of these distances is usually dependent upon the size of the livestock enterprise (animal units), and the distance is usually measured from the manure storage structure to the nearest non-owned residence, public building, or entity. Public notice to neighbors within a certain distance (for example, within 1.5 times the applicable buffer distance) may be required by the regulatory agency if an operation is required to obtain a permit.

Groundwater and surface water. Separation distances may be required for groundwater and surface water features. A given vertical separation (for example, 4 ft) may be required between the bottom of an earthen storage facility and the seasonally high water table. Separation requirements may also exist for manure storage structures and water supply facilities such as wells, reservoirs, or ponds. Check applicable local or state codes for any required separation distances.

Flood plain. Locating a manure storage structure in a flood plain presents several potential hazards. The facility may be inundated and structurally compromised due to flooding. Manure may be displaced from the

A geological investigation, along with test borings, provides important information on the suitability of a manure storage site.

facility by floodwater and become an environmental liability. Floodwater can exert unbalanced hydraulic pressure inward on earthen impoundments if the manure level inside the basin is lower than the water level outside the basin. Such unbalanced pressure may impair seal integrity and compromise the structural integrity of the impoundment.

Test borings

Conducting test borings may be the most important pre-construction activity in siting and constructing an earthen manure storage facility. Some states may require that test borings be taken and analyzed as a condition for issuance of a construction permit. Test borings yield important information on subsurface soil type, depth to groundwater, depth to bedrock, presence of sand or gravel, and other geological characteristics. Test borings are usually taken to the proposed excavated depth of the impoundment plus some additional distance (for example, excavated depth plus 4 ft) to ensure sufficient material is available between the impoundment bottom and any unknown sensitive geologic feature or condition.

The number of test borings necessary depends upon facility size and the inherent variability of geologic features (varying soil types, presence of rock, sand lenses) at a particular site. Generally, a minimum of four test borings is recommended. Test borings may be performed by Natural Resources Conservation Service (NRCS) personnel as a service to the landowner. Geotechnical firms in the private sector also have expertise and equipment to conduct test borings. Soil samples acquired through test borings may be analyzed in the laboratory for more detailed information such as soil classification, sieve analysis, maximum density, Atterburg limits, plasticity index, and permeability.