Petawawa Net Zero Facility Construction Plan

Amended June 20, 2025

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1 Introduction

This Construction Plan Report has been written in accordance with the guidelines provided by the Ministry of the Environment, Conservation and Parks (MECP) in May 2019 entitled: "Chapter 5: Guidance for preparing the Construction Plan Report". This report is required by the MECP to satisfy part of the requirements for a Renewable Energy Approval (REA) under Ontario Regulation 359/09 (O. Reg 359/09).

This report provides a description of the construction and installation activities that will occur in order to bring the proposed project into operation based on the 30% design report. Final construction plans will be prepared by the selected contractor following completion of the 100% design.

The report will include a detailed description of the following:

- Site Preparation;
- Facility Components;
- Project Schedule and Timing for construction and installation activities;
- Potential Negative Environmental Impacts associated with construction and installation activities on and within 300 m of the project site;
- Mitigation Measures to reduce or eliminate any identified negative environmental impact; and
- Environmental Monitoring Plan.

1.1 Report Requirements

The Construction Report is a supporting document where the details of the renewable energy project construction are presented.

This Construction Report has been prepared in accordance with Table 1 of O. Reg. 359/09, which sets out specific content requirements as provided in Table 1.1

Site Plan	Complete	Reference This Report Section #
Details of any construction or installation activities	Yes	Section 2, 3
The location and timing of any construction or installation activities for the duration of the construction or installation activities	Yes	Section 4, 5
Mitigation measures in respect of any negative environmental effects mentioned in the previous section	Yes	Section 6

2 Project Overview

The Petawawa Net Zero project (Project) will transform Petawawa Water Pollution Control Plant (WPCP) into a Resource Recovery Facility by upgrading its anaerobic digesters to divert waste from landfill and boost biogas production for use as electricity, making the plant energy neutral or positive, and reducing GHG emissions. This will involve the generation and utilization of biogas at site in a Combined Heat and Power (CHP) Unit and move the WPCP towards Net Zero, and in the future include upgrading biogas to Renewable Natural Gas (RNG).

The location of the project site is situated within the Petawawa WPCP (Water Pollution Control Plant) located at 560 Abbie Lane, Petawawa, County of Renfrew, K8H 2X2 (Site).

The basic components of the Town of Petawawa Net Zero Energy project will include the following:

- Slurry & Septage Reception Skid
- Dedicated Insulated & Heat-Traced Organics Reception Tank
- Organics Slurry feed pumps to Anaerobic Digestion
- Sludge Screw Thickener (SST) skid
- Anaerobic Digester (s) Mixers
- Replacement of existing Anaerobic Digester Roof with double membrane geo textile roof.
- Upgrade of existing biogas system
    - Combined Heat and Power Unit
    - Biogas Upgrading to RNG
- Overall process control system.

The Project will be built in phases, primarily Phase 0 and Phase 1-2. The first is Phase 0, which include addition of CHP, upgrades to digesters and organics receiving. Phase 1-2 involves the addition of a waste reception building, sludge thickening, biosolids dewatering and the capability of producing Renewable Natural Gas with a biogas upgrading unit, along with an increase in the amount of organics received at the facility. Phase 0 will be implemented in the near term, with future phases following on the lessons learned in Phase 0. The two phases are:

Phase 0

- Upgrades to existing digesters to co-digest biosolids and organic slurry to produce renewable energy.
- Installation of Combined Heat & Power (CHP) Engine to combust biogas produced from co digestion of biosolids and polished organic slurry and generate electricity and heat. Electricity will be used to offset plant electrical demand and heat will be used to heat anaerobic digesters.

Phase 1-2

- Augment digestate management with dewatering. The dry digestate (Cake) will be sent out for beneficial use.

- Additional biogas generated will be used for producing RNG. RNG will be injected in the natural gas grid system.

3 Site Preparation

3.1 Land Clearing and Site Preparation

The project site is the Petawawa WCPC. No existing structures will be demolished, and all structures to be constructed will be placed in open spaces within the existing fenced area. The specified locations within the project location are shown in the site plan (Appendix A).

Equipment required during land clearing and site preparation includes:

- 2-3 light trucks (Approx. 6 Tons with full payload);
- 1 excavators (Approx. 45 Tons);
- 2 bull dozers (Approx. 49 Tons);
- 1 Ride-on road roller (Approx. 20 tons)
- 2 articulating trucks (25 Ton); and
- 1 water truck (10,000 litre);

The site will be backfilled with suitable fill for geotechnical purposes to a depth of approximately 1.5 m in order to accommodate piping, drainage, and cover for footings which will be placed in bedrock.

3.2 Temporary Storage Facilities and Laydown Areas

Delivery of materials to the site will be placed on the ground surface within the perimeter of the site boundary during construction operations. Deliveries of materials will be timed to specific construction activities to minimize the laydown area. A centralized area of the site will be used for contractor portable offices which will include 3-4 office trailers.

No additional site clearing will be required for laydown areas associated with the construction activities on the site. No temporary storage facilities will be constructed on the site. On-site storage to take place north east of the facility in the previous sludge settling area.

3.3 Internal Roadways

Access to the site is currently from Abbie Lane. The internal access roadway will be slightly altered, expanding the roadway by 1025 m^2, to allow for access to the thickener building (Phase 1-2). A perimeter roadway currently exists around Digesters, which will be re-utilized. These roadways are shown on the site plan (Appendix A). No additional perimeter roadways will be required.

3.4 Utilities

Currently, the site is equipped with hydro and natural gas. A natural gas line will be connected to the main line to supply the site with natural gas for comfort heating, for emergency flare pilot fuel, for fueling the engines during start-up phase, and during normal operations in order to improve the biogas quality entering the engines. Hydro will be provided by HydroOne and connected from the existing power lines. The existing transformer will be used for outgoing power production and the incoming power consumption of the plant.

The following equipment will be used for stringing of electrical poles and the installation of buried electrical conduit, and erecting utility poles, if required:

- Contractor utility vehicles (Approx. 6 Tons with full payload);;
- Backhoe (Approx. 25 tons);
- Manual digging equipment;
- Reusable wood form and plywood removed after concrete has cured;
- Form oil, wood blocking and bucks, form ties;
- Grinder and manual rebar bending tools; and
- Mechanical wire pull

The new natural gas supply line will be tied into the main gas line located in the existing transformer building. Approximately 100 m of stainless steel gas line will be installed to connect the gas line to the pilot burner supply for the emergency flare, and 100 m from biogas upgrading skid compressor package to NG line for grid injection.

The following equipment would be used for the installation of the natural gas line:

- Contractor utility vehicles with portable welding and cutting equipment (Approx. 6 Tons with full payload);
- Backhoe (Approx. 25 tons);
- Manual digging equipment;
- Welder;
- Cutting torch;
- Handheld grinder; and,
- Manual handheld tools for fastening flange connections.

Potable water will be obtained from the water lines located in the digester gallery building, located between digesters # 3 and 4. Process wastewater from thickening, dewatering, and the respective operational buildings will be conveyed back to the headworks of the WPCP through existing pipelines or utilizing existing tunnels to twin lines back to WPCP headworks.

To connect potable water to the buildings, water lines will be brought to operational buildings utilizing routing through the existing digester galleries # 1 and # 2.

For the installation of the portable water supply and the process water supply, the following equipment will be used:

- Contractor utility vehicles with portable welding and cutting equipment (Approx. 6 Tons with full payload);
- Backhoe (Approx. 25 tons);
- Manually digging equipment;
- Welder;
- Cutting torch;
- Pipe cutter and threader;
- Handheld grinder; and,
- Manual handheld tools for fastening flange connections.

4 Facility Components

4.1 Site Services

4.1.1 Concrete Surfaces (Phases 0 and 1-2)

Concrete areas will be located throughout the site and include building foundations, containment areas, transformer pad, and equipment pads. Concrete will be poured in-situ and reinforced with rebar and ties where needed based upon structural requirements. Please refer to the site plan (Appendix A) for details on the changes to impervious surfaces during each phase and refer to the table below for a summary:

Table 1: Site Surface Summary (square metres)

	Existing	Phase 0	Phase 1	Phase 2	Total
Site Area	42,800	0	60	60	42,920
Impermeable Surfaces and Buildings	10,570	125	1,525	925	13,145
Impermeable Surfaces Collected to Sump	0	350	150	0	500

4.1.2 Natural Surfaces (Phases 0 and 1-2)

The project is located within the fenced boundary of the existing Petawawa WPCP. The natural areas surrounding the site will not be disturbed. The northern portion of the site will remain largely undeveloped as part of the proposed project, with the eastern most portion of the northern part of the site used for biogas applications. The southern portion of the site will require further development of the western portion of the site to allow for road access.

Trees grows along the perimeter of the site.

The stockpile of aggregate materials will be removed from site. Site surfaces that will remain free of concrete, asphalt, and gravel will be restored by seeding with grass or placement of sod post construction activities.

4.1.3 Secondary Containment Dry Pond

The secondary containment dry pond is designed to contain any potential major spills, including those from catastrophic tank failures, at the plant. The size of the pond takes into consideration containment of 110% of the largest tank volume on site, and 24-hour rainfall from a 100-year storm event.

Containment pond design details:

a.) Containment capacity is 100% of the volume of the largest tank plus 10% of the volume of the largest tank
b.) The containment area is structurally sound and lined with material having a permeability of less than 1x10-8 m/s.
c.) The containment area is designed to withstand a 100-year storm event
d.) All grades within the project area shall be sloped towards the containment pond to ensure no pooling of contaminants occurs
e.) Digestate storage tank volume = 2100 m3. Required volume for 110% is 2484m3
f.) 100-year storm is a rain event of 3.4mm/hr for 24 hours. Required volume in storage pond is 509.7m3
g.) Total required pond volume = 2994m3
h.) A gate valve will be installed on the 600mm discharge culvert
i.) All swales and the pond shall be vegetated to enhance nutrient uptake and reduce erosion

4.2 Plant Systems

4.2.1 Organics Delivery and Reception and Storage Tanks (Phases 0 and 1-2)

The organic materials will be delivered to site in two different ways;

- Slurry reception via truck: there will be one slurry reception skid;
- Liquid feedstock reception via pipe (biosolids via Petawawa WCPC): an insulated and heat traced pipe will be mounted between the Primary Sludge and Thickened Secondary Activated Waste lines located in the basement of digester gallery 2 and the transfer pumps to the buffer tank located in the thickening building;

Two tanks will be utilized in Phase 1-2. A buffer tank, to hold primary sludge and thickened waste activated sludge from the WPCP, and a slurry holding tank to hold received municipal curb-side collection. No buffer or holding tanks will be used in Phase 0.

Equipment required from the support of overhead pipes from Digester Gallery # 2 to Thickening Building will consist of the following:

- 3-4 light trucks (Approx. 6 Tons with full payload);
- 2 concrete pump trucks (Approx. 26 Tons);
- 3 concrete mixer trucks (Approx. 32 Tons with full load);
- 2 vibrators;
- 2 trowels;
- 1 stone slinger (Approx. 5 tons);
- Surveyor level;

- Portable welding equipment; and a,
- Boom Truck (Approx. 19 tons)

4.2.2 Slurry Receiving Skid (Phases 0 and 1-2);

The slurry reception via truck will be received through a camlock connection feeding through a rock trap, macerator, and feed pump to the slurry holding tank.

Main components of the system include:

2. Rock Trap;
3. Maceator;
4. Transfer pump to slurry holding tank;

The slurry reception skid will be shipped to site via truck, offloaded via a forklift and installed in the Thickener Building.

a.) Skid Requirements: 186.38" x 88.90" x 87.92" – Skid Specifications
b.) Weight: Estimate: Estimate 5000 - 6000 kg;
c.) Electrical Connection:
    a. 120V/1/60Hz (control);
    b. 575V/3/60Hz (power supply);
d.) Piping Connections:
    a. 150 DN Camlock Fitting, 304SS – Slurry Inlet Piping;
    b. 50 DN, 304 SS – Water Supply Line;
e.) Equipment Required for installation:
    a. Forklift (high capacity electric) (Approx. 10 tons);
    b. Manual handheld tools;
    c. Handheld grinder;
    d. Pipe cutter and threader; and
    e. Welder;

4.2.3 Septage Receiving Skid (Phase 1-2)

The slurry reception via truck will be received through a camlock connection feeding through a rock trap, macerator, and feed pump to the slurry holding tank.

Main components of the system include:

1. Rock Trap;
2. Grinder;
3. Separator;
4. Solids collection roll-away bin (not included in description);
5. Transfer pumps to slurry holding tank (not included on skid);

The septage reception skid will be shipped to site via truck, offloaded via a forklift and installed in the Thickener Building.

a.) System Requirements: Approx. 299 3/4" x 44 1/2" x 132 1/2"
b.) Weight: Estimate: Estimate 5000 - 6000 kg (with skid);
c.) Electrical Connection:
    a. 120V/1/60Hz (control);
    b. 575V/3/60Hz (power supply);
d.) Piping Connections:
    a. 100 DN Camlock Fitting, 304SS – Septage Inlet Piping;
    b. 300 DN, 304 SS – Septage Liquid Outlet;
e.) Equipment Required for installation:
    a. Forklift (high capacity electric) (Approx. 10 tons);
    b. Manual handheld tools;
    c. Handheld grinder;
    d. Pipe cutter and threader; and
    e. Welder;

4.2.4 Buffer Tank (Phase 1-2)

The buffer tank is to be constructed of a bolted glass fused to steel tank.

The foundation of the tank is to be a ring-wall foundation (concrete with embedded rebar).

A short description of the bolted glass fused to steel tank components include:

High-grade steel sheets, silo bolts, roof beams and panels, stiffening and fixing members, as well as a wide range of ancillaries (manholes, flanges, launders, ladders, platforms, etc.). The steel sheets, which are roll-curved to the radius appropriate for any given application, are punched with one of several rows of holes, through which they are bolted together on site.

The sheets are coated on both sides by special coating (like epoxy or Glass-Fused-to-Steel vitreous enamelling process). Whatever coating is selected, the coating will be able to withstand anticipated pH range, abrasive particulate, and be acceptable in applications from the storage of agricultural sludges to very demanding municipal/industrial effluents.

The coating is sprayed and fused onto the specially prepared sheets at the bolted-steel plant. Sheets are tested to confirm continuity of coating. For protection during transport and storage the edges are coated with an anti-corrosive system.

The overlap between sheets (both horizontal and vertical) must be coated with sufficient sealant for enough to be squeezed out when the bolts are tightened to allow it to be smoothed into a fillet which covers the edge of the sheet and extends several millimeters onto the exposed side of the sheet. Similarly, bolts and holes must have sufficient sealant to protect the bore and the shank, and to squeeze out to form a seal around the bolt head and nut. A bead of sealant must also be used to seal the nut when plastic nut covers are utilized.

Although tanks are nominally straight-sided, each ring (horizontal course of sheets) is slightly tapered inward, so that the outer face of one ring can fit against the inner face of the ring below it. The slight taper is

achieved by the appropriate location of the holes. Since each hole must be slightly larger than the bolt to facilitate assembly, all bolts must be in sheer between the sheets when they are tightened. Hence the importance of ensuring the correct straight shank length is used.

Once the foundation has been poured a starter ring can be installed by the installation contractor on the surface of the foundation. This creates the base of the bolted tank which the rest of the tank is built upon. This approach (known as the "Ring Beam and Infill Design") is generally considered to be the least complex design and favoured where the installation team has responsibility for the base and tank construction.

The ring beam can be installed prior to arrival of the tank kit on site and foundation bolts positioned whilst the concrete is still wet, if required.

The base slab (infill) is generally poured following construction of the starter or base ring. Alternatively it is poured following completion of the tank shell if the structure is being built using construction jacks.

The bottom of the tank is typically a concrete base pad with a membrane placed between concrete base and the walls of the tank to ensure that liquid contained in the tank doesn't seep into the foundation or below the base.

For the base perimeter, the following steps are to be taken.

1.) Concrete is poured to level specified on the drawing or level with existing foundations. Ensure that the concrete completely fills the gap between the ring beam or floor slab and the base angle. NOTE: It is recommended that a concrete vibrator is used to ensure that the concrete fully flows between and around the base angle.
2.) When the concrete has cured sweep clean the perimeter of the foundations inside the tank to remove any surface debris.
3.) Bolted-Steel tank surface immediately above the concrete level inside the tank to ensure good adhesion for the sealant fillet.
4.) Apply primer to the concrete base only extending approximately 50-60 mm inwards from the tank wall.
5.) If tank above 33.2 m diameter and 11.2 m in height, apply perimeter bond breaker as detailed and ensure it is touch dry;
6.) Review the instructions for use of the perimeter sealant being used and then apply the sealant.
7.) Allow to cure as manufacturer's instruction.

The roof of the tank is to be fixed constructed of stainless steel.

Note: All work must be undertaken by competent building crew familiar with relevant regulations with particular regard to Health and Safety. Furthermore, it is the responsibility of the building crew undertaking these works to consider each particular installation, its environment and the specific risks therein prior to commencement of work. To determine the protective equipment required by personnel and to plan the safe system of work that should be adopted in order for the task to carried out safety.

The external tapered beam roof is constructed by the following;

1. Tapered beam roofs are constructed at ground level;
2. Assemble top ring of sheets including the top angle;
3. Set up suitable load bearing scaffold in the center of the tank at the correct height to support the roof during building.
4. Refer to assembly drawings for positions of inserts, sealer plates, bolt lengths, etc. Roof top stiffener angle galvanized parts to be primed with Sika Primer 210T along joint face and allowed to dry before applying sealant.
5. To assist when hanging very large panels a hole is punched for attachment of a special lifting bracket. After fitting the panel apply sealant around the hole, insert a store bolt and tighten to 65 Nm.
6. When assembling Glass-Fused-to-Steel roof panels the bolt torque setting should be 65 Nm generally and 32 Nm where tapered inserts are fitted.
7. Check that the centre support ring is level and set to the correct height above the top stiffener angles.
8. Check roof layout for access upstand/flange positions and walkways and proceed to install the first four roof beams, placing them at 90 degree intervals.
9. Assemble the next four beams in the center of the four beams already installed. Proceed to assemble the rest of the beams using the same technique.
10. When all beams are in position the roof panels can be installed.
11. Proceed to fit outer roof panels in an anticlockwise direction by slackening and supporting the beams and inserting the panels between the beam and the top angle, ensure that the rubber inserts are correctly placed. It is advisable to assemble at least three panels before tightening and always leave two loose panels between the one being installed and the one being tightened.
12. Following completion of the outer ring of panels commence installation of the inner roof panels, again in a clockwise direction.
13. Apply sealant to upper surface of roof panel, along all bolt seams except at the top (shortest) edge. With suitable lifting equipment proceed to lift roof panels into position and fix to under side of beams installing all bolts in opposite sides of adjacent beams and lower edge seam.
14. Complete the full ring of panels torque up bolts in panel previously installed and apply sealant fillet along the edges of this panel.
15. Proceed to assemble the roof using these techniques on subsequent rings.
16. Apply sealant and fit roof cap plates together with roof cap stiffener.
17. The centre annulus support scaffold must not be removed until all roof panels are fitted.

After the tank is assembled, the mastic used to assemble the tank needs to cure for approximately 10 days prior to hydrostatic testing. Hydrostatic testing procedures to utilize standard approaches as outlined in the AWWA D126 guidelines.

Tank construction will only occur during daylight hours, and the crew utilized will be sufficient enough to complete construction of both of the tanks within a 2 week (10 business day period).

Buffer Tank Details:

a.) Capacity: 345 m^3
b.) Dimensions: 6.83 m Dia. x 11 m Height

a.) Dimensions and weight of Skids (for tank): Approx. 386 cm x 162 cm x 73 cm, 3000 to 800 kg (approx. 6 skids);

b.) Connections Schedule:

Table 4-2: Connection Schedule - Buffer Tank

#	Name	Qty	Dia (in)	Type	Mat'l	Location
1	Inlet # 1 (Feed)	1	6	ANSI 150# RF	Carbon Steel	TBD
2	Discharge # 1	1	6	ANSI 150# RF		TBD
3	Heat Coil Inlet	1	2	ANSI 150# RF	Coated	TBD
4	Heat Coil Outlet	1	2	ANSI 150# RF		TBD
5	Biogas PRV # 1	1	12	ANSI 150# RF		TBD
6	Manway # 1	1	30	Bolted Hatch		TBD
7	Service Box Hatch	1	1800 x 1720	Bolted Hatch		TBD
8	Cleanout Access Hatch	1	120 x 120	Bolted Hatch		TBD
9	Level Transmitter # 1	2	2	ANSI 150# RF		TBD
10	Temp Transmitter # 1	1	2	ANSI 150# RF		TBD
11	Pressure Transmitter	1	2	ANSI 150# RF		TBD
12	Sight Glass (w/ flush water connection)	1	6	ANSI 150# RF		TBD
13	Overflow	1	10	ANSI 150# RF		TBD
14	Spare Flanges (Bottom)	2	6	ANSI 150# RF		TBD
15	Spare Flanges (Headspace)	2	4	ANSI 150# RF		TBD

c.) Accessories included:

a. Spiral staircase for roof access and service box access (OSHA certified);
b. Roof perimeter inboard level walkway with railing;
c. Service Box extended working platforms (width of service box by 6 ft);
d. Nut caps.
e. Sight glass with water wash connection;
f. All hardware and material for anchoring, assembly, and connections (service boxes, pipe supports, etc.);
g. Externally supported roof, carbon steel w/ epoxy coating;
h. Full perimeter guardrail at roof level (OSHA certified);

d.) Equipment Required:

a. Small Tools and Equipment for Erection and Testing;

i. Levelling instrument;
ii. Large tape measurer (capable of measuring radius of tank);
iii. Ratchet spanner;
iv. 19 mm A/F impact sockets x 4
v. Tapered podgers to align holes in sheet, 3 mm tapered up to 14 mm;
vi. Cold chisel;
vii. Spanner set
viii. Screwdriver set
ix. Putty knife (x 8)
x. Hacksaw and blades
xi. 1m spirit level
xii. Lifting hooks for carrying shell sheets
xiii. Sheet plate carrier
xiv. Centre punch
xv. Crowbar 3 ft long
xvi. Hammer – ball peign
xvii. Torque wrench to cover range from 14 Nm to 70 Nm.
xviii. Plastic Bucket x 6
xix. Marker pens and chalk
xx. Mole grips
xxi. Tin snips
xxii. Pliers
xxiii. Scissors
xxiv. Broom
xxv. Shovels x 2
xxvi. Plastic floats x 2
xxvii. Bolt croppers
xxviii. Small tape measure – 5 m
xxix. Polyester slings for moving skids and lifting sheets;
xxx. 12.5 mm bridge reamer;

xxxi. 300 mm adjustable spanner
xxxii. Silsons.
xxxiii. 200mm (9 inch) cutting disks (x4);
xxxiv. Safety Glasses;
xxxv. Ear protectors;
xxxvi. Safety Helmets;
xxxvii. Safety Harness;
xxxviii. Gloves – good supply;
xxxix. Wheelbarrow x 2;
xl. Large special socket ½ inch drive for anchor bolts;
xli. Cleaning cloths;
xlii. Selection of drill bits 3 mm to 13 mm;
xliii. Wet sponge continuity detector;
xliv. Aluminium mobile scaffold tower;
xlv. Sealant trowels;
xlvi. One set of Allen keys;
xlvii. String line;
xlviii. Lock-up took chest to be kept on-site (during construction);
xlix. 2 x 10 mm shackles;

b. Electrical Equipment (all 110 volts);
    i. Impact gun ½ inch drive
    ii. Extension lead – length suitable for site;
    iii. Power Drill;
    iv. 220 mm disc grinder;
    v. Electrical hoist for lifting sheets;
    vi. Jig-saw (variable speed with a selection of blades);
    vii. Mobile generator if mains power is not available for 110 V tools;
    viii. Hammer drill plus drill bits to install anchor bolts
    ix. Single phase 110 V transformer

c. Large equipment;
    i. Concrete vibrator for rebar concrete;
    ii. Small crane, or similar, for installation of sheets;
    iii. Crane to lift roof beams and center support rings;
    iv. Construction jacks

e.) Shipping:
    a. All components come delivered in lightweight wooden crate packaging. The crates are manufactured from treated wood;
    b. Max. weight of crates is approx. 3,000 kg;
    c. Forklift is required to unload crates;
    d. Level ground is required to position unloaded crates; and
    e. Crates can be stacked.

f.) Tank will be fully insulated and cladded with 4” mineral wool and aluminum clad;

4.2.5 Slurry Holding Tank (Phase 1-2)

Please see installation specifications above for buffer tank. Slurry holding tank will be a GFS bolted tank.

Slurry Holding Tank Details:

a.) Capacity — 400 m^3

b.) Dimensions: — 8.51 m Dia. x 8.53 m Height

g.) Dimensions and weight of Skids (for tank): — Approx. 386 cm x 162 cm x 73 cm, 3000 to 800 kg (approx. 6 skids);

c.) Connections List:

Table 4-3: Connection List - Slurry Holding Tank

#	Name	Qty	Dia (in)	Type	Mat’l	Location
1	Inlet # 1 (Feed)	1	6	ANSI 150# RF	Carbon Steel Coated	TBD
2	Discharge # 1	1	6	ANSI 150# RF		TBD
3	Heat Coil Inlet	1	2	ANSI 150# RF		TBD
4	Heat Coil Outlet	1	2	ANSI 150# RF		TBD
5	Biogas PRV # 1	1	12	ANSI 150# RF		TBD
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11	Pressure Transmitter	1	2	ANSI 150# RF		TBD
12	Sight Glass (w/ flush water connection)	1	6	ANSI 150# RF		TBD
13	Overflow	1	10	ANSI 150# RF		TBD
14	Spare Flanges (Bottom)	2	6	ANSI 150# RF		TBD
15	Spare Flanges (Headspace)	2	4	ANSI 150# RF		TBD

d.) Accessories included:
    a. Spiral staircase for roof access and service box access (OSHA certified);
    b. Roof perimeter inboard level walkway with railing;
    c. Service Box extended working platforms (width of service box by 6 ft);
    d. Nutcaps;
    e. Sight glass with water wash connection;
    f. All hardware and material for anchoring, assembly, and connections (service boxes, pipe supports, etc.);
    g. Externally supported roof, carbon steel w/ epoxy coating;
    h. Full perimeter guardrail at roof level (OSHA certified);

e.) Equipment List for Installation: Please refer to Buffer Tank (Section 4.2.2)

f.) Shipping:
    a. All components come delivered in lightweight wooden crate packaging. The crates are manufactured from treated wood;
    b. Max. weight of crates is 3,000 kg;
    c. Forklift is required to unload crates;
    d. Level ground is required to position unloaded crates; and
    e. Crates can be stacked.

g.) Tank will be fully insulated and cladded with 4" mineral wool and aluminum clad;

4.2.6 Service Boxes (Phases 0 and 1-2)

Service boxes are installed on tanks to allow for the removal of internal mixers for servicing. Components of the service box package will include:

- Service Box:
- Installation Frame;
- Gas Lock;
- Height Adjustment Element;
- Square Guide Tube;
- Wire Rope;
- Gas Connection;

Service boxes and ancillary component will be shipped to site via truck and offloaded via forklift or crane. A crane will be required to lift the service boxes and ancillaries into place for installation.

Service Boxes:

a.) Dimensions: 79.45" x 69.61" x 60.43"
b.) Weight: 600 kg
c.) Mounting Frame Dimensions: 88.19" x 78.35" x 4.72"
d.) Mounting Frame Weight: 88 kg
e.) Gas Lock Dimensions: 78.66" x 66.82" x 41.34"

f.) Gas Lock Weight: 245 kg
g.) Square Guide Dimensions: 10,000 mm x 150 mm x 150 mm
h.) Square Guide Weight: 225 kg
i.) Cable Weight: 2.7 kg
j.) Material: All AISI 316L
k.) Gas Connection: 10" Class 150 RF
l.) Service Boxes mounted on Membrane Cover;
m.) Equipment Required for installation:
    a. 15 ton boom truck with telescopic crane;
    b. Forklift (high capacity electric) (Approx. 10 tons);
    c. Manual handheld tools;
    d. Handheld grinder;
    e. Pipe cutter and threader; and
    f. Welder;

4.2.7 Mixers (Phases 0 and 1-2)

All mixers utilized in buffer tank, solids holding tank, and digesters are the same model, and installed with a service box to allow for removal of the internal mixer.

The mixer will be mounted onto the guide tube of the service box, allowing for the mixer to be raised and lowered via service box if maintenance is required.

The mixers and ancillary components will be shipped to site via truck and offloaded via forklift or crane. A crane will be required to lift the mixers and masts into place for installation.

Mixers:

a.) Mixer Model: PSM 940
b.) Propeller Dia.: 37"
c.) Dimensions (mixer head): 45.94" x 37" x 37" (per mixer)
d.) Bracket: 200 DN square guide;

e.) Weight (empty): 330 kg
f.) Electrical Requirements: 12.5 kW, 575/3/60, Ex. II (1) G (Ex is Ga) IIB/IIC
g.) PTC Resistor Relay included with each mixer (24 VDC);
h.) Mixers are located in Buffer Tanks, Solid Holding Tanks, and 2 mixers per Digester.
i.) Spacer 1500 option to be used (spacer placed at the square guide pipe to prevent the propeller from hitting the floor);
j.) Equipment Required for installation:
    a. 15 ton boom truck with telescopic crane;
    b. Forklift (high capacity electric) (Approx. 10 tons);
    c. Manual handheld tools;
    d. Handheld grinder;

e. Pipe cutter and threader; and
f. Welder;

4.2.8 Heating Coils (Phase 1-2)

Heating coils are only utilized for the buffer tank and solids holding tank to ensure that tank temperatures are maintained above a target temperature (10 C) to ensure freezing doesn't occur.

The hot water coils will need to be installed in the tanks prior to hydraulic testing and coordinated with the tank assembly crew.

The heating coils will consist system will consist of a hot water pump, 3 hot water coils (installed in the tanks inner walls utilizing brackets), a three-way valve and temperature transmitter to ensure that hot water return temperatures are maintained.

All components will arrive via truck. The heating coils will arrive in sections and need to be stored according to manufacturer requirements in the lay down area. The hot water pumps are to be installed in the Digester Gallery.

4.2.8.1 Heating Coils

Heating Coils Buffer Tank:

a.) Approximate Length of Coils: 186 ft
a.) Inlet Connection: 2" inch hot water inlet
b.) Outlet Connection: 2" inch hot water outlet
c.) Average Coil Diameter in Tank: 4"
b.) Heating coil centerline distance from tank inside wall: 1.3 ft
c.) Vertical distance between coils: 1.5 ft
d.) Height of bottom coil from tank floor: 4.25 ft
e.) Minimum water depth above top coil: 2 ft

f.) Brackets to be provided by supplier.
g.) Equipment Required for installation:
    a. Manual handheld tools;
    b. Handheld grinder;
    c. Pipe cutter and threader; and
    d. Welder;

Heating Coils Solids Tank:

d.) Approximate Length of Coils: 238 ft
e.) Inlet Connection: 2" inch hot water inlet
f.) Outlet Connection: 2" inch hot water outlet
g.) Average Coil Diameter in Tank: 4"
h.) Heating coil centerline distance from tank inside wall: 1.3 ft

i.) Vertical distance between coils: 1.5 ft
j.) Height of bottom coil from tank floor: 4.25 ft
k.) Minimum water depth above top coil: 2 ft
l.) Brackets to be provided by supplier.
m.) Equipment Required for installation:
    a. Manual handheld tools;
    b. Handheld grinder;
    c. Pipe cutter and threader; and
    d. Welder;

4.2.8.2 Hot Water Pumps

Hot Water Pumps (for both Buffer Tank and Solids Holding Tank):

a.) Dimensions (mixer head): 16.5" x 8.625" x 8.625" (per pump)
b.) Weight (empty): 12.25 kg
c.) Inlet/Outlet Connection: 1.25" / 1"
d.) Drain plug: 3/8"
e.) Frame (bolt hole to centerlines): 1/3" bolts, 3" x 4 7/8"
f.) Electrical Requirements: 0.37 kW, 575/3/60,
g.) Hot Water Pumps are located in the Digester Gallery.
h.) Equipment Required for installation:
    a. Manual handheld tools;
    b. Handheld grinder;
    c. Pipe cutter and threader; and
    d. Welder;

4.2.9 Pressure Relief (Phases 0 and 1-2)

The digesters, slurry holding tank, and the buffer storage tank are each equipped with a pair of flash-back (flame) arresters and pressure/vacuum relief valves connected to the roof of the tanks, piped in parallel, with a three-way manual change-over valve installed in the common supply.

The pressure/vacuum relief valves and flash-back (flame) arresters will be protected from the weather by a suitably insulated enclosure to ensure reliability. The enclosure will be provided with adequate ventilation and accessibility for servicing.

a) Inlet size: 10"
b) Equipment Required for installation:
    a. Manual handheld tools;

4.3 Digesters

Digesters # 3 and # 4 (existing on-site), are to be upgraded and reutilized for the Petawawa Net Zero project. The digesters are to have the same operating capacity and all existing equipment in the digesters are to remain

in place. The digesters are being upgraded through the addition new gas holding membrane roofs and high-solids mixers.

Each digester will be mixed by two submersible mixers mounted of SS316 guide rail posts and furnished with a retrievable mechanical hoist.

Each mixer will have its own service box for a total of two service boxes for each digester. The service box is designed with a working platform.

Digesters will be heated through circulating a heated stream of digestate through digesters # 3 and # 4. The circulated stream of heated digestate will be heated through a heat exchanger located in the digester gallery between digesters # 3 and 4.

The roofs of these digesters will be replaced with a membrane roof to allow for capture of biogas generated in the digesters. Blowers will be provided to ensure sufficient pressure is provided to keep the membrane covers structurally viable.

To allow for installation of the following equipment in the Digester Gallery (Between Digesters # 3 and # 4) will required an opening to be made in the building to allow for equipment to be installed:

4.3.1 SSD Transfer Pumps (Phase 1-2)

Existing pumps to be utilized to transfer to sludge storage tanks for phase 1. In phase 2, when dewatering building is installed new transfer pumps will be installed to meet discharge pressure demands.

Transfer pumps will be shipped to site by truck. When the equipment arrives onsite, the equipment will be transported to the digester gallery for storage prior to installation or stored in a protected laid down area following procedures as outlined by the manufacturers.

Transportation of equipment from truck or laid-down area to digester gallery will be performed utilizing a forklift. Where possible the equipment will be brought into the digester gallery through the access door. If the equipment is too large for an access door, an opening will need to be made in the building.

Transfer Pumps, including:

a.) Dimensions: 40.875” x 33.5” x 37.44” (per pump)
b.) Anchor Details: 14 9/16” x 30 ¾”
c.) Centerline of Suction: 12 13/16” x 9 7/8” (from front anchor)
d.) Weight (dry weight): 625 lbs
e.) Configuration/Motor Mount: Overhead;
f.) Electrical Connection: 7.5 HP, 575V/3/60Hz; C1D1 Group D;
VFD located in MCC in Gallery Building;
g.) Piping Connections: 100 DN, (Material specification) – Sludge Transfer line (Existing);
h.) Pump located in Digester Gallery area (X Floor, X room);
i.) Equipment Required for installation:
    a. Forklift (high capacity electric) (Approx. 10 tons);

b. Manual handheld tools;
c. Handheld grinder;
d. Pipe cutter and threader; and
e. Welder;

4.3.2 Sludge Heating Equipment (Phase 1-2)

Hot Water Pump, Sludge transfer pump, and heat exchangers will be shipped to site by truck. When the equipment arrives onsite, the equipment will be transported to the digester gallery for storage prior to installation, or stored in a protected laid down area following procedures as outlined by the manufacturers.

Transportation of equipment from truck to digester gallery will be performed utilizing a forklift. Where possible the equipment will be brought into the digester gallery through the access door. If the equipment is too large for an access door, an opening will need to be made in the building.

Hot Water Pump:

a.) Dimensions: 16 5/8" x 45" x 17 3/8" (per pump)
b.) Weight (dry weight): 444 lbs (approx.)
c.) Motor Frame: 254T
d.) Mounting Bolt Size: 2" x 2 ½"
e.) Electrical Connection: 20 HP, 575V/3/60Hz; Explosion Proof;

f.) Piping Connections:
    a. 2.5" DN, (SS) – Hot water line (Suction);
    b. 2" DN, (SS) – Hot water line (Discharge);
g.) Pump located in Digester Gallery area (1st Floor, X room);

Sludge Circulation Pump:

a.) Dimensions: 54 11/16" x 29 15/16" x 50 3/16" (per pump)
b.) Anchor Spacing: 40 1/8" x 19 11/16"
c.) Base Dimensions: 43 11/16" x 23 5/8"
d.) Weight (operational / empty): 1,600 lbs
e.) Configuration/Motor Mount: Overhead;
f.) Electrical Connection: 30 HP, 575V/3/60Hz; (per pump)
g.) Piping Connections: 150 DN, (PVC, Sch 80) – Sludge Circulation Lines (Existing);
h.) Pump located in Digester Gallery area (1st Floor, X room);

Heat Exchanger:

a.) Dimensions: 11'10.125" x 1'8.875" x 3'11.75" (per pump)
b.) Anchor Spacing: 6'6.75" x 1'6.125"
c.) Weight (operational / empty): 3100 lbs / 2025 lbs
d.) Piping Connections:
    a. 125 DN, (PVC, Sch. 80) – Sludge Circulation Lines

b. 100 DN, (SSA) – Hot water line (Existing);

e.) Pump located in Digester Gallery area (1st Floor, X room);

Equipment required for installation:

- Forklift (high capacity electric) (Approx. 10 tons);
- Manual handheld tools;
- Handheld grinder;
- Pipe cutter and threader; and
- Welder;

4.3.3 Membrane Covers, Blowers, Internal Mixers, and Pressure Relief (Phases 0 and 1-2)

4.3.3.1 Membrane Covers and Blowers

Membrane covers will be utilized to collect biogas generated by the digesters.

To install membrane covers to the top of digester tanks two support structures are required including a center column for the net support system and net support system.

The membranes and supports will be transported by truck. When arriving onsite the membranes and supports will be brought to digester tanks utilizing a forklift. A crane will be required to lift the membrane into place.

Membrane Covers:

a) Dimensions: 13.30 m @ anchorage
b) Height – Air Membrane 5.50 m
c) Gas Storage (m3) (each): 550 m3
d) Air Membrane: Type III (1050 g/m2); white; 866 lbs;
e) Gas Membrane: Type II (1100 g/m2); green; 881 lbs;
f) Perimeter Anchorage:
    a. ¼" thick x 2" wide x 3 m length (anchorage flange);
g) Center Column for Net Support System:
    a. One (1) 304 SS central column (dia. 16", 6 mm thickness, height 9.5) to be mounted in the center of the tank to allow for installation of the straps and net system; design subject to change based on working pressure;
    b. One (1) 304 SS "upward cone" (height 1.5 m, dia. 1.6 m) to be mounted on top of central column to support the straps and net system;
    c. Vertical load;
h) Net Support System:
    a. One (1) net support system to support the digester cover during installation and operation
        i. Ensures membrane does not come into contact with mixers and abrasive solids;
        ii. One (1) support net, 100 x 100 mm square mesh (walkable net);
        iii. Includes 2" PET straps, attached around the interior circumference of the tank;

iv. Note: Perimeter drilling of the tanks for anchor points is provided by customer.
v. Strap anchor interval: 0.41 m;

i) Instrumentation;
   a. Intermediate Range Laser Level Transmitter (mounted to top of gasholder);
      i. Signal: continuous 4-20 mA and dual relay outputs;
      ii. Rating: C1D1 CSA;
      iii. Wiring: Top of gasholder base of gasholder and connector fittings; ‘

j) Equipment for installation:
   a. Boom Truck (with telescopic crane) (Approx. 40 tons);
   b. Forklift (high capacity electric) (Approx. 10 tons);
   c. Manual handheld tools;
   d. Pipe cutter and threader; and
   e. Welder;

Digester Pressure Blowers:

a.) Quantity: 2
b.) Dimensions: 13.78” x 13.39” x 20.60” (per blower)
c.) Piping Connections: 90 DN, Inlet / Outlet;
d.) Power: 1.5 kW, 575/3/60
e.) Digester Blowers located in Digester Gallery (Ground Floor, Room X) location;
f.) Included accessories:
   a. 2 check valves;
   b. 1 Y connection;
   c. 1 flex hose adaptor
   d. 15 ft of flex hose;
g.) Equipment to install blowers:
   a. Forklift;
   b. Manual handheld tools;
   c. Pipe cutter and threader; and
   d. Welder;

4.3.3.2 Service Boxes

Please refer to Section 4.2.6.

4.3.3.3 Mixers

Please refer to Section **Error! Reference source not found.**.

4.3.3.4 Pressure Relief

Please refer to Section 4.2.9.

4.4 Chemical Dosing System (Phases 0 and 1-2)

Units will be skid mounted and contained in a chemical berm. The systems will consist of a progressive cavity

pumps utilizing VFD drives. A calibration column, pressure relieving valves, and gauges will be provided on the skid. The chemical agents will be used on an as needed basis and will be delivered to site in 1,000 litre totes via tanker truck. There will be multiple above ground pipelines supported in a rack from the chemical totes area to the digesters. Pipelines will be constructed out of PVC or carbon steel for chemicals (PVDF or stainless steel for acid solutions).

Dosing Skid Dimensions: 24 1/8" x 6 9/32" x 16 11/32" (single pump only)
48" x 40" x 46" (ICB Tote only, anticipated dimensions, pump sitting on-top);
90" x 52" x 42.25" (anticipated tote dimensions)

Electrical Connections: 120V/1/60Hz, XX Amps

Equipment required for installation:

- Hand tools;

4.5 Thickening Building / Thickening Units (Phase 1-2)

The thickening building is to be a pre-constructed steel building consisting of 49'5" x 80' dimensions, with 2 x 8' x 8' roll-up access doors and 3 standard man doors. Each unit will including a HVAC package, fire detection, and light panel from the pre-constructed building supplier that will be able to meet specified ventilation requirements to ensure that all equipment contained within the building requires non-hazardous ratings, and lighting requirements.

The buildings will have a concrete slab floor as per structural engineering design for thickness and rebar placement. These buildings will be constructed out of steel columns, girts, purlins, and insulation. The outer walls will consist of metal clad siding with a sloped metal roof or ballast covered low slope ethylene propylene diene monomer (EPDM) roofing on steel roofing. The building (with buffer and slurry storage tank) will take up approximately 624.5 m^2.

The equipment pads will be required for the following equipment to be contained within the building, including:

- Food Reception Skid (to be placed over a grate and sump drain) (See Section 4.2.2)
- Thickener Unit # 1 and 2 packages, both packages (See Section 4.5.1)
- Chemical Holding Area:
    a) Holding Area Dimensions: 22' 5 1/8" x 20' x 25 6 11/16'
    b) Berm Dimensions: 22' 5 1/8" x 20' x 4"

- Transfer Pumps, including:

  Thickener Feed Pumps:

  a) Dimensions: 50 3/16" x 28 7/16" x 50 3/16" (per pump)
  b) Anchor Spacing: 40 1/8" x 19 11/16"

c) Base Dimensions: 43 11/16” x 23 5/8”
d) Configuration/Motor Mount: Overhead;
e) Weight (operational / empty): 1,180 lbs
f) Electrical Connection: 20 HP, 575V/3/60Hz; (per pump)
g) Piping Connections: 150 DN, Sch. 80 PVC;
h) Equipment Required for installation:
    a. Forklift;
    b. Manual handheld tools;
    c. Handheld grinder;
    d. Pipe cutter and threader; and
    e. Welder;

Slurry Feed Pumps:

a) Dimensions: 30” x 21 1/4” x 36 1/4” (per pump)
b) Anchor Spacing: 16 15/16” x 18 1/8”
c) Base Dimensions: 20 7/8” x 20 1/2”
d) Weight (operational / empty): 390 lbs
e) Electrical Connection: 3 HP, 575V/3/60Hz; (per pump)
f) Piping Connections: 75 DN, Sch. 80 PVC;
g) Equipment Required for installation:
    a. Forklift;
    b. Manual handheld tools;
    c. Handheld grinder;
    d. Pipe cutter and threader; and
    e. Welder;

Sump Pumps:

a. Quantity: 2
b. Dimensions: 14.63”x 18.68” x 46.73” (per pump)
   14.64”x 38.40”x 53.66” (with discharge bracket)
c. Weight (dry weight): 293.5 kg
d. Accessories: Guide Rails;
e. Electrical Connection: 14 HP, 575V/3/60Hz; (per pump)
f. Piping Connections: 100 DN, (Material specification) –;

Electrical Connections:

- 575/3/60 Connections provided to the following:
    - Thickener Building Control Room;
    - Dimensions:
        - Control Room to House the following Control Panels:

- Sprinkler Control Panel / Fire Detection Panel;
- Gas Detection Panel;
- Pump Control Panel;
- Main Control Panel (providing 120V source to);
    - Chemical Dosing Pump VFD;
    - Polymer Make-Down System;
- Building Lighting Panel;
- Building HVAC Panel;

- Thickener Skid # 1 Control Panel (mounted on skid);

- Thickener Skid # 2 Control Panel (mounted on skid);
- Slurry Reception Skid Control Panel (mounted on skid);
- Sump Pit Control Panel (to be located on wall near Sump Pit);

Plant Water Connections:

- Plant Water: 50 DN, SSA, 10 PSIG
- Sprinkler Line: 50 DN, SSA, 20 PSIG

Sump Pits:

Sump pits inside the thickener building include:

- Thickener Building Main Sump Trench;
- Thickener Building Main Sump Pit;
- Polymer and Chemical Sump;
- Truck Reception Sump Pit;

Each of the sump pits will be explained below.

Thickener Building Main Sump Trench and Pit;

a) Trench and Pit Volume: 46,112 L
b) Dimensions: 6’ x 4’ x XX’ (Thickener Building Sump Pit)

c) Description:
    a. Constructed of concrete;
    b. Floor of main bay of building to be sloped by 2% to center trough (3’ wide) which will be 2% sloped to sump pit (tank installed 1.6’ below grade);
    c. Polymer and Chemical Sump feeds to Thickener Building Main Sump Trench through 6” PVC drain pipe.
    d. Float Switches (24 VDC) to control sump pump operation;
    e. Truck reception sump pit feeds to thickener building sump pit by 6” PVC drain pipe.

Polymer Sump;

a) Polymer Sump Volume: 6,937 L
b) Dimensions: 8’ x 10’ x 2’
c) 6” PVC Drain line attaching to main sump trench;

Receiving Pad Sump;

a) Receiving Pad Sump Volume: 5 m^3

b) 6” PVC Drain line attaching to main sump pit;

Floor Total:

a) Floor Sump Volume: 18,926 L
b) Dimensions: Building Dimensions (see above);
c) Floor contained by a 4” impermeable curb inside the building;

Equipment to install sump pits;

a. To utilize same equipment used to install the building;

All buildings will be provided with Fire Extinguishers, Fire Detection Systems, Sprinkler Systems, and Gas Analyzers (CH4, O2, CO2, H2S) linked to alarm lights and audible alarms located inside and outside of the building to ensure staff safety.

Equipment required for installation:

- Concrete pump trucks (Approx. 26 Tons);
- Concrete mixer trucks (Approx. 32 Tons with full load);
- Handheld concrete vibrators;
- Trowels; Stone slinger;
- Surveyor level;
- Reusable formwork, wood blocking and bucks;
- Form oil;
- Handheld grinder and rebar bender;
- Contractor utility vehicles with portable welding and cutting equipment;
- 90 tonne crane (Appox. 90 tons);
- 15 tonne boom crane (Approx. 15 tons);
- Welders and cutting torch;
- Electric drill;
- Scissor lifts (Approx. 2.5 tons);
- Genie booms (Approx. 2.5 tons); and

- Concrete float.

4.5.1 Thickening Units (Phase 1-2)

The thickening unit will be skid mounted along with an inline mixer and flocculator. The unit will be elevated through legs (5') and a mezzanine will be provided around the thickener to provide access to the unit. A progressive cavity pump with inlet hopper will be located below the solids discharge outlet to convey thickened stream to the digester.

The filtrate of the thickener unit will flow by gravity to the sump pit and then transferred via sump pump to the filtrate return line located in the digester gallery between digesters #3 and #4, which will be conveyed to the headworks of the plant.

The equipment will be delivered to site via truck and moved from the truck to the Thickener Building via forklift and installed on the extension legs/supports.

a.) Dimensions (skid): 5711 mm x 2100 mm x 2507 mm
b.) Weight (skid): Approx. 5000 - 6000 kg;
c.) Electrical Connections: 11.4 kW, 575V/3/60Hz (to skid ITC)
d.) Connections:
    a. Inlet Connection: 4" ANSI 125/150
    b. Plant Water Connections: 2 x 1" Water Connection (21-32 GPM @ 73-102 PSI) (one per thickener);
    c. Plant Air Connections: 2 x ½" Compressed Air Line from Plant (90 – 150 PSI) (one per thickener);
    d. Polymer Connection: 40 DN
    e. Solids Outlet: 900 mm x 260 mm
    f. Filtrate Outlet: 8" ANSI 125/150
e.) Equipment Required for installation:
    a. Forklift (high capacity electric) (Approx. 10 tons);
    b. Manual handheld tools;
    c. Handheld grinder;
    d. Pipe cutter and threader; and
    e. Welder;

4.5.1.1 Thickener Transfer Pump

One Thickener Transfer pump per Thickener Skid. Inlet hopper to be provided by others and connected to thickener discharge duct.

The equipment will be delivered to site via truck and moved from the truck to the Thickener Building via forklift and installed underneath thickener solids discharge outlet, underneath the extension legs/supports.

a) Dimensions: 108 11/16" x 12 9/16" x 12 17/32" (per pump)
b) Anchor Spacing: 56 7/32" x 9"

c) Base Dimensions: 62 7/32” x 11”
d) Weight (operational / empty): 175 kg
e) Hopper: 900 mm x 260 mm x XX”
f) Electrical Connection: 7.5 HP, 575V/3/60Hz; (per pump)

g) Piping Connections: 100 DN, Sch. 80 PVC;
h) Equipment Required for installation:
    a. Forklift (Approx. 6 tons);
    b. Manual handheld tools;
    c. Handheld grinder;
    d. Pipe cutter and threader; and
    e. Welder;

4.6 Polymer Make-down System (Phase 1-2)

The units will be skid mounted and contained in a chemical berm. Polymer make-down systems will require 0.5” piping to and from the emulsion polymer tote, and a 1” water line (min flow and pressure 30 GPM @ 40 PSI) to allow for dilution. One unit will be provided for each thickening and dewatering set unit, one located in the thickening building and one located in the dewatering building, respectively.

The polymer make-down units and chemical totes will be transported by truck after the building has been completed. The make-down system and totes will be offloaded by a forklift and placed on anti-spill skids inside of a chemical containment area in the building.

a.) Dimensions: 40.29” x 24” x 49.90”
b.) Electrical Connections: 120 VAC/1/60Hz, 10 Amps to local Control Panels;
c.) Plant Water Connections:
    1 x 1” water line (min flow and pressure of 30 GPM @ 40 PSI);
    1 x 0.5” NPT connection for polymer;
    1 x 1.5” NPT Solution Outlet;
d.) Equipment Required for installation:
    a. Forklift (Approx. 6 tons);
    b. Manual handheld tools;
    c. Pipe cutter and threader; and
    d. Welder;

4.7 H2S removal units (Phases 0 and 1-2)

The H2S Removal system is to consist of two media adsorption filters, sized for 300 days per change-out in phase 0, and 75 days per change-out in phase 1-2. In phase 0, one vessel will be installed, providing 112 Nm3/hr capacity (<3500 ppm inlet, and <20 ppm outlet) with a second vessel added in phase 1-2, providing 348 Nm3/hr additional capacity (<3500 ppm inlet, and <20 ppm outlet). To meet process requirements an Oxygen Cylinder will be required onsite to allow for the 3:1 O2 to H2S ratios required to meet stoichiometric conditions to reduce outlet H2S concentrations to below 20 ppm. A gas analyzer will be sample from multiple

locations including digester # 3, digester # 4, combined biogas stream to H2S removal, and combined biogas stream after H2S removal.

Main components of the process include:

1. H2S Vessel containing adsorption media;
    a. 1 vessel in phase 0 sized for 112 Nm3/hr;
    b. 2 vessels in phase 1-2 sized for a combined total of 460 Nm3/hr.
    c. Each vessel estimated size and weight:
        i. Dimensions: 8’ dia. x 14’ height (per vessel) / 21’ height (including base & top inlet)
        ii. Weight (empty/operational): ~8,000 lbs / 32,000 lbs
        iii. Inlet/Outlet: 3” 150# RF x 1” NPT Ports
        iv. Area around vessel must be capable of supporting forklift with +27,000 lbs to allow for loading and removal of media.
2. Gas Analyzer;
    a. Location of Gas Analyzer: Mounted on Wall of HX room in Digester Building;
    b. Dimensions of Gas Analyzer: 564 mm x 700 mm x 268 mm
    c. Weight of Gas Analyzer: 34 kg
    d. Power Requirement: 80 W, 100-240 VAC, 60 Hz
    e. Measuring Points: 1-4
    f. Process connections: 4/6 mm SS, hose screw connection
    g. Required Clearance: 1 m

3. O2 Compressed Gas Cylinder;
    a. Location of Gas Cylinder; TBD (potential locations include, on pad or in digester gallery)
    b. Number of Gas Cylinders: 4
    c. Dimensions of Gas Cylinder: 30” (dia.) x 62”
    d. Weight of Gas Cylinder (empty): 568 kg
    e. Includes regulator and switch-over mechanism;

The H2S removal vessels will be shipped to site via truck and offloaded by crane onto foundation pads which the vessels will be anchored into.

a.) Foundation Requirements: 16’ x 32’ x 18”
    a. PAD Material Specifications:
        i. 6” Slab 30 MPa
        ii. 15M MAT 12” C.C. E.W.
        iii. 2’ from edge of pad – 24” x 12” SLAB THICKENING (4) 15M BAR CONTINUOUS, 15M STIRRUPS @ 24” C.C.
        iv. 2” RIGID INSULATION EXTEND 48” PAST SLAB;
        v. MIN 6” COMPACTED GRANULAR A, 96% COMPACTION IN MAX 6” LIFTS;

b.) Electrical Connection: 120V/1/60Hz (for gas analysis and oxygen injection);

c.) Piping Connections:
    a. 75 DN, (Material specification) – Biogas Inlet Piping;
    b. 15 DN, (Material specification) - Gas Analysis Lines;

d.) Equipment Required for installation:
    a. 90 tonne crane (Appox. 90 tons);
    b. 15 tonne boom crane (Approx. 15 tons);
    c. Welder;
    d. Pipe cutter and threaded;
    e. Handheld grinder; and
    f. Manual handheld tools.

4.8 Condensate / Sediment Traps and Biogas Blowers (Phases 0 and 1-2)

From the H2S Removal System, the treated gas will return to gallery building, pass through a condensate / sediment trap to remove moisture and sediment, and passed through a biogas blower to a common biogas manifold which multiple processes, including biogas conditioning systems for the CHP, biogas upgrading, and emergency flare will pull from. Further details for the condensate / sediment traps and biogas blowers will be provided in the proceeding sections.

4.8.1 Condensate / Sediment Traps and Biogas Blowers

Condensate / sediment traps and biogas blowers will be transported to site by truck. The equipment will be offloaded by hand or utilizing a forklift and brought to gallery building # 1. Mechanical and electrical set up will be carried out on the site by trained technologists.

Condensate / Sediment Trap:

a.)	Dimensions (LxWxH):	39” (dia.) x 38.13”
b.)	Material:	Stainless Steel
c.)	Inlet / Outlet:	8” inlet / outlet, 31.25” inlet height
d.)	Anticipated Pressure Drop:	0.5” water
e.)	1” NPT Trap connection;	

Biogas Blower:

a.)	Configuration:	2 units, (Duty/Standby)
b.)	Capacity @ discharge pressure per blower:	86 – 460 Nm3/hr @ 3.75” WG;
c.)	Dimensions (LxWxH) per blower:	12.6” x 13.78” x 24.22”
d.)	Base Dimensions per blower:	13.39” x 6.30”
e.)	Weight per blower:	TBD (less than 250 lbs)
f.)	Material:	Polypropylene Housing
g.)	Capacity @ discharge pressure per blower:	86 – 460 Nm3/hr @ 3.75” WG;
h.)	Inlet / Outlet:	3.54”
i.)	Power:	0.75 kW, 575V/3/60Hz, VFD Driven;

j.) Noise per blower: 80.5 dB / 77.8 dB(A)

k.) Equipment Required for installation (for both blowers and sediment / condensate traps):

a. Forklift (Approx. 6 tons);
b. Welder;
c. Pipe cutter and threaded;
d. Handheld grinder; and
e. Manual handheld tools.

4.9 Biogas Conditioning / Treatment / Utilization Pad (Phases 0 and 1-2)

The biogas conditioning, treatment, and utilization equipment are all located on a common concrete pad north east of the main building (provide UTM coordinates here). Systems and equipment installed on the pad include:

- Biogas Conditioning / Treatment:
  - Biogas Conditioning System for CHP
  - Biogas Conditioning System for CHP Chiller and Cold Water Pump;
  - Emergency Flare
  - Biogas Conditioning System for Biogas Upgrade System;
  - Activated Carbon Vessels (included Biogas Conditioning System for Biogas Upgrade);
  - Biogas Conditioning System for Biogas Upgrade Chiller and Cold Water Pumps;
- Biogas Utilization;
  - Combined Heat and Power (CHP) System;
  - Biogas Upgrade System;
  - Sales Gas Injection Compressor;

The following section will be divided into Biogas Conditioning/ Treatment Systems, Biogas Utilization Systems, and Biogas Equipment Pad sections.

4.9.1 Biogas Conditioning System for CHP

The biogas conditioning system will consist of the following components, a preliminary knock out tank, inlet blower, air cooler, heat exchangers, secondary knock out tank, and activated carbon tank (located on skid beside main skid).

The knock-out tank, air coolers, and heat exchangers are utilized to cool the inlet biogas to below the dew point of the biogas allowing for removal of moisture from the biogas stream. The activated carbon tanks allow for the removal of siloxanes and other impurities which could affect the operational life of the CHP.

4.9.1.1 Biogas Conditioning System for CHP - Skid Mounted System

Biogas conditioning skid will be transported to site by truck. Biogas conditioning skid will be offloaded using a gantry crane to move the biogas upgrade skid unit from the truck onto the corresponding concrete pad.

Mechanical and electrical set up will be carried out on the site by trained technologists. The auxiliary equipment for the biogas upgrading units will also be transported to the site via transport truck.

Biogas Conditioning Skid:

a.) Capacity: 112 Nm^3/hr
b.) Dimensions (LxWxH): 8' wide x 20' long
c.) Weight (kg): 6,803 kg
d.) Connections:
    a. IN – 575/3/60 Power (1");
    b. IN – Water/Glycol (from Chiller) (2");
    c. IN – Gas Inlet from H2S Vessel (6" Assumed);
    d. IN – Instrument Compressed Air (1/4");
    e. OUT – Gas to CHP (3");
    f. OUT – Gas to Activated Carbon Vessel (3" (assumed));
    g. OUT – Water/Glycol (return to chiller) (2")
    h. OUT – Condensate (1")
    i. OUT – Communication cable to SCADA (1")
e.) Power Supply: Approx. 7 kW, 575V/3/60Hz (power fed to on skid control panel).
f.) Clearance Required: 3' minimum clearance required, 6' preferred.
g.) Equipment Required for installation:
    a. Forklift (high capacity electric) (Approx. 10 tons);
    b. 15 tonne boom crane (Approx. 15 tons
    c. Welder;
    d. Pipe cutter and threaded;
    e. Handheld grinder; and
    f. Manual handheld tools.

4.9.1.2 Biogas Conditioning System for CHP – Non-Rated Chiller

Chiller utilized for the Biogas Conditioning Skid will be transported to site by truck separate from the skid. Chiller will be offloaded using a forklift to move the chiller from the truck onto the corresponding concrete pad. Mechanical and electrical set up will be carried out on the site by trained technologists.

Non-Rated Chiller (utilized for CHP Biogas Conditioning):

a.) Dimensions: 36" x 36" x 80" (LxWxH);
b.) Weight: 500 kg
c.) Connections: 2" inlet / outlet;
d.) Placement: Must be 10' from all gas lines;
e.) Clearance: 1 m on all sides minimum, 2 m ideal;
f.) Cooling Capacity: 5 Tons;

g.) Power: 4.5 kW, 575/3/60

h.) Pumps included with chiller package;

i.) Equipment Required for installation:

   a. Forklift (high capacity electric) (Approx. 10 tons);
   b. Welder;
   c. Pipe cutter and threaded;
   d. Handheld grinder; and
   e. Manual handheld tools.

4.10 Combined Heat and Power (CHP) Unit (Phases 0 and 1-2)

A packaged CHP plant is to be provided in the North end of the WPCP, being fed from the common biogas manifold. Hot water lines will be routed into the CHP heat exchange systems to allow for heat recovery, while the CHP engine generates electricity to be utilized by the system.

The CHP has its own control panel and auxiliary supply panel. In addition there is one master control panel. All panels will be mounted inside the electrical room as part of the engine building. The panels will be built according to CSA regulation.

The CHP unit will be transported to the site via transport truck. The CHP unit will be containerized and offloaded using a gantry crane to move the CHP unit from the truck onto the concrete foundation. Mechanical and electrical set up will be carried out on the site by trained technologists. The auxiliary equipment for the CHP units will also be transported to the site via transport truck.

CHP (to be installed in Phase 0):

a.) Container Details:

   a. Capacity: 200 kW
   b. Dimensions: 5550 mm x 3000 mm x 6500 mm
   c. Weight: 9085 kg

b.) Electrical Connection: 575V/3/60Hz;

c.) Piping Connections:

   a. 75 DN, (Material specification) – Biogas Inlet Piping;
   b. 25 DN, (Material specification) – Condensate Lines;
   c. 150 DN, (Material specification) – Vent;
   d. 50 DN, (Material specification) – HW Lines (inlet);
   e. 50 DN, (Material specification) – HW Lines (outlet);

d.) Hot Water CHP Pump:

   a. Capacity @ Discharge Pressure: 10.67 to 16.83 m^3/hr @ 60.96 m to 40.45 m (46.98 to 74.1 GPM @ 200 ft to 132.7 ft)
   b. Inlet Temperature: 70 C (158 F)
   c. Weight (empty): 41.57 kg (91.651 lbs)
   d. Type: Multi-Stage Pump
   e. Dimensions: 300 mm x 215 mm x 914.4 mm
   f. Inlet/Outlet: 50 DN / 50 DN (2” / 2”)

g. Power / Voltage: 5 HP, 575V/3/60Hz
h. Motor Rating: Explosion Proof (XP PE Motor)

e.) For the installation of the CHP and the auxiliary equipment the following equipment will be used:
   a. 15 ton boom truck with crane
   b. Forklift (high capacity electric) (Approx. 10 tons);
   c. Welder;
   d. Pipe cutter and threaded;
   e. Handheld grinder; and
   f. Manual handheld tools.

4.11 Emergency Flare (Phases 0 and 1-2)

The biogas emergency flare will have a 100 DN size ANSI 150 flanged connection. The flare will be located at the north-west side of the plant.

According to CSA B149.6 standards for waste gas burner stacks, the following requirements will be met:

- Flare discharge will be at minimum 4 m above grade, and 1.5 m above any obstruction.
- A waste gas burner and ignitor shall be not less than 15 m measured linearly outward from the perimeter of any digester or other potential source of combustion gas.
- An open-type waste gas burner shall be located so that its termination is not less than 7.5 m from any other gas burner stack termination or any appliance exhaust vent termination.
- A waste gas burner stack shall be located not less than 7.5 m measured horizontally from a property line or the travelled portion of any road.
- When a waste gas burner stack is accessible to the public, safety fencing shall be provided not less than 7.5 m horizontally from the stack.

The biogas emergency flare will be fed off of the biogas common manifold. The biogas emergency flare will have a pressure regulator, flame arrestor, and shut off valve installed inline on the biogas inlet, and flame arrestor installed inline on the pilot line (natural gas, supplied at minimum 10 PSI).

The emergency flare and ancillary components will be shipped to site by truck.

The emergency flare will be installed on a concrete pad onsite. The flare will be anchored to a concrete foundation, which will be anchored to bedrock.

Emergency Flare (to be installed in Phase 0):

a.) Dimensions of Flare: 609 mm x 5.49 m
b.) Preliminary Design Data:
   a. Windload (per ASCE 7-95): 120 MPH
   b. Seismic (per UBC-1994): ZONE 4
   c. Shear @ Base: 400 LB
   d. Moment @ Base: 4,000 LB-FT

e. Deadload: 500 LBS
f. Shell Design Temperature: 150°F
g. Corrosion Allowance: 0.0

c.) Electrical Connection: 120V/1/60Hz;

d.) Piping Connections:
   a. 100 DN, 150# F.F. (Material specification) – Biogas Inlet Piping (Existing);
   b. 15 DN, FNPT (Material specification) – Natural Gas Pilot Line (tied to control panel);
   c. 15 DN, FNPT (Material specification) – Pilot Conduit Connection;
   d. 15 DN, FNPT (Material specification) – Thermocouple Conduit Connection;
   e. 20 DN, FNPT (Material specification) – Pilot Thermocouple Conduit Connection;
   f. 15 DN, FNPT w Plug (Material specification) – Temperature Connection;
   g. 25 DN, FNT w Plug (Material specification) – Flow Meter Connection;

e.) Components required to meet CSA suggested ancillaries;
   a. 100 DN Check Valve x 2;
   b. 100 DN Isolation Valve x 2;
   c. 100 DN Pressure Regulating Valve;
   d. 100 DN High Pressure Switch Actuated Valve;
   e. 100 DN Low Pressure Switch Actuated Valve;
   f. 100 DN Flame Arrestor (Biogas Feed Line);
   g. Sample Valves x 3;
   h. 15 DN Flame Arrestor (Pilot Gas Feed Line);
   i. 15 DN Actuated Valve (Pilot Gas Feed Line);
   j. 15 DN Flowmeter (Pilot Gas)

f.) Note: h, i, and j provided by Anaergia, contractor, or client;

g.) Equipment Required for installation:
   a. 15 ton boom truck with crane
   b. Forklift (high capacity electric) (Approx. 10 tons);
   c. Welder;
   d. Pipe cutter and threaded;
   e. Handheld grinder; and
   f. Manual handheld tools.

4.12 Biogas Upgrading Unit and Injection Blower (including instrumentation) (Phase 1-2)

One biogas upgrading skid will be provided in phase 2. All units will be pre-skidded by vendor with independent local control panels.

The Biogas Upgrading Unit will consist of a biogas conditioning system for the biogas upgrading unit, a chiller, a compressor, the biogas upgrading unit itself, and a sales gas compressor and cooling system (to increase the pressure to a point where it can be injected into the natural gas distribution grid).

All biogas upgrading skid components will be transported to site by truck separately. All components will be offloaded using a gantry crane to move the component from the truck onto the corresponding concrete pad.

Mechanical and electrical set up will be carried out on the site by trained technologists. The auxiliary equipment for the component units will also be transported to the site via transport truck.

4.12.1 Biogas Conditioning System for Biogas Upgrade

a.) Container Details:
   a. Dimensions: 20’ x 8’ x 8.5’
   b. Weight: 3000 kg

b.) Electrical Connection: Power is fed from GFE MCC Panel

Contractor will need to run:
- 3-Phase Power to Blower from MCC (6 kW);
- 3-Phase Power to Compressor from MCC (80 kW);
- 120V Power to Junction Box;
- 24V Power to Junction Box;
- Communications Wire;

c.) Piping Connections:

a. IN – 575/3/60 Power (1”);
b. IN – Water/Glycol (from Chiller) (2”);
c. IN – Gas Inlet from H2S Vessel (6” Assumed);
d. IN – Instrument Compressed Air (1/4”);
e. OUT – Gas to CHP (3”);
f. OUT – Gas to Activated Carbon Vessel (3” (assumed));
g. OUT – Water/Glycol (return to chiller) (2”)
h. OUT – Condensate (1”)
i. OUT – Communication cable to SCADA (1”)

4.12.1.1 Activated Carbon Vessels (off-skid);

d.) Container Details:
   a. Dimensions: 5’ dia. x 7’ (body) vessels
   b. Weight: 1500 kg (empty) / 4350 kg with media
e.) Piping Connections:
   a. 75 DN, (Material specification) – Vessel Inlet Piping;
   b. 75 DN, (Material specification) – Vessel Outlet Piping;

4.12.1.2 Chiller (for Biogas Upgrade)

a.) Container Details:
   a. Dimensions: 36” x 46” x 98”
   b. Weight: 900 kg
b.) Electrical Connection: 14 kW, 575V/3/60Hz;
c.) Piping Connections:
   a. 50 DN, (Material specification) – Chiller line inlet;
   b. 50 DN, (Material specification) – Chiller line outlet;
d.) Pumps included with chiller package;

4.12.1.3 Biogas Upgrade Injection Compressor

a.) Electrical Connection: 80 kW, 575V/3/60Hz;
b.) Piping Connections:
   a. 50 DN, (Material specification) –Inlet Piping;
   b. 25 DN, (Material specification) –Outlet Lines;

4.12.2 Biogas Upgrading System

a.) Container Details:
   a. Dimensions: 25’ x 8’ x 8.5’
   b. Weight: 6000 kg
b.) Electrical Connection: 120V feed to on-skid junction box;
   24V feed to on-skid junction box;
   Communications wire
c.) Piping Connections:

a. 75 DN, Connection to membrane skid from pre-treatment skid;
b. 75 DN, Connection to pre-treatment skid from membrane skid;
c. 50 DN, (Material specification) – Chiller Lines (inlet);
d. 50 DN, (Material specification) – Chiller Lines (outlet);

d.) Clearance suggestions: 2’ from skid if possible

4.12.3 Biogas Upgrading System Sales Gas Compressor and Cooling System;

a.) Container Details:
   a. Dimensions: 7’ x 4’ x 4’
   b. Weight: 3000 kg

b.) Electrical Connection: 12-13 kW, 575V/3/60Hz;
Communications cable from GFE main panel;
3-phase power from MCC to on-skid ESD box for compressor;
3-phase power from MCC to on-skid ESD box for after-cooler;
120V feed from MCC to on-skid junction box;
24V feed from MCC to on-skid junction box;

c.) Piping Connections:
   a. 50 DN, connection from membrane skid to compressor;
   b. 25 DN, connection (sales gas) leaving compressor;
   c. 12.5 DN, condensate drain line;

d.) For the installation of biogas upgrading systems and the auxiliary equipment the following equipment will be used:
   a. 15 ton boom truck with crane
   b. Forklift (high capacity electric) (Approx. 10 tons);
   c. Welder;
   d. Pipe cutter and threaded;
   e. Handheld grinder; and
   f. Manual handheld tools.

4.13 Housing Pad for Biogas Conditioning / Treatment / Utilization Equipment (Phases 0 and 1-2)

A housing pad will be installed north east of the main building on-site, and used to house the following equipment:

- Biogas Conditioning Skid for CHP
- Chiller and Cold Water Pump for CHP Conditioning Skid;
- Combined Heat and Power (CHP) System;
- Biogas Conditioning Skid for Biogas Upgrade (installed in phase 1-2)
- Chiller and Cold Water Pumps for Biogas Upgrade Conditioning Skid (installed in phase 1-2);
- Biogas Upgrade System (installed in phase 1-2);
- Sales Gas Transfer Compressor (installed in phase 1-2);
- Emergency Flare;

The housing pad will be installed in phase 0 and sized to accommodate both phase 0 and phase 1-2 systems.

- Dimensions: 92’ x 41’ x 8” (housing pad for chillers and skidded system);
  15’ x 15’ x 12” (12” thickened pad for emergency flare);
  10’ x 15’ x 20” (connection between thickened pad and housing pad)
  Complete pad shape appears as a reverse L shape.

- Pad Specifications (See S-400 drawing):
  - Housing Pad:
    - Center of pad:
      - 6” SLAB 30 MPa
      - 15M MAT 12” C.C. E.W.
      - 2” RIGID INSULATION
      - Minimum 18” Compacted Granular A, 96% compaction in Max 6” Lifts;
    - 2’ towards edge of pad:
      - 6” SLAB 30 MPa;
      - 15M MAT 12” C.C. E.W.
      - 24” x 12” Slab Thickening (4) 15M BAR CONTINUOUS 15M STIRRUPS @ 24” C.C.
      - 2” RIGID INSULATION
      - Minimum 6” Compacted Granular A, 96% Compaction in Max 6” Lifts;
    - 4’ away from edge of pad
      - 1’ Native fill;
      - 2” RIGID INSULATION;
      - Minimum 6” Compacted Granular A, 96% Compaction in Max 6” Lifts;
  - Thickened Pad:
    - 12” thickened pad;
    - 15M BAR MATS @ 12” C.C. E.W. T&B;
    - 2” RIGID INSULATION;
    - Minimum 6” Compacted Granular A, 96% Compaction in Max 6” Lifts;
  - Connection Pad:
    - Specifications identical to Housing Pad, except face connecting to thickened pad.

Equipment to pour excavate volume and pour pad would be the same as the concrete pouring equipment listed in Section 4.1.1.

4.14 Switchgear (Phases 0 and 1-2)

Existing switchgear located in the building south of the CHP will be utilized (located in NW corner of building);

The existing main switchboard capacity is assumed to be 400 A, 600 V, 3P, and 4W.

The existing switchboard will have the following components:

- 400 A Fuse;
- Utility Metering Compartment;
- Digital Metering System
- Diesel Generator (250 kW, 600V, 0.8 P.F.) w 400 A A.T.S;
- Switchboard with existing loads from the Plant;
- New Generator Disconnect Switch for CHP, 600V, 400 A, 3P, 3W, switch cw 300A, J-Type Fuse;

4.15 Electrical Distribution Line and Interconnection Point (Phases 0 and 1-2)

The electrical distribution will be tied into the buried lines from the CHP to the main building housing the plant's switchboard. The CHP power line from the generator will tie into the existing switchboard that all of the other plant loads are provided. All power from the CHP will be 600V/3/60Hz.

Equipment required for installation:

- Hand Tools;
- 15 ton boom truck with crane
- Forklift (high capacity electric) (Approx. 10 tons);

4.16 Control System (Phases 0 and 1-2)

The control system will consist of one single control panel located in the thickener building. Interconnecting Termination Cabinets (ITC, aka Remote I/O) will be provided for each of the following systems to integrate the system to the main control panel and allow for local control:

- Thickener Building:
    - Main Control Panel;
    - Food Reception Interconnecting Termination Cabinet;
    - Thickener Unit # 1 Interconnecting Termination Cabinet;
    - Thickener Unit # 2 Interconnecting Termination Cabinet;
    - Polymer Make-down System # 1 Control Panel;
    - Transfer Pump Interconnecting Termination Cabinet;
        - Includes control for:
            - SST Transfer Pumps;
            - Slurry Transfer Pumps;
    - Sump Pit Interconnecting Termination Cabinet;
    - Lighting Interconnecting Termination Cabinet; and,
    - HVAC Interconnecting Termination Cabinet

  Note: General Building Alarms to be provided as dry contact;

- Dewatering Building:
    - Conveyor Control Interconnecting Termination Cabinet ;
    - Dewatering Unit # 1 Interconnecting Termination Cabinet;
    - Dewatering Unit # 2 Interconnecting Termination Cabinet;
    - Polymer Make-down System # 1 Control Panel;
    - Sump Pit Control Interconnecting Termination Cabinet;

- Lighting Control Interconnecting Termination Cabinet;
- HVAC Control Interconnecting Termination Cabinet;

Note: General Building Alarms to be provided as dry contact;

- Existing Building (Digester Gallery) Interconnecting Termination Cabinet:
  - Biogas Blowers Interconnecting Termination Cabinet;
  - HW Feed Pumps Interconnecting Termination Cabinet;
    - Heat Exchanger;
    - Buffer Tank Heating Coil Feed;
    - Slurry Holding Tank Heating Coil Feed;
  - Biogas Analysis Panel;
  - Sludge Recirculation Pumps Interconnecting Termination Cabinet;
  - Dewatering Transfer Pumps Interconnecting Termination Cabinet (Phase 2);

The following local control panels provided by third parties will be located on the Biogas Conditioning / Treatment / Utilization Pad, with all signals returning to the plant's common SCADA.

- Skid Mounted or Local Panels located near equipment:
  - Emergency Flare Control Panel (near flare);
  - Biogas Conditioning Skid Control Panel (CHP) (on skid);
  - Biogas Conditioning Skid Control Panel (Biogas Upgrade) (on skid);
  - CHP Control Panel (in container);
  - Biogas Upgrade and Injection Control Panel (on skid);

The local control panel will be designed to integrate with a standard Rockwell AB PLC with ethernet connection capability. Ethernet connections will be fed to the WPCP's SCADA system.

The interconnecting terminal cabinets will provide sufficient analog and digital connections, along with ethernet connections and HMI's as appropriate.

Panel dimensions and further information to be provided as design further develops.

4.17 Dewatering Building / Dewatering Unit (Phase 1-2)

The dewatering building is to be a pre-constructed steel building consisting of a 35' x 42' x 38 1 5/16" 2 story building with a 23' 4" x 40' x 21' extension for a truck bay, with 16' x 16' overhead access doors, 8' x 8' roll-up access door for chemical delivery, and 3 man doors (consisting of 3' x 7' dimensions, 2 on ground level, and 1 on 1st floor). Each building will include a HVAC package and light panel from the pre-constructed building supplier that will be able to meet specified ventilation requirements to ensure that all equipment contained within the building requires non-hazardous ratings, and lighting requirements.

Prefabricated buildings will be constructed on the site to house the dewatering screw presses, conveyors, truck bay, and chemical storage area.

The buildings will have a concrete slab floor as per structural engineering design for thickness and rebar placement. These buildings will be constructed out of steel columns, girts, purlins, and insulation. The outer walls will consist of metal clad siding with a sloped metal roof or ballast covered low slope ethylene propylene diene monomer (EPDM) roofing on steel roofing. The building will take up approximately 224 m^2.

The equipment pads will be required for the following equipment to be contained within the building, including:

- Mezzanine (including loads from Dewatering Units and Conveyors);
  - Dimensions: 35’ x 42’x 9’ 2 9/16” (height does not account peak of roof);
  - Pad Specs: Epoxy Floor Finished, 6” concrete w 6x6 6/6 WWM, Steel Deck Pan structural framework;
  - Loading: 2 x 4800 kg Dewatering Skids
    2x 2-TON ROLLING GANTRY, 12’ SPAN
  - Electrical / MCC Room:
    - Dimensions: 11’4 x 7’4” x 9’2 (9/16)”
    - Access: 3’x7’ door;
  - Access:
    - Stairwell from Ground Level;
    - 3’x7’ door from exterior stair; and
    - 16’ x 3’ Lifted Well (Covered and Grated);

- Chemical Holding Area:
  - Holding Area Dimensions: 18’8” x 20’ x 19’
  - Berm Dimensions: 18’8” x 20’ x 4”
  - Wall Construction: 8” LW CMU WALL, 15M BAR @ 32” C.C. Vert., block lock every four courses, painted both sides, lap epoxy floor cover up 6” both sides;
  - Access: 8’ x 8’ Roll-up Door (accessible from outside building)
    3’ x 7’ Door with 4” Curb
  - Polymer Sump Capacity: 4,533 L
  - Polymer Sump Dimensions: 10’ x 8’ x 2’ (with 2% min slope to 6” PVC Drain pipe to Main Sump)
  - Sump Cover: 2” FG Grating, Epoxy Coated W6x20 BEAMS, SET 2” BELOW T/O FLOOR ANCHOR EACH END TO SUMP WALL;

- Main Sump Pit:
  - Main Sump Pit Capacity: 4,364 L
  - Main Sump Pit Dimensions: 6’ x 6’ x 4’6”
  - Main Sump Cover: Epoxy coated W6x20 Beams, set 2” below T/O floor, anchor each end to sump wall;

- Truck Bay:
  - Dimensions: 75’ x 23’4” x 19’
  - Berm Dimensions: 75’ x 23’4” x 4”
  - Access: 16’ x 16’ Overhead Door;
  - Truck Bay Sump Capacity: 15,322 L
  - Truck Bay Sump Dimensions: 53’10” x 3’ x 3’6” (with 2% min slope to 6” PVC Drain pipe to Main Sump)
  - Sump Cover: 2.5” STEEL GRATING;

Summary of Sump Pits:

a) Total Trench Volume: 20 m^3

b) Sump Pumps (housed in main sump pit):
   a. Quantity: 2
   b. Dimensions: 14.63”x 18.68” x 46.73” (per pump)
      14.64”x 38.40”x 53.66” (with discharge bracket)
   c. Pump Outlet to Discharge Inlet Centerline: 10.24”
   d. Weight (dry weight): 293.5 kg
   e. Accessories: Guide Rails (2” Nominal);
   f. Electrical Connection: 14 HP, 575V/3/60Hz; (per pump)
   g. Piping Connections: 100 DN, (Material specification) ;

c) Equipment to install sump pits;
   a. To utilize same equipment used to install the building;

Electrical Connections:

- 575/3/60 Connections provided to the following:
  - Dewatering Building Control Room;
  - Dimensions: 11’4 x 7’4” x 9’2 (9/16)”
    - Access: 3’x7’ door;
  -
    - Control Room to House the following Control Panels:
      - Sprinkler Control Panel / Fire Detection Panel;
      - Gas Detection Panel;
      - Main Control Panel (providing 120V source to);
        - Polymer Make-Down System;
      - Building Lighting Panel;
      - Building HVAC Panel;
  - Dewatering Skid # 1 Control Panel (mounted on skid);
  - Dewatering Skid # 2 Control Panel (mounted on skid);
  - Conveyor Panel (mounted on wall nearby conveyors);
  - Sump Pit Control Panel (to be located on wall near Sump Pit);

Plant Water Connections:

- Plant Water: 50 DN, SSA, 10 PSIG
- Sprinkler Line: 50 DN, SSA, 20 PSIG

All buildings will be provided with Fire Extinguishers, Fire Detection Systems, Sprinkler System, and Gas Analyzers (CH4, O2, CO2, H2S) linked to alarm lights and audible alarms located inside and outside of the building to ensure staff safety.

Equipment required for installation:

- Concrete pump trucks (Approx. 26 Tons);

- Concrete mixer trucks (Approx. 32 Tons with full load);
- Handheld concrete vibrators;
- Trowels; Stone slinger;
- Surveyor level;
- Reusable formwork, wood blocking and bucks;
- Form oil;
- Handheld grinder and rebar bender;
- Contractor utility vehicles with portable welding and cutting equipment;
- 90 tonne crane (Appox. 90 tons);
- 15 tonne boom crane (Approx. 15 tons);
- Welders and cutting torch;
- Electric drill;
- Scissor lifts (Approx. 2.5 tons);
- Genie booms (Approx. 2.5 tons); and
- Concrete float.

4.17.1 Dewatering Unit

The dewatering unit will be skid mounted along with an inline mixer and flocculator. The units will be lifted by crane and placed on the second floor of the building to provide space below the unit to allow for a truck bed to be loaded with dewatered solids. A screwless conveyor with an opening to a loading conveyor (conveyor with three actuated slide-gates and open end), allowing for a truck bed to be evenly loaded.

The filtrate of the dewatering unit will flow by gravity to a filtrate transfer tank, which will be conveyed to the headworks of the plant.

The equipment will be delivered to site via truck and moved from the truck to the Dewatering Building via forklift and installed on the mezzanine in the dewatering building.

a.) Dimensions (skid): 5711 mm x 2100 mm x 2507 mm
b.) Weight (skid): Approx. 5000 - 6000 kg;
c.) Electrical Connections: 11.4 kW, 575V/3/60Hz (to skid control panel)
d.) Connections:
    a. Inlet Connection: 4” ANSI 125/150
    b. Plant Water Connections: 2 x 1” Water Connection (21-32 GPM @ 73-102 PSI) (one per thickener);
    c. Plant Air Connections: 2 x ½” Compressed Air Line from Plant (90 – 150 PSI) (one per thickener);
    d. Polymer Connection: 40 DN
    e. Solids Outlet: 900 mm x 260 mm
    f. Filtrate Outlet: 8” ANSI 125/150
e.) Equipment Required for installation:
    a. Forklift (high capacity electric) (Approx. 10 tons);
    b. Manual handheld tools;
    c. Handheld grinder;
    d. Pipe cutter and threader; and

e. Welder;

4.17.2 Polymer Make-down System

The units will be skid mounted and contained in a chemical berm. Polymer make-down systems will require 0.5” piping to and from the emulsion polymer tote, and a 1” water line (min flow and pressure 30 GPM @ 40 PSI) to allow for dilution. One unit will be provided for each thickening and dewatering set unit, one located in the thickening building and one located in the dewatering building, respectively.

The polymer make-down units and chemical totes will be transported by truck after the building has been completed. The make-down system and totes will be offloaded by a forklift and placed on anti-spill skids inside of a chemical containment area in the building.

e.) Dimensions: 40.29” x 24” x 49.90”

f.) Electrical Connections: 120 VAC/1/60Hz, 10 Amps to local Control Panels;

g.) Plant Water Connections:

1 x 1” water line (min flow and pressure of 30 GPM @ 40 PSI);
1 x 0.5” NPT connection for polymer;
1 x 1.5” NPT Solution Outlet;

h.) Equipment Required for installation:

a. Forklift (high capacity electric) (Approx. 10 tons);
b. Manual handheld tools;
c. Pipe cutter and threader; and
d. Welder;

4.18 Solids Loading Conveyor (Phase 1-2)

From the dewatering units, the digestate is thickened from X% to XX%, exits the dewatering unit solids outlet and enters a shaftless screw conveyor, stretching the length of a truck bed with four gate openings. Three of these openings will have actuated slide gates and level sensors which will allow for the truck bed to distribute the dewatered solids weight evenly across the bed.

a) Capacity: 4 m3/hr;
b) Operation: 12 hrs / day
c) Orientation: 0 degrees;
d) Filling Rate: 50%
e) Direction: Pushing;
f) Spiral;
   a. Material: Hardox 450
   b. Diameter: 8.5”
   c. Pitch: 8.5”
   d. Profile: 2.5” x ¾” + 1”1/2”
g) Trough:

a. Length: 18,300 mm
b. Steel: SS 304
c. Thickness: 11 ga (3.2 mm)
d. End plate: 3/8” (10 mm)
e. Wear Liner: UHMW 3/8” (10 mm)

h) Lids:
a. Steel: SS 304
b. Section Length: 1,000 mm
c. Thickness: 14 Ga (2 mm)
d. Gasket Material: Closed Cell Neoprene

i) Inlet Chute:

a. Quantity: 1
b. Dimensions: 270 x 270
c. Steel: SS 304
d. Thickness: 11 ga (3.2 mm)
e. Flange: ¼” (6.35 mm)

j) Outlet Chute:
a. Quantity: 4
b. Dimensions: 270 x 270
c. Steel: SS 304
d. Thickness: 11 ga (3.2 mm)
e. Flange: ¼” (6.25 mm)

k) Slid Gate:
a. Number: 3
b. Type: Frame gate with guides
c. Actuators: Electrical (liner)
d. Accessories: Limit Switches

l) Supports:
a. Number: 5
b. Type: Structural
c. Steel SS 304
d. Anchor Bolts: By Others;

m) Drive System:
a. Gear Drive Adaptor: Standard Atara (removable)
b. Seal: Packing gland with Labyrinth seal
c. Packing: ¼” Teflon
d. Drive Shaft: AISI 1040

n) Gear Drive:
a. Make: Nord
b. Speed: 20 RPM
c. Mounting Position: M1

d. Service Factor: 1.5

o) Motor:
   a. Type: Inverter Duty (VFD driven)
   b. Power: 3 HP
   c. Reversible: Yes
   d. Voltage: 575V/3/60Hz
   e. Explosion Proof: Optional
   f. Safety Factor: 1.15

p) Instrumentation:
   a. Motion Sensor;
   b. 4 x Level Sensor;
   c. Safety Pull Switch;

Conveyor motor, slide gates, and instrumentation all to feed into Dewatering Building ITC, which feeds signals back to main control panel located in Thickener Building.

a.) Equipment Required for installation:
   a. Forklift (high capacity electric) (Approx. 10 tons);
   b. 2 Scissor lifts (Approx. 2.5 tons);
   c. Manual handheld tools;
   d. Pipe cutter and threader; and
   e. Welder;

4.19 Prefabricated Buildings and Site Construction Buildings (Phase 1-2)

Please refer to Thickener and Dewatering building for pre-fab buildings to be used in process.

Site Construction Buildings;

Site trailers will be located on-site during construction, provided by contractors. The contractors will also supply their own:

- Washroom facilities;
- Lunch Areas;
- Parking Areas (if required);

Site Trailers will be mobile and be able to be hauled to site via truck. No pad will be required for site trailers.

Site Trainers, contractor parking area, and equipment laydown area to be located in the gated area north east of the site (previous sludge settling pond area).

Equipment required for installation:

- Truck (Approx. 6 tons with full payload);

4.20 Heating, Ventilation, and Air Conditioning Systems (Phase 1-2)

The Pre-Fabricated Buildings will require standard lighting and heating, ventilation, and air conditioning (HVAC) systems, capable of meeting ventilation requirements as laid out by the NFPA guidelines for suggested equipment and process ratings.

Equipment required for installation:

- 90 tonne crane (Approximately 90 tons);
- Welder;
- Pipe cutter and threaded;

- Handheld grinder; and
- Manual handheld tools.

5 Project Schedule and Timing

It is anticipated that construction for phase 0 will begin in Q4 2022. This is contingent on permitting and completion of the 100% design. Phase 1-2 will proceed at a presently undetermined time in the future after completion of Phase 0.

The contractors utilized for installation and high-level descriptions of scope is included in the table below:

Table 5-1: Contractor Preliminary Scope for Phase 0 and 1-2

Contractors	Phase 0 Scope	Phase 1-2 Scope
Civil Contractor	- Land preparation, site grading, roads, relocation of utilities (if required); - Foundation and footing installation; - All asphalt work; - All concrete pours; - Installation of Equipment Pads;	- Land preparation, site grading, roads, relocation of utilities (if required); - Foundation and footing installation; - All asphalt work; - All concrete pours; - Installation of Equipment Pads;
Mechanical Contractor	- Installation of equipment in Digester Gallery (between Digesters # 3 and 4); - Install of Digester Covers; - Installation of H2S removal system; - Installation of Emergency Flare, including natural gas line for pilot gas; - Installation of piping, supports, valves, instrumentation, insulation, and heat trace; - Receiving and offloading equipment; - Tank hydraulic testing; - Commissioning and Start-up assistance;	- Installation of Thickening Building; - Installation of equipment in Thickening Building; - Installation of Dewatering Building; - Installation of equipment in Dewatering Building; - Installation of skid mounted systems; - Installation of piping, supports, valves, instrumentation, insulation, and heat trace; - Receiving and offloading equipment; - Commissioning and Start-up assistance;
Tank Assembly Crew	- Install Starter Ring(s); - Install Tank(s); - Representative present for Tank Inspection;	N/A

Electrical Contractor	- Conduit installation; - Power cable runs; - Instrumentation Cable Runs; - Installation of control panels and connection of power to control panels; - Commissioning and Start-up assistance;	- Conduit installation; - Power cable runs; - Instrumentation Cable Runs; - Installation of control panels and connection of power to control panels; - Commissioning and Start-up assistance;
Programmer (Single individual)	- FAT Tests of all Control Panels; - Commissioning and Start-up assistance; - Coordinate with OCWA SCADA;	- FAT Tests of all Control Panels; - Commissioning and Start-up assistance; - Coordinate with OCWA SCADA;

Mechanical and electrical contractors can potentially be grouped together as a general contractor.

Tank assembly crew to be provided by Tank Supplier, which is a standard bolted tank installation practice.

In order to maintain the schedule, long lead equipment will be identified and potentially ordered ahead of time with approval from site and regulators for each of the project phases.

6 Potential Construction Related Environmental Mitigation Measures

6.1 General Site Conditions Pre-Construction

The location of the project site is situated within the Petawawa Water Pollution Control Plant, located at 560 Abbie Lane, Petawawa, County of Renfrew, K8H 2X2 (Site).

The land required for the Petawawa Net Zero will be built around the existing Digesters # 3 and # 4, and the a northern portion of the plant for biogas applications.

There is an existing electricity distribution connection owned and operated by HydroOne Inc. that will be used to connect the Project to the local grid. Any upgrades required to the existing electricity distribution connection will be done by the electrical contractor.

Solid waste generated at the facility will be disposed of off-site at an approved disposal facility.

6.2 Identification of Construction Related Potential Impacts

6.2.1 Vegetation and Soil Removal

Construction will take place entirely within the fenced perimeter of the Petawawa WPCP. The site is essentially void of vegetation other than mowed grass. Any soil stripped during construction will be set aside and replaced post construction or used as backfill.

Excess soils that cannot be used for backfill will be removed and used in local projects where appropriate or sold to third parties as fill material. Stockpiles of fill material will be temporarily stored on the property, northeast of the proposed site. The rock piles and coarse granular materials will be disposed of offsite.

Mitigation Measures and Monitoring:

The site is essentially void of vegetation with trees outside the fenced perimeter of the site. No trees will be removed during construction. Any herbaceous vegetation will be replaced with grass seed or sod to restore disturbed areas. Silt fencing will be used where appropriate to contain sediment on the construction site.

6.2.2 Air Quality

Air quality impacts associated with construction activities include mobile emission sources from trucks and heavy equipment. During the construction phase of the project, heavy machinery and transport trucks used to deliver equipment to the site are all sources of tailpipe emissions. Mobile tailpipe emissions cannot be avoided during the construction phase of the project; however, these impacts will be temporary with not all sources emitted at the same time.

Mitigation Measure and Monitoring:

In order to reduce adverse effects associated with mobile tailpipe emission sources during construction, heavy equipment operators and truck drivers will be responsible for ensuring that the vehicles are properly maintained and serviced as required (e.g. if a vehicle is burning oil, it will be serviced or replaced). Operators are expected to complete a vehicle check each day before operations commence. Idling of vehicles will be avoided.

6.2.3 Dust Creation

Dust may be created during site clearing during the construction phase of the project.

Mitigation and Monitoring:

Site clearing will be scheduled to begin in during appropriate periods when wind speeds are anticipated to be low, which will minimize the creation of dust. Water trucks will be available for dust suppression.

6.2.4 Noise Impacts

Noise will be generated during the construction phase of the project from heavy machinery, truck traffic, and general construction activities. The closest sensitive receptor to the site is a residential dwelling located approximately 120 metres from the site, south of receptor location.

Mitigation and Monitoring:

Construction activities will be scheduled to occur during daylight hours with no activities to occur past 7:00 pm or before 7:00 am on any given day. All activities are expected to occur Monday through Friday primarily between 8:30 am and 6:00 pm. Activities that result in excessive noise emissions will be scheduled to occur after 9:00 am and before 5:00 pm to avoid disturbing sensitive receptors.

6.2.5 Truck Traffic

Truck traffic is expected to increase during the peak phases of construction activities. There is a potential for increased congestion and accidents on surrounding roadways created by an increase in truck traffic.

Mitigation and Monitoring:

Truck drivers will be licensed to operate the size and weight of equipment brought to the site and will travel to the site primarily during daylight hours in order to reduce the likelihood of vehicle accidents. When needed, oversized loads will be accompanied by an escort to and from the site.

6.2.6 Spills

Chemicals on site during the construction phase of the project will include fuel within the heavy machinery and trucks, and maintenance fluids such as oil, grease and other vehicle fluids. There is a potential for spills or releases of these fluids to the ground surface during construction in the event of an accident or component failure.

Mitigation and Monitoring:

No on-site fuelling station for vehicles will be installed for the construction phase of the project. Heavy machinery and trucks will be fueled off-site or via a portable fuelling truck that will travel to the site for fuelling. Fuelling and maintenance activities will occur on a flat surface away from ditches or migration pathways. Should heavy machinery be fueled on the site, the transfer of fuel (diesel/gasoline) will be supervised by both the truck driver and heavy machinery operator so that any release or spills can be detected immediately and the transfer of fuel shut down. Retail sized containers of maintenance fluids will be stored on the site within construction trailers by the contractor. A spill kit will be located on the site in the event of an accidental spill or release for clean-up. The construction supervisors or designate will be trained in spill response and clean-up.

Any spilled material that reaches any water body surface will be reported to the MECP spill action centre (1-800-268-6060), and the Town of Petawawa. OCWA in accordance with MOE direction will devise a plan for clean-up and monitoring of spilled fluids that could adversely impact the environment.

6.2.7 Stormwater Runoff

In order to prevent the transfer of sediment to any surface water body, silt fencing will be erected and maintained during the construction phase of the project. In low lying areas, where the majority of the runoff is expected to occur, hay bales will be placed to trap sediment that may be carried by stormwater. Site clearing activities will be scheduled during anticipated periods of low precipitation or freezing conditions. Silt fencing and hay bales will be inspected weekly and after each significant rainfall event during construction activities. Silt fencing and hay bales will be repaired or replaced as needed. Silt fencing will remain in place until construction of the facility is complete. Post construction, the exposed areas of the site will be stabilized within 30 days (i.e. planting grass in swales).

Table 6-1: Summary Table

Potential effected ecosystem component	Potential Impact	Mitigation Measures	Monitoring Plan

Vegetation and soils	Removal of vegetation and soils from the project site.	Soils removed from the project site will be used during backfilling as appropriate. Additional soils will be removed from the property and used as backfill in local projects or sold to third parties. Areas of the site will be stabilized within 30 days post construction activities.	Ensure that post-construction, areas of the site are stabilized within 30 days. This includes seeding areas not consisting of concrete asphalt or gravel. Conduct monthly inspections to ensure herbaceous vegetation (primarily grass) is growing.
Surface water	Sedimentation caused by stormwater run-off.	Silt fencing will be placed around the site. In the shallow ditch along internal roadways, hay bales will be placed as a sediment trap. Site surfaces will be stabilized post construction within 30 days.	Silt fencing and hay bales will be visually inspected by the site foreman or designate each week during site clearing activities and after each significant rainfall event. Repairs or replacement of the silt fence will occur within 24 hours of noted repair / replacement needs.
Air Quality	Increased tailpipe emissions from heavy machinery and trucks.	Contractors are to ensure that their vehicles are properly maintained and serviced as necessary. Idling of all vehicles will be avoided.	The site supervisor will implement a policy that daily vehicle checks are to be performed each morning prior to the operation of heavy equipment. Vehicles needing servicing or repair (e.g. burning oil) are to be removed until they are serviced.

Potential effected ecosystem component	Potential Impact	Mitigation Measures	Monitoring Plan
Air Quality	Dust creation during site clearing and truck traffic	Site clearing will occur when there is reduced likelihood of dust generation (i.e. not in dry months such as August).	The site supervisor will monitor conditions that will result in dust creation (i.e.: hot dry or windy weather). Additional watering on these days may be necessary and water trucks will be scheduled more frequently.
Noise	Increased noise levels during construction activities.	Construction activities will occur primarily during daylight hours during the standard work week to reduce noise impacts to surrounding residential home owners.	The site supervisor will schedule noisy activities to occur after 9:00 am and before 5:00 pm. Any noise complaints will be logged and investigated by the site supervisor or designate within 1 week of receiving the complaint. The site supervisor or designate will maintain open lines of communication with the surrounding neighbours.
Health and safety	Increased truck traffic during construction.	Trucks travelling to the site will be operated by persons holding an appropriate license for the size and weight of the load they are transporting. Oversized loads will be accompanied by an escort when needed. The majority of truck traffic will arrive at or leave from the site during daylight hours that will increase visibility.	The site supervisor or designate will communicate to the truck drivers and vehicle operators to reduce speeds while on the site. Any accidents that occur on the site will be investigated by the site supervisor or designate.

Potential effected ecosystem component	Potential Impact	Mitigation Measures	Monitoring Plan
Soil, surface water and groundwater	Accidental spills of fuel and vehicular fluids to ground surface.	Fuelling activities are expected to occur off-site. In the event that heavy machinery requires fuel, a portable fuel truck will travel to the site. The transfer of any fuel will be supervised by both the fuel truck operator and the vehicle operator that is being fuelled. Should any leaks or spills be detected, fuelling activities will cease immediately. Any maintenance or fuelling activities will be performed on a flat area away from ditches or water migration pathways. A spill kit will be located on the site for minor spill clean-up. Used material will be placed into a sealed bin and disposed of off-site by a licensed waste hauler as needed. Retail sized containers or maintenance fluids will be stored within contractor trailers.	All spills are to be reported to the site supervisor immediately. Minor spills will be cleaned by trained spill response personnel on the site. Any spilled material that reaches any water body surface will be reported to the MECP spill action centre (1-800-268-6060), and the Town of Petawawa. OCWA in accordance with MECP direction will devise a plan for clean-up and monitoring of spilled fluids that could adversely impact the environment. The site supervisor will maintain a list of emergency response phone numbers in the event of a spill.

6.3 Construction Best Management Practices

Compliance with environmental legislation will be the responsibility of the general site manager and construction supervisor(s) on the site. The general site manager and/or contractor supervisor will be responsible for the activities of the field staff. Field staff will be trained on appropriate site works, field assessments, and reporting requirements. This will include identifying appropriate areas for maintenance activities, waste management, storage of any hazardous materials, maintenance of any environmental structures (silt fencing) and reporting any risks or non-compliance to their supervisor.

The site general manager/construction supervisor will ensure that the construction activities are managed which will include the following:

- Site office will be established;

- The site entrance and exit will be established;
- Temporary fencing will be erected around the perimeter of the site;
- Areas where heavy machinery is prohibited will be clearly marked and communicated to the field staff;
- Control measures for sediment, drainage, and erosion will be erected with a scheduled routine check and maintenance plan;
- All storage of hazardous materials will be identified. These substances will consist of maintenance fluids. All fluids will be stored in their original containers in a locked storage area on the site. The site supervisor will maintain a register of all on-site hazardous materials and their Material Safety Data Sheets.
- The disposal of regulated wastes will be carried out by a licensed waste hauler. Regulated materials will be clearly marked, transported and stored as appropriate. Other waste materials (lunch items, paper, and miscellaneous debris) will be removed from the site on a weekly basis. Materials that can be recycled will be sent to appropriate recycle facilities. Refuse will be placed in lugger bins and removed by a private waste hauler on a weekly basis or as needed.
- Ensure heavy machinery and trucks are in good repair. A walk-about by the driver will be performed each day prior to the operation of the vehicle.
- All incidents will be recorded by the site supervisor with appropriate actions taken. Environmental controls will be monitored with adjustments made as necessary.

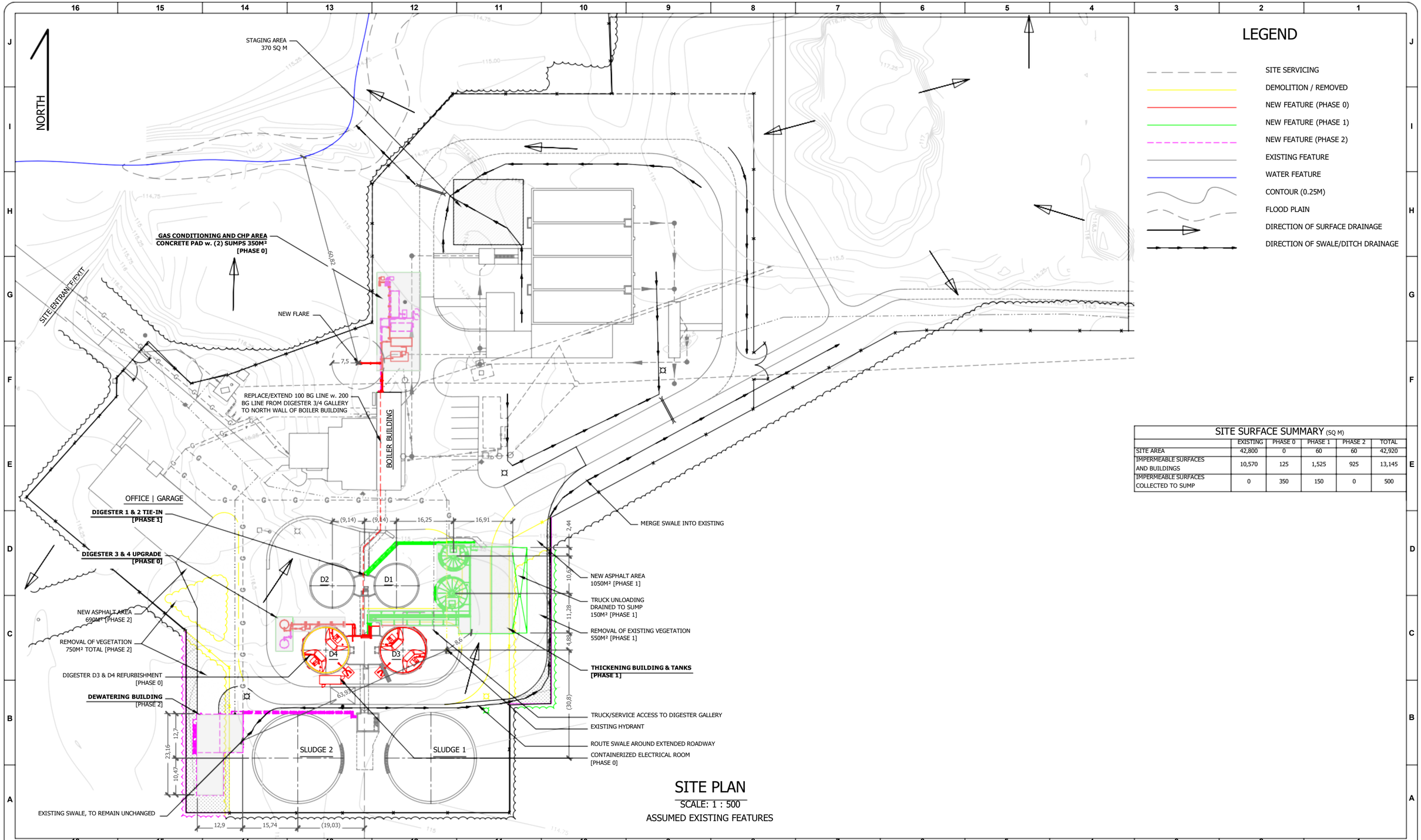
7 Report Summary

Construction related impacts include:

- Removal of vegetation and soil from the site;
- Stormwater runoff impacts;
- Air quality impacts from truck traffic and heavy machinery;
- Dust creation created by truck traffic and site clearing;
- Noise created during construction;
- Truck traffic volumes increase during construction; and
- Potential for spills of vehicular fluids.

Mitigation measures and best management practices will reduce or avoid impacts during the construction phase of the project. A monitoring plan has been prescribed to ensure that the mitigation measures will be effective. With the application of mitigation measures, best management practices and monitoring activities, no significant adverse effects are anticipated as a result of the construction activities proposed for the Petawawa Net Zero Facility.

Appendix A: Site Plan



LEGEND

- SITE SERVICING
- DEMOLITION / REMOVED
- NEW FEATURE (PHASE 0)
- NEW FEATURE (PHASE 1)
- NEW FEATURE (PHASE 2)
- EXISTING FEATURE
- WATER FEATURE
- CONTOUR (0.25M)
- FLOOD PLAIN
- DIRECTION OF SURFACE DRAINAGE
- DIRECTION OF SWALE/DITCH DRAINAGE

SITE SURFACE SUMMARY (SQ M)

	EXISTING	PHASE 0	PHASE 1	PHASE 2	TOTAL
SITE AREA	42,800	0	60	60	42,920
IMPERMEABLE SURFACES AND BUILDINGS	10,570	125	1,525	925	13,145
IMPERMEABLE SURFACES COLLECTED TO SUMP	0	350	150	0	500

SITE PLAN

SCALE: 1 : 500

ASSUMED EXISTING FEATURES

PRELIMINARY - NOT FOR CONSTRUCTION

H:\Anaergia\200902 – Petawawa\200902 – 06 – REA\200902–GA–001 – REA Site Plan.DWG

2022–06–17

REV NUM	DESCRIPTION	DRWN BY	CHK'D BY	DATE
A	PRELIMNARY	SW		2022–05–25

ATTENTION: 0 1/2 1 — IF THIS BAR DOES NOT MEASURE 1" @ 22x34 or ½" @ 11x17, THEN DRAWING IS NOT TO SCALE - SCALE ACCORDINGLY

Anaergia — Breaking Barriers in Sustainability

Rosebush Wilson

DESIGNED:
DRAWN: SWilson
CHECKED:
APPROVED:
REFERENCE#:
PROJECT NO.: 200902
SCALE: AS NOTED

PETAWAWA

SITE PLAN ILLUSTRATING ONSITE SURFACES, FEATURES AND DRAINAGE

DRAWING NUMBER

GA-002

REV A