Technical Memorandum

June 14, 2021

To	Patty Sinnamon, Township of Chatsworth	**Tel**	519 794-3232 x 124
Copy to	Étienne Bordeleau	**Email**	psinnamon@chatsworth.ca
From	Ben Samuell	**Ref. No.**	11223233
Subject	**BioGRID System Decommissioning and Recommissioning Plan Derby WWTW Asset Evaluation – Technical Memorandum #1**		

1. Introduction

GHD Limited (GHD) has been retained by the Township of Chatsworth, in collaboration with Ontario Clean Water Agency (OCWA), to provide an evaluation of decommissioning, recommissioning, and costs pertaining to the potential mothballing of the BioGRID system located at the Derby Wastewater Treatment Works (WWTW or Site).

1.1 Purpose

The purpose of this memorandum is to discuss the plan for decommissioning and recommissioning of the BioGRID system should it be mothballed, for an evaluation/mothballing period of five years.

1.2 Site and evaluation context

The BioGRID system (Bio Green Renewable Industrial Digester) is owned and managed by the BioGRID Joint Board of Management (Joint Board) comprising the Township of Georgian Bluffs (Georgian Bluffs) and the Township of Chatsworth (Chatsworth). Collectively, Georgian Bluffs and Chatsworth are referred to herein as "Townships". The Site is approved under Ontario Ministry of Environment, Conservation and Parks (MECP) Environmental Compliance Approval (ECA) No. 2206-8KSQZV, issued on August 23, 2011.

The WWTW sewage lagoons were implemented in 1975 and the BioGRID system was implemented in 2011. The sewage lagoons receive liquid sewage directly from the input to the WWTW Dumping Station #1 and are interconnected with the BioGRID system via a drum screen (i.e., the screened liquid portion of materials input to the BioGRID system process are conveyed to the sewage lagoons). The BioGRID system has faced operational and financial challenges related to securing organic waste feedstocks, approaches for setting organic waste feedstock tipping fees, capacity, and bottlenecks of the existing anaerobic digestion (AD) process, material receiving station and other associated infrastructure, renewable energy generation, as well as process/operations of the sewage lagoons. With the challenges faced and previously evaluated at the facility, this evaluation looks to the requirements around BioGRID system mothballing and separated sewage lagoons operations.

This evaluation is understood as supplementing a concurrent study (GHD, 2021) that looks to confirm the feasibility and costs of operating the BioGRID system going forward (e.g., whether as baseline/do-nothing

scenario or as modified scenarios via changes to organic waste feedstocks and infrastructure). Accordingly, this means:

– This evaluation is intended to provide information needed to cease the current BioGRID system operation and continue a standalone treatment process provided via the sewage lagoons system.
– The work of the concurrent study is alternatively reviewing potentially feasible options for the enhanced operation of the BioGRID system and is intended to provide information needed to proceed with operations in a preferred manner.

These two current projects are intended to assist the Townships in making informed decisions on the continued, mothballed, and/or standalone operations of the BioGRID system and sewage lagoons system.

1.3 Organization

This memorandum is organized in the following sections:

– **Section 1 Introduction** | Provides the evaluation purpose, context with decision-making intent, and organization of this memorandum.
– **Section 2 Site infrastructure and systems** | Discusses the Site infrastructure and systems identified as requiring specific attention to mothball the BioGRID system.
– **Section 3 Probable costs** | Defines the estimated probable costs to mothball the BioGRID system and undertake annual maintenance of the decommissioned infrastructure.
– **Section 4 Referenced information** | Lists the key relevant documentation reviewed/referenced for the development of this memorandum.
– **Section 5 Attachments** | Lists the enclosed documentation.

2. Site infrastructure and systems

Site infrastructure and systems have been identified as requiring specific attention/action for longer-term storage as part of potential mothballing of the BioGRID system. For purpose of this memo, these have been categorized within the following sub-systems:

1. Septage Receiving System
2. Drum Separator System (including Polymer System)
3. Fats, Oils, and Grease (FOG) System (including Pasteurizer and Hydrolyzer)
4. Digester and Digestate Storage
5. Air Pump, Compressor, and Odour Control System
6. Biogas Genset (including Cooling Bed and Monitoring Well)
7. Biogas Genset Electrical (Connections to Grid)
8. Building Cold Water Supply
9. Building and Site (Building, Fencing, Access).

The grouping of the sub-systems has been outlined as a marked-up overlay for the Genivar record drawing “Process Flow and Instrumentation Diagram for the Septage Biogas Project”, dated 06/05/2011, included as Attachment 1. General instructions and specific recommendations are provided herein for the systems/components.

The tasks, instructions, and costs for decommissioning, maintenance, and recommissioning are separate and additional to each other for mothballing the BioGRID system.

2.1 Preparation by operations

Preparation by operations staff is recommended prior to initiating a separate general contract for decommissioning and cleaning. By undertaking the following tasks, the Townships will reduce outside costs and ensure compliance with the existing regulatory requirements.

The intent of the preparation is to reduce the amount of material within the tanks and systems so that the general contractor is only required to clean up and dispose of the minimum amount.

The steps recommended for preparation of the Dewatering system by Operations staff are as follows:

1. Run down the stocks of polymer in the mixing tank to the lowest levels.
2. Cease operations receiving septage to be dewatered by the system.
3. Polymer feed system can be disconnected from polymer bottle and connected to clean water. Run clean water through the system as polymer to flush the lines into the Polymer mixing tank and avoid polymer set up.
4. If desired, undertake the caustic flushing and blow out of the lines as described in the supporting tables.
5. A polymer mixing tank can be drained and the dilute contents transferred to the treatment lagoons.
6. Run backwash cycle for the Drum separator and flush any additional points until no visible material is present on the screen.

The steps recommended for preparation of the BioGRID feed system by Operations staff are as follows:

1. Cease receiving FOG material, and pump FOG storage tank manually (over-riding normal low setpoint) to lowest level permitted by pump operation, transferring contents to the pasteurizer.
2. Allow the pasteurizer to operate normally. Once the pasteurization cycle is complete (1 hour) and the material is pasteurized, drain, or pump the full contents of the pasteurizer to the Hydrolyzer tank.
3. The contents of the hydrolyzer tank should then be pumped through to the digester, running the pump manually (over-riding the normal low-level setpoint) to the lowest level permitted by pump operation.
4. If possible (and for further cost savings), the existing FOG Storage, Pasteurizer, and Hydrolyzer tanks could be pressure washed by Operations staff and the washing material diverted to the septage receiving station or the digester.

Once the systems feeding the BioGRID digester cease operations (Dewatering and BioGRID feed systems as described above), the material within the digester be processed until it meets the requirements for Digestate (25-50 days). At this stage, the following steps are recommended to be taken by Operations:

1. Process the liquid digestate in the digestate storage tanks as normal for land application under existing approvals.
2. Lower digester temperatures below 25 degrees Celsius (intent includes lowering biogas production to a level that cannot support combustion).
    a. Continue to operate the mixer until temperature reaches below 25 degrees Celsius).
3. Open drain valve from BioGRID digester to drain liquid contents (now digestate) into the monitoring well chamber and pump from the chamber into digestate storage tanks, or directly into truck for normal Land Application under existing approvals.
    a. If the drain valve is not free draining, the drain line should be snaked from the drain valve end in an attempt to clear.
    b. If standard snaking does not clear the blockage, connection of a temporary pump to the drain valve, to flush water back through the pipe and up into the digester may clear the pipe and restore flow.
4. Transfer as much of the liquid contents of the digester as possible to the digestate storage tank or directly to tanks for off-site hauling and land application under current approval.

2.2 General decommissioning tasks

This section provides the identified decommissioning tasks for the BioGRID system.

2.2.1 Process liquid piping

All liquid process piping (and plumbing, refer to Section 2.2.2) should be mothballed as follows, unless otherwise indicated:

1. Flushed for solids.
2. Drained.
3. Blown out with compressed air.

GHD understands that the water supply is limited on-site. As such, flushing water may be settled/filtered and re-used to flush process lines clear of solids. Any chemically treated flushing should be monitored if being re-used to ensure levels of chemical remain suitable for the flushing and equipment.

2.2.2 Plumbing

Plumbing items such as the pressure tank, water heater, and hose bibs should be mothballed as follows:

1. Drained
2. Powered off (e.g., in the case of the water heater and UV system)
3. Cartridge filter housings should be drained and left open and dry.

2.2.3 Pumps

Pumps should be mothballed as follows, unless otherwise noted:

1. Drained.
2. Shaft is rotated.
3. Sprayed interior of the pump volute with an oil mist of suitable product (e.g., BioCorr Rust Preventative):
    a. The spraying of the interior of the pump volute would include removal of inspection covers to confirm coverage, and re-installing inspection covers. Any oil-lubricated cavities (e.g., seals) should be fully flooded to prevent moisture intrusion.
4. Suction and discharge ports:
    a. Capped suction and discharge ports (i.e., where the pump has been removed from piping); or
    b. Closed suction and discharge ports (i.e., where the pump has been left in place and not removed from piping).

2.2.4 VFDs and motor starters

For decommissioning, VFDs and motor starters can be powered down at the MCC level or main disconnect level to avoid any parasitic energy use over the mothballed period.

2.2.5 Valves

Generally, valves can be left in place and will be cleaned as the piping is flushed. Valves should be exercised periodically during mothballing to prevent seizing.

2.2.6 Instruments

Instruments such as magnetic flow meters should be mothballed as follows:

1. Powered down for duration.

They may be left in place if the piping can be confirmed to have been flushed clean and blown dry, though it is recommended that these be removed and capped at the ends (similar to the procedure outlined for pumps, refer to Section 2.2.3 Pumps).

Inline instruments such as temperature probes and ultrasonic level sensors should be mothballed as follows:

1. Drained
2. Flushed

They may be left in place, with the exception of the pH meter as noted in the supporting tables, which will require replacement.

2.2.7 Building and security

Power should be maintained to the building and control panels to provide some heat to the building (to a nominal temperature of five (5) degrees Celsius for freeze protection), and operation of control panel internal heaters to prevent condensation within the panels.

Site fencing, doors, and gates should be checked and locked.

2.2.8 Equipment specific instructions

Refer to a break-out of the major sub-components and equipment that are included decommissioning (and recommissioning) in Table 2.1 (attached).

2.2.9 BioGRID digester (and digestate storage tank)

The general steps for the BioGRID digester system shutdown are included below, though the detailed procedure is required to be reviewed and implemented prior to issuing a contract for cleaning and shut down:

1. Close isolation valve of the digester biogas to cooling field.
2. Ventilate freeboard space until 10 air exchanges have occurred.
    a. Use a grounded, non-sparking air mover. Monitor air exiting the air mover to verify whether the freeboard space has been sufficiently ventilated. Monitoring should include the following parameters: methane, hydrogen sulphide, and carbon monoxide.
3. Purge biogas piping with nitrogen
4. The membrane roof will need to be opened and partially removed to permit safe entry and removal of material. The membrane removal procedure is outlined in detail in the operations manual, but the steps generally are as follows:
    a. Relieve pressure in the membrane securement system.
    b. Shut off compressor.
    c. Bleed out excess air from the securement hose.
    d. At this point, the membrane will relax and can be folded back.
5. Once the digester has been purged of biogas, empty any remaining liquid contents.
    a. Drain liquid contents via drain line to the monitoring well.
    b. Solids can be re-fluidized by the addition of water to facilitate removal via a vacuum truck. The disposal of solids is discussed below given the general requirements and potential costs.

Once empty, the digester and digestate tanks become more susceptible to ice or frost formation under the base slab. Since the method of construction below the slab (e.g., drainage and insulation), is unknown, GHD

recommends that some method of insulation be utilized to prevent frost formation and reduce potential for frost heave and subsequent damage.

One method of insulating is to fill the tank partially (to depth of 1.5-2.0 m with clean water. The water provides insulative protection for the base slab. Measures also would have to be taken to try to avoid damage from ice formation within the tank. Some methods put into practice may be to provide recirculation (either by submerged tank mixer or by separate circulation pump), or to put in material that would be “crushed” during ice formation, to take the lateral strain that is generated as ice forms – this often takes the form of either wood logs or barrels. Regular inspection should be made during the winter months particularly to gauge the ice formation and any potential for damage. As an alternative to water, insulation could be placed in the form of board insulation, batt insulation, straw, or sand. Each of these would be more costly and difficult to replace though would reduce the potential for ice damage.

2.3 General recommissioning tasks

This section provides the identified recommissioning tasks for the BioGRID system.

For all of the equipment and infrastructure noted below, a visual inspection is recommended prior to the specific recommissioning tasks. The visual inspection should be undertaken to look for signs of corrosion, deterioration, cracks/spalling, coating delamination, or other potential modes of failure.

2.3.1 Process liquid piping

Where possible, leak testing should be completed for process liquid piping. For gravity lines, leak testing of the infrastructure can be as simple as filling with clean water and then observing liquid level for change over a period of 24 to 48 hours, along with visual inspection (where possible) for leaks.

For pressurized piping, GHD recommends a pressure test prior to bringing the lines back into service. Services/piping sections recommended for pressure test include:

– Main Process line from pumps at the Drum Separator discharge, up to both the hydrolyzer discharge and digester isolation valves.
– Line from hydrolyzer pump to digester isolation valve.
– Line from FOG pump (submersible, inside FOG tank) to Pasteurizer
– Chemical Dosing Lines
– Gas system lines from Digester to Biogas Genset (including cooling bed)

The liquid process lines are recommended to be tested with hydraulic test at pressure 1.5 times the pump dead-head pressure. The gas lines operate under vacuum, but a pressure test in accordance with current TSSA guidelines, or minimum 15 psig, would be recommended as well.

2.3.2 Plumbing

On re-start, the plumbing system should be checked for leaks, and the following actions are recommended:

1. Visually inspected for evidence of corrosion or degradation
2. Flushing and super-chlorination of water lines
3. Vents and drain valves closed
4. New Cartridge filters reinstalled
5. New UV lamp (bulb) installed
6. Pressure tank bladder pressure checked
7. Power up system and observe for leakage and confirm pressure and operation of well pump.

2.3.3 Pumps

Prior to re-start, the pumps should have the following actions undertaken:

1. Inspected visually for corrosion or degradation.
2. Oil and seal lubrication checked for quality and quantity.
3. Rotated by hand to confirm no seizing has occurred prior to bump test using power once confirmation is made.

On re-start the pump flow rate and operation under normal operating conditions (ideally with clean water testing) should be completed.

2.3.4 VFD's and motor starters

Procedure for re-start of VFDs is manufacturer-specific and should be followed in all cases, given that most VFDs and some motor starters have procedures specific to the manufacturer for re-start after storage for more than 12 months. For example, Eaton VFD drives require capacitors to be reformed before full voltage is applied after storage for more than 12 months.

It is recommended that re-start of VFD's be preceded by checkout by a technician certified by the manufacturer of the equipment in place.

2.3.5 Valves

Other than checking open/closed position is correct for the desired operation, there are no specific requirements for restart for process valves.

Valve leakage and seating will be checked as part of pressure testing of process lines, and the maintenance program in place over the shut down period should reduce the potential for full valve seizing or failure to operate.

2.3.6 Instruments

On restart, instruments generally should be checked and recalibrated.

The pH meter specifically will require a new probe attachment, as they are not designed for long-term shelf storage once in use.

2.3.7 Building and security

No recommissioning tasks are anticipated for the Building or building security, aside from any upkeep noted during the maintenance/inspections over the shut-down period.

2.3.8 Equipment specific instructions

Refer to a break-out of the major sub-components and equipment that are included recommissioning (and decommissioning) in Table 2.1 (attached).

2.3.9 BioGRID digester

A structural integrity inspection is recommended immediately prior to recommissioning, followed by a clean-water (potential to use lagoon effluent as available) fill and leak test.

Restart of the system should follow the procedure for start-up as outlined in the Operations and Maintenance manual prepared by CH4BioGas and will include a pressure test of the membrane and membrane seal, which typically will need to be witnessed or documented for TSSA.

2.3.10 Biogas handling and utilization unit

Restart of the system should follow the procedure for Startup as outlined in the Operations and Maintenance manual prepared by CH4BioGas.

Note that gas handling pipe and pressure systems will require witnessed pressure testing in accordance with CSA requirements by licensed technicians to satisfy TSSA requirements.

2.3.11 Odour control system

Restart of the system will require turning on power and checking the media state. Note that media may require replacement after extended storage.

3. Probable costs

3.1 Decommissioning tasks

GHD has prepared an estimate of probable costs for the initial work to clean and shutter the facility, with details provided in Table 3.1 (attached).

Several assumptions have been made with respect to quantities of material and disposal costs that would need to be confirmed by operations, or by general contractor for some items where confirmation is not possible while the facility is online. The chief assumption that creates the highest degree of price uncertainty is the assumption for the quantity and quality of the settled solids at the base of the digester tank. GHD has assumed that 1 m of solids will not drain out and be available for land application under existing approvals. This quantity is highly dependent on the quality of incoming feed, operation of digester, effectiveness of digester mixing, and time elapsed since the last cleanout. The removal and disposal of this material constitutes nearly half of the decommissioning costs, so the discovery of the real field conditions will have a high degree of influence on the costs to the Townships.

The disposal of the majority of the tank contents will be via land application under existing approvals for the digestate, and distribution back to the lagoon treatment system for the small amounts of wash water generated during cleaning.

3.2 Recommissioning tasks

Prior to recommissioning, Table 2.1 (attached) highlights specific items as broken out by component or system.

Several administrative or inspection tasks are highlighted below as key items for consideration as general tasks and/or risks.

The overall opinion of probable cost for recommissioning of the facility is detailed in Table 3.2 (attached) and summarized in the table below with further discussion.

Summary of probable recommissioning cost

Component	Probable Cost
Equipment (rounded probable cost)	$ 80,000
Permitting: ECA	$ 5,000
Permitting: TSSA	$ 15,000
Tank Structural Inspection	$ 20,000
Pre-Start Equipment Inspection	$ 20,000
Total	$ 140,000

In addition to the above known costs, GHD recommends that the inspections be performed ideally in the fiscal year immediately prior to the re-start plans, so that the cost of any required replacement or refurbishment can be updated and considered for subsequent budget/planning.

At a conceptual, 5% of the overall value of the installed equipment (1% equivalent maintenance per year of shut down) would amount to approximately $250,000, and at this stage of assessment would be reasonable to plan for future allotment.

3.2.1 Pre-start inspections: Equipment

While the provisions for decommissioning are anticipated to prepare the equipment and infrastructure for long term storage, in any situation when equipment is placed into and then re-started from storage there is a reasonable assumption some parts of the equipment or infrastructure will require refurbishment or repair.

Planning for Pre-Start equipment inspection is recommended to provide updated information on condition of equipment immediately prior to re-start. The goal of this inspection would be to plan for replacement of any obviously deteriorated equipment and update the anticipated cost for re-start to include any specific repair or refurbishment.

3.2.2 Pre-start inspections: Structural

A structural inspection prior to re-start is a requirement from TSSA for the digester tank.

It is recommended that a pre-start inspection also be completed by a structural Engineer licensed in the Province of Ontario for the other large outdoor tanks and at least visual inspection of in-ground structures.

The goal of this inspection is to satisfy TSSA requirements as well as to highlight any areas in need of repair, refurbishment, or recoating prior to re-start, and to provided updated information about cost and timing for any required repairs.

3.2.3 Permitting: MECP ECA

While the MECP ECA process does not specifically outline the requirements for a temporary facility shutdown, the MECP is typically most concerned about discharge compliance. Since the facility will be shut down there will be no discharge, so the requirements from MECP are not anticipated to be arduous. The anticipated regulatory approach for the ECA would include an administrative letter advising MECP of the temporary shut-down of the facility (no discharge or emissions during the shut-down period), with intent to restart. On re-start, a similar letter indicating the plan for re-start and re-commissioning of the facility would be required.

Preparation of anticipated letters and submission to MECP would be assumed to have nominal costs of ~$5k.

3.2.4 Permitting: TSSA

For TSSA, there is a more formalized procedure for inspection prior to start-up or in this case re-start of the system.

On re-start, a witnessed pressure test of each gas holding, or utilization system will be required as dictated by CSA codes. The testing will be completed by licensed technicians, and TSSA personnel will require inspection access at key points (after any structural repairs, but before any coatings), and during the water tightness test and then gas-tightness test. Pressure testing under current regulations is typically over a 24-hour period.

Costs for TSSA coordinating, permit applications, and inspections are on an hourly rate basis, but recent project experience had indicated a cost range for TSSA works from $10 k-$20 k dependent on the local requirements and the local inspector knowledge of the existing system (if any).

3.2.5 Permitting: Risks

For any regulatory agency, there is a risk that the policies, regulations, or enforcement approach and philosophy may change between shut-down and re-start.

Historically the pace of regulatory change is relatively slow, but over the time period for shut down being discussed (up to 5 years) it is likely that there will be updates to applicable codes, and adoptions by regulatory agencies (TSSA) of new or revised standards.

The shut-down and re-start of the facility may also result in a closer examination of the facility by regulatory agencies that could result in requirements for changes or updates to the facility to comply with new or revised permits, new or updated applicable codes and standards, or new or updated compliance requirements.

It is not possible to predict financial or technical implications of future updates to codes and standards at this time.

3.3 Annual maintenance tasks

In general, most of the annual maintenance tasks and related costs are routine visual checks by operations staff for signs of leakage, corrosion, or degradation. GHD recommends the following annual maintenance tasks:

- Once monthly walkthrough
  - Includes exercising valves and running the hot water system circulation pump.
- Bi-monthly walkthrough
  - Includes a somewhat more comprehensive checklist as compared with the once-monthly event.
- Semi-annual walkthrough
  - Includes a more comprehensive checklist as compared with the once-monthly event, comprising opening vaults, manholes, and tanks for detailed visual inspection.
- Annual walkthrough
  - Includes inspection and maintenance (e.g., rotating shafts) of the CHP system and the Boiler by a licensed technician.

The base cost for the once monthly and semi-annual walk-throughs is anticipated to be less than twelve person-days per year by personnel familiar with operating water or wastewater facilities. The additional cost for the annual walkthrough is anticipated at $5,000 per year. The recommended inspections for the subcomponents at the facility are provided in Table 3.3 (attached).

4. Referenced information

The key relevant documentation reviewed/referenced for the development of this memorandum is listed below in Table 4.1.

Table 4.1 Referenced information

No.	Document title
1.	Bioenergy Consumption
2.	OpManual_2018
3.	Property map with circle
4.	Drawing 03 012 11 G5RD
5.	Drawing 03 012 11 G7RD
6.	Drawing 03 012 11 M1RD
7.	Drawing 03 012 11 S1RD
8.	Drawing 03 012 11 G2RD
9.	Township of Georgian Bluffs Strategic Plan 2020 2024
10.	Basic Treatment Units Flow Diagram
11.	MECP Amended ECA No. 2206 8KSQZV August 23, 2011
12.	OPA Contract Notification
13.	OPA Contract Termination Excerpt
14.	ESA for Genset
15.	TSSA Approval for Boiler
16.	TSSA Inspection Report
17.	O&M Manuals
18.	O&M Manuals

5. Attachments

Attachment 1: Genivar record drawing “Process Flow and Instrumentation Diagram for the Septage Biogas Project” dated 06/05/2011

Attachment 2: Supporting tables

Table 2.1 Specific recommendations – Decommissioning and recommissioning requirements

- Septage Receiving System Components
- Dewatering System Components
- BioGRID Feed System Components
- BioGRID Digester and Digestate Storage Tanks

– Biogas Handling and Utilization Systems
– Odour Control System
– Building Hot and Cold-Water Supply Systems

Table 3.1 Probable costs – Decommissioning Tasks

– Including same overall components/system as per above.

Table 3.2 Probable costs – Recommissioning Tasks

– Including same overall components/system as per above.

Table 3.3 Recommended Inspections and Maintenance

Regards,

Ben Samuell
Senior Project Manager

CM/mc/TM01

Attachments

Attachment 1

Genivar record drawing “Process flow and instrumentation diagram for the septage biogas project”
dated 06/05/2011

BIOGRID DIGESTER AND DIGESTATE STORAGE TANK

DIGESTATE STORAGE #1
854m³ DESIGN CAPACITY,
923m³ TOTAL CAPACITY
EL 284.50
EL 278.50
FREEBOARD (0.45m)
6m
5.55m DESIGN STORAGE HEIGHT
14.0m
INCREASER 150x100ø
200ø
NC
NO

ANAEROBIC DIGESTER
1000m³ DESIGN CAPACITY
1111m³ TOTAL CAPACITY
EL 286.90
EL 280.90
0.8m FREEBOARD
6m
5.2m DESIGN STORAGE HEIGHT
15.36m
MIXER
PRV
PS
TS
LS
150ø
100ø
DRAINLINE
MONITORING WELL
50ø

BIOGAS COOLING BED
100ø

ELECTRICITY TO HYDRO ONE
100kw BIOGAS GENSET
(c/w BOILER, HEAT EXCHANGER, HEATING WATER PUMPS, ETC.)
FIN FLR 285.00
CONTAINER
HOT WATER SERVICE/ HOT WATER RETURN
DIGESTER
HYDROLYZER
FOG TANK
PASTEURIZER

BIOGAS HANDLING AND UTILIZATION

BIOGRID FEED SYSTEM

EL 285.00
HYDROLIZER
100m³ CAPACITY
HYDROLIZER PUMP
EL 280.45

BAIL STORAGE AREA
1700 m³ CAPACITY
(CORN STOVER, CANOLA STRAW, WHEAT STRAW, AND CORN SILAGE)
EL VARIES

NORTH CELL
SOUTH CELL
AERATION CELL
FACULATATIVE STORAGE LAGOONS

CONTROL & SEPTAGE DEWATERING BUILDING
FIN FLR 285.00

BUILDING HOT AND COLD WATER SUPPLY SYSTEMS

BUILDING COLD WATER SERVICES
HW TANK
UV UNIT
13ø TREATED WATER SAMPLE TAP
PRESSURE TANK
INCREASER 50x25ø
13ø RAW WATER SAMPLE TAP
7 IGPM FLOW RESTRICTOR
50ø WATER SERVICE
13ø FROST FREE HOSE BIBB
PRESSURE TANKS (PARALLEL)
REDUCER 32x25
INCREASER 32x50

DEWATERING SYSTEM

REDUCER 100x150
SEMI-SOLIDS PUMP (DUTY/STANDBY)
DRUM SEPARATOR
POLYMER MIXING TANK
BACKWASH WATER INLET
FEED LINE TO POLYMER INJECTION SYSTEM
CONSISTENCY METER
MAGNETIC FLOW METER
SECONDARY CONTAINMENT
POLYMER BOTTLE
POLYMER INJECTION SYSTEM
MIXER
PASTEURIZER
AIR PUMP AND COMPRESSED AIR TO DIGESTER
FOG PUMP
FOG STORAGE TANK
(50m³ CAPACITY)
EL 284.60

ODOUR CONTROL STATION
FROM DRUM SEPARATOR, FOG TANK, HYDROLYZER AND PASTEURIZER
VENT TO ATMOSPHERE

ODOUR CONTROL SYSTEM

MANHOLE No 1
INCREASER 150x200ø
MANHOLE No 2
VALVE CHAMBER
INCREASER 150x200ø
REDUCER 200x150ø

SEPTAGE RECEIVING SYSTEM

SEPTAGE RECEIVING LOGGING STATION
150ø CAMLOCK FITTING
SEPTAGE BAR SCREEN & DUMPING STATION #2
EL 290.53
BARSCREEN
NON-ORGANIC MATERIAL TO LANDFILL (TRUCK HAULAGE)
SEPTAGE DUMPING STATION #1
INCREASER 150x200ø

DIGESTATE STORAGE #2
5,630 DESIGN CAPACITY
FREEBOARD (0.45m)
ELEV. 283.77
279.50
4.27m
3.82m DESIGN STORAGE HEIGHT
14.0m

WELL #1
SUBMERSIBLE WELL PUMP #1

LEGEND:
- H/LS HIGH/LOW LEVEL SWITCH
- TS TEMPURATURE SENSOR
- PS PRESSURE SENSOR
- M AUTMATIC CONTROL VALVUE
- LS LEVER SWITCH
- NC ISOLATION VALVUE
- PG PRESSURE GAUGE
- PS PRESSURE SWITCH

RECORD DRAWING

DATE	DESCRIPTION
06/05/2011	RECORD DRAWING
05/02/2010	POST TENDER – CONSTRUCTION DRAWING
07/10/2009	ISSUE FOR TENDER

REVISION / ISSUE

Seal not valid unless signed and dated

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Telephone: (519) 376-7612 / Fax: (519) 376-8008
Toll Free: 1-888-376-7612

Title:
PROCESS FLOW AND INSTRUMENTATION DIAGRAM

SEPTAGE BIOGAS PROJECT

Client: TOWNSHIP OF GEORGIAN BLUFFS/TOWNSHIP OF CHATSWORTH

Design: MRS/CSW	Scale: N T S
Drawn: E K	Approved:
Checked: M R S	
Date: DEC 2009	Design Engineer

DRAWING No. 03-012-11-G2RD

Attachment 2

Supporting tables

Attachment 2 - Supporting Tables

GHD Project No: 11223233
Dated: 14-Jun-21

BioGRID System Decommissioning and Recommissioning Plan
Derby WWTW Asset Evaluation – Technical Memorandum #1

Table 2.1 - Specific Recommendations – Decommissioning and Recommissioning Requirements

Septage Receiving System Components

Component/Subsystem	Description	Decommissioning Requirements	Recommissioning Requirements
Septage Receiving Logging Station	Septage receiving logging station is an above ground component, operated by electricity. Septage customer proceeds to drop of their load after logging in at the station. There is no weighting station or flowmeter to record the volume of the load. Logging station topically registers which customer and when their truck arrived.	The logging station can be left power on with onboard heat to prevent condensation within the panel and reduce potential for corrosion.	No specific requirement.
Dumping Station No. 1	150 mm diameter influent sewer from the septage receiving tank to the aerated sewage lagoon.	In the event, the site is not receiving any septage or sewerage load then dumping station no. 1 should be emptied out, flushed & power washed. Locked/Secured from entry.	No specific requirement.
Dumping Station No. 2 & Bar Screen	Manual bar screen with 9mm spacing, with rated capacity of 57.5 m3/day.	In the event, the site is not receiving any septage or sewerage load then dumping station no. 1 should be emptied out & power washed. Locked/Secured from entry. If possible based on condition, screen should be pivoted/raised up to avoid ice formation around bars with any water accumulation at the base of the chamber.	If raised, lower screen back into operable position.
Valve Chamber	Valve chamber is consisting of two valves; one controls the flow towards the Aerated lagoon and other flow goes to the polymer mixing tank.	Emptied out, cleaned & power washed.	No specific requirement.
MH No. 1 & 2 (to the Aeration Lagoon)	MH No. 1 receives flow from the drum screen and MH No1.	In the event, the site is not receiving any septage or sewerage load then both the manholes need to be cleaned and flushed, power washed of accumulated material. Secured from entry/tampering.	No specific requirement.

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BioGRID System Decommissioning and Recommissioning Plan
Derby WWTW Asset Evaluation – Technical Memorandum #1

Table 2.1 - Specific Recommendations – Decommissioning and Recommissioning Requirements

Dewatering System Components

Component/Subsystem	Description	Decommissioning Requirements	Recommissioning Requirements
Magnetic Flow Meter	Magnetic Flow Meter is located on a 200 mm diameter pipe which conveys sewerage/septage going from the valve chamber to the polymer mixing tank.	The pipeline feeding the flowmeter should be flushed with water, then purged with diluted caustic water, then flush with water again. Drain and blow out pipe to remove moisture from pipe and meter. Flow meter can be powered down or left on.	Power up and calibration.
Polymer Injection System	Facility utilizes a formula CP 9310 emulsion polymer. Polymer chemical pump, diluted polymer feed pump, tubing/piping to mixing tank are all part of this system.	Polymer injection system should be well flushed with water (~1 hour). Rinse with diluted caustic water to deactivate any residual polymer, then flush with diluted chlorine water, then rinsed with clean water again. On conclusion, the system should be drained an blown out with compressed air to remove residual water.	Flooding with polymer, re-test of dilution water flow, recalibration of system.
Polymer Mixing Tank	Polymer mixing tank is a stainless-steel tank equipped with a mixer and a level sensor at the top.	Emptied out, cleaned & power washed. Level sensor can be left in place.	No specific requirement for tank. Level sensor will require calibration check.

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BioGRID System Decommissioning and Recommissioning Plan
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Table 2.1 - Specific Recommendations – Decommissioning and Recommissioning Requirements

BioGRID Feed System Components

Component/Subsystem	Description	Decommissioning Requirements	Recommissioning Requirements
FOG Storage Tank,	Fats Oils and Greases (FOG) are received in the FOG tank, volume of the tank is 50 m3.	Emptied out, cleaned & power washed.	No specific requirements
FOG Tank Temperature Sensor	The temperature of FOG in the tank is measured using an immersed temperature sensor, GOG is maintained at 20 degrees C via the FOG tank heating control.	Ensure tank cleaning also cleans insertion portion of temperature sensor.	Calibration check.
Chopper Pump	There is chopper pump in the FOG tank, which agitates and transfers FOG to the pasteurizer.	Recommend that the chopper pump inside the FOG be flushed with chorine water, cleaned, dried then stored on blocks in dry, secure location.	Recommend pump test on restart to confirm operation.
Pasteurizer Tank	FOG is pumped from FOG tank into the pasteurizer in batch mode. FOG is pasteurized at 70 deg C in a 2m3 pasteurizer. Pasteurized FOG is delivered to BioGRID or Hydrolyzer via gravity drainage, controlled by the motorized valve cV9. C	Emptied out, cleaned & power washed.	No specific requirements
Pasteurizer Mixer	There is a mixer to agitate FOG, level switch, pasteurizer heat control valve associated with the pasteurizer. As supplied by Waler Engineered Products	Ensure tank cleaning also cleans mixer of any accumulated material.	No specific requirements
Hydrolyzer Tank	Pasteurized FOG and dewatered/thickened septage is conveyed to the hydrolyzer prior to the BioGRID. Hydrolyzer tank is 6.775 m dia x 2.8 m SWD, 100 m3, in-ground covered hydrolyzer tank for conditioning of waste prior to anaerobic digestion. Dry substrate loading chute with cover.	Emptied out, cleaned & power washed.	No specific requirements
Hydrolyzer Temperature Sensor	The temperature of FOG in the tank is measured using an immersed temperature sensor, GOG is maintained at 20 degrees C via the FOG tank heating control.	Ensure tank cleaning also cleans insertion portion of temperature sensor.	Calibration check.
Hydrolzyer pH Meter	pH sensor is part of the hydrolyzer package.	pH sensor component will not last for duration of storage. Remove sensor module.	Purchase and install replacement pH sensor module.
Hydrolyzer Heat Control Valve	Heating system control valve.	No specific requirements, will be flushed as part of pipe flushing.	No specific requirements
Hydrolyzer Chopper Pump	Chopper pump is submersible, located within the hydrolyzer tank.	The chopper pump inside the hydrolyzer needs to be flushed with chorine water and cleaned and dried then stored at a secured place.	Recommend pump test on restart to confirm operation.

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BioGRID System Decommissioning and Recommissioning Plan
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Table 2.1 - Specific Recommendations – Decommissioning and Recommissioning Requirements

BioGRID Digester and Digestate Storage Tanks

Component/Subsystem	Description	Decommissioning Requirements	Recommissioning Requirements
BioGRID Digester	BioGRID digester is 1000m3, maintained at an internal temperature of around 25-40 degrees C via the hot water heating system. Covered with a flexible membrane to allow gas storage in the freeboard space, held in place with a compressed-air filled securement system.	Digester decommissioning procedure should be completed. Clean out is recommended to prevent settling and solidification of grit and solids within the digester.	Suggest structural inspection prior to refill. Recommissioning will require water fill/leak test, reinstallation of the membrane, and pressure testing. TSSA notification and witness of pressure testing will be required on restart.
Air Compressor and Air Pump	Located in the BioGRID control room, the air compressor supplies air to the membrane securement system and to the feed for desulphurization.	Drain moisture traps. Disconnect from the local disconnect.	No specific requirements
Digester Pressure Relief Valve	PRV is located on top of the BioGRID, it prevents over pressurization of digester freeboard.	Purge piping of any residual biogas. Would recommend removal and storage within clean, dry, secure space.	No specific requirements
Digestate Storage Tank	There are two digestate storage tanks, with storage capacity of 854m3 and 5,630m3 respectively.	Tanks to be emptied and power washed.	Inspection prior to restart, and check for leaks.

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BioGRID System Decommissioning and Recommissioning Plan
Derby WWTW Asset Evaluation – Technical Memorandum #1

Table 2.1 - Specific Recommendations – Decommissioning and Recommissioning Requirements

Biogas Handling and Utilization Systems

Component/Subsystem	Description	Decommissioning Requirements	Recommissioning Requirements
Biogas Cooling Field	The biogas cooling field is a 6.1 mix 15.2 m grid of HDPE piping designed to provide passive gas cooling and moisture removal. Biogas is collected from BioGRID and piped to the Biogas Cooling Field. It is at a 4% incline and the condensate is trapped in the monitoring well.	After the biogas flow has been stopped, piping should be purged of biogas. All the condensate water needs to be allowed to be drained. Condensation needs to allow either to percolate through the digester footing drainage or can be pumped to the valve chamber to send to the Aeration lagoon.	Pressure test prior to restart is recommended.
Boiler	The biogas boiler serves to facilitate system start-up and can act an alternative consumer of biogas. The Biogas boiler receives biogas after it has passed through the biogas cooling filed. Thermal energy produced by the boiler is used to heat the HOT Water Supply system. Low temperature hot water boiler (1.2 MMBtu, model number Raytherm 1223).	The gas line of the boiler should be purged with nitrogen. The hot water system should be flooded with propylene glycol to prevent freezing and pipe damage. Power can be shut off at local disconnect.	Full inspection of boiler by licensed technician is prior to restart is recommended. Inspection of fuel train is required prior to restart.
Biogas generator/ CHP unit	100 Kw Co-generation unit uses biogas as a fuel for combustion and production of thermal and electrical energy. The co-generation unit is primary method of biogas combustion. Thermal energy is captured from the exhaust and engine jacket and then supplied to the Hot Water Supply and Return system. Electrical energy is exported to the public through the Hydro One Inc. and power purchase agreement with the Ontario Power Authority.	Isolate the biogas line and purge with nitrogen, including headspace of engine. Batteries need to be disconnected and stored in a cool, dry, secure area and charger should be turned off. Put new oil and filters in engine before storage. Check the freeze level of the antifreeze in the engine loop. Temperature of the storage room should be between 15 deg C to 35 deg C with relative humidity 60%.	Full inspection and servicing of engine by licensed technician prior to restart is recommended. Inspection of fuel train is required prior to restart.

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BioGRID System Decommissioning and Recommissioning Plan
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Table 2.1 - Specific Recommendations – Decommissioning and Recommissioning Requirements

Odour Control System

Component/Subsystem	Description	Decommissioning Requirements	Recommissioning Requirements
Odour Control System	Odour control system consists of a carbon drum filter within the control and dewatering building. Purafill is the manufacturer of the OCS. The drum separator, FOG tank, hydrolyzer, and the pasteurizer are connected to the odour control station.	Turn off suction fan at local disconnect. The media in the OCS can be left in filter as it is or stored in a dry storage.	No specific requirements.

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BioGRID System Decommissioning and Recommissioning Plan
Derby WWTW Asset Evaluation – Technical Memorandum #1

Table 2.1 - Specific Recommendations – Decommissioning and Recommissioning Requirements

Building Hot and Cold Water Supply Systems

Component/Subsystem	Description	Decommissioning Requirements	Recommissioning Requirements
Hot water supply system	Hot water Supply and Return system consists of a series of PEX tubing. Insulated twin PEX tubing distributes hot water throughout the Site while PEX tubing is embedded in the walls of the BioGRID, below the FOG storage tank, in the walls and floor of the Hydrolyzer and Pasteurizer to provide heating.	Water in the piping loop should be drained of water. Because the system is difficult to drain completely, recommendation is that the piping loop should be flushed and filled with propylene glycol to prevent freezing.	System to be drained of polypropelene glycol and refilled with water, unless assessed to determine whether system will operate with appropriate heat transfer using polypropelene glycol.
Cold water supply system		Water in the piping loop, pressure tank, UV system, filter, and building cold water services should be drained and blown out.	Recommend draining the cold water line and frost-free hydrants and blowing clear with compressed air. The well pump system should be turned off at local disconnect.

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BioGRID System Decommissioning and Recommissioning Plan
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Table 3.1 - Probable Costs – Decommissioning Tasks

Septage Receiving System Components

Component/Subsystem	Decommissioning Requirements	Decommissioning Cost	Decommissioning Cost Assumptions (as applicable)
Septage Receiving Logging Station	The logging station can be left power on with onboard heat to prevent condensation within the panel and reduce potential for corrosion.	$ -	
Dumping Station No. 1	In the event, the site is not receiving any septage or sewerage load then dumping station no. 1 should be emptied out, flushed & power washed. Locked/Secured from entry.	$ 3,000.00	1 base day of contractor work for septage receiving area
Dumping Station No. 2 & Bar Screen	In the event, the site is not receiving any septage or sewerage load then dumping station no. 1 should be emptied out & power washed. Locked/Secured from entry. If possible based on condition, screen should be pivoted/raised up to avoid ice formation around bars with any water accumulation at the base of the chamber.	incl. above	
Valve Chamber	Emptied out, cleaned & power washed.	incl. above	
MH No. 1 & 2 (to the Aeration Lagoon)	In the event, the site is not receiving any septage or sewerage load then both the manholes need to be cleaned and flushed, power washed of accumulated material. Secured from entry/tampering.	incl. above	

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BioGRID System Decommissioning and Recommissioning Plan
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Table 3.1 - Probable Costs – Decommissioning Tasks

Dewatering System Components

Component/Subsystem	Decommissioning Requirements	Decommissioning Cost	Decommissioning Cost Assumptions (as applicable)
Magnetic Flow Meter	The pipeline feeding the flowmeter should be flushed with water, then purged with diluted caustic water, then flush with water again. Drain and blow out pipe to remove moisture from pipe and meter. Flow meter can be powered down or left on.	$ 1,500.00	
Polymer Injection System	Polymer injection system should be well flushed with water (~1 hour). Rinse with diluted caustic water to deactivate any residual polymer, then flush with diluted chlorine water, then rinsed with clean water again. On conclusion, the system should be drained an blown out with compressed air to remove residual water.	$ 750.00	
Polymer Mixing Tank	Emptied out, cleaned & power washed. Level sensor can be left in place.	$ 870.00	

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BioGRID System Decommissioning and Recommissioning Plan
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Table 3.1 - Probable Costs – Decommissioning Tasks

BioGRID Feed System Components

Component/Subsystem	Decommissioning Requirements	Decommissioning Cost	Decommissioning Cost Assumptions (as applicable)
FOG Storage Tank,	Emptied out, cleaned & power washed.	$ 12,133.80	50m^3 – 50,000 Litres -Rectangular Concrete Tank 10feet deep, 16” x16” access, confined space, approximately 2 feet sludge in bottom to vacuum out and offload into on site dumping station. BUDGET $19,500.00 Power Wash down walls and floor and vacuum out wash water and residue, confined Space , and offload into on site dumping station BUDGET $32,350.00
FOG Tank Temperature Sensor	Ensure tank cleaning also cleans insertion portion of temperature sensor.	incl. above	
Chopper Pump	Recommend that the chopper pump inside the FOG be flushed with chorine water, cleaned, dried then stored on blocks in dry, secure location.	$ 750.00	
Pasteurizer Tank	Emptied out, cleaned & power washed.	$ -	2m^3- 2000 Litres – small stainless steel tank to be empty prior to our power washing and vacuum out wash water and residue, confined space, and offload into on site dumping station
Pasteurizer Mixer	Ensure tank cleaning also cleans mixer of any accumulated material.	incl. above	
Hydrolyzer Tank	Emptied out, cleaned & power washed.	$ 8,053.08	1 Day, vac truck, wash truck, material transferred to on-site dumping station, as quoted by Accuworkx Inc.
Hydrolyzer Temperature Sensor	Ensure tank cleaning also cleans insertion portion of temperature sensor.	incl. above	
Hydrolzyer pH Meter	pH sensor component will not last for duration of storage. Remove sensor module.	incl. above	
Hydrolyzer Heat Control Valve	No specific requirements, will be flushed as part of pipe flushing.	incl. above	
Hydrolyzer Chopper Pump	The chopper pump inside the hydrolyzer needs to be flushed with chorine water and cleaned and dried then stored at a secured place.	$ 750.00	

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BioGRID System Decommissioning and Recommissioning Plan
Derby WWTW Asset Evaluation – Technical Memorandum #1

Table 3.1 - Probable Costs – Decommissioning Tasks

BioGRID Digester and Digestate Storage Tank Components

Component/Subsystem	Decommissioning Requirements	Decommissioning Cost	Decommissioning Cost Assumptions (as applicable)
BioGRID Digester	Digester decommissioning procedure should be completed. Clean out is recommended to prevent settling and solidification of grit and solids within the digester.	$ 307,200.93	Pressure washing and cleaning of tank only, not disposal of residual solids was quoted by Accuwork Inc. at cost of $36,745, estimated at 6.5 days effort Removal of solids is estimated based on 1m depth evenly distributed over the base of the 16m diameter tank, for a total of 200m3 of material. Removal crew for solids is based on 2 months of work (assuming productivity rate from recent GHD project at Humber), and assuming transport at $2,410.00 per load, 10m3 load as slurry, disposed of at Townships landfill with no additional tipping fee to Townships)
Air Compressor and Air Pump	Drain moisture traps. Disconnect from the local disconnect.	$ 750.00	
Digester Pressure Relief Valve	Purge piping of any residual biogas. Would recommend removal and storage within clean, dry, secure space.	$ 1,500.00	
Digestate Storage Tank	Tanks to be emptied and power washed.	$ 41,971.56	7 Day, vac truck, wash truck, material transferred to on-site dumping station, as quoted by Accuworkx Inc. On-site disposal of washing residuals.
Digestate Storage Tank	Tanks to be emptied and power washed.	$ 23,771.40	3 Day, vac truck, wash truck, material transferred to on-site dumping station, as quoted by Accuworkx Inc. On-site disposal of washing residuals.

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BioGRID System Decommissioning and Recommissioning Plan
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Table 3.1 - Probable Costs – Decommissioning Tasks

Biogas Handling and Utilization Units

Component/Subsystem	Decommissioning Requirements	Decommissioning Cost	Decommissioning Cost Assumptions (as applicable)
Biogas Cooling Field	After the biogas flow has been stopped, piping should be purged of biogas. All the condensate water needs to be allowed to be drained. Condensation needs to allow either to percolate through the digester footing drainage or can be pumped to the valve chamber to send to the Aeration lagoon.	$ 750.00	
Boiler	The gas line of the boiler should be purged with nitrogen. The hot water system should be flooded with propylene glycol to prevent freezing and pipe damage. Power can be shut off at local disconnect.	$ 8,000.00	Technician on site for single day servicing, including flooding of hot water system with polypropylene glycol and nitrogen purging of fuel lines
Biogas generator/ CHP unit	Isolate the biogas line and purge with nitrogen, including headspace of engine. Batteries need to be disconnected and stored in a cool, dry, secure area and charger should be turned off. Put new oil and filters in engine before storage. Check the freeze level of the antifreeze in the engine loop. Temperature of the storage room should be between 15 deg C to 35 deg C with relative humidity 60%.	incl. above	

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BioGRID System Decommissioning and Recommissioning Plan
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Table 3.1 - Probable Costs – Decommissioning Tasks

Odour Control System

Component/Subsystem	Decommissioning Requirements	Decommissioning Cost	Decommissioning Cost Assumptions (as applicable)
Odour Control System	Turn off suction fan at local disconnect. The media in the OCS can be left in filter as it is or stored in a dry storage.	$ 750.00	

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BioGRID System Decommissioning and Recommissioning Plan
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Table 3.1 - Probable Costs – Decommissioning Tasks

Building Hot and Cold Water Supply Systems

Component/Subsystem	Decommissioning Requirements	Decommissioning Cost	Decommissioning Cost Assumptions (as applicable)
Hot water supply system	Water in the piping loop should be drained of water. Because the system is difficult to drain completely, recommendation is that the piping loop should be flushed and filled with propylene glycol to prevent freezing.	$ 3,250.00	
Cold water supply system	Water in the piping loop, pressure tank, UV system, filter, and building cold water services should be drained and blown out.	$ 1,500.00	

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Table 3.2 - Probable Costs – Recommissioning Tasks

Septage Receiving System Components

Component/Subsystem	Recommissioning Requirements	Recommissioning Cost	Recommissioning Cost Assumptions
Septage Receiving Logging Station	The logging station can be left power on with onboard heat to prevent condensation within the panel and reduce potential for corrosion.	$ 7,200.00	
Dumping Station No. 1	In the event, the site is not receiving any septage or sewerage load then dumping station no. 1 should be emptied out, flushed & power washed. Locked/Secured from entry.	incl. above	
Dumping Station No. 2 & Bar Screen	In the event, the site is not receiving any septage or sewerage load then dumping station no. 1 should be emptied out & power washed. Locked/Secured from entry. If possible based on condition, screen should be pivoted/raised up to avoid ice formation around bars with any water accumulation at the base of the chamber.	incl. above	
Valve Chamber	Emptied out, cleaned & power washed.	incl. above	
MH No. 1 & 2 (to the Aeration Lagoon)	In the event, the site is not receiving any septage or sewerage load then both the manholes need to be cleaned and flushed, power washed of accumulated material. Secured from entry/tampering.	incl. above	

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Table 3.2 - Probable Costs – Recommissioning Tasks

Dewatering System Components

Component/Subsystem	Recommissioning Requirements	Recommissioning Cost	Recommissioning Cost Assumptions
Magnetic Flow Meter	The pipeline feeding the flowmeter should be flushed with water, then purged with diluted caustic water, then flush with water again. Drain and blow out pipe to remove moisture from pipe and meter. Flow meter can be powered down or left on.	$ 3,500.00	
Polymer Injection System	Polymer injection system should be well flushed with water (~1 hour). Rinse with diluted caustic water to deactivate any residual polymer, then flush with diluted chlorine water, then rinsed with clean water again. On conclusion, the system should be drained an blown out with compressed air to remove residual water.	$ 1,500.00	
Polymer Mixing Tank	Emptied out, cleaned & power washed. Level sensor can be left in place.	incl. above	

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Table 3.2 - Probable Costs – Recommissioning Tasks

BioGRID Feed System Components

Component/Subsystem	Recommissioning Requirements	Decommissioning Cost	Decommissioning Cost Assumptions
FOG Storage Tank,	Emptied out, cleaned & power washed.	$ 3,500.00	Fill tanks and leak test of system. Assume use of temporary transfer pumps for re-use of lagoon water for pressure testing. 1 days cumulative effort to complete the filling and inspection.
FOG Tank Temperature Sensor	Ensure tank cleaning also cleans insertion portion of temperature sensor.	incl. with dewatering system Flow Meter line item	
Chopper Pump	Recommend that the chopper pump inside the FOG be flushed with chorine water, cleaned, dried then stored on blocks in dry, secure location.	$ 750.00	
Pasteurizer Tank	Emptied out, cleaned & power washed.	incl. above	0
Pasteurizer Mixer	Ensure tank cleaning also cleans mixer of any accumulated material.	$ 750.00	
Hydrolyzer Tank	Emptied out, cleaned & power washed.	incl. above	0
Hydrolyzer Temperature Sensor	Ensure tank cleaning also cleans insertion portion of temperature sensor.	incl. with dewatering system Flow Meter line item	
Hydrolzyer pH Meter	pH sensor component will not last for duration of storage. Remove sensor module.	incl. with dewatering system Flow Meter line item	
Hydrolyzer Heat Control Valve	No specific requirements, will be flushed as part of pipe flushing.	incl. above	
Hydrolyzer Chopper Pump	The chopper pump inside the hydrolyzer needs to be flushed with chorine water and cleaned and dried then stored at a secured place.	incl. above	

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BioGRID System Decommissioning and Recommissioning Plan
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Table 3.2 - Probable Costs – Recommissioning Tasks

BioGRID Digester and Digestate Storage Tank Components

Component/Subsystem	Recommissioning Requirements	Decommissioning Cost	Decommissioning Cost Assumptions
BioGRID Digester	Digester decommissioning procedure should be completed. Clean out is recommended to prevent settling and solidification of grit and solids within the digester.	$ 39,000.00	Filling and leakage testing using lagoon water. Mobilization cost for crane/scaffold for roof re-installation. Pressure testing per TSSA Witness / Permit by TSSA
Air Compressor and Air Pump	Drain moisture traps. Disconnect from the local disconnect.	$ 750.00	
Digester Pressure Relief Valve	Purge piping of any residual biogas. Would recommend removal and storage within clean, dry, secure space.	$ 750.00	
Digestate Storage Tank	Tanks to be emptied and power washed.	$ 9,000.00	Transfer of liquid from digester to digestate storage, and top up with lagoon water as needed. Pump out back to lagoons at completion of testing.
Digestate Storage Tank	Tanks to be emptied and power washed.	incl. above	0

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BioGRID System Decommissioning and Recommissioning Plan
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Table 3.2 - Probable Costs – Recommissioning Tasks

Biogas Handling and Utilization Units

Component/Subsystem	Recommissioning Requirements	Decommissioning Cost	Decommissioning Cost Assumptions
Biogas Cooling Field	After the biogas flow has been stopped, piping should be purged of biogas. All the condensate water needs to be allowed to be drained. Condensation needs to allow either to percolate through the digester footing drainage or can be pumped to the valve chamber to send to the Aeration lagoon.	$ 3,000.00	
Boiler	The gas line of the boiler should be purged with nitrogen. The hot water system should be flooded with propylene glycol to prevent freezing and pipe damage. Power can be shut off at local disconnect.	$ 5,000.00	Checkout by licensed technician prior to restart.
Biogas generator/ CHP unit	Isolate the biogas line and purge with nitrogen, including headspace of engine. Batteries need to be disconnected and stored in a cool, dry, secure area and charger should be turned off. Put new oil and filters in engine before storage. Check the freeze level of the antifreeze in the engine loop. Temperature of the storage room should be between 15 deg C to 35 deg C with relative humidity 60%.	incl. above	

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BioGRID System Decommissioning and Recommissioning Plan
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Table 3.2 - Probable Costs – Recommissioning Tasks

Odour Control System

Component/Subsystem	Recommissioning Requirements	Decommissioning Cost	Decommissioning Cost Assumptions
Odour Control System	Turn off suction fan at local disconnect. The media in the OCS can be left in filter as it is or stored in a dry storage.	$ 750.00	

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BioGRID System Decommissioning and Recommissioning Plan
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Table 3.2 - Probable Costs – Recommissioning Tasks

Building Hot and Cold Water Supply Systems

Component/Subsystem	Recommissioning Requirements	Decommissioning Cost	Decommissioning Cost Assumptions
Hot water supply system	Water in the piping loop should be drained of water. Because the system is difficult to drain completely, recommendation is that the piping loop should be flushed and filled with propylene glycol to prevent freezing.	$ 3,750.00	
Cold water supply system	Water in the piping loop, pressure tank, UV system, filter, and building cold water services should be drained and blown out.	incl. above	

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Table 3.3 - Recommended Inspections and Maintenance

Septage Receiving System Components

Component/Subsystem	Description		Monthly	Bi-Monthly	Semi-Annually	Annually
Septage Receiving Logging Station	Septage receiving logging station is an above ground component, operated by electricity. Septage customer proceeds to drop of their load after logging in at the station. There is no weighting station or flowmeter to record the volume of the load. Logging station topically registers which customer and when their truck arrived.		None	Visual inspection for corrosion or degredation.	Visual inspection for corrosion or degredation.	Power down and open panel to visually inspect for corrosion or degredation.
Dumping Station No. 1	150 mm diameter influent sewer from the septage receiving tank to the aerated sewage lagoon.		None	Inspection for water/ice accumulation in chamber.	Inspection for water/ice accumulation in chamber.	Inspection for water/ice accumulation in chamber.
Dumping Station No. 2 & Bar Screen	Manual bar screen with 9mm spacing, with rated capacity of 57.5 m3/day.		Inspection for water/ice accumulation in chamber.	Inspection for water/ice accumulation in chamber.	Inspection for water/ice accumulation in chamber.	Inspection for water/ice accumulation in chamber.
Valve Chamber	Valve chamber is consisting of two valves; one controls the flow towards the Aerated lagoon and other flow goes to the polymer mixing tank.		None	Exercise of valves, 1/4 turn in either direction to confirm free movement.	Exercise of valves, 1/4 turn in either direction to confirm free movement.	Exercise of valves, 1/4 turn in either direction to confirm free movement.
MH No. 1 & 2 (to the Aeration Lagoon)	MH No. 1 receives flow from the drum screen and MH No1.		None	Inspection for water/ice accumulation in chamber.	Inspection for water/ice accumulation in chamber.	Inspection for water/ice accumulation in chamber.

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Dewatering System Components

Component/Subsystem	Description		Monthly	Bi-Monthly	Semi-Annually	Annually
Magnetic Flow Meter	Magnetic Flow Meter is located on a 200 mm diameter pipe which conveys sewerage/septage going from the valve chamber to the polymer mixing tank.		Visually inspect for signs of corrosion or degredation, or moisture accumulation around display screen/readout.	Visually inspect for signs of corrosion or degredation, or moisture accumulation around display screen/readout.	Visually inspect for signs of corrosion or degredation, or moisture accumulation around display screen/readout.	Visually inspect for signs of corrosion or degredation, or moisture accumulation around display screen/readout.
Polymer Injection System	Facility utilizes a formula CP 9310 emulsion polymer. Polymer chemical pump, diluted polymer feed pump, tubing/piping to mixing tank are all part of this system.		None	Visual inspection for corrosion or degredation.	Visual inspection for corrosion or degredation.	Visual inspection for corrosion or degredation.
Polymer Mixing Tank	Polymer mixing tank is a stainless-steel tank equipped with a mixer and a level sensor at the top.		None	Visual inspection for corrosion or degredation.	Visual inspection for corrosion or degredation.	Visual inspection for corrosion or degredation.

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BioGRID Feed System Components

Component/Subsystem	Description		Monthly	Bi-Monthly	Semi-Annually	Annually
FOG Storage Tank,	Fats Oils and Greases (FOG) are received in the FOG tank, volume of the tank is 50 m3.		None	Visual inspection for corrosion or degredation.	Visual inspection for corrosion or degredation.	Visual inspection for corrosion or degredation.
FOG Tank Temperature Sensor	The temperature of FOG in the tank is measured using an immersed temperature sensor, GOG is maintained at 20 degrees C via the FOG tank heating control.		None	None	Visual inspection for corrosion or degredation.	Visual inspection for corrosion or degredation.
Chopper Pump	There is chopper pump in the FOG tank, which agitates and transfers FOG to the pasteurizer.		None	Rotate pump shaft (on shelf) to reduce potential for seizing due to long term storage.	Rotate pump shaft (on shelf) to reduce potential for seizing due to long term storage.	Rotate pump shaft (on shelf) to reduce potential for seizing due to long term storage.
Pasteurizer Tank	FOG is pumped from FOG tank into the pasteurizer in batch mode. FOG is pasteurized at 70 deg C in a 2m3 pasteurizer. Pasteurized FOG is delivered to BioGRID or Hydrolyzer via gravity drainage, controlled by the motorized valve cV9. C		None	Exercise valve to reduce potential for seizing.	Exercise valve to reduce potential for seizing.	Exercise valve to reduce potential for seizing.
Pasteurizer Mixer	There is a mixer to agitate FOG, level switch, pasteurizer heat control valve associated with the pasteurizer. As supplied by Waler Engineered Products		None	Rotate mixer shaft to reduce potential for seizing due to long term storage	Rotate mixer shaft to reduce potential for seizing due to long term storage	Rotate mixer shaft to reduce potential for seizing due to long term storage
Hydrolyzer Tank	Pasteurized FOG and dewatered/thickened septage is conveyed to the hydrolyzer prior to the BioGRID. Hydrolyzer tank is 6.775 m dia x 2.8 m SWD, 100 m3, in-ground covered hydrolyzer tank for conditioning of waste prior to anaerobic digestion. Dry substrate loading chute with cover.		None	None	Visual inspection for corrosion or degredation.	Visual inspection for corrosion or degredation.
Hydrolyzer Temperature Sensor	The temperature of FOG in the tank is measured using an immersed temperature sensor, GOG is maintained at 20 degrees C via the FOG tank heating control.		None	None	Visual inspection for corrosion or degredation.	Visual inspection for corrosion or degredation.
Hydrolzyer pH Meter	pH sensor is part of the hydrolyzer package.					
Hydrolyzer Heat Control Valve	Heating system control valve.		None	Exercise valve to reduce potential for seizing.	Exercise valve to reduce potential for seizing.	Exercise valve to reduce potential for seizing.
Hydrolyzer Chopper Pump	Chopper pump is submersible, located within the hydrolyzer tank.		None	Rotate pump shaft (on shelf) to reduce potential for seizing due to long term storage.	Rotate pump shaft (on shelf) to reduce potential for seizing due to long term storage.	Rotate pump shaft (on shelf) to reduce potential for seizing due to long term storage.

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BioGRID Digester and Digestate Storage Tank Components

Component/Subsystem	Description		Monthly	Bi-Monthly	Semi-Annually	Annually
BioGRID Digester	BioGRID digester is 1000m3, maintained at an internal temperature of around 25-40 degrees C via the hot water heating system. Covered with a flexible membrane to allow gas storage in the freeboard space, held in place with a compressed-air filled securement system.		None	Periodic inspection for deterioration or rainwater ingress	Periodic inspection for deterioration or rainwater ingress	Periodic inspection for deterioration or rainwater ingress
Air Compressor and Air Pump	Located in the BioGRID control room, the air compressor supplies air to the membrane securement system and to the feed for desulphurization.		None	None	Exercise to charge and discharge the system.	Exercise to charge and discharge the system.
Digester Pressure Relief Valve	PRV is located on top of the BioGRID, it prevents over pressurization of digester freeboard.		None	None	Visual inspection for corrosion or degredation.	Visual inspection for corrosion or degredation.
Digestate Storage Tank	There are two digestate storage tanks, with storage capacity of 854m3 and 5,630m3 respectively.		None	None	Visual inspection for corrosion or degredation.	Visual inspection for corrosion or degredation.

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Biogas Handling and Utilization Units

Component/Subsystem	Description		Monthly	Bi-Monthly	Semi-Annually	Annually
Biogas Cooling Field	The biogas cooling field is a 6.1 mix 15.2 m grid of HDPE piping designed to provide passive gas cooling and moisture removal. Biogas is collected from BioGRID and piped to the Biogas Cooling Field. It is at a 4% incline and the condensate is trapped in the monitoring well.		None	None	None	None
Boiler	The biogas boiler serves to facilitate system start-up and can act an alternative consumer of biogas. The Biogas boiler receives biogas after it has passed through the biogas cooling filed. Thermal energy produced by the boiler is used to heat the HOT Water Supply system. Low temperature hot water boiler (1.2 MMBtu, model number Raytherm 1223).		Visual inspection for corrosion or degredation.	Visual inspection for corrosion or degredation.	Visual inspection for corrosion or degredation.	Inspection by licensed technician
Biogas generator/ CHP unit	100 Kw Co-generation unit uses biogas as a fuel for combustion and production of thermal and electrical energy. The co-generation unit is primary method of biogas combustion. Thermal energy is captured from the exhaust and engine jacket and then supplied to the Hot Water Supply and Return system. Electrical energy is exported to the public through the Hydro One Inc. and power purchase agreement with the Ontario Power Authority.		Visual inspection for corrosion or degredation.	Visual inspection for corrosion or degredation.	Visual inspection for corrosion or degredation.	Inspection by licensed technician

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Odour Control System

Component/Subsystem	Description		Monthly	Bi-Monthly	Semi-Annually	Annually
Odour Control System	Odour control system consists of a carbon drum filter within the control and dewatering building. Purafill is the manufacturer of the OCS. The drum separator, FOG tank, hydrolyzer, and the pasteurizer are connected to the odour control station.		Visual inspection for corrosion or degredation.	Visual inspection for corrosion or degredation.	Visual inspection for corrosion or degredation.	Visual inspection for corrosion or degredation.

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Building Hot and Cold Water Supply Systems

Component/Subsystem	Description		Monthly	Bi-Monthly	Semi-Annually	Annually
Hot water supply system	Hot water Supply and Return system consists of a series of PEX tubing. Insulated twin PEX tubing distributes hot water throughout the Site while PEX tubing is embedded in the walls of the BioGRID, below the FOG storage tank, in the walls and floor of the Hydrolyzer and Pasteurizer to provide heating.		Inspection for leaks. Running circulation pump.	Inspection for leaks. Running circulation pump.	Inspection for leaks. Running circulation pump.	Inspection for leaks. Running circulation pump.
Cold water supply system			Visual inspection for leaks, corrosion, or degredation.	Visual inspection for leaks, corrosion, or degredation.	Visual inspection for leaks, corrosion, or degredation.	Visual inspection for leaks, corrosion, or degredation.