



Organic Material Recovery AND Bioenergy Project

Technical Appendix



1. OVERVIEW

This Appendix provides a detailed analysis of the GHG emissions analysis associated with the measures included in this project:

- Measure 1: Diversion of seafood processing waste, brewery waste, and septage
- Measure 2: Digester of food waste (in addition to the above high strength organic waste [HSOW])

Table 1 provides the detailed analysis. The rest of the appendix provides a narrative of each of the parameters included in the table.

Table 1. Detailed Analysis of GHG Emissions

No.	Parameter	Unit	Measure 1 (without food waste diversion)		Measure 2 (with food waste diversion)	
			Without project (baseline)	With HSOW biodigester	Without project (baseline)	With HSOW biodigester
1	Source & Quantity of HSOWs					
2	Seafood waste	gpd	36,524	36,524	36,524	36,524
3	Brewery waste	gpd	15,107	15,107	15,107	15,107
4	Septage	gpd	3,830	3,830	3,830	3,830
5	Commercial food waste	gpd	--	--	2,130	2,130
6	Combined HSOWs	gpd	55,461	55,461	57,591	57,591
7	Seafood waste	lbs-VS/d	13,072	13,072	13,072	13,072
8	Brewery waste	lbs-VS/d	2,665	2,665	2,665	2,665
9	Septage	lbs-VS/d	600	600	600	600
10	Commercial food waste	lbs-VS/d			2,100	2,100
11	Combined HSOWs	lbs-VS/d	16,337	16,337	18,437	18,437
12	Management/Treatment of HSOWs					
13	Landfill	wt/d	166.8		174.9	
14	Farmland - unprocessed	wt/d	28.6		28.6	
15	Septage haulage	wt/d	14.5		14.5	
16	Anaerobic digestion	wt/d		210		218
17	Farmland - digested biosolids (Class B)	wt/d		8.2		9.6
18	Electricity Requirement for Future Digester Site					
19	HSOW processing	kWh/y		104,400		108,400
20	Thermophilic digestion	kWh/y		1,076,000		1,117,300
21	Centrifuge dewatering	kWh/y		158,000		178,300
22	Total electricity consumption	kWh/y		1,338,400		1,404,000
23	Annual GHG Emissions					
24	Electricity consumption	tonne CO _{2e} /y		385		404
25	Landfill	tonne CO _{2e} /y	6,737		9,075	
26	Septage haulage	tonne CO _{2e} /y	38		38	
27	Land application - emissions	tonne CO _{2e} /y	11	242	11	274
28	Land application - offsets	tonne CO _{2e} /y	(40)	(189)	(40)	(214)
29	Net GHG emissions	tonne CO _{2e} /y	6,746	438	9,084	464
30	GHG reduction from baseline	tonne CO _{2e} /y		(6,300)		(8,600)



Narrative of each parameter presented in Table 1. (The number of each parameter relates to the number in the table)

- **Source & Quantity of HSOWs.** The source and quantity of each organic waste stream based on survey results previously completed as part of the *Organic Materials Recovery and Bioenergy Feasibility Study Project for Clatsop County, Oregon* (Jacobs 2022).
- **Seafood waste in gallons per day** was derived from the historical data for seafood processors operating in the County.
- **Brewery waste in gallons per day** was derived from the historical data for breweries operating in the County.
- **Septage in gallons per day** was derived from the historical data for septage haulers operating in the County.
- **Commercial food waste in gallons per day** was derived based on factors from the CalRecycle 2014 Generator-Based Characterization of Commercial Sector Disposal and Diversion in California Report (CalRecycle, 2015) and the number of employees for four main business types (grocery stores, restaurants, hotels and food manufacturing), and assumption of 50% capture rate.
- **Combined HSOW in gallons per day** was the sum of the applicable HSOWs.
- **Seafood waste in pounds of volatile solids per day** was derived from the historical data for seafood processors operating in the County.
- **Brewery waste in pounds of volatile solids per day** was derived from the historical data for breweries operating in the County.
- **Septage in pounds of volatile solids per day** was derived from the historical data for septage haulers operating in the County.
- Commercial food waste in pounds of volatile solids per day was based on typical characteristics of food waste.
- Combined HSOW in pounds of volatile solids per day was the sum of the applicable HSOWs.
- **Management & Treatment of HSOWs.** The equivalent wet (metric) tonne of each organic waste stream (or digested solids in the case of the biodigester project) associated with each management alternative.
- **Landfill.** Quantity of organic materials diverted to landfill in wet (metric) tonne.
- **Farmland - unprocessed.** Quantity of unprocessed organic materials applied to farmland in wet (metric) tonne.
- **Septage haulage.** Quantity of septage hauled to out of county WWTPs in wet (metric) tonne.
- **Anaerobic digestion.** Quantity of organic materials diverted to the proposed biodigester facility in wet (metric) tonne.
- **Farmland – digested biosolids (Class B).** Quantity of digested biosolids (generated from the proposed biodigester facility) applied to farmland in wet (metric) tonne; based on mechanical dewatering to solids concentration of 20%.
- **Electricity Requirement for Future Digester Site.** Estimated electricity demand for new process equipment at the proposed biodigester facility, obtained from the final report of *Organic Materials Recovery and Bioenergy Feasibility Study Project for Clatsop County, Oregon* (Jacobs 2022), as follows:
 - **HSOW processing**– associated with mechanical equipment and odour control system
 - **Thermophilic digester** – associated with mixing and other auxiliary equipment.
 - **Dewatering** – based on centrifuge.
 - Total Electricity Demand is the sum of the electricity requirements.
 - Annual Greenhouse Gas Emissions
 - **Electricity consumption.** 634 lb CO_{2e}/MWh (US EPA eGRID - NWPP)



- **Landfill.** Estimated using Biosolids Emissions Assessment Model (BEAM*2022; <https://www.biosolidsghgs.org/>), assuming 50 percent of the landfill gas is captured for energy recovery ('typical landfill' selected in BEAM).
- **Septage haulage.** Estimated using BEAM*2022; based on typical heavy-duty truck (diesel) and haulage distance of 100 miles (round-trip).
- **Land application – emissions.** Estimated using BEAM*2022; included CH₄ emitted from extended storage (only for the portion of dewatered biosolids that need to be stored outside of land application season), CO₂ emission associated with diesel consumption when applying to land, and N₂O emitted from land application.
- **Land application – offsets.** Estimated using BEAM*2022; included carbon sequestration as result of land application (based on % organic carbon), and commercial fertilizer offsets from land application (based on % nitrogen and % phosphorus).
- **Net GHG Emissions** are the sum of emissions and offsets.
- **GHG reduction from baseline** is the estimated GHG reduction potential by implementing the proposed biodigester project.