Minnesota Pollution Control Agency and Environmental Quality Board Anaerobic Digester Guidance

This document is designed to help project proposers utilize the Minnesota Climate Calculator (Calculator) to answer Item 18: Greenhouse Gas (GHG) Emissions/Carbon Footprint, specifically for animal feedlots. Project prospers **must** include the Excel file when submitting the Environmental Assessment Worksheet (EAW).

Project information

The first step is to enter the basic information of the project including construction start date, operation year, lifetime, acreage, and square footage of buildings as highlighted in the red below. While not explicitly stated in the U.S. Energy Information Administration, anaerobic digester can be classified as industrial buildings.

The cells highlighted in green allows project proposers to identify energy that is from renewable sources. Entering a percentage value in either field will result in lower emission under the building energy category. The top cell in highlighted in green asks project proposers if any of the electricity generated **onsite** is from renewable sources, or if any of the electricity comes from renewable energy credits. The second asks project proposers if any of the natural gas comes from renewable sources.

Project Information

Enter information into all yellow cells. Results may not calculate if fields are left blank, as highlighted by the red x marks
construction projects, select the Apply Defaults button to populate the Construction Duration with the default data from t

Project Name	Anaerobic Digester
Project Category (primary)	Subp. 5, Fuel conversion Facilities
Project Category (secondary)	
Location (County)	Sherburne

Construction Start Date	1/1/2026
Operational Year	2027
Operational Lifetime (Years)	40

Total Project Acreage	10.0
Residential Building Area (sq ft)	
Commercial Building Area (sq ft)	
Industrial Building Area (sq ft)	10,000.0
Institutional Building Area (sq ft)	
Other Building Area (sq ft)	

Building Construction Project?	Yes

Construction Stage	Duration (Days)	Default*
Demolition	20.0	20.0
Site Preparation	10.0	10.0
Grading	30.0	20.0
Building Construction	300.0	230.0
Architectural Coatings	20.0	20.0
Paving and Landscaping	20.0	20.0

*Defaults are dependent on total project acreage and are only applicable to bui

Electricity Provider	Grid Average
Portion of Building Electricity Consumption to be Generated On-Site via Renewables or Supplied through the Purchase of Renewable Energy Credits (RECs)	50%
Portion of Building Natural Gas Consumption to be Supplied from Renewable Sources	50%

Applicable emission sources

Next is to determine what the applicable emission sources. Project proposers are advised to start with “Apply Defaults” but then to review what information they have available and modify which sources to include. The Applicable Emission Sources are broken out into two project phases, Construction and Operation.

The category of fuel conversion facilities covers a wide range of projects. Several of the default applicable emission do not apply to anaerobic digesters.

The following emissions sources should be changed to ‘no’.

- Coal production; and
- treatment of waste off-site.

Applicable Emission Sources

Information is provided below on emission sources potentially applicable to your project depending on the project category selected in the section above. Select the 'Apply Defaults' button to include all applicable sources, or manually select "Yes" or "No" to indicate which emission sources to estimate GHG emissions for in this calculator. The red x mark will appear until a selection is made for all emission sources.

Project Phase	Emission Source	Include Emission Source?	Applicable to Project Category?
Construction	Material inputs	Yes	Yes
Construction	Transportation of material inputs		
Construction	Employee commuting	Yes	Yes
Construction	Construction equipment	Yes	Yes
Construction	Land use change (construction)	Yes	Yes
Construction	Construction waste	Yes	Yes
Operation	Building energy consumption	Yes	Yes
Operation	Coal production	No	Yes
Operation	Natural gas and oil products	No	No
Operation	Industrial processes	No	No
Operation	HFC leakage	Yes	Yes
Operation	Land use change (operations)	No	No
Operation	On-road vehicles	No	No
Operation	Treatment of waste on-site	Yes	Yes
Operation	Treatment of wastewater on-site	No	No
Operation	Treatment of waste off-site	No	Yes
Operation	Enteric fermentation	No	No
Operation	Manure management		

Apply Defaults

Reset Button

User inputs

After determining the Applicable Emission Sources, project proposers move on to the User Inputs tab to populate specific information within each emission source.

Construction phase

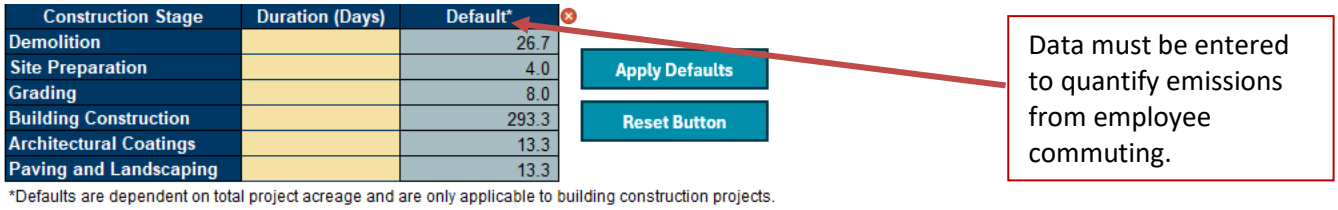
There are six emission sources under the construction phase. Project proposers should attempt to populate each source; however, it is understood that data may not be available at the time of preparing the EAW. When data is not available, project proposers may use defaults when available. Project proposers should note that defaults are used. If project proposers think the default values are not appropriate for the project, then they can toggle the “Include Emission Source to ‘No’.

Project Phase	Emission Source	Include Emission Source?	Applicable to Project Category?
Construction	Material inputs	No	Yes
Construction	Transportation of material inputs		

- Material Inputs:
  - Project proposers should enter the estimated amount of material such as concrete, asphalt, etc. (if known). The Calculator will calculate the transportation of the material depending on where the material was sources (domestic or imported).

- Employee Commuting:
  - Daily average number of employees commuting to the site during different staged of construction.
  - The average one-way commute length.
  - The percentage of transportation mode. If employee commuting habits are unknown, then 100% single occupancy vehicle should be used.

Note: Employee commuting calculations are tied to the Construction Stage duration input fields on the Project Background tab. If these fields are blank, the Calculator will create a warning that inputs are incomplete.



- Construction Equipment:
  - There are 15 types of construction equipment listed. Project proposers will enter the number of hours per day that a piece of equipment is used (if known).
  - The default number of hours per day is based on the project acreage input in D17 on the Project Background tab.
  - If a piece of equipment used on site is not on the list, project proposers may model the equipment after a similar piece of equipment. Equipment information is below or on the Assumptions Tab starting on B101. MPCA recommends including any assumption on the Notes Tab.

Table 1. Construction equipment.

Equipment type	Horsepower	Load Factor	Btu/hp-hr
Air Compressors	37	0.48	7,684.73
Cement and Mortar Mixers	10	0.56	7,709.24
Concrete/Industrial Saws	33	0.73	7,774.65
Cranes	367	0.29	7,133.38
Excavators	36	0.38	7,938.58
Forklifts	82	0.20	7,126.94
Generator Sets	14	0.74	7,684.18
Graders	148	0.41	7,182.18
Pavers	81	0.42	7,119.22
Paving Equipment	89	0.36	7,134.75
Rollers	36	0.38	7,935.40
Rubber Tired Dozers	367	0.40	7,195.40
Scrapers	423	0.48	7,151.74
Tractors/Loaders/Backhoes	84	0.37	7,164.18
Welders	46	0.45	7,683.89

  - A second options for calculating emissions from construction equipment is as follows:
    - Project proposers enter the estimated fuel consumption of equipment in the natural gas and oil products emission source within the Operation Emission Phase.
    - If this option is utilized, project proposers must change the option to ‘yes’ to include natural gas and oil products.

Project Phase	Emission Source	Include Emission Source?	Applicable to Project Category?
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Construction	Transportation of material inputs		
Construction	Employee commuting	Yes	Yes
Construction	Construction equipment	Yes	Yes
Construction	Land use change (construction)	Yes	Yes
Construction	Construction waste	Yes	Yes
Operation	Building energy consumption	Yes	Yes
Operation	Coal production	No	No
Operation	Natural gas and oil products	Yes	No

- Land Use Change (Construction):
  - This section account for emissions associated with modifying the land as in converting grassland to an impervious surface (i.e. new building). Project proposers should enter land converted to accommodate additional waste into the landfill.
- Construction Waste:
  - Only enter material from any demolition that occurred.

Operation phase

- Building Energy Consumption:
  - Building energy consumption is determined based on the type of building and square footage.
  - Based on data from the U.S. Energy Information Administration, anaerobic digesters should be classified as industrial facilities based on the NAICS code of 2212.
  - Project proposers are strongly encouraged to use real world data if available.

Table 2. Energy consumption.

	Energy Intensity (Btu/sq ft/year)			
Building type	Electricity	Natural gas	Propane	Kerosene or fuel oil
Industrial	299,952	656,393	0	8,192

- Coal Production:
  - There are no anticipated emissions associated from anaerobic digester.
- Natural Gas and Oil Products:
  - Project proposers may enter any additional fuel (i.e. natural gas, renewable natural gas, gasoline, etc.) utilized to run the anaerobic digester not accounted for in the Building Energy Consumption section. This could include mobile sources such as nonroad or on-road (if not accounted for in the designated section).
- Industrial Process Emissions:
  - This section accounts for the emissions associated with the extraction of raw materials. There are no anticipated emissions associated from anaerobic digesters.
- HFC Leakage:
  - These emissions are based on the square footage of the building(s) and percentage of the building(s) that utilize air conditioning.
- Land Use Change (Operation):
  - See Land Use Change (Construction) above. There are no anticipated emissions from anerobic digesters.
- On-Road Vehicles:
  - Enter the estimated vehicle miles traveled per year for the associated speed bin.

    - An alternative for on-road vehicles, if the speed bins are unknown, is to enter the amount of fuel used in the natural gas and oil products.
- Treatment of waste on-site:
    - This section accounts for the treatment of waste from multiple strategies, including anaerobic digesters, both wet and dry. Project prospers enter the amount of waste or feedstock treated by anaerobic digestion.
    - If the anaerobic digester is partnered with a farm, utilizing animal manure as an additional feedstock, project proposers must use the Eneteric Fermentation and Manure Management section.
    - Emission factors from anaerobic digesters come from EPA's GHG Emission Factor Hub. These factors include the transportation of feedstock to the digester facility, equipment used at the facility, biogas leakage, and emissions released during the curing and land application process.
        - Emission factors for wet anaerobic digesters are modeled with food waste (non-meat).
        - Emission factors for dry anaerobic digesters are modeled with food waste.
- Treatment of wastewater on-site:
    - There are no anticipated emissions from this section association with anaerobic digesters (the calculator does not quantify emissions from biosolids).
- Treatment of waste off-site:
    - This section accounts for waste generated by households and is not applicable for anaerobic digesters.
- Enteric Fermentation and Manure Management:
    - If the anaerobic digesters are partnered with farms, populate the appropriate fields.