

ENGINEERING REPORT

**HOG FARM & WASTE STORAGE FACILITY
CUMBERLAND LLC
GRANTSBURG, WI**

SUIDA-01-19

October 2022

Engineering Report Authorization

Prepared for:

Cumberland, LLC
12884 State Highway 48
Grantsburg, WI 54840
Contact: Jeff Sauer

Prepared by:

Oakridge Engineering, Inc.
877 Gaylord Avenue
Mondovi, WI 54755
Phone: 715-926-1110

Prepared By:

Erik T. Lietz, PE

Date

Reviewed By:

Michael J. Tiry, PE

Date

Distribution List

# of Copies		Recipient
Hard Copy	Digital Copy	
2	1	Jeff Sauer Cumberland LLC N13126 Bruce Mound Ave Thorp, WI 54771 JeffSauer2@gmail.com
-	1	Wisconsin Department of Natural Resources Via ePermitting
1	-	Jason Towne Land Services Director Burnett County Land Services Department 7410 County Road K #120 Siren, WI 54872 715-349-2109 jtowne@burnettcounty.org
1	1	File Copy - Oakridge Engineering Inc.

Table of Contents

1.0 Project Information.....	1
1.1 Land Parcels.....	1
1.2 Proposed Facility Description.....	1
1.2.1 Animal Rotation.....	2
1.2.2 Feed Storage.....	2
1.2.4 Manure and Waste Water Storage.....	2
1.3 Management Assessment.....	2
1.1.1 Waste Characterization.....	3
1.1.2 Land base available for utilization of waste.....	3
1.1.3 Method of distribution of manure onto the land base.....	3
1.1.4 Planned storage period.....	3
1.1.5 Waste handling and transfer methods from source to storage.....	3
1.1.6 Facility waste removal methods.....	4
1.1.7 Storage facility liner possibilities and preferences.....	4
1.1.8 Access needs and limitations.....	4
1.1.9 Safety Needs.....	4
1.1.10 Labor and Equipment needs.....	4
1.1.11 Potential odor concerns.....	5
1.1.12 Provisions for facility expansion.....	5
1.3 Site Assessment.....	5
1.3.1 Locations.....	5
1.3.2 Property Line Setbacks.....	5
1.3.3 Wetlands.....	6
1.3.4 Regional Water Table.....	6
1.3.5 Access Drive.....	6
1.3.6 Subsurface Investigation.....	6
1.3.7 Karst Features.....	7

1.3.8 Sensitive Environmental Settings.....	7
1.4 Separation from Subsurface Saturation or Bedrock.....	7
1.5 Design and Components.....	7
1.5.1 Soil Materials.....	7
1.5.2 Design Storage Volume and Period.....	7
1.5.3 Permanent Markers.....	8
1.5.4 Design Storage Volume.....	8
1.5.5 Remaining Waste.....	8
1.5.6 Freeboard Volume.....	8
1.5.7 Waste Removal.....	8
1.5.8 Staff Gauge.....	8
1.5.9 Windbreak.....	8
1.6 Safety.....	9
1.7 Failure Analysis.....	9
2.0 Operation and Maintenance Plan.....	10
3.0 Construction Quality Assurance Plan.....	10
4.0 Plans and Specifications.....	10

Appendices

Appendix A – Maps

Appendix B – Correspondence

Appendix C – Wetlands

Appendix D – Subsurface Investigation

Appendix E – Design Calculations

Appendix F – Operation and Maintenance Plan

Appendix G – Quality Assurance Plan

Appendix H – Construction Specifications

Appendix I – Engineering Plans

1.0 Project Information

Cumberland LLC - Hog Farm & Waste Storage Facility

¼	¼	Section	Township	Range	Project Name	Project No.
	NW	7	T37N	R18W	Hog Farm & WSF	SUIDA-01-19
Town/Village/City			County		Contact Name	Phone
Trade Lake			Burnett		Jeff Sauer	715-773-1976
Site Address (if available)				Contact Address		
12884 State Highway 48 Grantsburg, WI 54840				N13126 Bruce Mound Road Thorp, WI 54771		
Engineer Name				Address		Phone
Erik Lietz, P.E. Oakridge Engineering, Inc.				877 Gaylord Avenue Mondovi, WI 54755		715-926-1110

The proposed Cumberland LLC project is a new swine farm to be operated as a turn-key farrow to wean facility. The site in its current state is used for agricultural crops. There is an existing abandoned residence located at the site address above. The existing residence is in extremely poor condition and proposed to be razed in the development process.

1.1 Land Parcels

Parcels purchased for development of this project include Property Identification Numbers (PINs):

07-034-2-37-18-07-2 04-000-011000 (North Lot – Undeveloped Cropped Field)

07-034-2-37-18-07-2 04-000-012000 (South Lot)

07-034-2-37-18-07-2 04-000-013000 (12884 State Highway 48)

Not included in the project is a 1.04 acre parcel that contains a cell phone tower, utility building and paved parking area along Hwy 48 remains privately owned. There is no residence on this parcel. A map of these parcels is shown in Attachment A of this report.

1.2 Proposed Facility Description

Cumberland LLC will be a newly constructed swine farrowing facility. This facility will house 7,500 sows, 100 boars and up to 18,750 pigs on site for a maximum of 6,163 AU. This facility will be covered under a Wisconsin Pollution Discharge Elimination System (WPDES) permit. A nutrient management plan (NMP) will be submitted separately as part of the WPDES permitting process.

1.2.1 Animal Rotation

Animals will be rotated throughout the facility throughout their gestation cycle. Pregnant sows and gilts are kept in the gestation barn throughout the approximate 114 day gestation cycle. Just before farrowing, sows and gilts will be moved to the Farrowing Barn to have their litter. The sow and piglets will remain in the farrowing barn until the piglets are weaned. Most of the weaned piglets and all replaced sows will be sold and moved from the farrowing barn. Replacement pigs will be moved to the nursery and gilt development unit (GDU). Mature gilts will be moved to the breeding and gestation barn as replacements.

1.2.2 Feed Storage

Feed for the swine will be delivered by truck to the bulk bins located around the perimeter of the barns. Automated systems will distribute stored feed to feeders within the barns. Automated mechanical feeding systems will assist with animal feeding operations. All feed is stored in bins that are sealed from contact with precipitation. Therefore, no leachate or contaminated runoff from feed storage will be present.

1.2.3 Water Storage

Potable water will be pumped from the well(s) and stored in a proposed water storage tower on site. The tower will be a 17-foot diameter Harvestore type structure that will be 45 feet tall. The water tower on site will help to moderate demand on the well pumps and aquifer.

1.2.4 Manure and Waste Water Storage

Animal manure and waste water used to clean the facility will fall through the slotted floors of the barns and be stored in the deep pits beneath each barn. Human wastes and municipal wastewater will be stored in separate septic tanks and will utilize leach fields (by others under separate contract and permits).

1.3 Management Assessment

The following management assessment was completed in order to explore options and determine the purpose of the proposed waste storage facility components, available resources, manure disposal schemes, and waste characteristics in accordance with Natural Resources Conservation Service Conservation Practice Standard (NRCS CPS) 313 *Waste Storage Facility*, and 522 *Pond Sealing or Lining - Concrete*.

1.1.1 Waste Characterization

The source of all wastes stored in the under barn storage's and in the new WSF are a mixture of swine manure, waste food, and waste water. It is estimated that there will be 4,000 hogs in the finishing barns (55 lbs to market) and 4,300 pigs in the nursery barns (up to 55 lbs). There is a variability in the liquid manure produced by the nursery barns. A diet high in liquid content may produce higher than projected wastes. Variability in the growth rate of the nursery pigs also affects the volume of manure released for storage in the large finishing barn storage pit. The additional storage provided in the WSF(s) will allow the farm to accommodate potential variations (increases) in waste without affecting ventilation of the finishing barns.

In addition to the actual swine waste, the facility will collect waste water from the farm operations (spilled feed water, wash down water, cooling water, etc.) and will also store wastewater and waste sludge from industrial sources. The industrial wastes are further described in the facility's NMP. A summary of waste generation is provided in Appendix C "Engineering Design Calculations" section of this report. Each WSF will have capacity for industrial waste volume.

1.1.2 Land base available for utilization of waste

All land base available for utilization of waste is addressed in the facility's Nutrient Management Plan (NMP). This plan is provided under separate cover by Dairyland Labs. All land base availability is either owned or contracted for spreading.

1.1.3 Method of distribution of manure onto the land base

All stored manure is removed from the storage pits by use of a PTO driven pump and loaded into a tank spreader. The manure is taken to the fields and injected into the soils. This distribution method minimizes odor emissions from the application process and also minimizes runoff potential. The facility's Operation & Maintenance plan is located in Appendix F of this report. This plan provides more specific information on waste handling and odor reduction practices. See the facility's NMP for full guidance on land application of wastes.

1.1.4 Planned storage period

Total wastes estimated to be produced and stored at this facility in one year is approximately 9,020,637 gallons. The combined waste storage volumes for the farm below the maximum operating limit (MOL) and excluding 1-foot of sludge storage, the combined waste storage volume is 15,574,800 gallons. This storage volume equates to 630 days storage for the proposed animal capacity.

1.1.5 Waste handling and transfer methods from source to storage

The farm will use traditional methods of waste transfer, direct drop through slatted floors in all three of the proposed barns. Pump ports located around the perimeter of each of the barns will be used for access to the stored liquid manure for pumping and agitation. The barns will utilize positive pressure ventilation air flow for supply air and venting of gases from the storage areas.

1.1.6 Facility waste removal methods

Contents of the storage structures will be agitated and pumped empty by use of PTO pumps and waste spreading equipment. Sumps will be provided to allow for complete liquid draw-down.

1.1.7 Storage facility liner possibilities and preferences

The waste storage impoundments (three total) are each less than 25 feet deep and are planned for agriculture waste storage that will protect soil and water resources.

Each waste storage impoundment will be constructed in whole or as part of a 10-foot deep pit under each barn. The farrowing barn has a section of 2-foot deep pit and another section where there is no pit under the building. Each impoundment will be constructed with poured in place reinforced concrete perimeter walls over a reinforced concrete floor. The concrete impoundments will be constructed with reduced seepage concrete with waterstop at all control joints. Precast concrete columns will be installed over thickened slab footings within the floor. The floor will be constructed as one continuous pour where possible.

Following the requirements of CPS 313 and 522, and based upon the subsurface investigation findings, the WSF components can be constructed as a Reduced Seepage Concrete – Soil Composite, or “Type B” based on Table 2 – Concrete Liner System Criteria in CPS 522. “Type B” reduced seepage concrete allows for soils with >20% P200 and PI > 7, which the native soils have. The soil component of the concrete-soil composite system will be 1.5 feet thick of soils beneath and along the walls. Soils back filled around the walls will be compacted to WI Specification 204. The sub-Liner soils requirements for a Reduced Seepage Concrete – Soil Composite will be a column “A” sub-liner based on Table 2A – Sub-Liner Soil Requirements in CPS 522. Based on the subsurface investigation, this sub-liner soil will be the in-situ sandy clay soils.

1.1.8 Access needs and limitations

A PTO driven pump will be used to transfer wastes directly to out of the WSF and into spreader tanks. Access to the pump ports is provided around the perimeter of each barn. Pump ports will also be used as access points for agitation equipment and staff gauges for monitoring stored liquid waste elevation.

1.1.9 Safety Needs

The storage impoundments will be confined spaces. Build-up of manure gasses is always a danger in confined spaces. Ventilation systems within each barn will allow for adequate airflow through provided clearances between the barn floor slats and the liquid level within the pits remains clear. Levels of stored liquid manure shall be maintained below the Maximum Operating Level (MOL) at all times. See the Operations and Maintenance plan in Appendix F for additional safety information.

1.1.10 Labor and Equipment needs

Labor will be required to hook up and run the pumping equipment when deep pits are being emptied. Direct observation of the transfer is recommended for the duration of running a transfer pump. Any observed leaks, disconnections, equipment malfunction or spillage must be addressed appropriately and immediately.

A PTO driven pump, flexible hoses and manure spreaders are necessary for proper application of stored wastes. Agitators are necessary for suspending manure solids during load-out operations. All manure spreading volumes must be recorded and documented in accordance with the facility's NMP.

Maintenance on any ventilation fans must be addressed promptly to maintain adequate removal of manure gases.

1.1.11 Potential odor concerns

Concerns about odor are a constant priority when handling, agitating and field applying stored wastes. See sections in the enclosed Operations & Maintenance Plan on minimizing odors associated with wastes and avoid weather conditions likely to promote odor drift. Consideration for odor drift in manure management practices, handling and transfer are important in minimizing odor concerns. It is recommended to apply all liquid manure to fields by injection equipment rather than surface spreading.

As a part of this proposed facility, a wind break is proposed to be planted around the facility, see 1.5.9.

1.1.12 Provisions for facility expansion

No expansion is proposed at this time or for the five year forecast of this facility's operation. It may be preferred to construct approximately half of the facility upon approval and receipt of permits for the project. Completion of the project construction will be completed within the permitted construction period.

1.3 Site Assessment

The following site assessment was completed in order to determine the physical site characteristics that will influence the placement, construction, maintenance, and environmental integrity of the proposed waste storage facility in accordance with NRCS CPS Code 313 and 522.

1.3.1 Locations

Topographic survey was completed by Oakridge Engineering, Inc. and its subcontractors. Pertinent locations and elevations of buildings, roads, existing facility components, and other necessary site elements were recorded. This information was utilized in designing the proposed facility.

Locations of the proposed barns were highly dependent upon avoiding and minimizing impact to existing wetlands on this site and abiding by Chapter ATCP 51 setback requirements. Elevations of proposed facilities were set to minimize elevation differences between barns and for balancing earthwork operations. Backfill around the Gestation Barn was modified to also minimize the impact to adjacent wetlands. No setbacks, wells, springs, floodplains, utilities or cultural resources are present to influence the location.

1.3.2 Property Line Setbacks

Burnett County has adopted Chapter ATCP 51 "Livestock Facility Siting", which will govern setback distances for construction of animal housing and waste storage facilities. Wis. Stats. ATCP 51.12(1)(b) defines a livestock structure setback to be a maximum of 200 feet from property lines and a maximum of 150 feet from any public road right-of-way since the facility will have greater than 1,000 Animal Units

(AU). Wis. Stats. ATCP 51.12(2) defines the setback for waste storage structures to be a maximum of 350 feet from any property line or public road right-of-way.

A "Livestock Structure" is defined by Wis. Stats. ATCP 51.01(20) as a "building or other structure used to house or feed livestock, to confine livestock for milking, to confine livestock for feeding other than grazing, to store livestock feed, or to collect or store waste generated at a livestock facility." By definition, all barns foundations, including pump ports and feed storage bins must be located beyond the defined setbacks.

A "waste storage structure", according to Wis. Stats. ATCP 51.01(44)(a) "does not include... a structure used to collect and store waste under a livestock housing facility." Therefore all setbacks for the hog barns, which all have storage pits beneath the housing facility will be 200 feet to property lines and 150 feet to public road rights-of-way.

1.3.3 Wetlands

Wetland maps are included in Appendix A of this report. The mapped wetlands extend into an area of proposed construction on this site. Due to the proximity of the wetlands, a formal delineation was performed by Tetra Tech. Tetra Tech is not an assured delineator therefore wetlands boundaries were requested to be confirmed by Wisconsin DNR and Army Corps of Engineers. Delineated wetland limits are shown on the engineering drawings. A copy of the wetland permit and supporting information is included in Appendix C.

1.3.4 Regional Water Table

The Burnett County Groundwater Resource Investigation map was produced by the Wisconsin Geological and Natural History Survey and the Burnett County Board of Supervisors. The estimated ground water elevation is at 920 feet MSL. The lowest barn pit floor elevation is set at 975 feet MSL.

1.3.5 Access Drive

The residence at the project address has an access drive connected to State Highway 48. Access to the site is proposed to utilize the existing location with an expanded width to accommodate truck turning movements following Wisconsin Department of Transportation guidance and permitting, if necessary.

1.3.6 Subsurface Investigation

Soil maps of this site show Alstad loam and Branstad fine sandy loam to be present. In March 2019, Oakridge staff performed subsurface investigations on the property by digging test pits with an excavator. A total of 27 test pits were performed. The test pits are shown on the Engineering Plans. The site was fairly consistent in having a soil profile with a silt cap overlaying a massive depth of sandy clay (SC) and clay (CL) soils. No bedrock or groundwater was encountered.

Samples of the sandy clay (SC) and clay (CL) soils were tested for grain size and Atterberg Limits. All SC and CL soils tested had a minimum P200 of 40.2% and an average Plasticity Index (PI) of 9.7 and a minimum of 7.5. See Appendix B for laboratory reports of the soils analysis.

1.3.7 Karst Features

The bedrock in Burnett County is not susceptible to karst formation. No karst features have been identified to be located within 400' of the proposed location of the proposed development.

1.3.8 Sensitive Environmental Settings

This site is not part of a sensitive environment by the definition set forth in CPS 313.

1.4 Separation from Subsurface Saturation or Bedrock

There was no subsurface saturation encountered during the subsurface investigation.

The Generalized Water-Table Elevation Map of Burnett County, Wisconsin indicates groundwater to be at elevation 920 (the lowest barn pit floor elevation is set at 975). None of the test pits showed evidence of seeps. No perched water conditions were encountered. There were mottles observed in many of the test pits signifying water being held up in the Clay and Sandy Clay soils. A drain tile will be installed at the perimeter of the waste storage footing.

There was no bedrock encountered during the subsurface investigation.

1.5 Design and Components

This wastes storage facility system has been designed in accordance with NRCS CPS Code 313 and 522. Additional details of the design can be found in Design Calculations included in Appendix C. The interior flooring system (precast concrete columns, beams, floors, etc.) and barn systems (structures, ventilation, etc.) are not included in this submittal and therefore, Oakridge Engineering is not responsible for those systems. The WSF design does include loadings and factors from the flooring system and barn above the WSF in the design calculations. It is anticipated to use an approved engineered precast concrete flooring system designed for swine facilities. This work will be coordinated with other parties during construction activities.

1.5.1 Soil Materials

During the subsurface investigations soil samples were taken from various layers to determine suitability as construction materials. The soils meet column B from Table 2A – Sub-liner Soil Requirements for Waste Storage Facility Impoundments. The soils also meet the requirements of the soil component of the Reduced Seepage Concrete – Soil composite of column A from Table 2 – Concrete Liner System Criteria for Waste Storage Facility Impoundments.

1.5.2 Design Storage Volume and Period

Design calculations show that the proposed facility will have approximately 15.57 million gallons of liquid manure storage available under the three proposed barns. Annual waste production is anticipated to be approximately 9.02 million gallons. The storage period for the existing condition is 630 days. The MOL and 180 day level elevations and storage volumes for each barn shown in Appendix D – Waste Volume Calculations.

1.5.3 Permanent Markers

Permanent markers must be installed on this facility to monitor depth of liquid manure stored. Permanent markers should clearly show the Maximum Operating Level (MOL) and 180-Days Level (L-180). Included in the design calculations of this report are stage-storage graphs that show the correlation between depth and volume of the proposed WSF.

1.5.4 Design Storage Volume

The waste production for this facility is based on the facility's Nutrient Management Plan (NMP). The annual waste production is based upon anticipated waste from the animals, waste waters used on the farm, and other wastes brought to the farm. The proposed design storage volume was chosen to provide the facility with more than one year of storage. The proposed combined storage provide over 15.5 million gallons of available storage.

1.5.5 Remaining Waste

Remaining waste on liquid storage facilities with vertical walls was considered at 1.0 foot. MOL storage volumes exclude the lowest 12" of storage to account for accumulated solids that are not able to be removed even with agitation.

1.5.6 Freeboard Volume

A freeboard depth of 12-inches is used for the under-barn deep pits. An additional 6-inches clearance is required due to ventilation requirements. This results in a total of 18-inches of clearance for the maximum operating level. The precast concrete slats are 5-inches thick and support beams are 10-inches tall. No precipitation enters the waste storage facility(s). The MOL elevation is the same as the freeboard elevation.

1.5.7 Waste Removal

Design components for removing wastes from the deep pits include the sump and pump port covers. Agitation of stored liquid manure should take support column placement into consideration. Excessive jetting of liquid manure at support columns may cause scouring of concrete. This could be detrimental to the life expectancy of the column integrity. Pump port access points should be kept clear of clutter or obstructions. Human or animal entry into the storage pit is prohibited due to the dangers associated with confined spaces.

1.5.8 Staff Gauge

A removable staff gauge or permanent mounted graduated staff is recommended for determination of the liquid level in the proposed WSF. Locate this gauge at a pump port dedicated as a test level port for regular monitoring of depths to be reported. A convenient stage-storage graph is included in the "Engineering Design Calculations" section of this report for converting depth to volume in the WSF.

1.5.9 Windbreak

A proposed windbreak is included in this site design as a coordinated effort in odor abatement. Trees, shrubs and other landscape vegetation should be maintained as recommended by general landscaping

principles. Dead or damaged elements of the windbreak should be replaced with similar plantings. A continuous and thriving vegetated screening is essential to effective odor control.

1.6 Safety

Permanent safety features are designed to minimize the identified risks and hazards to animals and people in and around this facility. All safety fences must be constructed and maintained to serve the intended purpose. Areas that need to be accessible (ie. sumps and pump out ports) shall provide limited temporary access by use of access port covers that remain shut in times when not in use. Warning signs declaring the danger of confined spaces, hazardous atmospheres, and drowning hazard and stored liquid manure are required. Warning signs shall be affixed to walls at all areas meant for temporary access.

1.7 Failure Analysis

Breach of a vertical concrete wall on this WSF is unlikely. The concrete design was shown to be adequate from complete backfill depth to a minimum of 4' of backfill depth. A leak in a vertical wall or failure of a wall would lead to a release of manure down a vegetated slope.

A wall containment failure or floor liner failure could also cause the perimeter drain tile to intercept leaking manure which would be discharged at the southwest corner of the subject property.

The Operations & Maintenance Plan addresses emergency response actions to be taken in the event of a breach or spill.

2.0 Operation and Maintenance Plan

The operation and maintenance plan is located in Appendix F.

3.0 Construction Quality Assurance Plan

The quality assurance plan is located within Appendix G.

4.0 Plans and Specifications

The construction specifications for the proposed facility and waste storage facility are located within Appendix H.

The engineering plans for the proposed facility and waste storage facility are located within Appendix I