



Northern Oaks Landfill

Landfill Gas-to-Energy Facility Operation and Maintenance Plan (Malfunction, Abatement/Preventative Maintenance Plan)

Prepared for:

Waste Management of Michigan, Inc.

Permit to Install Number : 240-09

State Registration No. (SRN): N6010

Emission Unit ID: EUCENGINE1

Prepared by:

PIC Group Inc.

1165 Northchase Parkway

Marietta, GA 30067

August 2010

(Revised January 2023)

Revised by WM Renewable Energy, LLC

TABLE OF CONTENTS

Section	Page
1. INTRODUCTION.....	1
2. ORGANIZATION	1
3. PERSONNEL REQUIREMENTS.....	2
3.1 Management Organization.....	2
3.2 Personnel Responsibilities.....	2
4. FACILITY OPERATIONS.....	3
4.1 Facility Start-Up.....	4
4.2 Facility Shutdown.....	5
4.3 Landfill Gas Collection System	5
4.4 GTE Facility Compressor Room	5
4.5 GTE Facility Engine/Generator Room	6
4.6 GTE Facility Control Room	6
4.7 Planned and Unplanned Shutdowns	7
4.7.1 Planned Shutdowns	7
4.7.2 Unplanned Shutdowns	9
5. DESCRIPTION OF SAFETY FEATURES	10
5.1 Power Interruptions.....	10
5.2 Fire Prevention within the GTE Facility.....	13
5.3 System Alarm Screens	14
5.4 Generator Alarm Screens.....	14
5.5 Ventilation System Annunciation Panel	14
6. SITE SECURITY METHODS	15
7. SITE EMERGENCY	15
8. RECORD KEEPING	15
9. SPARE PARTS.....	16
Appendix 1 – CAT 3520 Engine Preventative Maintenance Schedule	17
Appendix 2 – Plant Utility Readings	18
Appendix 3 – Fuel Gas Compressor Readings	19
Appendix 4 – Engine Operating Readings.....	20
Appendix 5 – Generator Operating Readings.....	21
Appendix 6 – Engine Radiator Level Readings.....	22
Appendix 7 – Gas Recovery Production Log	23
Appendix 8 – Spare Parts.....	24

1. INTRODUCTION

This document presents an Operation and Maintenance (O&M) Plan for the Northern Oaks Landfill Gas-To-Energy Facility (GTE Facility).

Waste Management of Michigan, (WM) operates a single internal combustion (IC) reciprocating engine GTE Facility on a parcel adjacent to the existing landfill on North County Farm Road. The GTE Facility is designed to combust landfill gas (Methane) in a single (Caterpillar V-20) internal combustion reciprocating engine and generates electrical power. Landfill gas (Methane) is produced by the decomposition of material in the landfill. This gas is collected, processed, and compressed to be used as fuel to run the engine/generator set. The GTE Facility will produce approximately 1.6 megawatts (MW) of electrical power that can be transmitted through a local utility company's power distribution grid to power the equivalent of 1,600 homes for one year. The single V-20 IC reciprocating engine is capable of combusting approximately 600 cubic feet per minute (cfm) of landfill gas.

2. ORGANIZATION

The remainder of this O&M Plan is organized into the following sections:

- Section 3 provides a description of the facility personnel requirements.
- Section 4 provides a description of the operation of the facility and the machinery and equipment used at the facility.
- Section 5 provides a description of safety features, facility monitoring systems and alarms.
- Section 6 provides a description of site security methods.
- Section 7 describes site emergency response references.
- Section 8 describes recordkeeping procedures.
- Section 9 provides information about spare parts inventory.

3. PERSONNEL REQUIREMENTS

3.1 Management Organization

WM is responsible for the management of the Northern Oaks Landfill and related facilities including the GTE Facility. The District Manager is responsible for making all primary decisions related to the administration and operation of the site. A GTE Facility Manager is responsible for the operation and maintenance of the GTE Facility and reports to the District Manager. The GTE Facility Manager also receives instructions from the WM Renewable Energy staff concerning the daily operation of the GTE Facility; technical repairs and diagnostic troubleshooting; and purchasing tools, equipment and supplies for the GTE Facility.

3.2 Personnel Responsibilities

Operation of the GTE Facility requires a full-time staff. The staff members can vary in number and level of responsibility. However, in general, staff members and their responsibilities are as follows:

- One District Manager who will (i) manage all landfill operations; (ii) make and manage contracts with waste hauling companies; (iii) oversee any construction at the site, and (iv) ensure that the landfill is operating in compliance with the terms and conditions of the permit.
- One GTE Facility Manager who will operate and maintain the landfill gas recovery plant: **Mike Kruskamp, 989-588-1126** (24-Hour Contact).
- One Regional Manager: **Rich Kunze, 231-220-4585** who is the supervisor of the GTE Facility Manager.
- A Well Field Technician who will be responsible for maintaining and tuning the well field and operating and maintaining the enclosed flares and landfill gas collection system.
- A Site Engineer who will (i) ensure that the landfill and related facilities including the GTE Facility are developed according to the engineering plans; (ii) record any variations from the engineering plans; and (iii) monitor environmental compliance of the facility.

In addition to the normal full-time staff, third party contractor personnel may be added during scheduled and unscheduled maintenance of the facility. If conditions warrant,

additional engineering and operations and safety personnel may be obtained from other Waste Management facilities in the area.

Personnel related to the GTE Facility operation are trained to perform their specific duties and to recognize potentially hazardous or dangerous situations at the landfill and the GTE Facility. Training for GTE Facility related personnel includes, but is not limited to, the following topics under supervised review:

- Construction and Operating Permit Conditions
- Spill Prevention
- Emergency Management and Reporting Procedures
- Lock Out Tag Out Procedures
- Special Waste Management

4. FACILITY OPERATIONS

The GTE Facility operation is divided into four main segments:

- The landfill gas collection system
- The GTE facility gas compressor room
- The GTE facility engine room
- The GTE facility control room

Electrical power transmission to the local utilities transmission lines is controlled by two main circuit breakers 52U and 52T. Tie Breaker 52T is used to control electrical power from the generators and utility circuit breaker 52U is the main breaker connecting the GTE Facility to the utility's grid system. Breaker 52U is located in the transformer switchyard and breaker 52T is located in the switchgear in the control room with the generator breakers. For initial startup of the GTE Facility, power from the local electrical utility system is used via the 4.16 KV switchgear, to activate the GTE Facility systems. This is accomplished by closing the utility circuit breaker (52U), and tie breaker (52T). An electrical interlock controls the sequencing of utility breaker (52U) and tie breaker (52T). The tie breaker (52T) cannot be closed until the utility breaker (52U) breaker has been closed.

4.1 Facility Start-Up

After the auxiliary load has been activated, normal operation of the reciprocating engine generator set is started as follows:

- Verify that the Main Gas Inlet Valve for the wellfield header to the plant is in the open position.
- Visually inspect the gas compressor. Verify that the oil level is correct and that the unit is ready for operation.
- Open Main Header Bleed valve for re-circulation of gas to the condensate knockout tank.
- Start the compressor and verify compressor pressure to the main gas header.
- Verify fluid levels and coolant and oil valve positions for each engine prior to start sequence.
- Place Engine Control Switch to the Run position.
- Depress start button on switchgear to initiate engine start sequence.
- Unit should start and obtain normal operating RPM.
- After engine oil has obtained a minimum temperature of 190 degrees F, then the unit can be paralleled with utility and loaded to desired load.
- After at least one unit is running, the Gas Bypass Valve off of the main header can now be closed.
- Bring the engine to desired load.
- After engine is set to desired load, enable vacuum control on the system panel. This will allow engine loads to adjust to keep desired vacuum on the landfill.
- Once at load, verify proper operation by checking all panels and instrument readings.

After achieving the required voltage and frequency, the generator is manually synchronized with the utility electrical system and breaker 52-G1 is closed. After breaker 52-G1 is closed, generator loading takes place, and the generator power is supplied to the 4.16 KV switchgear and the utility system.

4.2 Facility Shutdown

In the event the GTE Facility must be shutdown, the following procedures are used:

- Unload engine by depressing the soft unload push button. The engine will gradually unload at a rate of 3kW per second and then will automatically trip the generator breaker at 50kW.
- Once the main generator breaker trips off-line, the unit will then go into cool down mode. The engine will operate for an additional 5 minutes and will then shutdown.
- Once the unit has been shutdown, then the gas compressor will be shut off by turning the key switch on the compressor from "run" to "off" mode.

4.3 Landfill Gas Collection System

The existing landfill gas collection systems at the Northern Oaks facility consist of vertical gas extraction wells and associated header piping. The collected gas was previously sent to an existing enclosed flare system.

The GTE Facility is designated as the prime user with the enclosed flare system combusting the landfill gas that the GTE Facility doesn't use. Assuming the engine consumes 600 cfm of landfill gas at maximum power output, the GTE Facility will use landfill gas at a rate of approximately 600 cfm when the engine is in service. If the gas collected exceeds the gas needed to operate the engine, the existing enclosed flare system will ensure control of all the gas collected by burning off the excess gas.

4.4 GTE Facility Compressor Room

The GTE Facility compressor room contains the equipment required to pump the landfill gas from the main header and treat the landfill gas prior to combustion in the engines. The landfill gas treatment, as described below, includes filtration, dewatering and compression.

- Filtration - Landfill gas is filtered in the treatment system in two locations. First, there is a scrubber mesh pad as part of the landfill gas scrubber in the initial portion of the treatment system. Then there are filters after the cooler for additional filtration at the back end of the system.

- **Dewatering** - Landfill gas is de-watered by cooling the superheated gas from the blower in the cooler. Gas at approximately 113°F is cooled down to approximately 80F in the cooler, lowering the gas temperature to below the dew point and causing the water in the gas to condense. The condensed water is trapped in the filters and then dropped out to a condensate system after the cooler. The cooled gas is then reheated to 120°F prior to entering the gas plant.
- **Compression** - Landfill gas is extracted from the landfill under vacuum and compressed by a Tuthill vacuum blower system. The gas is compressed in the blower such that it is approximately 4 to 5 psi entering the plant. Each compressor is equipped with a discharge silencer to lower the DbA sound levels.

4.5 GTE Facility Engine/Generator Room

The GTE Facility engine/generator room includes the engine/generator set and local control cabinets, storage tanks for virgin and used motor oil, storage tanks for engine coolant, exterior radiators to cool the engine coolant, and a work area for equipment maintenance. The engine/generator set is comprised of a single Caterpillar 3520 landfill gas V-20 engine driving a Caterpillar 4.16 kilovolts (KV) generator. The Caterpillar 3520 engine/generator set is rated at 2000 kVA, 1600KW, 0.80 power factor, 3 phase, 60 hertz, 4,160 volts output at 278 amperes. The engine/generator output is connected to the local utility source and provides power as "sell-back" to the utility grid. The engine/generator set is connected to a 4.16 KV switchgear, providing power to station auxiliary loads with the balance of power exported to the utility grid via a 3 phase station transformer which steps up the generated voltage from 4,160V to the high line voltage.

The engine/generator set is supplied lube oil and coolant from two storage tanks located in the base and at the front of the container. Along with these two tanks is the used oil storage that is also at the base of the container.

4.6 GTE Facility Control Room

The GTE Facility control room contains master controls for landfill gas recovery through the gas compressor, control of the engine and generator systems, synchronization control for the utility grid, and an annunciation panel and autodialer in the event of an upset

condition in the GTE Facility.

Three control panels make up the station switchboard and includes a System Compartment, Tie Compartment, and a Generator Control Compartment. These compartments include the following:

- One System Compartment, which contains the station Operator Interface Module (OIM) with a touchscreen mounted on the cubicle door, system indicating lights and control switches, and the utility protective relays.
- One Tie Breaker Compartment, which contains the Digital Metering Display (DMD), a synchroscope switch and synchronizing mode selector switch for manual paralleling. The Tie Breaker Compartment also contains the bus tie breaker control switches, tie breaker status indicators, tie breaker protective relays, and the 86T lockout relay. The tie breaker is located in a separate cabinet in the facility switchgear room.
- One Engine/Generator Set Control Cubicle for Gen #1, (52-G1). The cubicle contains a Digital Metering Display (DMD), generator protective relays, Operator Interface Module (OIM) with a touchscreen mounted on the cubicle door, control switches, a high-speed trip relay (86 Device) and the generator Emergency Stop Pushbutton (ESPB). The generator breaker is located in a separate cabinet in the facility switchgear room.

Each cubical is constructed of a metal cabinet. Each cabinet has hinged front and rear doors for access to the cabinet interiors.

4.7 Planned and Unplanned Shutdowns

Company records indicate the average on-line time for a GTE Facility owned and operated by Waste Management using the CAT 3520 engines exceeds 92%. The 8% off-line time includes planned and unplanned shutdowns.

4.7.1 Planned Shutdowns

Planned shutdowns are generally performed for maintenance reasons, or at scheduled intervals as requested by the utility receiving the electrical power from the GTE Facility. The Facility Manager will use the following maintenance schedule as a general guideline. Scheduled maintenance items, shown below and in **Appendix 1**, may be adjusted for specific operating conditions as required by the engine:

Fuel Gas Compressor		
Unit	Maintenance Action	Maintenance Interval (run hours)
Fuel Gas Compressor	Change oil and oil filter	Every 4,500 to 9,000 hours based on sample results
	Change micron filters	Every 4,500 to 9,000 hours based on inspection
	All other repairs	As needed

Planned shutdowns for regularly scheduled maintenance occur as follows:

- The engine is typically shutdown for approximately 1.5 hours each month for general service including oil, filter, and sparkplug changes. These guidelines may be adjusted if operational characteristics require change.
- The engine is typically shutdown annually for approximately 8 hours for overhauling of the engine top end (heads and valves) based on operating characteristics of the engine, once again this may be adjusted based on operational requirements.
- The plant is shut down for approximately 1 day each year to service the landfill gas compressor (treatment) system, and the electrical system by changing the oil and filters in the compressor and checking the safety system. Specific maintenance schedules and procedures are described in the manufacturer's operation and maintenance guide, which is kept in the Facility Manager's office and can be provided upon request. Electrical maintenance is also performed at this time.
- Electrical switchgear is maintained annually by an outside contractor. At this time all safety shutdown devices and generator breakers are tested and re-certified to manufacturer specifications.
- The flow computer will be calibrated annually in accordance with the instructions and guidelines in the Flow Computer operation and maintenance manual.
- Leak testing of the gas header entry to the plant was performed prior to the commissioning of the plant. Methane detection is provided throughout the plant. In the event of methane contamination, an alarm will sound, the gas supply to the plant will be shut off, the engines will shut down and the exhaust and supply fans will automatically start to supply fresh air

to the building and exhaust the contaminated air.

- A leak test is also performed on the pipe connections and valves whenever an engine or compressor is replaced. This is accomplished using a bottle with leak detection solution and saturating all connection points and evaluating each joint for possible leaks.

4.7.2 Unplanned Shutdowns

Unplanned shutdowns are generally the result of unexpected events such as:

- Power interruptions within the utility power grid due to increased power usage tripping main breakers or blowing transformers or lightning strikes.
- Detection of explosive concentrations of flammable gases within the GTE Facility.
- Excessive detonation and resulting vibration in the engine.
- High levels of oxygen in the landfill gas.
- Failure of a component in the engine, generator, or landfill gas treatment system compressor.
- Failure of one of the components of the main facility step-up transformer.
- Acts of nature such as ice storms, electrical storms, and wind.

In most cases, unexpected events listed above will trigger an automatic shutdown of the engine generator set, the gas compressor or the whole plant. At the same time, an annunciator alarm and panel light will be activated on the annunciator panel in the control room. The GTE Facility will automatically notify the Facility Manager through an autodialer that there is an issue that requires attention at the GTE Facility. The Facility Manager, as part of his/her job responsibilities, is required to respond to the alert and troubleshoot and correct the cause of the unexpected shutdown.

During times when the GTE Facility is shut down for planned or unplanned reasons, landfill gas that is normally combusted in the plant, will be diverted through the enclosed flare by manually adjusting valves and starting the flare.

5. DESCRIPTION OF SAFETY FEATURES

The GTE Facility has been designed to detect a number of upset conditions during facility operation as described below. Upset conditions are sensed by relay elements that will cause an autodialer to be activated notifying the Facility Manager or designated person of the upset condition. The autodialer functions as a remote alarm monitor, typically monitors critical facilities which are not staffed 24 hours a day. The Facility Manager or designee is on call 24 hours a day; seven days a week to respond to upset conditions at the GTE Facility.

In addition to notifying the Facility Manager of an upset condition, the relay elements can also shut down all or a portion of the GTE Facility. An upset condition might result in the termination of electrical energy flow to the utility grid, shut down one or more engine/generator sets, and/or shut down the gas treatment system. For example, upset conditions in the power utilities system, within the GTE Facility or the gas collection system might activate the upset condition detection and cause all or a portion of the GTE Facility to shut down.

The landfill gas collection and control system at the existing Northern Oaks Landfill includes the landfill gas collection system, the candlestick flare, and the GTE Facility. In the event of a partial or complete shutdown of the GTE Facility, the candlestick flare has the capacity to control landfill gas generated by the Landfill.

5.1 Power Interruptions

When a power failure or voltage or frequency disturbance occurs on the utility line, the event is detected by one of the relays, which will initiate a trip the utility breaker (52U). Opening breaker 52U will cause tie breaker 52T to trip. Upon restoration of the utility line voltage, the Facility Manager can close the utility breaker (52U) and the process of restarting power generation can occur.

Overpower, overcurrent or grounding fault on the utility line side of the main transformer is detected by Schweitzer relays, which will trip the utility breaker (52U) and tie breaker (52T) via lockout relays 86U and 86T. At the same time, an alarm will be annunciated as described in Section 5.3. The trip of any breaker will annunciate an alarm.

The generator is equipped with an automatic voltage regulator and an automatic power factor controller. The generator is also protected by a multifunction Schweitzer SEL-300G relay against unbalanced current (46), instantaneous and time delay overcurrent (50/51), reverse power (32), loss of excitation (40) and faults that cause a flow of differential currents through the generator windings (87G). Neutral grounding of the generator is achieved through the grounding resistor, to limit ground fault current to 200 Amps. In case of grounding, the fault will be sensed by relay elements 50N/51N. Actuation of any relay element will cause the associated generator breaker (52-G1) to trip via its respective lockout relay 86-G1. At the same time, an alarm will be annunciated as described in Section 5.4. The trip of any breaker will annunciate an alarm.

The protective relays for the system consist of a lockout switch (86 Device), a lock out relay (86T), a Schweitzer SEL-300G generator relay, a Schweitzer SEL-551 Overcurrent Relay, a Schweitzer SEL-587 Current Differential Relay, a Schweitzer SEL-351 Protection System, a Schweitzer SEL-351A Distribution Protection System Relay, and a Schweitzer SEL-551 Overcurrent Relay. All Schweitzer relays are connected through a SEL-2030 Communication Processor.

Emergency Stop

Each generator breaker is also equipped with an Emergency Stop Pushbutton (ESPB) located at the genitor control cabinet for each unit. The emergency stop switch has a red mushroomed operator which makes it easy to locate. The switch, when activated is maintained, and must be manually reset. Each generator has a local emergency stop push button at the local control panel. As with the other switch, when activated, the switch is locked in and must be manually reset.

Lock Out Relay (86T)

This lock out relay is a high speed, electrically operated, manually reset switch with a trip target. It is used to accumulate the actions of the tie protective relays to initiate tripping of the tie circuit breaker (52T).

Lock Out Switch (86U Device)

This lock out switch is a high speed, electrically operated, manually reset switch with a

trip target. It is used to accumulate the actions of the tie protective relay (Schweitzer SEL-351) to initiate tripping of the utility breaker (52U) and the tie breaker (52T) through its lock out relay (86T).

Schweitzer SEL-587

The Schweitzer SEL-587 is a Current Differential Relay. This relay provides protection control, monitoring and recording for two terminal apparatus including transformers with embedded tertiary windings. This relay provides protection elements including Differential (87), Instantaneous time overcurrent (50/51) and Instantaneous ground overcurrent (50/51G), for the utility line side of the main transformer will be detected by relays 87 (Differential) and 50/51 (Instantaneous) When activated, the SEL-587 relay will initiate tripping of the utility breaker 52U and tie breaker 52T via lockout relay 86T. The relay also provides status of the tie breaker (52T) and the utility breaker (52U).

Schweitzer SEL-351

The Schweitzer SEL-351 is a Multifunction Relay. This relay provides protection elements including Undervoltage (27), Overvoltage (59), Over/Under Frequency (81O/81U), Ground Overcurrent (50/51N), Instantaneous time Overcurrent (50/51), Ground Overvoltage (59G), and Synchronizing Check (25). When activated, the SEL-351 relay will initiate tripping of the tie breaker (52T) and/or the utility breaker (52U) through the lock out relay (86T). The relay also provides status of the tie breaker (52T), the utility breaker (52U) and the generator output breakers (GI).

Schweitzer SEL-351A

The Schweitzer SEL-351A is a Multifunction Distribution Protection Relay. This relay provides protection elements including Undervoltage (27), Overvoltage (59), Over/Under Frequency (81O/81U), Instantaneous time Overcurrent (50/51). When activated, the SEL-351 relay will initiate tripping of the tie breaker (52T) and/or the utility breaker (52U) through the lock out relay (86T). The relay also provides status of the tie breaker (52T) and the utility breaker (52U).

Schweitzer SEL-300G

The Schweitzer SEL-300G is a comprehensive, multifunction generator protection relay

intended for primary and/or backup protection for any size synchronous machine. This relay provides protection elements including Over Excitation (24), Undervoltage (27), Overvoltage (59), Over/Under Frequency (81O/81U), Reverse Power (32), Differential (87), Voltage Restraint Time Overcurrent (51V), Ground Overcurrent (50N/51N), Instantaneous Overcurrent (50), Loss of Excitation (40), Sync Check (25), and Negative Sequence (46). When activated, the SEL-300G relay will initiate tripping of the associated generator breaker 52-G1, G2, or G3 via their respective lockout relay 86-G1. This will also initiate engine shutdown. At the same time, an alarm will be annunciated as described in Section 5.4. The relay also provides status of the generator breaker (52-G1) and the engine condition.

Schweitzer SEL-551

The Schweitzer SEL-551 is an Overcurrent Relay. This relay provides protection elements including Phase Instantaneous Overcurrent (50) and Phase Time Overcurrent (51). This relay also provides status of the station step-down transformer circuit breaker (52SST). Breaker 52SST provides power for the 4160/600V Station Service Transformer and MCC.

5.2 Fire Prevention within the GTE Facility

The GTE Facility has been designed so that if any of the following faults occur, the generator breaker (52G) is tripped, and the engine/generator set is shut down:

- High methane
- Blower failure
- High oxygen
- Fire detection alarm

The engine/generator set is shutdown in order to control the potential for fire and explosion within the plant. It should be noted that the GTE Facility building is constructed with a minimum of combustible material, so as to limit the propagation of fire. The building fire protection consists of ionization detectors, thermal detectors, smoke detectors on the ceiling and in the duct work, methane detectors, audible and visual alarm devices, and manual fire pull stations.

5.3 System Alarm Screens

The GTE Facility has an Operator Interface Module (OIM) located in the system control cubicle in the control room. The OIM has two screens for system alarms. Each screen is provided with alarm windows labeled for both alarm and shutdown functions.

The Facility Manager uses the annunciation panel as an initial diagnostic tool to determine where the upset condition is. Each screen panel provides a silence/acknowledge push button to acknowledge the alarm and silence horn. There is also a system reset push button to reset alarm once the upset condition has been corrected. The screens also have a test lamp push button used for testing the alarm windows.

5.4 Generator Alarm Screens

Each generator control panel has an Operator Interface Module (OIM) located in the system control cubicle in the control room. The OIM has two screens for system alarms. Each screen is provided with alarm windows labeled for both alarm and shutdown functions.

The Facility Manager uses the annunciation panel as an initial diagnostic tool to determine where the upset condition is. Each screen panel provides a silence/acknowledge push button to acknowledge the alarm. There is also a system reset push button to reset alarm once the upset condition has been corrected. The screens also have a test lamp push button used for testing the alarm windows.

5.5 Ventilation System Annunciation Panel

The GTE Facility also has an annunciation panel for the ventilation system. The ventilation control panel is provided with ten back-lighted windows labeled for both alarm and fault conditions.

The Facility Manager uses the annunciation panel as an initial diagnostic tool to determine where the alarm/fault condition is located. The annunciation panel is provided with a touchscreen for alarm management, an auto operation ON/OFF selector switch, and an annunciator reset push button is available to reset the annunciator once the alarm condition has been corrected.

6. SITE SECURITY METHODS

The landfill is enclosed by a fence with locking gates in all areas where the public has access. The GTE Facility is locked during times when the GTE Facility Manager is not present. The access doors to the control room from the outside are steel insulated doors with locking dead bolts. Steel overhead doors provide access to the engine and generator room. The overhead doors are controlled from inside the GTE Facility.

7. SITE EMERGENCY

Site emergencies are handled in accordance with the site emergency Response/ Contingency plan. This plan covers the following:

- Fire Response
- Medical Emergencies Response
- Spill/Release/Emission Response
- Natural Disasters
- Bomb Threats
- Civil Disturbance/Demonstration

8. RECORD KEEPING

Various readings are recorded at the beginning of each day. The different types of spreadsheets used at this facility are listed below.

Recording of utility readings is performed at the beginning of each day and maintained in the GTE facility manager's office for future reference and trending. An example of a typical utility reading spreadsheet is provided in **Appendix 2**.

Operation readings for the fuel gas compressor is recorded at the beginning of each day and maintained in the GTE facility manager's office for future reference and trending. An example of a typical spreadsheet used for recording the gas compressor readings is provided in **Appendix 3**.

Operating readings for the engine is recorded at the beginning of each day and maintained in the GTE facility manager's office for future reference and trending. An example of a typical

spreadsheet used for recording the engine operating readings is provided in **Appendix 4**.

Operating reading for the generator is recorded at the beginning of each day and maintained in the GTE facility manager's office for future reference and trending. An example of a typical spreadsheet used for recording the generator readings is provided in **Appendix 5**.

Engine radiator levels is recorded at the beginning of each day and maintained in the GTE facility manager's office for future reference and trending. An example of a typical spreadsheet used for recording the radiator levels is provided in **Appendix 6**.

A facility production log is completed at the beginning of each day and maintained in the GTE facility manager's office for future reference and trending. An example of a typical spreadsheet used for recording the production readings is provided in **Appendix 7**.

9. SPARE PARTS

The facility maintains a stock of replacement parts to minimize down time of the engine. A list of the spare parts maintained on site is provided in **Appendix 8**.

Appendix 1 – CAT 3520 Engine Preventative Maintenance Schedule

	Daily	Weekly	Monthly	750 Hrs	1,500 Hrs	3 Mos	6 Mos	Yearly	As Req'd	Comments
Monitor Operations										
Check Oil Level										
Check Radiator Level										
Check Air/Fuel Ratio										
Check Engine DDT										
Read Crankcase Pressure										Adjust as required
Check Batteries										Wear proper PPE
Check Air Filter										
Lube Oil Analysis										
Add Coolant Conditioner										If required
Check Crankcase Breather										
Check Radiator Fan Belts										
Clean Radiator Fins										If needed
Change Oil										Ck oil analysis
Change Oil Filters										
Replace Spark Plugs										
Grease & Inspect Fuel Linkage										
Check Ignition Timing										
Check Valve Clearance										
Inspect Turbocharger										
Inspect Exhaust Bypass Valve										
Inspect Carburetor Diaphragm										
Replace Air Filter										Or as required
Test Safety Shutdowns										
Clean & Flush Cooling System										If required
Check Compression										If required

Appendix 2 – Plant Utility Readings

Month _____ Northern Oaks Utility Readings									
Day	Time	KW	Power Factor	Hertz	Amp/Volts			Utility Hours	Comments
					A-Phase	B-Phase	C-Phase		
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
23									
24									
25									
26									
27									
28									
29									
30									
31									

Appendix 3 – Fuel Gas Compressor Readings

Month _____				Fuel Gas Compressor Readings											
Day	Time	FGC Hours	FGC Inlet Temp	FGC Inlet Press	FGC Disc. Temp	FGC Disc. Press	Inst Air Press	FGC Oil Level	FGC Oil Temp	FGC Oil Press	Cool Inlet Temp	Cool Disch Temp	Final Disch Temp	FGC Inlet VAC	Shop Air Comp Hours
1															
2															
3															
4															
5															
6															
7															
8															
9															
10															
11															
12															
13															
14															
15															
16															
17															
18															
19															
20															
21															
22															
23															
24															
25															
26															
27															
28															
29															
30															
31															

Appendix 4 – Engine Operating Readings

Month _____

Engine Operating Readings

Day	Time	Engine Hours	Batt Volt	Batt Amps	Oil PSI	Oil Temp	MAT	MAP	AFR VLV%	Oil Filter Diff	Jkt Wtr PSI	Day Tank	Aft Cooler Wtr Temp	Jacket Wtr Temp	MAN KPA	Throttle Position	Oil Level	Oil Used	
1																			
2																			
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			
11																			
12																			
13																			
14																			
15																			
16																			
17																			
18																			
19																			
20																			
21																			
22																			
23																			
24																			
25																			
26																			
27																			
28																			
29																			
30																			
31																			

Appendix 5 – Generator Operating Readings

Month _____

Day	Time	KW	Power Factor	Hertz	Amps/Volts			KW/HRS	Comments
					A-Phase	B-Phase	C-Phase		
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
23									
24									
25									
26									
27									
28									
29									
30									
31									

Appendix 6 – Engine Radiator Level Readings

Month _____

Day	Time	After Cooler Water Temp	Jacket Water Temp	Pressure	Comments
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					
31					

Appendix 7 – Gas Recovery Production Log

Month _____

Day	Time	Amb Temp	Bar Press	Wind Speed/ Direction	%O2	%N2	%CH4	Inlet VAC	Load (mw)	Plant Flow	Comments
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											
21											
22											
23											
24											
25											
26											
27											
28											
29											
30											
31											

Appendix 8 – Spare Parts

Description	Part Number	Quantity
SEAL-O-RING	033-6031	4
SEAL-O-RING	061-9456	4
PLUG	090-9019	1
SEAL-O-RING	095-1674	20
BOLT HEAD	0S-1590	4
BEARING	107-7330	1
GASKET	107-8505	2
SEAL-O-RING	109-2332	4
GASKET CYLINDER HEAD	110-6991	20
SPACER PLATE	110-6994	4
GASKET	111-1349	1
GASKET	111-5822	2
GEAR	116-3242	1
GASKETS	122-8856	4
BOLT HEAD	131-0420	8
SEAL-O-RING	131-3718	2
GASKET	136-3246	4
SEAL-O-RING	136-7226	8
PIN PISTON	138-8506	1
REG WATER TEMP 120C	142-9675	10
ROD AS	144-0725	1
GASKET PLATE	144-5692	20
GASKET	146-7386	2
BELLOWS	153-4045	2
SEAL-O-RING	153-4906	5
SEAL	154-7477	4
BOLT M8X1.25X25-MM	156-2603	8
PLUG	162-0177	1
PIPE PLUG	168-3349	2
SEAL O RING	172-5635	3
SEAL-O-RING	174-3357	4
GASKET	186-2558	4
GASKET	190-5082	2
SEAL INTEGRAL	192-2262	2
HOSE	195-4403	4
GASKET	197-8120	2
PLUG PIPE	1A-5822	1
GASKET	1A-9066	1
BOLT	1B-2790	10
WASHER	1B-4218	2
BOLT 5/16-18X1.25	1B-7182	10

Description	Part Number	Quantity
BOLT 5/16-18X1.625	1H-5514	10
SCREEN	1W-1564	1
RETAINER	1W-4188	2
SCREW ADJUSTER	200-2003	4
ELBOW	200-6407	1
FLANGE	200-6409	1
SEAL O RING	200-6410	10
GASKET	200-6547	4
MAN-EXH-LH	200-6551	2
MAN-EXH-RH	200-6552	2
CAP	200-6553	1
BELLOWS	200-6554	2
SEAL	200-6555	15
SHAFT	201-8290	1
BASE ROCKER	201-8292	1
ROCKER ARM	201-8296	1
ROCKER ARM	201-8301	1
SEAL	203-4571	5
GASKET	203-7859	22
SEAL-O-RING	203-9745	10
GASKET	204-3506	20
SEAL	204-5426	80
SEAL	204-5427	80
CLAMP ASSY	204-6472	2
GASKET	205-9127	8
SEAL	206-5988	20
ADAPTER	207-1316	4
ADAPTER	207-1317	1
SEAL	208-2362	4
SEAL	208-2363	4
GASKET	209-1823	3
LINER	211-7826	2
SEAL O RING	213-9397	4
REG WATER SSC DEG	219-3306	4
SEAL-O-RING	219-7000	8
SEAL	220-7191	2
COVER VALVE	222-1962	2
GASKET	226-7485	4
BELLOWS	227-9027	2
ELBOW	230-3411	1
SEAL-O-RING	235-3546	3
SEAL-O-RING	235-3548	4
PUMP GRP WATER	235-4535	1
GASKET	235-5751	2
GASKET	239-1038	2

Description	Part Number	Quantity
ADAPTER	241-6953	8
COVER BASE BREATHER	244-5626	1
CLAMP	244-8861	6
GASKET	247-3796	2
REG TEMP 98C DEG	247-7133	8
PLUG	252-5060	2
NEW TURBO	254-0789	1
SEAL	255-6466	4
BRIDGE	256-4367	2
SEAL O RING	259-4596	2
TUBE AS OIL JET	260-0135	1
SEAL	261-7952	4
SEAL	261-7954	4
BODY PITON	262-2061	1
RING TOP	262-3066	2
SEAL	262-4568	2
LIFTER	263-6679	2
GASKET	273-3967	1
REGULATOR	273-4069	2
SEAL	2G-6303	2
SEAL-O-RING	2H-3928	3
SEAL-O-RING	2H-3928	2
SEAL-O-RING	2J-0157	42
GASKET	2N-0931	2
SCREW	2N-5842	4
FILTER ENG OIL	2P-4005	8
GASKET	2W-0752	2
RING RETAINER	2W-4005	2
FILTER AIR	2W-4246	2
GEAR	2W-7320	1
CYLINDER HEADS NEW	315-2633	20
SEAL-O-RING	3D-2824	4
PLUG	3E-2331	2
NUT FULL 3/8-16	3E-6916	10
SEAL-O-RING	3J-1907	3
SEAL-O-RING	3J-7354	4
NUT JAM	3J-9196	4
SEAL-O-RING	3K-0360	8
SEAL-O-RING	3P-0654	2
SEAL-O-RING	3P-0655	2
SEAL LIP	3S-9643	10
GASKETS	4B-8407	2
SEAL-O-RING	4J-5477	4
SEAL-O-RING	4K-1388	10

Description	Part Number	Quantity
GASKET	4L-8149	4
GASKETS	4N-0699	2
GASKETS	4N-0933	2
GASKET	4N-1320	2
GASKET	4P-3452	2
SEAL-O-RING	4S-5898	20
RING RETAINER	4W-0530	2
GASKET	4W-3100	2
PUSH ROD	4W-6682	4
PLUG	5F-0304	1
SEAL-O-RING	5F-9657	2
SEAL-O-RING	5H-6734	4
BOLT 3/8-16X5	5L-6887	20
GASKET	5M-0330	4
WASHER	5M-2894	10
BOLT 3/8-16X1.5	5P-0076	10
SEAL-O-RING	5P-0840	40
SEAL-O-RING	5P-5846	3
SEAL-O-RING	5P-7817	1
SEAL-O-RING	5P-7818	1
SEAL-O-RING	5P-8210	4
SEAL-O-RING	5P-8872	1
BOLT 3/8-16X1.75	5P-8880	8
WASHER SEALING	5R-7136	4
WASHER SEALING	5R-7137	4
GASKET	6F-4868	1
SEAL-O-RING	6V-1454	4
SEAL-O-RING	6V-1903	15
SEAL-O-RING	6V-3348	2
SEAL-O-RING	6V-3603	8
SEAL-O-RING	6V-3908	2
SEAL-O-RING	6V-4589	4
SEAL-O-RING	6V-5048	4
SEAL-O-RING	6V-5049	8
SEAL-O-RING	6V-5054	8
SEAL-O-RING	6V-5066	4
SEAL-O-RING	6V-5101	20
SEAL-O-RING	6V-5103	8
SEAL-O-RING	6V-5134	4
SEAL-O-RING	6V-5139	4
SEAL-O-RING	6V-5778	4
SEAL-O-RING	6V-6609	4
SEAL-O-RING	6V-7351	1
SEAL-O-RING	6V-7681	2
SEAL-O-RING	6V-8398	10

Description	Part Number	Quantity
REDUCER-O-RING	6V-8942	6
SEAL-O-RING	6V-9746	20
SEAL-O-RING	6V-9769	20
WASHER	7C-3258	1
SHAFT	7C-3259	1
SEAL-RING	7E-2326	4
GASKET	7E-6016	6
SEAL-O-RING	7J-0204	4
SEAL-O-RING	7J-9108	6
BOLT 3/8-16X2.25	7L-6443	8
SEAL-O-RING	7M-8485	6
SEAL-O-RING	7N-2046	9
BOLT ROD	7N-2405	4
GASKET	7N-3368	2
GASKETS	7N-4320	1
SPRING LIFTER GUIDE	7N-4782	2
GASKET	7N-4945	2
GASKET	7N-5057	1
OIL RING	7W-2221	2
SEAL-O-RING	7X-1547	2
SEAL-O-RING	7X-4805	3
PLUG	7X-7731	2
VALVE AS SAMPLING	8C-3446	2
SEAL	8C-5196	20
CONNECTOR	8C-6866	1
BUTTON VALVE	8F-8858	2
SEAL-O-RING	8L-2786	2
SEAL-O-RING	8L-9241	4
RING INTER	8N-1234	2
RETAINING RING	8N-1991	2
BAND-FILLER	8N-4707	2
RETAINER PIN	8N-7296	2
SEAL-O-RING	8T-1919	6
SEAL-O-RING	8T-2928	2
SEAL-O-RING	8T-2929	2
PLUG	8T-6761	1
PLUG PIPE	8T-6762	1
PLUG PIPE	8T-6763	1
PLUG PIPE	8T-6765	1
PLU PIPE	8T-6766	1
BOLT 12 PT	8T-7581	2
RING RETAINER	9F-7707	2
GASKET	9F-8127	2
GASKET	9L-1480	2
BOLT 3/8-16X2	9L-7373	20

Description	Part Number	Quantity
NUT 3/8-24	9L-7712	2
WASHER	9M-1974	10
SEAL-O-RING	9M-2092	4
PLUG	9S-4182	2
PLUG O RING	9S-4185	2
PLUG	9S-4190	1
PLUG	9S-8002	1
PLUG O RING	9S-8004	2
PLUG	9S-8005	2
PLUG	9S-8007	1
PLUG O RING	9S-8008	2
PLUG	9S-8009	1
NUT 3/8-16	9S-8752	6
NUT 3/8-16X3.5	9X-2068	4
SEAL-O-RING	9X-7371	1
SEAL	9X-7523	4
SEAL	9X-7538	2
SEAL O RING	9X-7562	4
GASKET	9Y-6893	4
GASKET	9Y-8069	2
GASKET	9Y-8387	4
GASKET	9Y-8388	1
BOLT	OS-1590	4
BOLT 3/8-16X1.5	OS-1591	10
SERVICE	REN5975	1
PARTS	SEBP3872	1

ELECTRICAL PARTS		
Description	Part Number	Quantity
SPEED SENSOR	102-9029	2
PRES SWITCH	110-1168	2
SENSOR MAIN AIR PRESSURE	130-8299	2
SENSOR TEMP	130-9811	2
SENSOR PRESSURE	149-5150	2
EXTENSION	150-2050	20
SENSOR GRP PRESSURE	163-8523	3
KIT	171-6721	1
CONTROL GRP	176-1286	1
TRANSFORMER ASSY	191-9346	8
	194-6724	1
DETONATION	195-2431	3
TEMP SENSOR	207-2371	4
C-BREAKER	207-8496	2
C-BREAKER	207-8497	2
C-BREAKER	207-8498	2
SEAL	231-9892	1
BAR BUSS (NONE ON HAND)(NONE FOUND OR ON HAND)	233-7424	1
VOLTAGE REGULATOR	235-5725	1
SPARK PLUG (CHECK TO SEE IF THIS IS MOST CURRENT NUMBER)	243-4291	80
CONTROL GROUP BRAIN	256-7635	2
HARNESS	261-5678	1
SENSOR GP AIR	261-5731	2
SEAL-O-RING	6V-5048	3
SEAL	8L-2786	2
TOGGLE SWITCH	BN-0694	1
SWITCH	9F-3099	2
SPEED SENSOR MAG	9X-5392	1