Odour Study Report for a Wastewater Treatment Facility

In Support of an REA Application

July 22, 2022

Prepared for:
Ontario Clean Water Agency

In Association With:
Town of Petawawa

VERSION CONTROL

Revision	Date	Revision Description	Prepared By:	Submitted To:
Draft	October 22, 2021	Odour Study Report for a Wastewater Treatment Plant	Cambium Inc.	Ontario Clean Water Agency
Final	July 22, 2022	Operator changed to OWCA	Cambium Inc.	Ontario Clean Water Agency

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1.0 Introduction

The Ontario Clean Water Agency operates a wastewater treatment facility (the Facility) located at 560 Abbie Lane in Petawawa, Ontario. The Facility is proposing to add a combined heat and power (CHP) system and required auxiliary equipment to utilize the biogas produced from the treatment process. Approximately 200 kWh of the biogas energy will go to the local grid and the remainder will be used to power or heat the Facility's operations. Under Ontario Regulation 359 (O. Reg. 359), a Renewable Energy Approval (a REA) is required for the proposed operations. The Facility's operations are non-agricultural, which is classified as a "Class 3 Anaerobic Digester" under O. Reg. 359.

An Odour Study Report (an OSR) is required as part of the REA application. This odour study report, as required under O. Reg. 359, identifies sources of odour and assesses their potential to cause negative effects at odour receptors near the Facility. This report also details the procedures and equipment that will be implemented for the control, mitigation, and monitoring of all potential odour sources associated with the Facility's operations.

2.0 Facility Information

The main processes at the proposed Facility consists of the treatment of wastewater and the preparation of biogas off-gassed from the treatment process to use as sales gas and to supply a CHP system that will produce approximately 200 kwh of electricity to the local grid.

2.1 Facility Description

The Facility's wastewater treatment process involves primary, secondary, and ultraviolet (UV) treatment. Primary treatment includes chemical addition, screening, grit removal, pre-aeration, scum removal (skimming), and sedimentation (clarification). Secondary wastewater treatment is accomplished using a Sequencing Batch Reactor (SBR) activated sludge process. Finally, before the water is eventually discharged into the Ottawa River, it is treated using an UV system.

The first thickened activated sludge from the wastewater treatment and the sorted curbside collections and septage received by truck as part of the proposed expansion are sent for

anaerobic digestion in a two-stage process. Digested sludge is dewatered and hauled off the property by truck. The biogas collected from the digestion process, rather than wasted and used for site boilers, will be sent through a hydrogen sulfide removal and upgrade system before being used in the CHP units or stored as sale gas. All excess biogas is directed through an emergency flare.

The North American Industry Classification System (NAICS) industry code that best applies to the Facility is 221320 – Sewage treatment facilities, which is part of NAICS subsector code 221 – Utilities. Cambium has provided an illustration of the process on Figure 1 (Odour Process Flow Diagram).

2.2 Site Address

The Facility is located at 560 Abbie Lane in Petawawa, Ontario (the Site). Cambium has presented the Site Plan and Odourous Exhausts of the Facility on Figure 2. The UTM co-ordinates for the Site are:

- Zone – 18
- Easting – 325449 m
- Northing – 5085456 m

3.0 Identification of Potential Sources of Odour

We have identified potential odour sources by reviewing the equipment and activities associated with each stage of the Facility's processes. The pathway of each odour source to the atmosphere was also acknowledged. We have noted the odorous emission sources in Figure 1 Odour Process Flow Diagram, and the locations of their discharge to the atmosphere on Figure 2 Site Plan and Odourous Exhausts.

Cambium expects most air emissions with odourous properties to remain within boundaries of the Site. Significant sources of odour releases are expected to occur from the off gassing of decomposing organic material from the processed waste. The waste processing activities are described below.

3.1 Wastewater Treatment

Most of the treatment process is enclosed except for sedimentation that occurs in the clarifiers and the sequencing batch reactor. These processes are diluted in water and do not promote biogas formation and are therefore expected to release minor fugitive emissions.

3.2 Waste Receiving

Unsealed trucks will deliver processed and sorted curb-side collections from the community and tankers septage to the Facility. Unloading of the tankers are not expected to produce significant emissions as air is drawn into the tanker rather than out. Odours will be fugitively released from the exposed trucks that will spend most of the time onsite unloading at the thickening building.

The slurry receiving and thickening station are sealed but slight odour emissions will occur as thickened solids are discharged from the separator screw press. Dry solids from the separator screw press will be stored in a pile in a closable rolling bin and stored on a concrete pad until the container is removed. Some fugitive odour releases have the potential to occur from the container. All equipment associated with the preparation of the sludge for anaerobic digestion will be located within the thickener building.

3.3 Anaerobic Digestion

Any odour emissions from anaerobic digestion are expected to be insignificant fugitive emissions since the process is sealed to allow for the collection of the biogas. Equipment for this process includes the anaerobic digester with a combined solid/liquid fraction and a biogas generation/storage fraction above.

3.4 Waste Output

Open top trucks will be utilized for dewatered cake collection, and potentially for digestate collection, both for land application. These are assumed to have significant fugitive odour emissions, but they can be covered if necessary to reduce these emissions.

Open top trucks will be used to remove liquid digestate for land application, and dewatered cake once the proposed operations are implemented. The trucks containing either bulk digestate or

dewatered solids will fugitively discharge odours as they drive from the plant and while stationary on the weigh scale or when being loaded. Trucks are loaded in front of the digestate storage tanks and will move to the dewatering building once the proposed operations are implemented. Covered trucks can be used to reduce odour emissions.

3.5 Biogas Treatment

Captured biogas is directed through a conditioning system where hydrogen sulfide (the main odourous contaminant in biogas) is removed and the methane is concentrated. The exhaust points of the gas are the vent of the membrane biogas upgrade system or the flare. All other gas will be consumed by the CHP system or stored as sale gas.

There may be an odour from unburnt hydrocarbons and combustion gases in the flare or CHP plant and from the exhaust of the membrane biogas upgrade system that may still contain some small concentration of odourous contaminants.

The biogas will be stored in gas storage membrane covers of the digesters prior to cooling, treatment, and combustion through the flare, CHP, or upgraded to sale gas. The cover system is made with a single upper membrane, pressurized by an air fan 24 hours a day to keep the biogas chamber at a fixed and constant positive pressure. Closed piece construction prevents gas losses through the anchor bolts that fix the cover to the ground or tank.

4.0 Odour Emissions and Relative Intensity

Cambium has assessed odour emissions from the Facility using worst-case operating conditions and odour data. Therefore, the actual odour impacts are expected to be less than the modelled predictions.

Odour emission calculations in this report are based on all the biogas produced being combusted by the Flare, representing an emergency condition where all biogas produced is flared off. Additionally, waste processing was assumed to be occurring at the expected maximum throughputs. We have sorted the sources of odour identified in the table below based on their relative intensity.

Insignificant	Faint	Distinct	Strong	Extremely Strong
• Anaerobic digestion • Chemical storage • Blowers • HVAC equipment (comfort heating and cooling) • Janitorial cleaning • General Facility exhausts and other employee comfort areas • Office Areas	• Flare • CHP • Biogas upgrade system	• Clarifiers • Sequencing Batch Reactor • Waste Receiving	• Waste output	-

5.0 Evaluation of Negative Environmental Effects

Hydrogen sulfide and ammonia are the primary odour contaminants released while volatile organic compounds (VOCs) contribute to a lesser extent. These contaminants are products of degradation and aerobic/anerobic consumption of the organic matter treated. As these materials originated from fugitive sources their impacts are generally greater closer to the source and propagate outwards in the direction of the wind, which for the Facility is typically to the east.

Figure 3 Site Location Plan details the nearby odour receptors. The closest receptor is located approximately 200 m north-west of the nearest source of odour emission while the closest receptor following the dominate wind direction to the east is approximately 300 m away. The expected worst-case odour impact at these locations is 0.15 OU and 0.10 OU respectively. Therefore, odour is not anticipated to result in a negative impact off site. Modelling and

calculation methodology of odour emissions are detailed in the Emission Dispersion and Modelling (ESDM) report for the Facility (Cambium Inc., 2021). Odour impacts are expected to be much less given the conservative production estimates and worst-case operating conditions assumed.

6.0 Description of Mitigation Measures

The current management practices at the Facility are discussed in this section. The Facility currently implements a variety of practices to ensure emissions are minimized by managing the use and containment of odorous materials, and emissions will be properly dispersed through stack design and material containment.

The clarifiers and batch reactors are uncovered and installing a cover to capture odours for treatment would be effective should additional measures be needed to control odours. However, detailed evaluation would be required because of the operating constraints such as high ventilation requirements, and disruption to maintenance and operations. Covered materials in trucks however, would be much simpler to implement should it be required.

6.1 Anaerobic Digestion and Thermal Treatment

Thermal oxidation is highly effective at removing odorous contaminants through oxidation. All biogas from the digestion process will be contained and directed to the Facility's combined heat and power units, sale gas storage, or flared.

6.2 Process Optimization

Flocculation/coagulation will be optimized to maximize the removal of organic solids so less is present during latter treatment of the wastewater. Use of tank volume monitoring, transfer flow monitoring, automated shut-off, and control of wastewater properties (i.e. temperature, pH, etc.) will limit opportunities for odour generation.

6.3 Dewatering and Thickening

Dewatering by centrifuge and filtration reduces the volume of sludge to be stored and disposed.

6.4 Best Management Practices

Continued development of standard operating procedures (SOPs) and employee training on best management practices (BMPs) should focus on the following:

- process and control equipment maintenance and operation
- good housekeeping
- spill prevention and response
- reducing chemical and cleaner usage
- managing wastes

All materials not readily being processed is to be stored in sealed containers or transported offsite.

7.0 Community Engagement and Compliant Response Procedures

From our understanding, complaints have not been issued to the Facility by the public at the time that this report was published. In the event that the number of complaints increase to rare (i.e. greater than once a month), Ontario Clean Water Agency will decide on the best media to present information to the community and what information will be made available. All employees will continue to be trained on company policy with how to address individuals external to the company. The employee handling the community response will be trained in media relations and managing difficult situations in accordance with company policy.

8.0 Maintenance

The frequency of equipment maintenance is more strictly regulated than what would be typically required for odour management because of the quality control and assurance policies in place for production. These maintenance procedures follow the recommendations in the manufacture’s specifications for the equipment at minimum. Maintenance includes functionality upkeep as well as sanitization to minimize the exposure of surplus materials. Major maintenance efforts will be placed on keeping the Facility’s exhausts operating as designed.

9.0 Conclusions

This odour study report identifies sources of odour and assesses their potential to cause negative effects at odour receptors near the Facility. Waste output and storage are expected to be the significant contributors to odour releases during normal operation, however during upset conditions where the digestion gas is flared greater odour emissions will occur. Cambium has modelled this upset scenario using the USEPA, AERMOD atmospheric dispersion model and did not predict a negative impact at any of the nearby sensitive receptors. Modelling and calculation methodology of odour emissions are detailed in the Emission Dispersion and Modelling (ESDM) report for the Facility (Cambium Inc., 2021).

Procedures and equipment have been implemented and are available for the control, mitigation, and monitoring of all potential odour sources associated with the Facility's operations. As proposed no additional control measures are required based on our modelling.

Respectfully submitted,

Cambium Inc.

Sadie Bachynski, P.Eng.
Senior Project Manager

Cody Given, EIT.
Technologist

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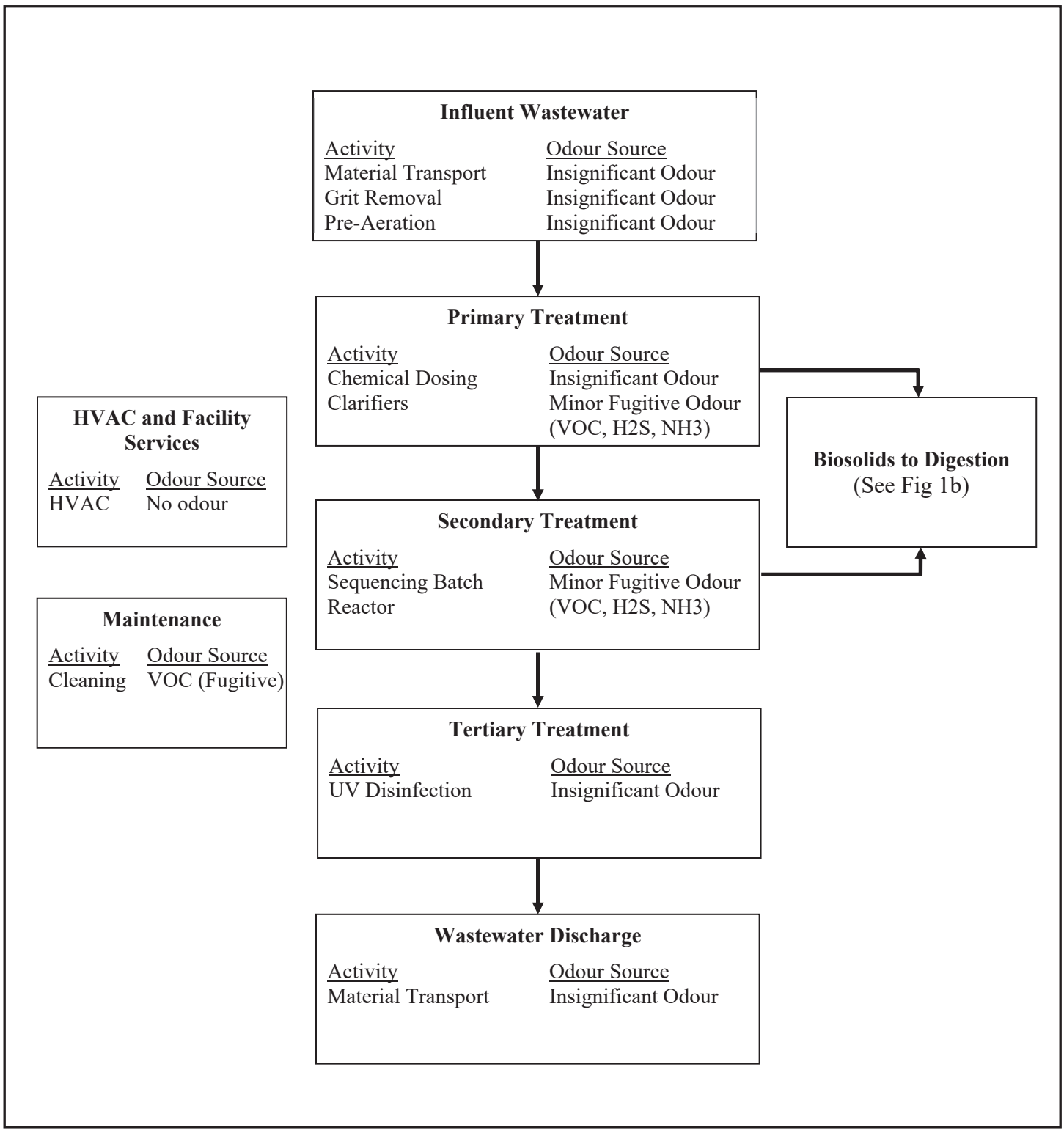
REFERENCES

Cambium Inc. (2021). *Emission Summary and Dispersion Modelling Report for a Wastewater Treatment Facility.*

Appended Figures



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Created by:	Project No.:
CWG	11757-003
Checked by:	Scale:
SLB	NA
Date:	
October 2021	

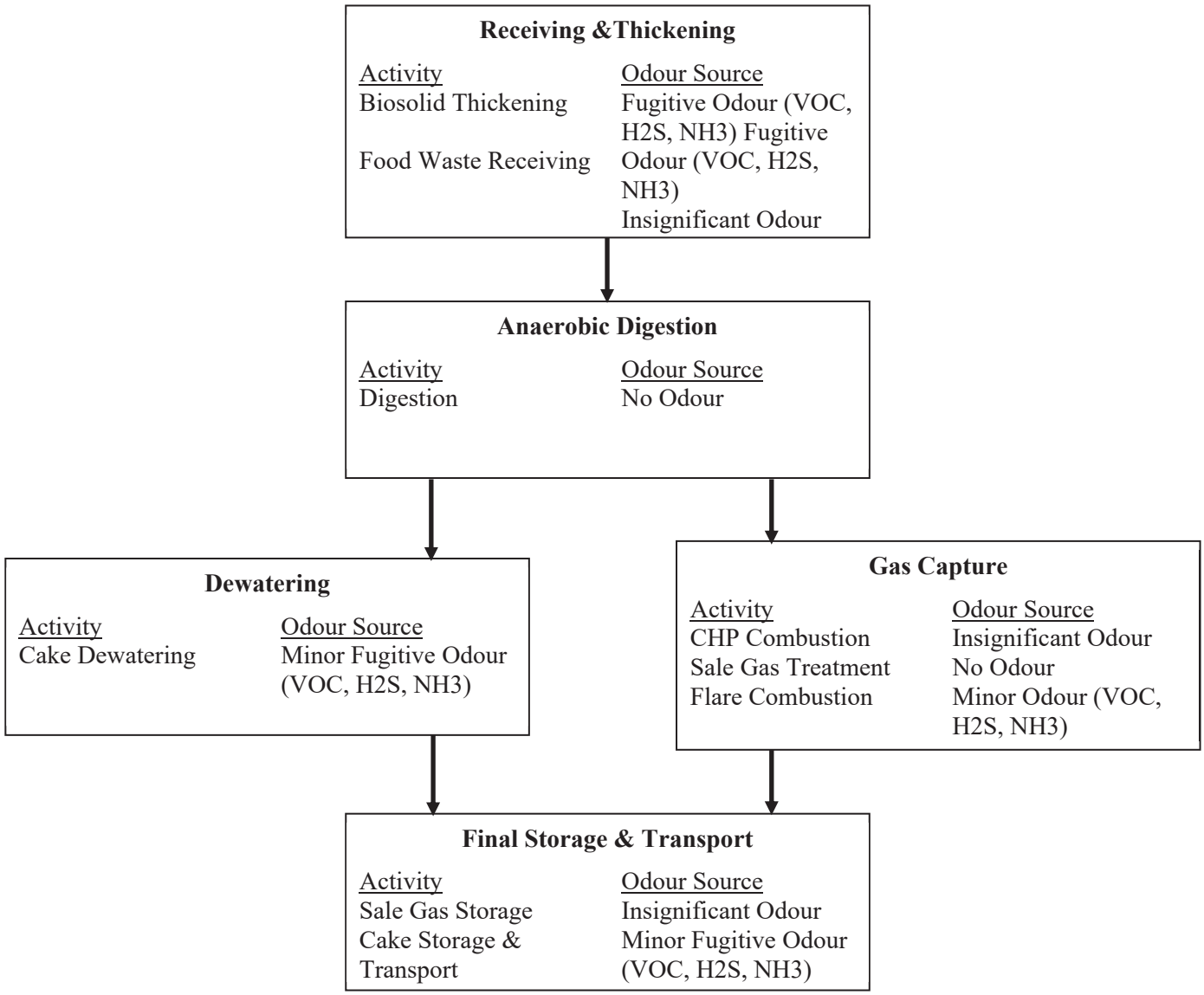
ODOUR PROCESS FLOW DIAGRAM

Town of Petawawa

Odour Study

Petawawa, ON.

Figure No: **1a**



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SLB	NA
Date:	
October 2021	

ODOUR PROCESS FLOW DIAGRAM

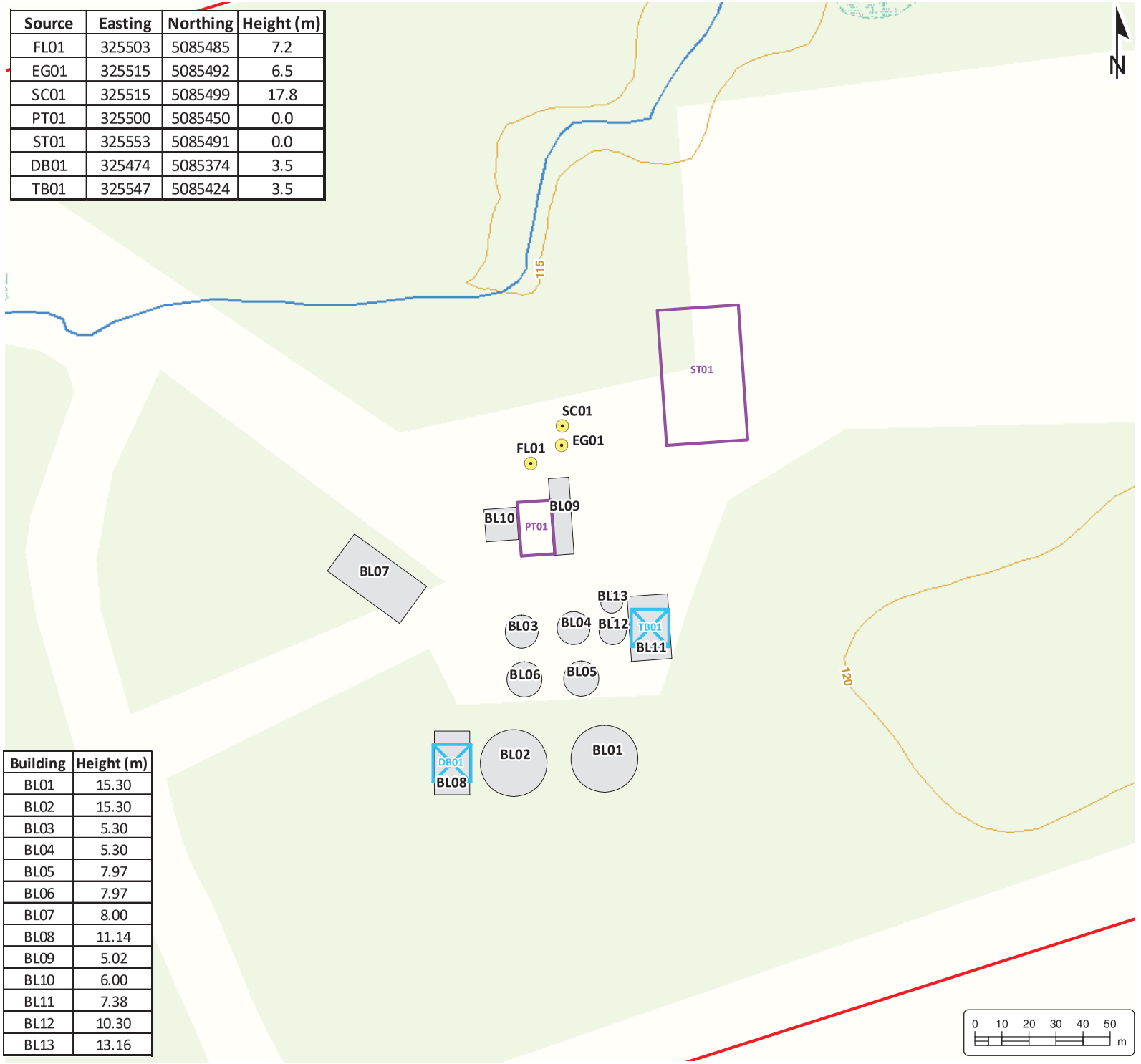
Town of Petawawa

Odour Study

Petawawa, ON.

Figure No: **1b**

Source	Easting	Northing	Height (m)
FL01	325503	5085485	7.2
EG01	325515	5085492	6.5
SC01	325515	5085499	17.8
PT01	325500	5085450	0.0
ST01	325553	5085491	0.0
DB01	325474	5085374	3.5
TB01	325547	5085424	3.5



Building	Height (m)
BL01	15.30
BL02	15.30
BL03	5.30
BL04	5.30
BL05	7.97
BL06	7.97
BL07	8.00
BL08	11.14
BL09	5.02
BL10	6.00
BL11	7.38
BL12	10.30
BL13	13.16

ODOUR STUDY
TOWN OF PETAWAWA
560 Abbie Lane
Petawawa, Ontario

LEGEND

- Point Source
- Area Source
- Volume Source
- Watercourse, Permanent
- Contour 5m Interval (Minor)
- Unevaluated Wetlands
- Wooded Area
- Building
- Site (approximate)

Notes:
- Base mapping features are © Queen's Printer of Ontario, 2019 (this does not constitute an endorsement by the Ministry of Natural Resources or the Ontario Government).
- Distances on this plan are in metres and can be converted to feet by dividing by 0.3048.
- Cambium Inc. makes every effort to ensure this map is free from errors but cannot be held responsible for any damages due to error or omissions. This map should not be used for navigation or legal purposes. It is intended for general reference use only.

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SITE PLAN AND ODOUROUS EXHAUSTS

Project No.:	Date:
11757-003	September 2021
	Rev.:
Scale:	Projection:
1:2,000	NAD 1983 UTM Zone 18N
Created by: TLC	Checked by: SLB
Figure: 2	

O:\GIS\MXDs\11700-11799\11757-003.JDM Designworks - Air & Noise - Petawawa STP\2021-09-27 Odour - FIG 2 - Site Plan and Odourous Exhausts.mxd

Odour Study

TOWN OF PETAWAWA
560 Abbie Lane
Petawawa, Ontario

LEGEND

- Building
- Major Road
- Minor Road
- Watercourse, Permanent
- Contour 5m Interval (Major)
- Contour 5m Interval (Minor)
- Unevaluated Wetlands
- Water Area
- Provincial Park
- Wooded Area
- Building
- Site (approximate)

Notes:
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SITE LOCATION PLAN

Project No.: 11757-003		Date: September 2021	Rev.:
Scale: 1:5,000		Projection: NAD 1983 UTM Zone 18N	
Created by: TLC	Checked by: SLB	Figure: 3	

O:\GIS\MXDs\11700-11799\11757-003 JDM Designworks - Air & Noise - Petawawa STP\2021-09-27 ESDM - FIG 1 - Site Location Plan.mxd

Appendix A
Process Flow Diagrams

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Petawawa Food Waste Co-digestion BFD: Summary

February 4th, 2021

NOT FOR CONSTRUCTION

Phase		Stream				
		PS Feed	WAS Feed	Food reception	Digestate out of AD	Total Biogas (Nm3/d)
1A	Operation (days/wk)	7	7	5	7	7
	Flow (MT/day)	29.75	49.00	28.20	33.60	2713
	TS	3%	2%	15%	5.0%	NA
1B	Operation (days/wk)	7	7	5	7	7
	Flow (MT/day)	43.44	71.54	16.29	33.60	2111
	TS	3%	2%	15%	5.5%	NA
2A	Operation (days/wk)	7	7	5	7	7
	Flow (MT/day)	43.44	71.54	76.91	71.30	6582
	TS	3%	2%	15%	4.7%	NA
2B	Operation (days/wk)	7	7	5	7	7
	Flow (MT/day)	43.44	71.54	107.40	90.32	8831
	TS	3%	2%	15%	4.6%	NA

Rev.	Date	Edit.	Check.	Appr.	Drawing No.:
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02					
01	2020.09.14	IK	AK		
00	2020.09.09	IK	AK		

Drawing Name: Block Flow Diagram Future Optimized

Project: Petawawa 30% Design Basis

Project-No:

Street: 560 Abbie Lane

City: Petawawa, ON

Country: Canada

Customer: Petawawa

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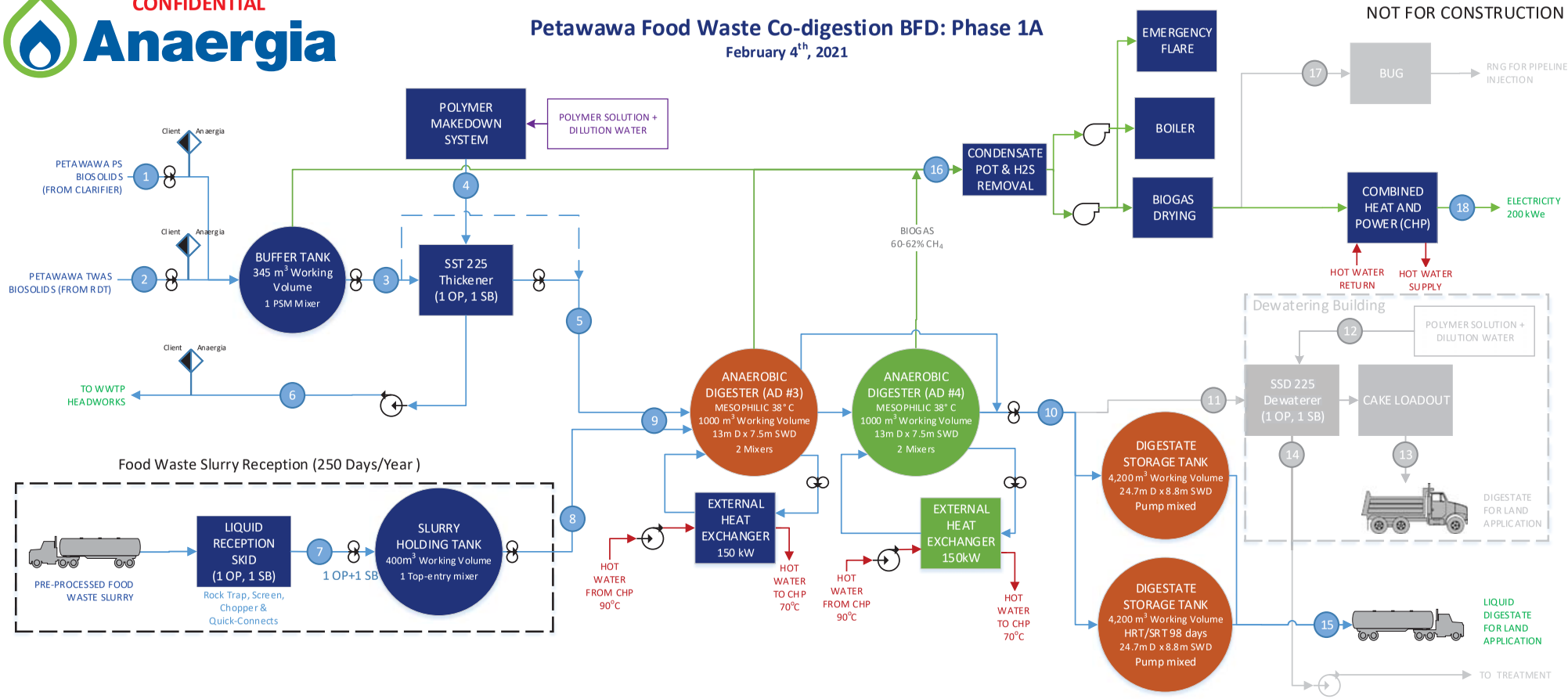
Petawawa Food Waste Co-digestion BFD: Phase 1A

February 4th, 2021



Position	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Stream	PS Feed	WAS Feed	SST Feed	SST dil polymer	AD Sludge Feed	SST Filt to Headworks	Food reception	Food to AD	Sludge and Food to AD	Digestate out of AD	Digestate to SSD	SSD dilute polymer	Cake solids	SSD Filtrate	Liquid dig to land	Total Biogas (Nm3/d)	Biogas to BUG (Nm3/d)	Power (kWe)
Operation (days/wk)	7	7	7	7	7	7	5	7	7	7	NA	NA	NA	NA	5	7	NA	7
Flow (MT/day)	29.75	49.00	78.75	3.28	16.85	61.90	28.20	20.14	37.00	33.60	NA	NA	NA	NA	47.04	2713	NA	200
TS	3%	2%	2.4%	0.20%	10%	0.30%	15%	15%	13%	5.0%	NA	NA	NA	NA	5.0%			

Comments:

1. Operation is on a 365 days/year, 7 days/week, and 24 hours per day basis unless otherwise specified.
2. Flows are expressed in metric tonnes.
3. External feedstock reception is expected to operate 250 days/year, 5 days/week.

Preliminary Design – For Approval, not for construction

SST 225
Hydraulic Capacity: 35m3/h
Solids Loading Capacity: 700 kg/h

LEGEND

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Project: Petawawa 30% Design Basis					
Project-No:					
Street: 560 Abbie Lane					
City: Petawawa, ON					
Country: Canada					
Customer: Petawawa					

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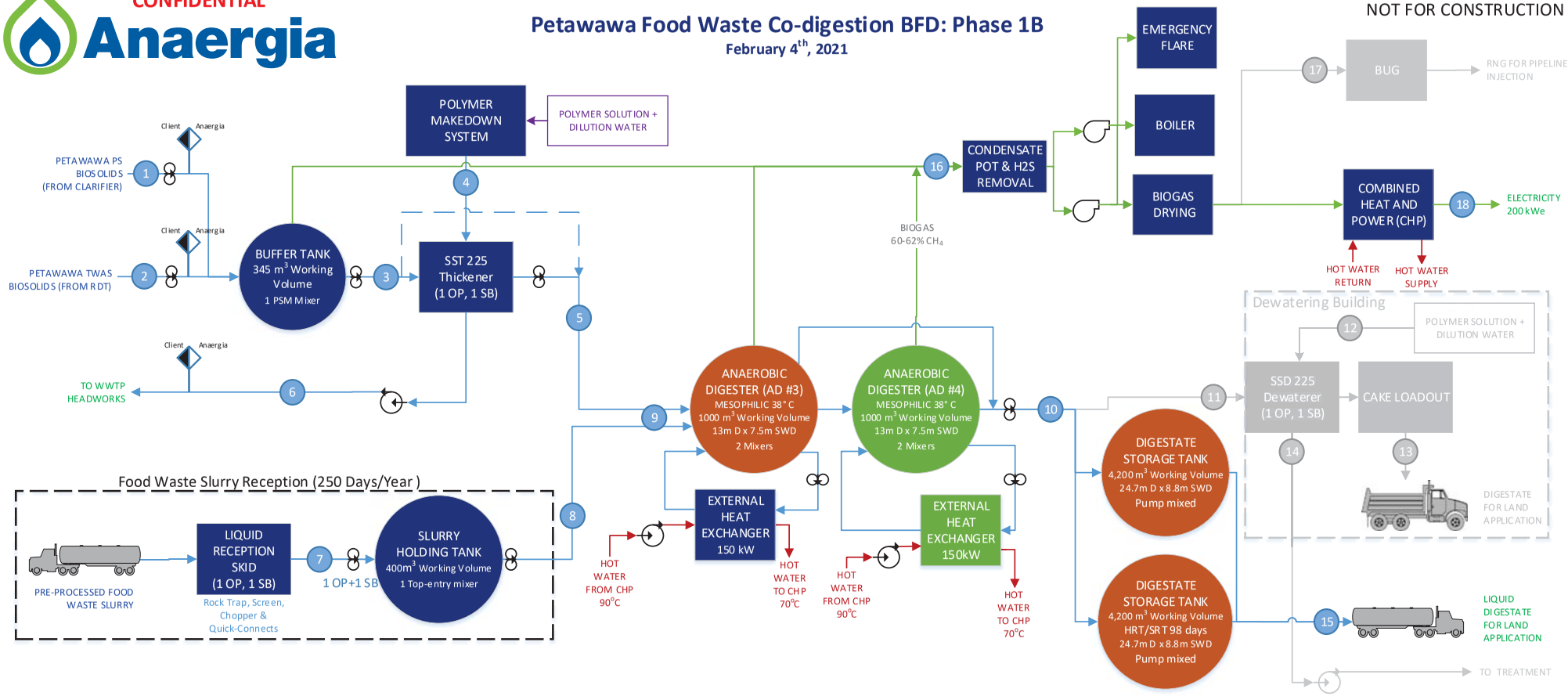
Petawawa Food Waste Co-digestion BFD: Phase 1B

February 4th, 2021



Position	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Stream	PS Feed	WAS Feed	SST Feed	SST dil polymer	AD Sludge Feed	SST Filt to Headworks	Food reception	Food to AD	Sludge and Food to AD	Digestate out of AD	Digestate to SSD	SSD dilute polymer	Cake solids	SSD Filtrate	Liquid dig to land	Total Biogas (Nm3/d)	Biogas to BUG (Nm3/d)	Power (kWe)
Operation (days/wk)	7	7	7	7	7	7	5	7	7	7	NA	NA	NA	NA	5	7	NA	7
Flow (MT/day)	43.44	71.54	114.98	4.78	24.60	95.15	16.29	11.60	36.24	33.60	NA	NA	NA	NA	47.04	2111	NA	200
TS	3%	2%	2.4%	0.20%	10%	0.29%	15%	15%	12%	5.5%	NA	NA	NA	NA	5.5%			

Comments:

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Project-No:

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City: Petawawa, ON

Country: Canada

Customer: Petawawa

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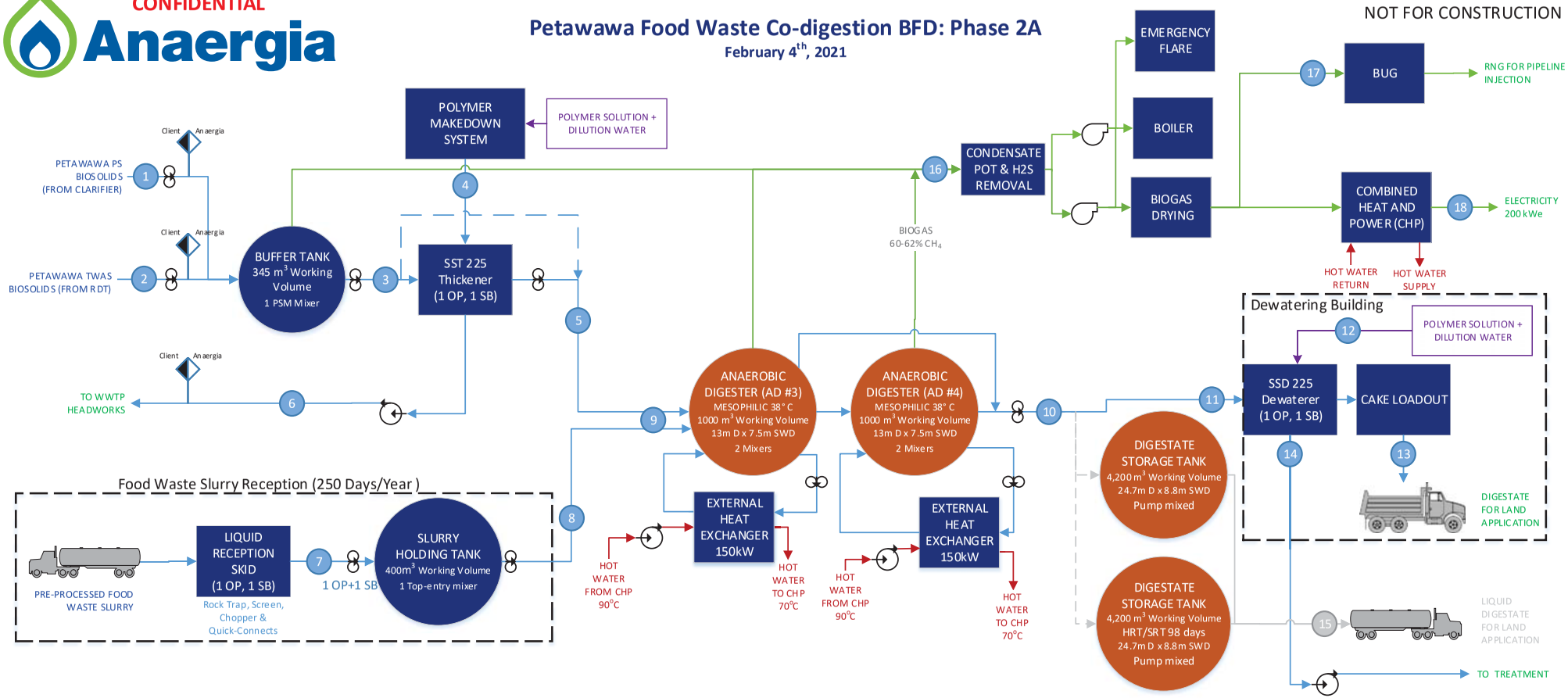
Petawawa Food Waste Co-digestion BFD: Phase 2A

February 4th, 2021



Position	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Stream	PS Feed	WAS Feed	SST Feed	SST dil polymer	AD Sludge Feed	SST Filt to Headworks	Food reception	Food to AD	Sludge and Food to AD	Digestate out of AD	Digestate to SSD	SSD dilute polymer	Cake solids	SSD Filtrate	Liquid dig to land	Total Biogas (Nm3/d)	Biogas to BUG (Nm3/d)	Power (kWe)
Operation (days/wk)	7	7	7	7	7	7	5	7	7	7	7	7	7	7	NA	7	7	7
Flow (MT/day)	43.44	71.54	114.98	4.78	24.60	95.15	76.91	54.94	79.54	71.30	71.33	4.01	8.24	67.1	NA	6582	4703	200
TS	3%	2%	2.4%	0.20%	10%	0.29%	15%	15%	13%	4.7%	4.7%	0.20%	25%	0.34%	NA			

Comments:

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Solids Loading Capacity: 700 kg/h

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Drawing Name: Block Flow Diagram Future Optimized

Project: Petawawa 30% Design Basis

Project-No:

Street: 560 Abbie Lane

City: Petawawa, ON

Country: Canada

Customer: Petawawa

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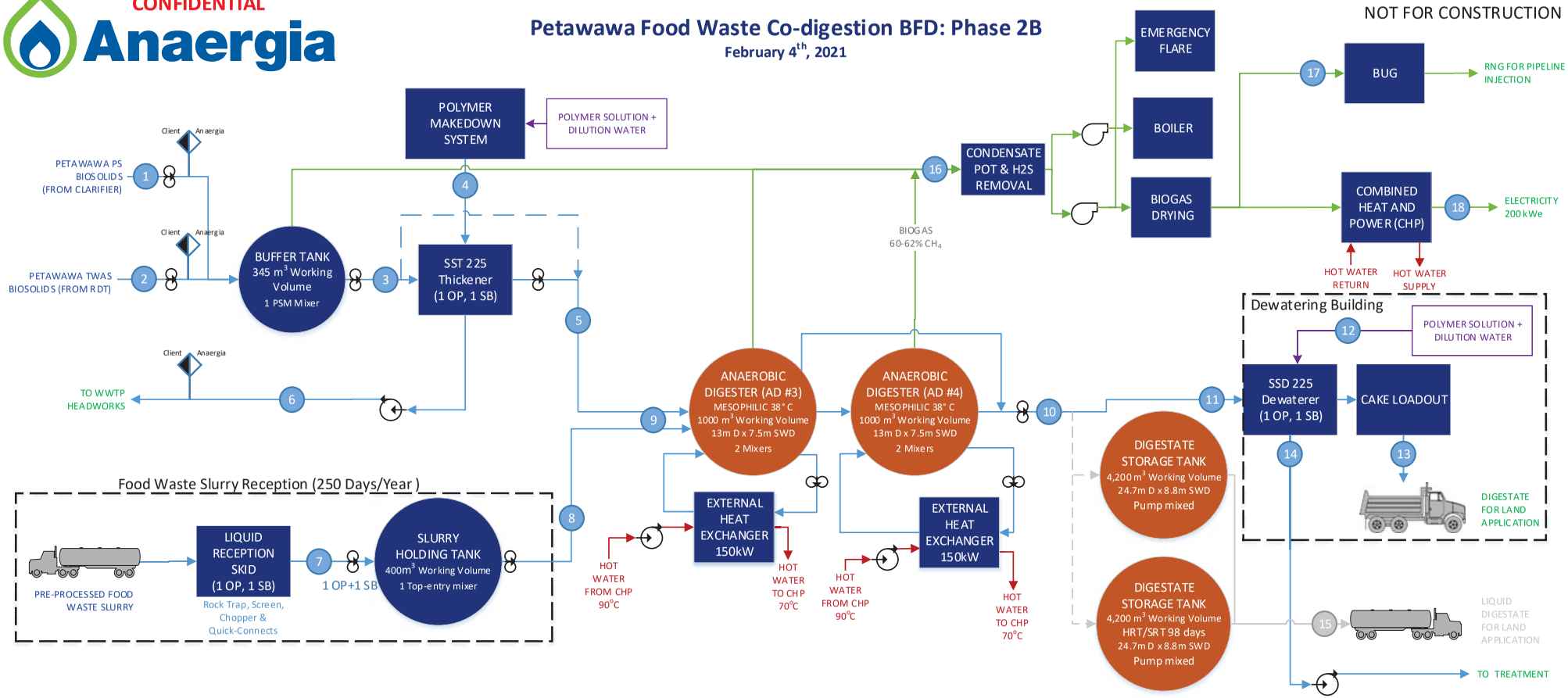
Petawawa Food Waste Co-digestion BFD: Phase 2B

February 4th, 2021



Position	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Stream	PS Feed	WAS Feed	SST Feed	SST dil polymer	AD Sludge Feed	SST Filt to Headworks	Food reception	Food to AD	Sludge and Food to AD	Digestate out of AD	Digestate to SSD	SSD dilute polymer	Cake solids	SSD Filtrate	Liquid dig to land	Total Biogas (Nm3/d)	Biogas to BUG (Nm3/d)	Power (kWe)
Operation (days/wk)	7	7	7	7	7	7	5	7	7	7	7	7	7	7	NA	7	7	7
Flow (MT/day)	43.44	71.54	114.98	4.78	24.60	95.15	107.40	76.71	101.32	90.32	90.32	4.85	9.98	85.19	NA	8831	6954	200
TS	3%	2%	2.4%	0.20%	10%	0.29%	15%	15%	14%	4.6%	4.6%	0.20%	25%	0.33%	NA			

Comments:

1. Operation is on a 365 days/year, 7 days/week, and 24 hours per day basis unless otherwise specified.
2. Flows are expressed in metric tonnes.
3. External feedstock reception is expected to operate 250 days/year, 5 days/week.

Preliminary Design – For Approval, not for construction

SST 225
Hydraulic Capacity: 35m3/h
Solids Loading Capacity: 700 kg/h

LEGEND

NEW BY ANAERGIA | EXISTING MODIFIED BY ANAERGIA | AVAILABLE – ON STANDBY | NOT APPLICABLE

Rev.	Date	Edit.	Check.	Appr.	Drawing No.:
03					
02					
01	2020.09.14	IK	AK		
00	2020.09.09	IK	AK		
Drawing Name: Block Flow Diagram Future Optimized					Anaergia
Project: Petawawa 30% Design Basis					
Project-No:					
Street: 560 Abbie Lane					
City: Petawawa, ON					
Country: Canada					
Customer: Petawawa					